

# TECHNICAL ANALYSIS



**The  
Complete Resource  
for Financial Market  
Technicians**

CHARLES D. KIRKPATRICK • JULIE R. DAHLQUIST



FINANCIAL TIMES

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# TECHNICAL ANALYSIS

THE COMPLETE RESOURCE  
FOR FINANCIAL MARKET TECHNICIANS

**Charles D. Kirkpatrick II, CMT**  
**Julie R. Dahlquist, Ph.D.**

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*Charles Kirkpatrick  
Durango, CO  
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# **PART I**

## **INTRODUCTION**

**CHAPTER 1 INTRODUCTION TO TECHNICAL ANALYSIS**

**CHAPTER 2 THE BASIC PRINCIPLE OF TECHNICAL ANALYSIS—THE TREND**

**CHAPTER 3 HISTORY OF TECHNICAL ANALYSIS**

**CHAPTER 4 THE TECHNICAL ANALYSIS CONTROVERSY**

# INTRODUCTION TO TECHNICAL ANALYSIS

Technical analysis. These words may conjure up many different mental images. Perhaps you think of the stereotypical technical analyst, alone in a windowless office, slouched over stacks of hand-drawn charts of stock prices. Or, maybe you think of the sophisticated multicolored computerized chart of your favorite stock you recently saw. Perhaps you begin dreaming about all the money you could make if you knew the secrets to predicting stock prices. Or, perhaps you remember sitting in a finance class and hearing your professor say that technical analysis "is a waste of time." In this book, we examine some of the perceptions, and misperceptions, of technical analysis.

If you are new to the study of technical analysis, you may be wondering just what technical analysis is. In its basic form, technical analysis is the study of past market data, primarily price and volume data; this information is used to make trading or investing decisions. Technical analysis is rooted in basic economic theory. Consider the basic assumptions presented by Robert D. Edwards and John Magee in the classic book, *Technical Analysis of Stock Trends*:

- Stock prices are determined solely by the interaction of demand and supply.
- Stock prices tend to move in trends.
- Shifts in demand and supply cause reversals in trends.
- Shifts in demand and supply can be detected in charts.
- Chart patterns tend to repeat themselves.

Technical analysts study the action of the market itself rather than the goods in which the market deals. The technical analyst believes that "the market is always correct." In other words, rather than trying to consider all the factors that will influence the demand for Gadget International's newest electronic gadget and all the items that will influence the company's cost and supply curve to determine an outlook for the stock's price, the technical analyst believes that all of these factors are already factored into the demand and supply curves and, thus, the price of the company's stock.

Students new to any discipline often ask, "How can I use the knowledge of this discipline?" Students new to technical analysis are no different. Technical analysis is used in two major ways: predictive and reactive. Those who use technical analysis for predictive purposes use the analysis to make predictions about future market moves. Generally, these individuals make money by selling their predictions to others. Market letter writers in print or on the web and the technical market gurus who frequent the financial news fall into this category. The predictive technical analysts include the more well-known names in the industry; these individuals like publicity because it helps market their services.

On the other hand, those who use technical analysis in a reactive mode are usually not well known. Traders and investors use techniques of technical analysis to react to particular market conditions to make their decisions. For example, a trader may use a moving average crossover to signal when a long position should be taken. In other words, the trader is watching the market and reacting when a certain technical condition is met. These traders and investors are making money by making profitable trades for their own or clients' portfolios. Some of them may even find that publicity distracts them from their underlying work.

The focus of this book is to explain the basic principles and techniques for reacting to the market. We do not attempt to predict the market, nor do we provide you with the Holy Grail or a promise of a method that will make you millions overnight. Instead, we want to provide you with background, basic tools, and techniques that you will need to be a competent technical analyst.

As we will see when we study the history of technical analysis, the interest in technical analysis in the U.S. dates back over 100 years, when Charles H. Dow began writing newsletters that later turned into the *Wall Street Journal* and developing the various Dow averages to measure the stock market. Since that time, much has been written about technical analysis. Today, there are entire periodicals, such as *Technical Analysis of Stock and Commodities* and the *Journal of Technical Analysis*, devoted to the study of the subject. In addition, there are many articles appearing in other publications, including academic journals. There are even a number of excellent books on the market. As you can see from this book's extensive bibliography, which is in no way a complete list of every published item on technical analysis, a massive quantity of material about technical analysis exists.

So, why does the world need another book on technical analysis? We began looking through the multitude of materials on technical analysis a few years ago, searching for resources to use in educational settings. We noticed that many specialized books existed on the topic, but there was no resource to provide the student of technical analysis with a comprehensive summation of the body of knowledge. We decided to provide a coherent, logical framework for this material that could be used as a textbook and a reference book.

Our intent in writing this book is to provide the student of technical analysis, whether a novice college student or an experienced practitioner, with a systematic study of the field of technical analysis. Over the past century, much has been written about the topic. The classic works of Charles Dow and the timeless book by Edwards and Magee still contain valuable information for the student of technical analysis. The basic principles of these early authors are still valid today. However, the evolving financial marketplace and the availability of computer power have led to a substantial growth in the tools and information available to the technical analyst.

Many technical analysts have learned their trade from the mentors with whom they have worked. Numerous individuals who are interested in studying technical analysis today, however, do not have access to such a mentor. In addition, as the profession has advanced, many specific techniques have developed. The result is that the techniques and methods of technical analysis often appear to be a hodge-podge of tools, ideas, and even folklore, rather a part of a coherent body of knowledge.

Many books on the market assume a basic understanding of technical analysis or focus on particular financial markets or instruments. Our intent is to provide the reader with a basic reference to support a life-long study of the discipline. We have attempted to provide enough background information and terminology that you can easily read this book without having to refer to other references for background information. We have also included a large number of references for further reading so that you can continue learning in the specialized areas that interest you.

Another unique characteristic of this book is the joining of the practitioner and the academic. Technical analysis is widely practiced, both by professional traders and investors and by individuals managing their own money. However, this widespread practice has not been matched by academic acknowledgment of the benefits of technical analysis. Academics have been slow to study technical analysis; most of the academic studies of technical analysis have lacked a thorough understanding of the actual practice of technical analysis. It is our hope not only to bring together a practitioner-academic author team but also to provide a book that promotes discussion and understanding between these two groups.

Whether you are a novice or experienced professional, we are confident that you will find this book helpful. For the student new to technical analysis, this book will provide you with the basic knowledge and building blocks to begin a life-long study of technical analysis. For the more experienced technician, you will find this book to be an indispensable guide, helping you to organize your knowledge, question your assumptions and beliefs, and implement new techniques.

We begin this book with a look at the background and history of technical analysis. In this part, we discuss not only the basic principles of technical analysis but also the technical analysis controversy—the debate between academics and practitioners regarding the efficiency of financial markets and the merit of technical analysis. This background information is especially useful to those who are new to technical analysis and those who are studying the subject in an educational setting. For those with more experience with the field or with little interest in the academic arguments about market efficiency, a quick reading of this first part will probably suffice.

In the second part of the book, we focus on markets and market indicators. Chapter 5, "An Overview of Markets," provides a basic overview of how markets work. Market vocabulary and trading mechanics are introduced in this chapter. For the student who is unfamiliar with this terminology, a thorough understanding of this chapter will provide the necessary background for the remaining chapters. Our focus in Chapter 6, "Dow Theory," is on the development and principles of Dow Theory. Although Dow Theory was developed a century ago, much of modern-day technical analysis is based on these classic principles. A thorough understanding of these timeless principles helps keep the technical analyst focused on the key concepts that lead to making money in the market. In Chapter 7, "Sentiment," we focus on sentiment; the psychology of market players is a major concept in this chapter. In Chapter 8, "Measuring Market Strength," we discuss methods for gauging overall market strength. Chapter 9, "Temporal Patterns and Cycles," focuses on temporal tendencies, the tendency for the market to move in particular directions during particular times, such



as election year cycles and seasonal stock market patterns. Because the main fuel for the market is money, Chapter 10, "Flow of Funds," focuses on the flow of funds. In this chapter, we look at measures of market liquidity and how the Federal Reserve can influence liquidity.

The third part of the book focuses on trend analysis. In many ways, this part can be thought of as the heart of technical analysis. If we see that the market is trending upward, we can profitably ride that trend upward. If we determine that the market is trending downward, we can even profit by taking a short position. In fact, the most difficult time to profit in the market is when there is no definitive upward or downward trend. Over the years, technical analysts have developed a number of techniques to help them visually determine when a trend is in place. These charting techniques are the focus of Chapter 11, "History and Construction of Charts." In Chapter 12, "Trends—The Basics," we discuss how to draw trend lines and determine support and resistance lines using these charts. In Chapter 13, "Breakouts, Stops, and Retracements," we focus on determining breakouts. These breakouts will help us recognize a trend change as soon as possible. We also discuss the importance of protective stops in this chapter. Moving averages, a useful mathematical technique for determining the existence of trends, are presented in Chapter 14, "Moving Averages."

The fourth part of this book focuses on chart pattern analysis—the item that first comes to mind when many people think of technical analysis. In Chapter 15, "Bar Chart Patterns," we cover classic bar chart patterns; in Chapter 16, "Point-and-Figure Chart Patterns," we focus on point-and-figure chart patterns. Short-term patterns, including candlestick patterns, are covered in Chapter 17, "Short-Term Patterns."

Part V, "Trend Confirmation," deals with the concept of confirmation. We consider price oscillators and momentum measures in Chapter 18, "Confirmation." Building upon the concept of trends from earlier chapters, we look at how volume plays a role in confirming the trend, giving us more confidence that a trend is indeed occurring.

Next, we turn our attention to the relationship between cycle theory and technical analysis. In Chapter 19, "Cycles," we discuss the basic principles of cycle theory and the characteristics of cycles. Some technical analysts believe that cycles seen in the stock market have a scientific basis; for example, R. N. Elliott claimed that the basic harmony found in nature occurs in the stock market. Chapter 20, "Elliott, Fibonacci, and Gann," introduces the basic concepts of Elliott Wave Theory, a school of thought that adheres to Elliott's premise that stock price movements form discernible wave patterns.

Once we know the basic techniques of technical analysis, the question becomes, "Which particular securities will we trade?" Selection decisions are the focus of Chapter 21, "Selection of Markets and Issues: Trading and Investing." In this chapter, we discuss the intermarket relationships that will help us determine on which market to focus by determining which market is most likely to show strong performance. We also discuss individual security selection, measures of relative strength, and how successful practitioners have used these methods to construct portfolios.

As technical analysts, we need methods of measuring our success. After all, our main objective is making money. Although this is a straightforward objective, determining whether we are meeting our objective is not quite so straightforward. Proper measurement of trading and investment strategies requires appropriate risk measurement and an understanding of basic statistical techniques. The last couple of chapters help put all the tools and techniques we present

throughout the book into practice. Chapter 22, "System Design and Testing," is devoted to developing and testing trading systems. At this point, we look at how we can test the tools and indicators covered throughout the book to see if they will make money for us—our main objective—in the particular way we would like to trade. Finally, Chapter 23, "Money and Risk Management," deals with money management and avoiding capital loss.

For those who need a brush-up in basic statistics or wish to understand some of the statistical concepts introduced throughout the book, Dr. Richard J. Bauer, Jr. (Professor of Finance, Bill Greehey School of Business, St. Mary's University, San Antonio, TX) provides a tutorial on basic statistical techniques of interest to the technical analyst in Appendix A, "Basic Statistics."

For those who are unfamiliar with the terms and language used in trading, Appendix B provides brief definitions of specific order types and commonly used terms in order entry.

As with all skills, learning technical analysis requires practice. We have provided a number of review questions and problems at the end of the chapters to help you begin thinking about and applying some of the concepts on your own. The extensive bibliography will direct you to further readings in the areas of technical analysis that are of particular interest to you.

Another way of honing your technical skills is participating in a professional organization that is focused on technical analysis. In the United States, the Market Technicians Association (MTA) provides a wide variety of seminars, lectures, and publications for technical analysis professionals. The MTA also sponsors the Chartered Market Technician (CMT) program. Professionals wishing to receive the prestigious CMT designation must pass three examinations and adhere to a strict code of professional conduct. More information about the MTA and the CMT program may be found at the web site: [www.mta.org](http://www.mta.org). The International Federation of Technical Analysts, Inc. (IFTA) is a global organization of market analysis societies and associations. IFTA, and its member associations worldwide, sponsor a number of seminars and publications. IFTA offers a professional certification, the Certified Financial Technician, and a Masters-level degree, the Master of Financial Technical Analysis. The details of these certifications, along with contact information for IFTA's member associations around the world, can be found at their web site: [www.ifta.org](http://www.ifta.org).

Technical analysis is a complex, ever-expanding discipline. The globalization of markets, the creation of new securities, and the availability of inexpensive computer power are opening even more opportunities in this field. Whether you use the information professionally or for your own personal trading or investing, we hope that this book will serve as a stepping-stone to your study and exploration of the field of technical analysis.

# THE BASIC PRINCIPLE OF TECHNICAL ANALYSIS—THE TREND

## CHAPTER OBJECTIVES

After reading this chapter, you should be able to

- Define the term "trend"
- Explain why determining the trend is important to the technical analyst
- Distinguish between primary, secondary, short-term, and intraday trends
- Discuss some of the basic beliefs upon which technical analysis is built

"The art of technical analysis—for it is an art—is to identify trend changes at an early stage and to maintain an investment position until the weight of the evidence indicates that the trend has reversed." (Pring, 2002)

Technical analysis is based on one major principle—trend. Markets trend. Traders and investors hope to buy a security at the beginning of an uptrend at a low price, ride the trend, and sell the security when the trend ends at a high price. Although this strategy sounds very simple, implementing it is exceedingly complex.

For example, what length trend are we discussing? The trend in stock prices since the Great Depression? The trend in gold prices since 1980? The trend in the Dow Jones Industrial Average (DJIA) in the past year? Or, the trend in Merck stock during the past week? Trends exist in all lengths, from long-term trends that occur over decades to short-term trends that occur minute-to-minute.

Trends of different lengths tend to have the same characteristics. In other words, a trend in annual data will behave the same as a trend in five-minute data. Investors must choose which trend is most important for them based on their investment objectives, their personal preferences, and the amount of time they can devote to watching market prices. One investor may be more concerned about the business cycle trend that occurs over several years. Another investor may be

more concerned about the trend over the next six months, while a third investor may be most concerned about the intraday trend. Although individual investors and traders have investment time horizons that vary greatly, they can use the same basic methods of analyzing trends because of the commonalities that exist among trends of different lengths.

Trends are obvious in hindsight, but ideally, we would like to spot a new trend right at its beginning, buy and then spot its end, and sell. However, this ideal never happens, except by luck. The technical analyst always runs the risk of spotting the beginning of a trend too late and missing potential profit. The analyst who does not spot the ending of the trend holds the security past the price peak and fails to capture all of the profits that were possible. On the other hand, if the analyst thinks the trend has ended before it really has and sells the security, the analyst has then lost potential profits. Therefore, the technical analyst spends a lot of time and brainpower attempting to spot as early as possible when a trend is beginning and ending. This is the reason for studying charts, moving averages, oscillators, support and resistance, and all the other techniques we explore in this book.

The fact that market prices trend has been known for thousands of years. Specific records are available from the eighteenth century in Japan. Academics have disputed that markets tend to trend because if it were true, it would spoil their theoretical models. Recent academic work has shown that the old financial models have many problems when applied to the behavior of real markets. In Chapter 4, "The Technical Analysis Controversy," we discuss some of the new academic findings about how market prices behave and some of the evidence against the old finance theories. Academics and others traditionally have scorned technical analysis as if it were a cult, but as it turns out, the almost religious belief in the Efficient Markets Hypothesis has become a cult itself, with adherents unwilling to accept the enormous amount of evidence against it. In fact, technical analysis is very old, developed through practical experience with the trading markets, and has resulted in some sizeable fortunes for those following it.

## **How DOES THE TECHNICAL ANALYST MAKE MONEY?**

There are several requirements needed to convert pure technical analysis into money. The first and most important, of course, is to determine when a trend is beginning or ending. The money is made by "jumping" on the trend as early as possible. Theoretically, this sounds simple, but profiting consistently is not so easy.

The indicators and measurements that technical analysts use to determine the trend are not crystal balls that perfectly predict the future. Under certain market conditions, these tools may not work. Also, a trend may suddenly change direction without warning. Thus, it is imperative that the technical investor be aware of risks and protect against such occurrences causing losses.

From a strategic standpoint, then, the technical investor must decide two things: First, the investor or trader must choose when to enter a position, and second, he or she must choose when to exit a position. Choosing when to exit a position is composed of two decisions. The investor must choose when to exit the position to capture a profit when price moves in the expected direction. The investor must also choose when to exit the position at a loss when price moves opposite

from what was expected. The wise investor is aware of the risk that the trend may differ from what he or she expected. Making the decision of what price level to sell and cut losses before even entering into a position is a way in which the investor protects against large losses.

One of the great advantages in technical analysis, because it studies prices, is that a price point can be established at which the investor knows that something is wrong either with the analysis or the financial asset's price behavior. Risk of loss can therefore be determined and quantified right at the beginning of the investment. This ability is not available to other methods of investment. Finally, because actual risk can be determined, money management principles can be applied that will lessen the chance of loss and the risk of what is called "ruin."

In sum, the basic ways to make money using technical methods are

- "The trend is your friend"—play the trend.
- Don't lose—control risk.
- Manage your money—avoid ruin.

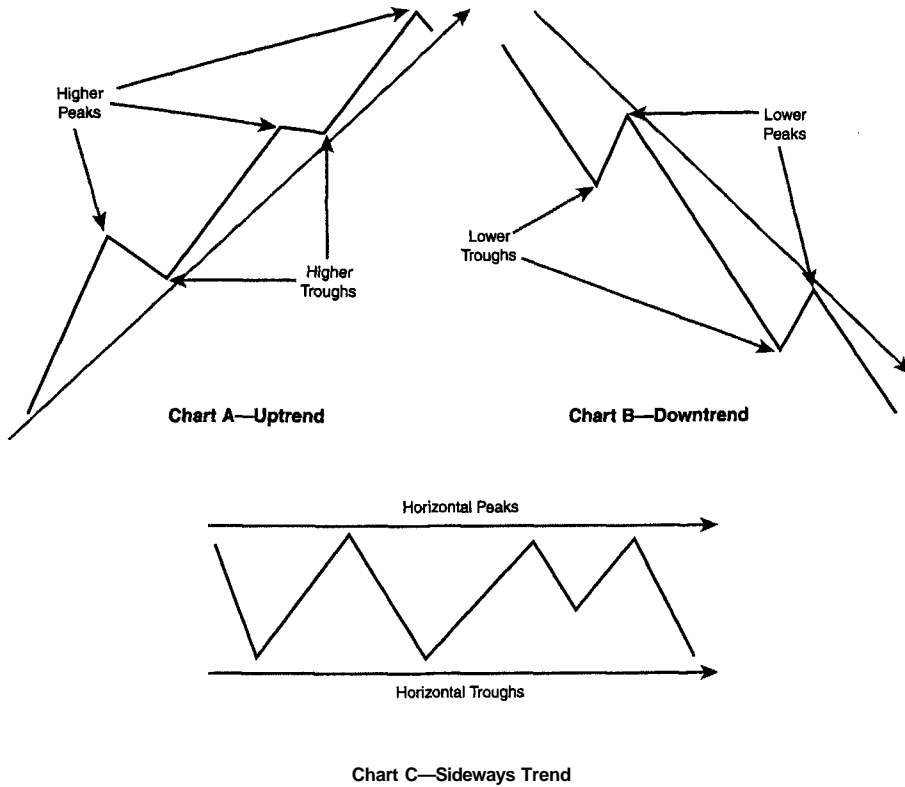
Technical analysis is used to determine the trend, when it is changing, when it has changed, when to enter a position, when to exit a position, and when the analysis is wrong and the position must be closed. It's as simple as that.

## **WHAT IS A TREND?**

What exactly is this "trend" that the investor wants to ride to make money? A rising trend, or "uptrend," occurs when prices reach higher peaks and higher troughs. An uptrend looks something like Chart A in Figure 2.1. A declining trend, or "downtrend," is the opposite—when prices reach lower troughs and lower peaks. Chart B in Figure 2.1 shows this downward trend in price. A sideways or flat trend occurs when prices trade in a range without significant underlying upward or downward movement. Chart C in Figure 2.1 is an example of a sideways trend; prices move up and down but on average remain at the same level.

Figure 2.1 shows a theoretical example of an uptrend, downtrend, and sideways trend. But, defining a trend in the price of real-world securities is not quite that simple. Price movement does not follow a continuous, uninterrupted line. Small counter-trend movements within a trend can make the true trend difficult to identify at times. Also, remember that there are trends of differing lengths. Shorter-term trends are parts of longer-term trends.

From a technical analyst's perspective, a trend is a directional movement of prices that remains in effect long enough to be identified and still be playable. Anything less makes technical analysis useless. If a trend is not identified until it is over, we cannot make money from it. If it is unrecognizable until too late, we cannot make money from it. In retrospect, looking at a graph of prices, for example, many trends can be identified of varying length and magnitude, but such observations are observations of history only. A trend must be recognized early and be long enough for the technician to profit from it.



**FIGURE 21** The trend

### How ARE TRENDS IDENTIFIED?

There are a number of ways to identify trends. One way to determine a trend in a data set is to run a linear least-squares regression. This statistical process will provide information about the trend in security prices. Unfortunately, this particular statistical technique is not of much use to the technical analyst for trend analysis. The regression method is dependent on a sizeable amount of past price data for accurate results. By the time enough historical price data is accumulated, the

trend is likely beginning to change direction. Despite the tendency for trends to be persistent enough to profit from, they never last forever.

### **BOX 2.1 Linear Least Squares Regression**

Most spreadsheet software includes a formula for calculating a linear regression line. It uses two sets of related variables and calculates the "best fit" between the data and an imaginary straight (linear) line drawn through the data. In standard price analysis, the two variable data sets are time and price—day d1 and price X1, day d2 and price X2, and so forth. By fitting a line that best describes the data series, we can determine a number of things. First, we can measure the amount by which the actual data varies from the line and thus the reliability of the line. Second, we can measure the slope of the line to determine the rate of change in prices over time, and third, we can determine when the line began. The line represents the trend in prices over the period of the line. It has many useful properties that we will look at later, but for now, all we need to know is that the line defines the trend over the period studied.

Many analysts use moving averages to smooth out the shorter and smaller trends within the trend of interest and identify the longer trends. We will discuss the use of moving averages in Chapter 13, "Breakouts, Stops, and Retracements."

Another method of identifying trends is to look at a graph of prices for extreme points, tops, and bottoms, separated by reasonable time periods, and to draw lines between these extreme points (see Figure 2.2). These lines are called "trend lines." This traditional method is an outgrowth of the time before computer graphic software when trend lines were hand-drawn. It still works, however. Using this method to define trends, you must define extreme points. We will cover several methods of determining extreme points in Chapter 12, "Trends—The Basics," but most extreme points are obvious on a graph of prices. By drawing lines between them, top to top and bottom to bottom, we get a "feeling" of price direction and limits. We also get a "feeling" of slope, or the rate of change in prices. Trend lines can define limits to price action, which, if broken, can warn that the trend might be changing.

## **WHY DO MARKETS TREND?**

Why do markets trend? No one knows for sure. Recently there has been much study of human emotion and behavior in an effort to understand why traders and investors act the way they do, often emotionally, with biases developed and inherited, and irrationally. But no model of investor behavior has yet been developed.

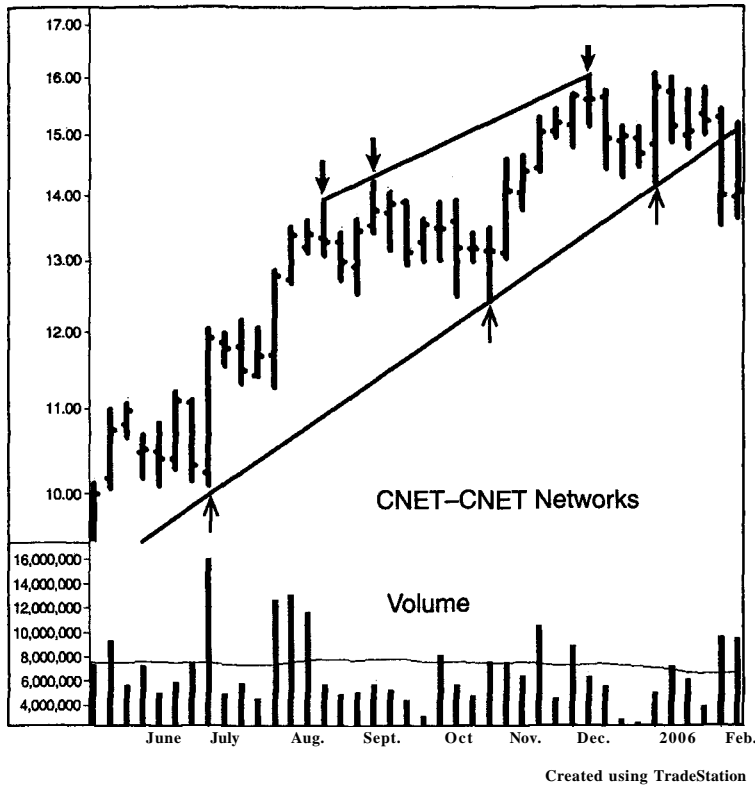


FIGURE 22 Hand-drawn trend lines from top to top and bottom to bottom

As in all markets, whether used cars, grapefruit, real estate, or industrial products, the economic principle that the interaction of supply and demand determines prices applies to trading markets. Each buyer (demand) bids for a certain quantity at a certain price, and each seller (supply) offers or "asks" for a certain quantity at a certain price. When the buyer and seller agree and transact, they establish a price for that instant in time. The reasons for buying and selling can be complex—perhaps the seller needs the money, perhaps the seller has learned of unfavorable information, perhaps the buyer heard a rumor at the golf club locker room—whatever the reason, the price is established when all of this information is collected, digested, and acted upon through the bid and offer.

Price, therefore, is the end result of all those inexact factors, and it is the result of the supply and demand at that instant in time. When prices change, the change is due to a change in demand and/or supply. The seller may be more anxious; the buyer may have more money to



invest; whatever the reason, the price will change and reflect this change in supply or demand. The technical analyst, therefore, watches price and price change and doesn't particularly worry about the reasons, largely because they are indeterminable.

It has long been observed that prices don't change immediately. Instead, they trend. Fortunately, they do trend. Otherwise, technical analysts would not be able to make money. Again, why do they trend? Obviously, they trend because the changes in supply and demand don't react immediately either. They tend to trend, too. In addition, remember that many players for many reasons determine supply and demand. In the trading markets, supply and demand may come from long-term investors accumulating or distributing a large position or from a small, short-term trader trying to scalp a few points. The number of players and the number of different reasons for their participation in supply and demand is close to infinite. Thus, the technical analyst believes it is futile to analyze supply and demand except through the prices it creates. Prices are readily available, are extremely accurate, have historic records, and are specific. What better basis is there for study than this important variable? Furthermore, when one invests or trades, the price is what determines profit or loss, not corporate earnings, or Federal Reserve policy. The bottom line, to the technical analyst, is that price is what determines success, and fortunately, for whatever reasons, prices tend to trend.

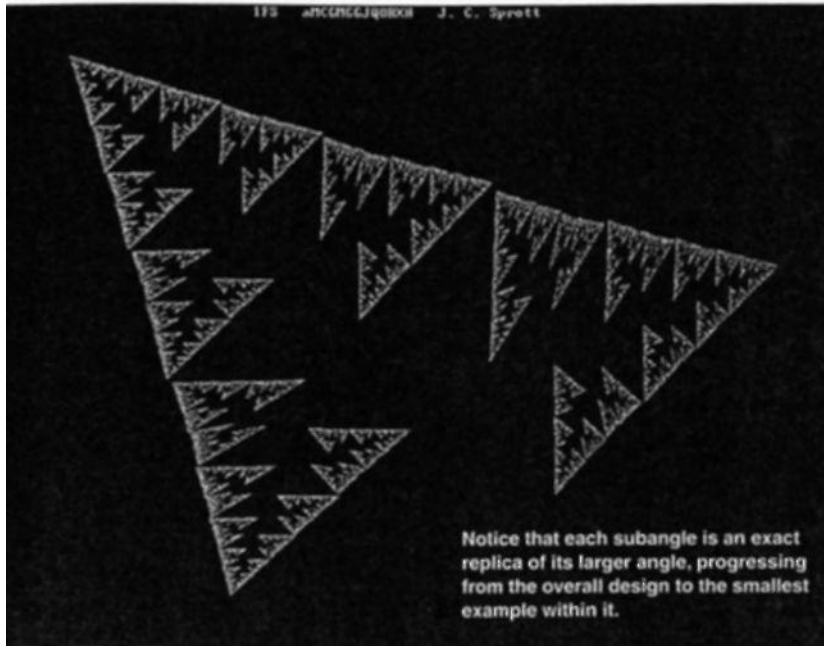
## WHAT TRENDS ARE THERE?

The number of trend lengths is large. Investors and traders need to determine which length they are most interested in, but the methods of determining when a trend begins and ends are the same regardless of length. This ability for trends to act similarly over different periods is called the "fractal" nature of trends. Fractal patterns or trends exist in nature along shorelines, in snowflakes, and elsewhere. For example, a snowflake is always six-sided, having six branches, if you will. Each branch has a particular, unique pattern made of smaller branches. Using a microscope to look closely at the snowflake, we see that the smaller branches off each larger branch have the same form as the larger branch. This same shape carries to even smaller and smaller branches, each of which has the same pattern as the next larger. This is the fractal nature of snowflakes. The branches, regardless of size, maintain the same pattern. Figure 2.3 shows a computer-generated fractal with each subangle an exact replica of the next larger angle.

The trading markets are similar in that any period we look at—long, medium, or very short—produces trends with the same characteristics and patterns as each other. Thus, for analysis purposes, the length of the trend is irrelevant because the technical principles are applicable to all of them. The *trend length of interest* is determined solely by the time horizon of the investor or trader.

This is not to say that different trend lengths should be ignored. Because shorter trends make up longer trends, any analysis of a trend of interest must include analysis of the longer and shorter trends around it. For example, the trader interested in ten-week trends should also analyze trends longer than ten weeks because a longer trend will affect the shorter trend. Likewise, a trend shorter than ten weeks should be analyzed because it will often give early signals of a change in

direction in the larger ten-week trend. Thus, whatever trend the trader or investor selects as the trend of interest, the trends of the next longer and next shorter periods should also be analyzed.



Courtesy of Dr. J.C. Sprott (<http://sprott.physics.wisc.edu/fractals.htm>)

**FIGURE 2J** Example of computer-generated fractal

For identification purposes, technical analysts have divided trends into several broad, arbitrary categories. These are the *primary* trend (measured in months or years), the *secondary* or *intermediate* trend (measured in weeks or months), the *short-term* trend (measured in days), and the *intraday* trend (measured in minutes or hours). Except for the intraday trend, Charles H. Dow, founder of the Dow Jones Company and the *Wall Street Journal*, first advanced this division in the nineteenth century. Charles Dow also was one of the first to identify technical means of determining when the primary trend had reversed direction. Because of his major contributions to the field, Dow is known as the "Father" of technical analysis. We will look more closely at Dow's contributions in Chapter 3, "History of Technical Analysis," as we study the history of technical analysis, and in Chapter 6, "Dow Theory."

## WHAT OTHER ASSUMPTIONS DO TECHNICAL ANALYSTS MAKE?

That markets trend is the basic principle underlying the theory of technical analysis. Of course, it is the price of the securities that are being monitored that form the trend. Supporting this notion of trending prices, technical analysts have made several other assumptions that we will cover briefly.

First, technical analysts assume that *price is determined by the interaction of supply and demand*. As basic economic theory teaches, when demand increases, price goes up, and when demand decreases, price goes down. One of the factors that determine supply and demand is buyer and seller *expectations*. (You do not buy a stock unless you expect it to rise in price.) Expectations result from human decisions, and decisions are based on information (perceived, accurate, or otherwise), emotions (greed, fear, and hope), and cognitive limitations such as behavioral bias. The causes for the demand or supply are numerous and mostly irrelevant to the technician. The technician looks at prices to determine when the relationship between supply and demand is apparently changing and, thus, when the specific price trend direction is likely to change.

Second, technical analysts assume that *price discounts everything*. Price discounts all information, related to the security or otherwise, as well the interpretation of expectations derived from that information. This concept was first articulated by Charles H. Dow, later reemphasized by William Peter Hamilton in his *Wall Street Journal* editorials, and succinctly described by Robert Rhea (1932), a prominent Dow Theorist, when writing about stock market averages:

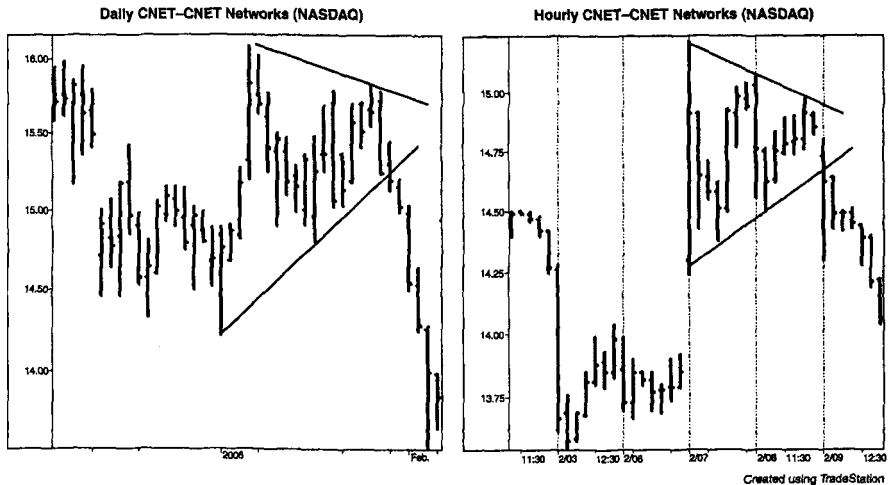
The Averages discount everything: The fluctuations of the daily closing prices of the Dow-Jones rail and industrial averages afford a composition index of all the hopes, disappointments, and knowledge of everyone who knows anything of financial matters, and for that reason the effects of coming events (excluding acts of God) are always properly anticipated in their movement. The averages quickly appraise such calamities as fires and earthquakes.

This sounds a little like Eugene Fama's (1970) famous statement related to the Efficient Markets Hypothesis (EMH) that "prices fully reflect all available information." However, Fama was referring more to information on the specific security and was presuming that all interpretation of that information was rational and immediate. Although technical assumptions include the price discount assumption of EMH adherents, they go far beyond that simplicity. They include not only information, both about the security and about all other outside factors that might influence that security price, but also the interpretation of that information, which may or may not be rational or directly related, and the expectations derived from that information. Interpretation, according to technical analysis, is subject to "irrational exuberance" and will "drive men to excess" as well as to a "corresponding depression" (Hamilton, 1922).

An important corollary to the notion that markets trend is the technical analyst's belief that *prices are nonrandom*. As we will address further in Chapter 4, if prices are nonrandom, past prices can be used to predict future price trends. Technical analysts reject the notion that stock prices are random and thus entirely independent of each other.

Technical analysis assumes that *history, in principle, will repeat itself* (or as Mark Twain said, "History rhymes: It does not repeat"), and that humans will behave similarly to how they have in the past in similar circumstances. *Prices, as determined by these people, thus tend to form into patterns that have predictable results.* These patterns are believed to be the result of trader or investor psychology but are statistically difficult to prove. They are almost never identical and are thus subject to interpretation, with all its own biased problems, by the technical analyst. This is the most controversial aspect of technical analysis, as well as its most long-standing, and it is only recently being investigated with sophisticated statistical methods (see Chapter 4).

Technical analysts also believe that, like trend lines, these *patterns are fractal* (see Figure 2.4). Each investor or trader has a specific time frame in which he or she operates. Interestingly, regardless of period, patterns occur with very similar, though not identical, shapes and characteristics. Thus, one who is watching five-minute bar charts will observe the same patterns that one watching monthly bar charts will see. These patterns suggest that the behavior that produces them is dependent also on the participants' period of interest. A pattern in a five-minute bar chart, for example, is the result of other traders with a five-minute bar chart time horizon. Monthly investors would have very little effect on the five-minute bar chart, as five-minute traders would have almost no effect on the monthly bar chart. Thus, each group of participants, as defined by their investment period, has its own little world of patterns that may or may not affect each other but will be similar in shape. Pattern analysis is therefore universal with respect to time.



Notice that the patterns are almost identical, yet they occur over different time intervals, one with daily bars and the other with hourly bars. The development of the pattern, the shape of the pattern, and the final breakdown are very similar. These patterns are said to be "fractal" in that they occur irrespective of time.

**FIGURE 24** Daily and hourly charts showing the same formation in the same stock over different periods

Technical analysis is also based on the notion that emotions and investor behavior influence security prices. *Two basic human emotions—fear and greed—affect investors' and traders' decisions.* Investors tend to become overly optimistic or overly pessimistic based on immediate past price history. Technical analysis presumes that prices will expand beyond equilibrium for emotional reasons and eventually will revert to the mean and then expand beyond the mean in the opposite direction, constantly oscillating back and forth with excessive investor sentiment.

## CONCLUSION

The focus of this chapter has been on the importance of understanding price trends to the practice of technical analysis. We have introduced some of the basic assumptions and beliefs of technical analysts. As we go through the next few chapters, we will address each of these assumptions in more detail. Some of the basic beliefs that technical analysis is built on and that we will be building upon throughout this book are as follows:

- The interaction of supply and demand determine price.
- Supply and demand are affected by investors' emotions, particularly fear and greed.
- Price discounts everything.
- Prices trend.
- Recognizable patterns form within trends.
- Patterns are fractal.

## REVIEW QUESTIONS

1. Explain why the notion that prices trend is central to the practice of technical analysis.
2. The earlier an uptrend can be spotted, the more money an investor can make by "riding the trend." Explain why recognizing a trend too late reduces potential profits for the investor.
3. The sooner an investor recognizes that a trend has changed, the more profitable the investor's trading will be. Explain why early recognition of trend reversals influences the investors' profitability.
4. Newton's first law of motion is inertia—an object in motion will remain in motion in the same direction unless acted upon by an unbalanced force. How does this physics principle serve as an analogy for the notion of trends in technical analysis?
5. Define primary, secondary, short-term, and intraday trends.
6. Gather monthly data for the DJIA from 1965 until the present. One publicly available source for this data can be found electronically at <http://finance.yahoo.com> using the ticker

***Parti Introduction***

symbol^DJI. Under "quotes," choose the "historical prices" options. At this point, you will be able to choose a monthly data option and download the data into a spreadsheet.

- a. Graph the monthly data for the DJIA for the time period 1965-1980. Was the market in an uptrend, downtrend, or sideways trend during that time? Explain your answer.
- b. Graph the monthly data for the DJIA for the 1980 through 1990 time period. Was the market in an uptrend, downtrend, or sideways trend during that time? Explain your answer.
- c. Graph the monthly data for the DJIA from 1990 until the present. Has the market been in an uptrend, downtrend, or sideways trend? Explain your answer.
- d. Comparing the three charts that you have generated, what conclusions do you draw about historical market trends?

Choose a one-year period during each of the 1965-1980, 1980-1990, and 1990-present periods. Download daily DJIA data from the Yahoo! Finance web site for each of these three one-year periods. Graph the daily data for each of these three periods. What types of trends do you see in these daily data graphs? Comparing these daily graphs to the monthly graphs during the same time periods, what similarities and what differences do you find?

# HISTORY OF TECHNICAL ANALYSIS

## CHAPTER OBJECTIVES

In this chapter, you will gain knowledge about

- The records of the existence of historical financial markets and exchanges
- The creation of market indices by Charles Dow
- The development of technical analysis in the U.S. over the past century
- The impact that academic theory and fundamental stock market analysis have had on the development and use of technical analysis
- The impact that data availability and computer power have had on the development of technical analysis

## EARLY FINANCIAL MARKETS AND EXCHANGES

Although technical analysis is thought to be an ancient method of analyzing markets and prices, its history has been poorly recorded. We do not have recorded evidence of technical analysis being used, but it is conceivable that technical analysis, in some form, was used in the distant past in freely traded markets.

Markets in one form or another have existed for centuries. For instance, we know that notes and checks between traders and bankers existed in Babylon by 2000 BC (Braudel, 1981). Currency exchange, commodities, and participations in mercantile voyages were traded in Ostia, the seaport of Rome, in the second century AD (Braudel, 1982). In the Middle Ages, wheat, bean, oat, and barley prices were available from 1160 on in Angevin, England (Farmer, 1956); and a large grain market existed in Toulouse as early as 1203 (Braudel, 1982). Publicly available evidence suggests that as early as the twelfth century, markets existed in most towns and cities and were linked in a network of arbitrage (Braudel, 1982).

Exchanges were developed later where more complicated negotiable instruments, such as state loan stocks, were invented, accepted, and traded. The earliest exchanges appeared in the fourteenth century, mostly in the Mediterranean cities of Pisa, Venice, Florence, Genoa, Valencia, and Barcelona. In fact, the *Lonja*, the first building constructed as an exchange, was built in 1393 in Barcelona (Carriere, 1973). The *Lonja* has been described as

"... a whole squadron of brokers [could be seen] moving in and out of its pillars, and the people standing in little groups were *corridors d'orella*, the 'brokers by ear' whose job was to listen, report, and put interested parties in touch." (Carriere, 1973)

The statutes of Verona confirm the existence of the settlement or forward market (*mercato a termine*), and a jurist named Bartolomo de Bosco is recorded as protesting against a sale of forward *loca* in Genoa in 1428 (Braudel, 1981). As early as the fifteenth century, *Kuxen* shares in German mines were quoted at the Leipzig fairs (Maschke) and stocks traded in Hanseatic towns (Sprandel, 1971). A trading market for municipal stocks known as *renes sur L'Hotel* existed in France as early as 1522 (Schnapper, 1957).

Can we assume that traders would record prices in these sophisticated markets and would attempt to derive ways to profit from those recordings? It seems very likely. Even if prices were not recorded using pencil and paper, traders mentally remembering past prices and using these memories to predict future price movements would be using a form of technical analysis.

By 1585, public quotes of over 339 items were reported as traded on the streets and in the coffee houses in Amsterdam (Boxer, 1965). Commodities had been traded there as early as 1530 (Stringham, 2003). The greatest of the early exchanges, the Amsterdam Exchange, called "The Beurs" or "Bourse," was founded in 1608. The building housing the exchange was built in 1611 and was modeled after the Antwerp Bourse of 1531 (Munro, 2005). This exchange is famous for the "Tulip Bulb Mania" of 1621. By 1722, the Amsterdam Exchange provided trading space for over 4,500 traders every day between noon and 2 o'clock (Ricard, 1722). Dealers, brokers, and the public traded and speculated on short sales, forwards, commodities, currencies, shares of ventures, and maritime insurance, as well as other financial instruments such as notes, bonds, loans, and stocks. They traded grain, herring, spices, whale oil, and, of course, tulips (Kellenbenz, 1957, 19%). The principal stock traded was in the Dutch East India Company. (See Figure 3.1, which is an example of one of the oldest stock shares.) It seems likely that prices for these items were also recorded and analyzed.

In the eighteenth century, as the Dutch empire declined, the London and Paris Exchanges gradually surpassed the Amsterdam Exchange in activity and offerings. In other parts of the world, specifically in Japan, cash-only commodity markets in rice and silver were developing, usually at the docks of major seacoast cities. It is in these markets that we first have recorded information of a wealthy trader who used technical analysis and trading discipline to amass a fortune.

His name was Sokyo Honma. Bom in 1716 as Kosaku Kato in Sakata city, Yamagata Prefecture during the Tokugawa period, he was adopted by the Honma family and took their name. A coastal city, Sakata was a distribution center for rice. Honma became very wealthy by trading rice and was known throughout Osaka, Kyoto, and Tokyo. He was promoted to Samurai (not bad for a technical trader) and died in Tokyo at the age of 87.





Source: [www.oldest-share.com](http://www.oldest-share.com)

**Dutch Verelnigte OostIndische Compalgnle (VOC) share certillcate \* 6, down-payment on a share; Issued by the Came re Amsterdam 27th September 1606. Original signatures: Arent ten Grotenhuys and Dlrcck van Os, company founder van Verre and after 1602 Directors of VOC Kammer Amsterdam. Source: Private collection**

FIGURE II Oldest stloek certificote-Dutch United East Indio Company (1606)

Honma's rules are recorded as the "Sakata constitution." These rules include methods of analyzing one day's price record to predict the next day's price, three days of rice prices to predict the fourth day's price, and rate of change analysis (Shimizu, 1986). None of this information was recorded on charts—they came later in Japan. Honma's rules might also be considered "trading rules" rather than "technical rules" because they had much to do with how to limit loss and when to step away from markets. Nevertheless, his methods were largely technical, were successful, and most importantly, were recorded.

Because Japan is the first place in which recorded technical rules have been found, many historians have suggested that technical analysis began in the rice markets in Japan. However, it seems inconceivable that technical analysis was not used in the more sophisticated and earlier markets and exchanges in Medieval Europe. Indeed, even in Japan, it is thought that charts were introduced first in the silver market around 1870 by an "English man" (Shimizu, 1986). Thus, technical analysis has a poorly recorded history but by inference is a very old method of analyzing trading markets and prices.

## MODERN TECHNICAL ANALYSIS

Although the practice of technical analysis in some forms likely dates back many centuries, Charles Dow (1851-1902) was the first to reintroduce and comment on it in recent times. He is

considered the father of "modern" technical analysis. Dow's introduction of stock indexes to measure the performance of the stock market allowed for a major advance in the sophistication of stock market participants.

Dow was a lifelong newspaper journalist. His specialization in covering financial news began with a mining story he wrote when working for the *Providence Journal* in 1879. In 1880, Dow relocated to New York, where he continued covering the mining industry. In 1882, Dow joined with Edward Jones and Charles Bergstresser to form Dow Jones & Company. The company offices were located behind a soda shop that was located next door to the entrance of the New York Stock Exchange. Daily hand-written news bulletins were written by the company and distributed by messenger to customers in the Wall Street vicinity.

On July 3, 1884, Dow published his first version of a stock index in the company's "Customer's Afternoon Newsletter." Dow calculated this price-weighted average simply by summing the prices of the stocks in the index and dividing by the number of stocks. This index included a total of 11 stocks—9 railroads and 2 industrials.

Table 3.1 shows the companies that Dow included in this first index. Although this may seem to be an odd combination by today's standards, the index was consistent with the important role the railway companies played in the economy of the 1880s. In February 1885, Dow began publishing a daily index of actively traded, highly capitalized stocks. This index contained 12 railways and 2 industrial stocks. By January 1886, Dow replaced the 14-stock index with a 12-stock index, containing 10 railroads and 2 industrials. By May 1896, Dow recognized the increasing role the emerging industrial sector was playing in the U.S. economy and altered his index so that it consisted entirely of industrial stocks. The first version of the Dow Jones Industrial Average (DJIA) appeared in the *Wall Street Journal* on May 26, 1896, and included the 12 stocks listed in Table 3.2. Although all of these companies survive in some form today, only General Electric remains a component of the DJIA.

**TABLE 3.1** "Customer's Afternoon Newsletter" (Forerunner to the *Wall Street Journal*)

List of Representative Stocks

- Chicago & North Western
- Illinois Central
- Lake Shore
- New York Central
- Portland
- Northern Pacific
- Union Pacific
- Missouri Pacific
- Louisville & Nashville
- Pacific Mail
- Western Union

Dow's initial index of rail stocks was renamed the Railroad Average. The Railroad Average developed into the modern-day Dow Transportation Average on January 2, 1970, when it included nonrailroad stocks such as airlines and truckers. As of today, of the 20 stocks in the Dow Transportation Average, only 10 are railroad stocks—Burlington Northern & Eastern Railroad, Chesapeake & Ohio Railway, Conrail, Erie Railroad, Norfolk Southern Corp., and Union Pacific Corp.

For the next ten years, additions and deletions were made to the DJIA, but the number of stocks included remained at 12. In 1916, 14 years after Charles Dow's death, the DJIA was expanded to 20 stocks. It was in 1928 that the index was further expanded to 30 stocks. Although the average has been updated to reflect the changing

**TABLE 3.2** *Wall Street Journal***May 26, 1896****Original Dow Jones Industrial Average**

American Cotton Oil  
 American Sugar  
 American Tobacco  
 Chicago Gas  
 Distilling & Cattle Feeding  
 General Electric  
 Laclede Gas  
 National Lead  
 North American  
 Tennessee Coal & Iron  
 U. S. Leather pfd.  
 U. S. Rubber

composition of trading, market capitalization, and industrial composition, the practice of including 30 stocks continues today.

Dow's original intent was to use these averages as predictors of the economy, but his analysis took a life of its own, and his theories became known as the "Dow Theory." (See Chapter 6, "Dow Theory.") They are the foundation for modern technical analysis. The principles that Dow established are still valid today, albeit in a different form.

However, Dow's contribution to the field of technical analysis goes beyond the creation of indexes. The Dow Jones Company was the first in the U.S. to publicly report stock prices. Private subscription letters with stock prices had existed earlier but were available only to the few who paid directly for them. The reporting of prices on

a consistent basis provided the "meat" for technical analysis. Motivation came from the many wide swings in prices both from legitimate news and information as well as from manipulation. By watching prices, investors and traders hoped to gather information on who was buying and selling shares and thus what the prospects for future prices might be. *Technical analysis is a means for the uninformed to become informed.*

With recording of prices and the calculation of averages, analysts began to see that prices often traded with certain repetitive patterns. They also noticed that market dynamics are complicated and influenced by people and their own way of looking at investments, their own time horizons, their own information, and their own emotions. Patterns in market averages, specifically the "line" and the "double" top or bottom, were first mentioned by Charles Dow and his subsequent followers, William Peter Hamilton, S. A. Nelson, and Robert Rhea, in the 1920s. Richard D. Wyckoff offered a successful correspondence course in trading and investing, principally using technical analysis theories, in 1931. Earlier, in the 1920s, he published a technical newsletter that reached over 200,000 subscribers.

Also in the 1920s and 1930s, classic indicators such as the advance-decline line (A/D line) were created. Colonel Leonard P. Ayers created an early measure of business confidence and is considered the originator of the A/D line. Ayers ran a company called Standard Statistics. In 1941, Standard Statistics merged with a company headed by Henry Poor; this new entity became Standard and Poor's.

Richard W. Schabacker, the financial editor of *Forbes* magazine and of the *New York Times*, began to recognize individual stock patterns and observed many common characteristics between different issues. He is probably the first person to use the words "triangle," "pennant," and "head-and-shoulders" to describe chart formations we consider in future chapters. Schabacker authored

*Stock Market Theory and Practice* (1930), *Technical Analysis and Market Profits* (1932), and *Stock Market Profits* (1934). The commodity markets, which had long depended on price action for their speculative activity, also evolved their share of special technical theories such as those by William Delbert Gann. This was the age of speculation, inside information, and manipulation with little regulation. Those outside the information loop were at a disadvantage. Technical analysis made the difference by using price action as a predictive tool.

During the late 1930s and much of the 1940s, little was written about stock market analysis. If we consider the business and economic climate at that time, it is not surprising that there is a void in the literature. After the Securities Act of 1933 and the Securities Exchange Act of 1934, Graham and Dodd published one of the few pieces of security analysis of the period. In their book, *Security Analysis* (1934), Graham and Dodd established the fundamental analysis side of investment analysis, which is concerned with economic conditions and company value. Although this book provides the groundwork for the development of fundamental analysis, a closer reading of this book reveals that Graham and Dodd did not believe that fundamental analysis alone determined stock prices. For example, consider the following passage from their book:

The influence of what we call analytical factors over the market price is both partial and indirect—partial, because it frequently competes with purely speculative factors which influence the price in the opposite direction; and indirect, because it acts through the intermediary of people's sentiments and decisions. In other words, the market is not a weighing machine, on which the value of each issue is recorded by an exact and impersonal mechanism, in accordance with its specific qualities. Rather we should say that the market is a voting machine, whereon countless individuals register choices which are the product of and partly of emotion, (p. 28)

It was not until 1948 that Robert Edwards (son-in-law to Schabacker) and John Magee (see Figure 3.2) published the first edition of *Technical Analysis of Stock Trends*. Edwards and Magee demonstrated the technical patterns observed in hundreds of stocks. Their interpretations are still used to this day, and technicians know their book as the "bible of technical analysis." In fact, the eighth edition of the book was published in 2003.

At first, prices were recorded and then plotted by hand. Indeed, even today, strict followers of point-and-figure technique plot their charts by hand, as do many specialists and traders who wish to get the "feel" of the stocks they are trading. Chart services published books of hand-plotted charts for those who could not afford the time to check for accuracy and plot their own charts.

As technical analysts became increasingly comfortable with more complex mathematical tools, technicians focused on more than just the chart patterns of their predecessors. The analysts began using more advanced mathematics to describe price action. The most prominent technical analyst of the 1950s was Joseph Granville. Granville, who worked for E.F. Hutton, published a short article on the Barron's Confidence Index in *Barron's* in 1959. After this article, Granville wrote two books in which he covered on-balance volume, the 200-day moving average, and other tools and concepts that are still popular today. Some of the other great technicians during this time were Kenneth Ward, Edmund Tabell, E. S. C. Coppock, D. G. Worden, Garfield Drew, and George Lindsay.

**Edwards****Magee**

Source: W.H.C Basselti, adjunct professor Finance and Economics, Golden Gate University, San Francisco; editor John Magee Investment Series; editor and coauthor, *Edwards and Magee's Technical Analysis of Stock Trends*, eighth edition

FIGURE 3.2 Edwards and Magee

In the 1960s, the concept of rate of change (ROC), or momentum, became part of the technician's tool chest. By the late 1970s, computer technology was available to draw charts more accurately and with greater speed. In addition, ratios, oscillators, and other more arcane calculations could be moved from the adding machine to the computer for quicker calculation and more thorough testing. The computer changed the face of technical analysis forever.

One of the most popular technical tools developed in the 1970s was the relative strength index (RSI), created by J. Welles Wilder, Jr. (see Figure 3.3). One of the most inventive technicians, Wilder is also credited with the Directional Movement concept, the Parabolic System, and Average True Range, all still used today. Another technician and commodity trader, Richard Donchian, promoted the use of the 10-day and 20-day moving averages crossovers as buy and sell signals, as well as the "4-wcck" rule, whereby a price break above or below the four-week high or low indicated the initial stage of a new trend. Focusing on the options market, technician Martin Zweig examined the use of the put-call ratio. A variety of moving average indicators was developed, such as moving-average envelopes, moving-average crossover, and the Moving-Average Convergence/Divergence (MACD) oscillator, by technicians like Fred Hirschler and Gerald Appel. Many other inventive technical analysts are mentioned in later chapters when we cover their specialties.

Just as the mathematical sophistication and computer technology was allowing for great advances in the development of technical analysis, technical analysis came under fire by the academic community. Academics argued that technical analysis was impossible because prices were randomly distributed and had no history imbedded in them that could predict future prices. At the same time, proponents of the Efficient Markets Hypothesis argued that markets were efficient and that news, information, and so on, was immediately and rationally discounted in the markets. Because no means of price study could anticipate such news, technical analysis was a futile study. Gradually, professional money managers, most of whom were raised and trained at business schools in this anti-technical school of thinking, closed their technical departments, and technical analysis went into a decline.



Source: J. Welles Wilder, Jr.

FIGURE 3J J. Welles Wilder, Jr.

However, although the academic community was discounting the use of technical analysis, the technical analyst's access to more powerful computers and better data was rapidly increasing. The fast computers and accessibility to a large data set of clean post-World War 0 data allowed analysts to attempt to optimize their trading strategies, taking past price data and performing numerous calculations to determine which of a number of strategies would have yielded the best profits. These optimized results could be used to develop future trading strategies, assuming that the markets would behave similarly in the future.

Ironically, although the dawning of the computer age brought new, increasingly sophisticated technical tools to the study of technical analysis, the development of these tools coincided with the introduction of an ancient technical tool to the U.S. financial markets. As we discussed earlier, Japanese candlestick charts dated back to the mid-1700s; however, the western financial markets had not had access to the Japanese writings and technical tools. Steve Nison introduced candlestick charts into U.S. technical analysis in the late 1980s.

## CURRENT ADVANCES IN TECHNICAL ANALYSIS

Interest in technical analysis is resurging. The Efficient Markets Hypothesis has been found to have a number of serious flaws, and stock price motion is being shown to be nonrandom. This new knowledge has cast doubt on the objections raised earlier about technical analysis, and academics are gradually beginning to perform serious studies on technical theory and indicators. Behavioral Finance, a relatively new realm of study concerned with the psychology of market participants, has shown that investors do not necessarily act rationally, as is assumed in the Efficient Markets Hypothesis. They have found instances of predictable investor behavior and are beginning to explain some of the patterns known by technical analysts for over a hundred years.

During the equity market decline from 2000 to 2002, many stocks declined severely before the damaging information causing their decline was made public. The names of Enron, World Com, Tyco, HealthSouth, Qwest, and others ring in the ears of those who suffered large losses by owning these stocks and by being fooled and lied to by their managements. Although this may not have been manipulation in the old style, it nevertheless again was the uninformed being duped by the informed.

Figure 3.4 shows a monthly stock chart for Tyco. Technical analysis, if properly applied, would have protected an investor from large losses in this stock because it would have warned that the price action of these stocks was not consistent with what management was saying to the fundamental analysts. On January 9, 2002, a Prudential Securities analyst was the first large Wall Street analyst to downgrade the stock from a buy to a hold (*New York Times*). Figure 3.4 shows the price of Tyco falling while fundamental analysts were still recommending that investors buy the stock and while insiders of the company, such as the CFO, were claiming, "The more you

know about our accounting, the more comfortable you will be" (*Wall Street Journal*, February 14, 2002).

In addition, falling commissions and maximum speed of communication have made technical analysis extremely useful to those who can spend the time studying it. Trading models have been developed based on technical rules that trade by themselves without human intervention. Futures markets in stock averages, currencies, and other markets have expanded and become more efficient, making competition extremely keen. Stock market trades have become almost instantaneous, and with the advent of computerized markets, intermediaries, with their delay and cost, have largely been eliminated.

Computers have become so sophisticated that almost every possible technical calculation has been tried and tested. Market participants know now, as they have long suspected, that no magic formula for riches exists. The reason is that people trading and investing in an imperfect world determine prices. Because technical analysis deals only with price and some other incidental trading information, it has evolved into a study of more intangible information, concerned mostly with psychology and trading behavior. **Modern computer technology has demonstrated that prices are not necessarily random, but also that they are not perfectly predictable.** The reason, of course, is that people buy and sell items based not only on what they believe is reasonable but also on emotion, specifically fear and greed, inherent and learned bias, over-confidence, perception, and prejudice. Emotion has always been a large component in technical analysis studies.



Cfoalod using TradoSlatlon

FIGURE 3.4 Exemple ol Fraudulent Insiders 11996-2003)

Today, technical analysis covers many different time horizons: (1) long-term investing and (2) short-term swing and intraday trading being the most basic. The indicators and methods utilized for these horizons often have their own characteristics. In addition to time horizons, different investing or trading instruments exist. Commodities, for example, have their own technical information and peculiarities, as do currencies and financial instruments such as bonds and notes. *The subject of technical analysis is complex.* Because knowledge of all possibilities is impossible, the individual must decide the period, methods, and instruments best suited to his or her personality, ability, knowledge, and time available. Although the basic principles of technical analysis that we investigate in this book are common to all areas of markets, investors must learn by reading, studying, and experiencing the peculiarities of the markets in which they wish to profit.

"When you enter the stock market [or any other market], you are going into a competitive field in which your evaluations and opinions will be matched against some of the sharpest and toughest minds in the business. You are in a highly specialized industry in which there are many different sectors, all of which are under the intense study by men (and women) whose economic survival depends on their best judgment. You will certainly be exposed to advice, suggestions, and offers of help from all sides. Unless you are able to develop some market philosophy of your own, you will not be able to tell the good from the bad, the sound from the unsound."

—John Magee (Edwards and Magee, 2003)



# THE TECHNICAL ANALYSIS CONTROVERSY

## CHAPTER OBJECTIVES

After studying this chapter, you should have a good understanding of

- The basic principles of the Random Walk Hypothesis (RWH)
- The historical distribution of stock market returns
- The basic principles of the Efficient Markets Hypothesis (EMH)
- The pragmatic criticisms of technical analysis
- How technical analysts respond to critics

Although technical analysis is widely used by practitioners, its popularity is not mirrored in the academic community. The divergence in emphasis placed on technical analysis is highlighted by a study conducted by Flanegin and Rudd (2005) in which they surveyed both college professors and practitioners. The college professors were asked how much emphasis they placed on each of 20 topics in their investment courses. These professors ranked the subject areas on a 1 to 5 scale, with "1" indicating that they spent very little time in class on the material and "5" indicating that they spent considerable time on the topic. Given the same list of 20 topics, the practitioners were asked which subject matter they utilized within the realm of their jobs on a fairly consistent basis. These professionals also ranked the topics on a 1 to 5 scale, with "1" signifying the topic was not used and "5" indicating that the subject was used all the time. Table 4.1 provides a summary of their results. The practitioners report showed them seldom using many of the topics most thoroughly covered by the professors. Likewise, professors report very little class time is spent teaching the subject material practitioners claim to use most often.

**TABLE 4.1** Importance of Financial Topics as Reported by Professors and Practitioners\*

<b>Topic</b>	<b>Instructors' Mean</b>	<b>Practitioners' Mean</b>
Portfolio Theory	3.89	2.44
Discounted Cash Flows	3.87	2.95
CAPM/Bell	3.85	2.48
Required Rate of Return	3.85	2.41
Dividend Discount Model	3.77	1.73
Efficient Markets Hypothesis	3.54	1.85
Ratio Analysis	2.70	2.56
Arbitrage Pricing	2.40	2.21
Accounting Aspect of Earnings	2.34	2.95
Crowd Psychology	1.99	3.56
Charting	1.80	3.56
EC Analysis	1.70	2.56
Trend Lines	1.70	4.39
Support/Resistance levels	1.68	4.41
Trading Ranges	1.66	4.37
Relative Strength Index	1.65	3.54
Stochastic	1.63	3.51
Volume Tracking	1.54	3.78
Moving Average/Convergence	1.49	3.56
Overbought/Oversold	1.46	3.93

\*Adapted from Flanegin and Rudd (2005)

This divergence is not surprising given the fact that the majority of academics opposes the use of technical analysis. In fact, a study by Robert Strong (1988) showed that over 60 percent of PhDs do not believe that technical analysis can be used as an effective tool to enhance investment performance. Because of the view of these academics, little emphasis has been placed on technical analysis in traditional finance curriculums in recent years, as shown in the Flanegin and Rudd survey results.

Because of the strong resistance of the academic community to the use of technical analysis, we will address in this chapter some of the academic community's criticisms before moving on to the specific techniques and tools of technical analysis. The principal theoretical arguments against technical analysis are the Random Walk Hypothesis (RWH) and the Efficient Markets Hypothesis (EMH). Each hypothesis makes broad assumptions that in their purest state would eliminate the possibility for technical analysis, or fundamental analysis for that matter. Let us look at each of these hypotheses a little more closely.

## Do MARKETS FOLLOW A RANDOM WALK?

Opponents of technical analysis claim that looking at past technical data, such as price and volume, to help predict the future is outlandish. In the popular book, *A Random Walk Down Wall Street*, Burton Malkiel refers to technical analysis as "sharing a pedestal with alchemy." Some of these opponents believe that no underlying patterns exist in stock prices. These individuals believe that prices move in a random fashion and have no "memory." This assumption would imply that technical analysis, which depends on prices predicting prices, has no foundation because all price motion is random.

A random walk occurs when future steps cannot be predicted by observing past steps. For example, flipping a coin produces a random walk. Suppose you flip a coin once and it lands on heads; observing that the coin landed on heads does not help you predict what the outcome will be the next time the coin is flipped. Each flip of the coin is an independent event, and the outcome of one flip of the coin has no impact on the outcome of any other flip. If the stock market follows a random walk, future stock prices cannot be predicted by observing past stock price movements.

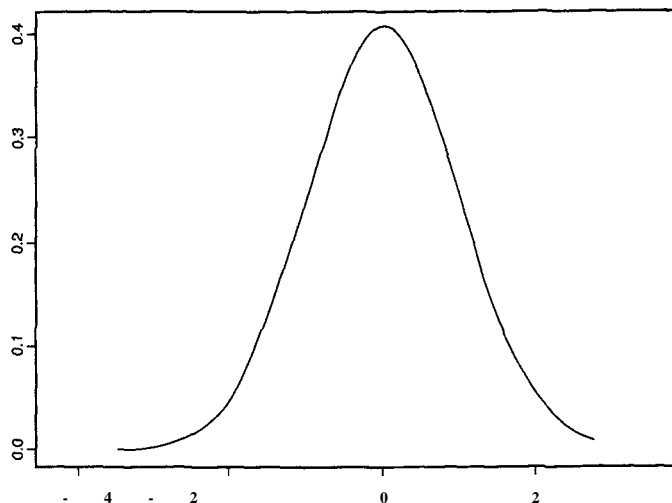
The concept that stock price returns followed a random walk was first suggested by Louis Bachelier (see Box 4.1), a French mathematician, in his Ph.D. thesis "The Theory of Speculation" (1900, 1906, and 1913). He commented that "the mathematical expectation of the speculator is zero." In the 1937 *Econometrica* article "Some A Posteriori Probabilities in Stock Market Action," Alfred Cowles and Herbert E. Jones also hypothesized that the stock market prices exhibited randomness. It was Paul Cootner's 1964 book *The Random Character of Stock Market Prices* that popularized the random walk theory and its application in the stock market. The following year, Eugene Fama's seminal article, "The Behavior of Stock Market Prices" was published in the *Journal of Business*, giving additional credence to the random walk theory.

### BOX 4.1 Louis Bachelier

Louis Bachelier (1870-1946) was the first person to anticipate Brownian motion, random walk of financial prices, option pricing, and martingales long before Einstein, Wiener, and Black and Scholes. Receiving high marks from his advisor, the famous mathematician, Henri Poincare, Bachelier became a lecturer at the Sorbonne and at several other universities. In 1926, he was turned down for a professorship at Dijon because of a critical letter from another famous mathematician, Paul Levy, who was unfamiliar with his earlier work. Later, in 1931, Levy learned of his work and sent an apology. Bachelier ended up as a professor in Besancon. Einstein had never heard of his work, and not until the 1960s were his financial theories "rediscovered."

## Fat Tails

A normal distribution curve looks like the bell-shaped chart in Figure 4.1.

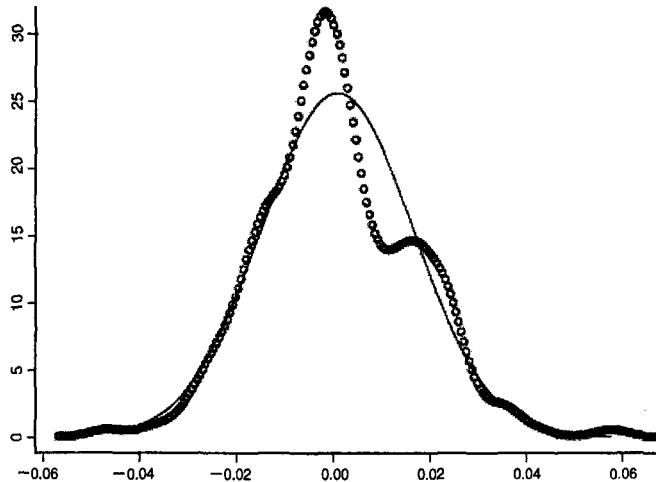


**FIGURE 4.1** Normal bell-shaped curve

Figure 4.2 shows a chart of the actual distribution of stock returns for General Electric between January 1, 2003 and November 19, 2004. Compare Figure 4.1 with Figure 4.2. Notice how the chart of real historical returns (Figure 4.2) does not perfectly match the bell-shaped curve shown in Figure 4.1. In particular, compare the outer edges, or tails, of the two charts. The tails of the normal distribution, in Figure 4.1, get thinner and thinner, approaching zero. However, in the actual stock return data in Figure 4.2, we do not see this thinning of the tails; instead, we see that the tails have bumps or remain flat. Thus, "fat tails" are present in Figure 4.2 but not in Figure 4.1.

Benoit Mandelbrot (1963) first noticed this phenomenon of fat tails, called a "leptokurtic distribution," in stock market returns in the early 1960s. Fat tails occur when one or more events cause stock prices to deviate extraordinarily from the mean.

An example of one of these events is the large decline in stock prices that occurred on October 19, 1987. On this day, known as "Black Monday," the U.S. stock market crashed, sending the Dow Jones Industrial Average down 22.6%. What are the chances of a one-day drop of this magnitude occurring randomly? In a 1996 article appearing in the *Journal of Finance*, Jens Carsten Jackwerth and Mark Rubenstein state that if the life of the universe had been repeated one billion times and the stock market were open every day, a crash of that magnitude would still have been "unlikely." In his 2003 book *Why Stock Markets Crash: Critical Events in Complex Financial Systems*, Didier Sornette claims that, statistically, a crash as large as was seen on Black Monday would be expected to occur only once in 520 million years. Thus, the huge negative return seen in October of 1987 is clearly an outlier.



**FIGURE 42** Density estimation for GE compared to a normal distribution (adapted from Luke Olsen, "Why Be Normal?" Society for Amateur Scientists, E-bulletin, November 21, 2003)

## Drawdowns

Black Monday represented an abnormally large one-day negative return in the stock market. Although this alone was a significant deviation from the mean stock return, even more significant is the fact that October 19 was preceded by three days of market losses. Market losses were 2%, 3%, and 6% on the three previous trading days. In other words, there were four consecutive days of trading losses, resulting in a 30% decline in the market. Periods of successive losses like this are referred to as "drawdowns."

Sornette has studied these types of drawdowns in an attempt to understand why outliers occur and how they can be integrated into the RWH. He argues that while independence can accommodate one large deviation, the probability of two or more large deviations occurring back-to-back is out in the stratosphere.

For example, the probability of a one-day decline of 10% in the stock market is approximately 1 in 1000. In other words, a 10% drop would occur once every four years statistically. Although a drop of this magnitude would be a large deviation from the average daily stock return, it would fall within the normal distribution. If stock returns are independent, then the probability of two consecutive daily drops of 10% would be the product of the probability of the two independent events occurring, or  $1/1000$  multiplied by  $1/1000$ . Likewise, the probability of three consecutive 10% drops, or a 30% drawdown, is  $1/1000 \times 1/1000 \times 1/1000$ , or 1 in 1,000,000,000. This means, statistically, a 30% three-day drawdown could be expected to occur only once every four million years!

Historically, of course, these back-to-back events have occurred, especially in declines. Dismissing randomness under such events suggests that when sequential returns reach a critical mass, they begin to foretell future returns and are, thus, no longer random or independent. Sornette calls these periods "bursts of dependence" or "pockets of predictability." If these successive declines occur more often than what is statistically predicted, some correlation must exist between the daily stock returns, indicating that stock returns do not follow a random walk.

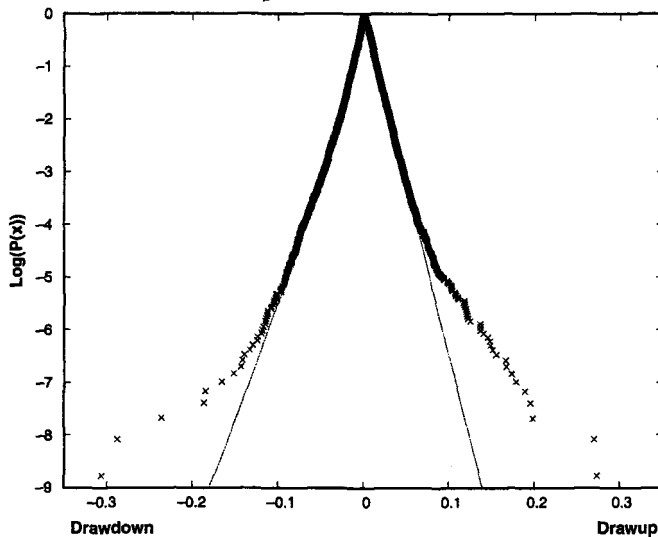
**TABLE 4.2** Historical Drawdowns in the Dow Jones Industrial Average\*

Rank	Beginning Date	Dow Jones Industrial Average	Duration (Days)	Decline (Percent)
1	10/1987	2508	4	-30.7
2	7/1914	76.7	2	-28.8
3	10/1929	301	3	-23.6
4	7/1933	109	4	-18.6
5	3/1932	77.2	8	-18.5
6	11/1929	238	4	-16.6
7	11/1929	274	2	-16.6
8	8/1932	67.5	1	-14.8
9	12/1931	90.1	7	-14.3
10	9/1932	76.6	3	-13.9
11	9/1974	674	11	-13.3
12	6/1930	240	4	-12.9
13	9/1931	110	5	-12.4
14	8/1998	8603	4	-12.4

\*Adapted from Didier Sornette, 2003

As shown in Table 4.2, Sornette's research indicates that large drawdowns in the DJIA have *occurred more* often than can be statistically expected. When considering the three largest twentieth century stock market declines (1914, 1929, and 1987), Sornette calculates that statistically about fifty centuries should separate crashes of these magnitudes. He concludes that three declines of this magnitude occurring within three-quarters of a century of each other are an indication that the series of returns was not completely random.

What Sornette found was that under normal circumstances, returns follow a generally normal distribution. These normal conditions represent about 99% of market drawdowns. However, there appears to be a completely different dynamic occurring in the remaining 1% of drawdowns; these drawdowns occur in the fat tails of the distribution when extraordinary market declines occur (see Figure 4.3). Interestingly, Sornette also found this drawdown outlier behavior common to currency, gold, foreign stock markets, and the stocks of major corporations, even though individual day declines were contained within the normal distribution.



In this chart, Sornette compares the number of times particular drawdowns and drawups occurred in the DJIA during the twentieth century. Compare the actual numbers with those assumed by the null hypothesis of randomness shown by the straight lines.

Courtesy of Didier Sornette, from a January 28, 2003 private paper: *Critical Market Crashes*

FIGURE 4.3 Frequency of drawdowns and drawups in the DJIA

### Proportions of Scale

A random walk is associated with a specific scaling property. Under RWH, if price change fluctuates over one series of intervals, say days, price change fluctuations over another series of intervals, say weeks, should be randomly distributed and proportional to the square root of the original interval changes. In other words, the square of the typical amplitude of return fluctuations increases in proportion to time. If this proportional relationship does not exist, then the price changes are not completely random. And if the plot of the distribution of price changes shows any irregularity from the ideal plot of a random sequence of numbers, the assumption of randomness is challenged.

Andrew W. Lo of MIT (see Figure 4.4) and A. Craig MacKinlay of the Wharton School of Business have tested to see if this proportional relationship does indeed exist. In their 1988 *Review of Financial Studies* article, "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test," they report that these amplitudes were not proportional for the time period from September 1962 to December 1985 and conclude that stock returns were nonrandom.

Lo and MacKinlay used a simple mathematical model to demonstrate the nonrandomness of stock prices. Surprised that such a simple proof had not been used earlier, they conducted a more thorough research of the literature. In doing so, they found that others (Larson, 1960; Alexander, 1961; Osborne, 1962; Cootner, 1962; Steiger, 1964; Niederhoffer and Osborne, 1966; and Schwartz and Whitcomb, 1977) had also demonstrated the absence of random walk in securities prices. With the exception of the Schwartz and Whitcomb article, these previous studies had been published outside of the mainstream academic finance journals and had been ignored by finance academics. Even today, many professionals, not having read the literature or heard the results from their peers, incorrectly believe that security prices follow a random walk.

"The random walk model is strongly rejected for the entire sample period (1962-1985) and for all subperiods for a variety of aggregate returns indexes and size-sorted portfolios. Although the rejections are due largely to the behavior of small stocks, they cannot be attributed completely to the effects of infrequent trading or time-varying volatilities. Moreover, the rejection of the random walk for weekly returns does not support a mean-reverting model of asset prices." —Lo and MacKinlay (1988)



Courtesy of Professor Andrew W. Lo, MIT

FIGURE 4.4 Andrew W. Lo

In sum, evidence against the RWH has been found in many tests of independence, distribution, and proportion. The occurrence of strange outliers implies that other dynamics are occurring in freely traded markets. The evidence against the possibility of a random walk in price returns, however, does not suggest that technical analysis is an assured strategy. Yes, certain technical strategies may work, but the rejection of the RWH only suggests that because price returns are not purely randomly distributed, they may be dependent; in other words, they may have a "memory" and may provide some form of predictive power. The importance of the elimination of the RWH to technical analysis is that the profitability of technical analysis cannot be automatically dismissed as improbable. If price returns are somewhat dependent, as the tests show, then the gates are open for technical analysis to predict future prices.



## **CAN PAST PATTERNS BE USED TO PREDICT THE FUTURE?**

Some researchers who have accepted that stock prices do not follow a random walk still do not accept the validity of technical analysts. These opponents agree that there may be patterns that can be fitted to stock price movement after-the-fact, but they argue that these past patterns cannot be used to predict the future. In other words, past patterns cannot be exploited to gain above-average returns. There are two major reasons why this group of opponents, especially academics, has drawn these conclusions.

First, although there may be some underlying patterns, markets are constantly being affected by new information. This new information causes enough variability in the underlying pattern that any knowledge of the underlying pattern will not be enough to exploit the knowledge for profit. For example, a recurring business cycle is a well-known and accepted economic phenomenon but not a predictable harmonic. The economy experiences expansionary periods followed by recessionary periods repeatedly. Therefore, we can expect cycles of expansions and contractions in the future. However, each of these business cycles is unique; the cycles vary in length and intensity. Thus, acknowledgment of a recurring cycle cannot be equated with the ability to predict the timing of an expansion or the intensity of a recession.

Second, even if we can use past stock market statistics, such as price and volume, to help predict future stock market movements, this information will not allow us to earn abnormal, above-average profits in the stock market. This conclusion is a result of the assumption of market efficiency. The EMH is widely accepted in the economic and finance communities, especially among academics. The EMH argues that price changes occur only on new information, immediately and rationally applied, and that any irregular price action is quickly adjusted back to true value by arbitrage. Because prices change only on new information, technical analysis cannot determine future prices without that new information and is thus futile.

## **WHAT ABOUT MARKET EFFICIENCY?**

Because of the central role the EMH has played in financial theory in the past 35 years, we will spend a little time developing the basic ideas of the EMH and how, while it may be an interesting and thought-provoking model, it does not necessarily describe the real world of investments and markets.

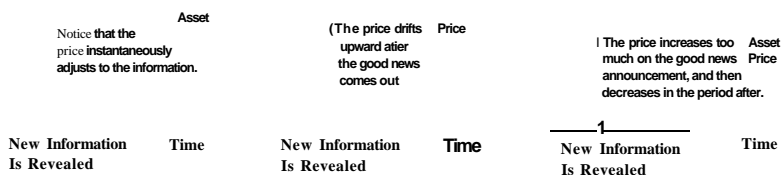
"Market efficiency is a description of how prices in competitive markets respond to new information. The arrival of new information to a competitive market can be likened to the arrival of a lamb chop to a school of flesh-eating piranha, where investors are—plausibly enough—the piranha. The instant the lamb chop hits the water, there is a turmoil as the fish devour the meat. Very soon the meat is gone.

leaving only the worthless bone behind, and the water returns to normal. Similarly, when new information reaches a competitive market, there is much turmoil as investors buy and sell securities in response to the news, causing prices to change. Once prices adjust, all that is left of the information is the worthless bone. No amount of gnawing on the bone will yield any more meat, and no further study of old information will yield any more valuable intelligence." —Higgins (1992)

The EMH, which evolved in the 1960s from Eugene Fama's Ph.D. dissertation, states that at any given time, security prices fully reflect all available information. The implication of this hypothesis is that if current prices fully reflect all information, the market price of a security will be a good estimate of its intrinsic value, and no investment strategy can be used to outperform the market.

The basis for the EMH is the economic theory of competitive markets. Basic economic theory teaches that arbitrage competition among investors and their profit motive will create efficient markets. As new information enters the marketplace, so the hypothesis states, all investors will be appraised of it immediately and will act rationally to adjust the price to the new intrinsic value of the security. Should the price deviate from its true value, so-called "noise," arbitrageurs will compete to bring that price back to that value at which the price will be in equilibrium with its value. Such is a purely efficient market. Figure 4.5 shows what would happen in a purely efficient market to a security price upon the announcement of new information. It shows a step-like progression as the price reacts instantly to that new information.

**This figure shows the ideal efficient market assumption of how information affects price and two other assumptions that have been shown to be more realistic.**



Courtesy Professor Aswath Damodaran, Stern School, New York University

FIGURE 4.5 The impact that new information has on security prices

Unfortunately for the hypothesis and fortunately for technical analysis, empirical evidence demonstrates that these immediate and complete reactions to new information do not occur. The

problems with the hypothesis center around the assumptions that all investors will receive new information instantly, will react rationally to that new information, and that arbitrageurs will immediately and always act to adjust any deviations in the price back to its new value. Indeed, in their 1980 article "On the Impossibility of Informationally Efficient Markets," Stanford Grossman and Joseph Stiglitz argue that because information is costly for investors to obtain, prices cannot perfectly reflect all available information. If prices do perfectly reflect all available information, those who obtain costly information receive no compensation for doing so.

Even Paul Samuelson, professor at MIT and originator of the EMH, has begun to slightly change his tune.

*Samuelson's Dictum*

"Modern markets show considerable micro efficiency (for the reason that the minority who spot aberrations from micro efficiency can make money from those occurrences and, in doing so, they tend to wipe out any persistent inefficiencies). In no contradiction to the previous sentence, I had hypothesized considerable macro inefficiency, in the sense of long waves in the time series of aggregate indexes of security prices below and above various definitions of fundamental values." (Paul A. Samuelson in a private letter to John Campbell and Robert Shiller, from Robert J. Shiller, *Irrational Exuberance*, 2nd Edition, 2001, p 243)

## New Information

Information for purposes of the EMH is any news that will affect the intrinsic value of the security. In the case of a stock, most analysts and theoreticians hypothesize that the value of a company's stock is equal to the present value of the future cash flows that the investor purchasing the stock expects to receive. This present value is a function of all of the company's future cash flows and the expected interest rate during the period that the cash flows occur. New information is any news that affects interest rates or cash flow directly or indirectly. That information can be related to the underlying company or can be any of a multitude of other news about the economy, politics, and so on. In short, it can be almost anything, because almost all change has an affect on value regardless of its immediate importance.

Information itself is subject to many problems and thus brings into question the precepts about it in the EMH. A well-documented characteristic of financial markets is the presence of asymmetric information. Asymmetric information refers to a situation in which one party of a transaction has information that the other party involved in the transaction does not have. For example, the managers of a corporation have better information about how well their business is doing than the stockholders do. In addition, the company managers know whether or not they are being honest about their reporting of the company's financial position, but stockholders cannot immediately discern whether the managers are being honest.

As any investor knows, in the real world, all information is not disseminated instantly to all market players. A classic example of the presence of asymmetric information is the Enron debacle in 2000. The management of Enron knew for years that the fundamental numbers being reported to the public and to analysts were incorrect and were upwardly exaggerated to maintain an artificially high stock price for acquisitions. (See Figure 4.6.) The true information was kept inside the corporation and known by only a few insiders.

Even when the real story began to leak out and the stock price began to decline, security analysts on Wall Street continued to recommend the stock based on projections from the old, incorrect numbers. Thus, this new information was dribbled out to the public in small amounts. But, even when finally disseminated among analysts, it was not interpreted correctly. This is an extreme case, of course, but in the practical world of investments, new information gets disseminated slowly through the investment world and is acted upon with even more hesitation.

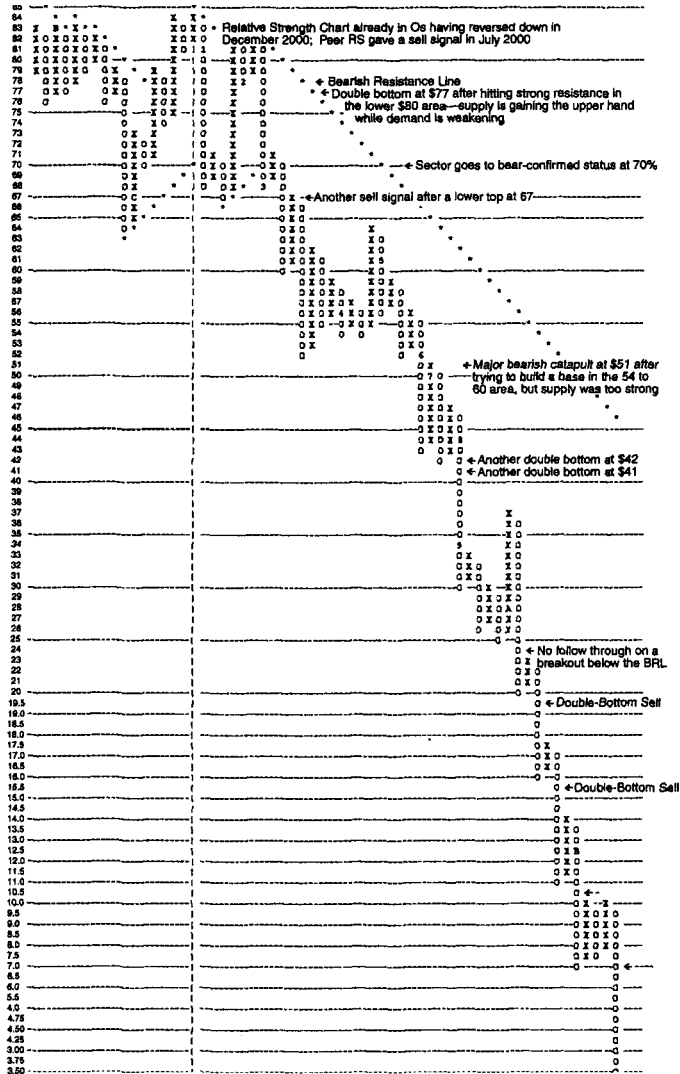
Therefore, several problems exist in the process of information dissemination. First, in its transmission, the information may be inaccurate. Second, the source may be intentionally lying, as in the case of Enron executives. Third, the information may not be disseminated immediately even though it is time-sensitive. Fourth, there exists a natural lag between when the news is announced and when it is received by the last recipient, during which time the information may have changed.

Once information disseminates, the market participants must interpret the information. This interpretation can be extremely difficult and problematic. The information may be too numerous and too complex and, thus, not easily or inexpensively interpreted. The "Information Age" produces an enormous and incomprehensible amount of news and data that is impossible to assimilate. Often information is vague and its consequences not understandable. Not enough precedent has occurred to be able to judge what potential consequences are likely from specific information. In short, information by itself is unreliable and its interpretation subject to logical errors.

Academic studies suggest that it would be extremely costly for market participants to attain and assimilate perfectly new information. In his book, *A Theory of Adaptive Economic Behavior*, Cross (1983) discusses the costliness of solving the complex statistical problems that modern economic and financial theory assume that individuals in the market are working.

"The methodological price for this approach [traditional statistical and mathematical decision analysis] has been extremely high, however, for it has become necessary to assume individuals in these markets can be represented as mathematical statisticians capable of solving specific problems that are often beyond the analytic abilities of professionals in that field. It also requires reliance on the assumptions that individuals follow optimizing rules of behavior under just those dynamic and risky types of situations for which the assumption of optimization has the least empirical support." —Cross (1983)

Point-and-Figure Enron Chart  
 March 12-November 29, 2001



Enron chart and associated commentary courtesy of Dorsey, Wright & Associates, [www.dorseywright.com](http://www.dorseywright.com)

FIGURE 4.6 Point-and-figure chart of Enron stock price March 2001 through November 2001, with samples of Wall Street advisory comments on specific dates (Continues)

**Advke from Major Wall Street Firms on Enron  
March 12-November 20, 2001**

Data	Price		Date	Price	
3/12	\$61.27	Prudential—cut upward target price	10/17	32.20	First Albany—reiterated strong buy
3/14	62.75	Commerzbank—raised to accumulate	10/19	26.05	AG Edwards—cut to hold
3/21	55.89	Merrill—reiterated near-term buy	10/22	20.65	CIBC—downgraded to hold
3/22	55.02	Commerzbank—reiterated accumulate			Prudential—downgraded to hold
3/29	55.31	Goldman—reiterated Recommend List	10/23	19.79	Edward Jones—cut to reduce
4/16	59.44	Goldman—reiterated Recommend List	10/24	16.4)	Prudential—cut to se))
4/17	60.00	AAerrill—reiterated near-term buy			JP Morgan—cut to long-term buy
4/18	61.62	Goldman—reiterated Recommend List			Lehman—reiterated strong buy
		Commerzbank—reiterated to accumulate			First Albany—cut to buy
5/21	54.99	Prudential—price target cut	10/25	16.35	Banc America—cut to market perform
6/8	51.13	Bear Sterns—reiterated attractive			Salomon—reiterated buy but target cut from 55 to 30
6/15	47.26	JP Morgan—reiterated buy			S&P—cuts to negative
6/20	45.80	Goldman—reiterated Recommend List			Merrill—near-term neutral
6/22	44.88	AG Edwards—raised to accumulate	11/1	11.99	CIBC—reiterated buy - but sow no reason to buy the stock
6/27	46.72	Goldman—estimate raised			AG Edwards—cut to sell
7/10	49.22	JP Morgan—reiterated buy	11/7	9.05	Commerzbank—cut lo hold
7/13	48.78	First Albany—estimates raised	11/9	8.63	Prudential—raised to hold
8/15	40.25	Banc America—reiterated strong buy	11/12	9.24	Edward Jones—raised to maintain position
		Goldman—reiterated Recommend List	11/13	9.98	Goldman—cut to market perform
		Bear Sterns—reiterated attractive	11/21	5.01	CIBC-c ut to hold
		Merrill—cut to near-term neutral			Edward Jones—cut to sell
8/28	38.16	Banc America—reiterated strong buy			Prudential—estimates reduced
9/6	30.49	Sanders Morris—raised to buy	11/28	.61	UBS-c u l to hold
9/26	25.15	AG Edwards—upgraded to strong buy			Commerzbank—cut to sell
10/3	33.49	Goldman—reiterated Recommend List			Credit Suisse—cut to hold
10/4	33.10	AG Edwards—downgraded to buy	11/29	.36	RBC Capital—cut to underperform
10/5	31.73	First Albany—reiterated strong buy			
10/9	33.39	Merrill—raised lo long-term buy			
10/16	32.84	Mem'//—raised to near-term accumulate			

Enron chart and associated commentary courtesy of Dorsey, Wright & Associates, [www.dorseywright.com](http://www.dorseywright.com)

HGURE4.6 Continued

Some of the optimization problems that market participants would need to be solving are beyond the analytical abilities of professional statisticians using high-speed computers. G. Hawawini and D. Keim (1994) argue that markets are not efficient because investors are prevented from optimizing by their inherent cognitive limits. Rode, et al., in a Wharton School working paper (1995) argue that there are "substantial constraints on the information processing time allowed," that "this is also a continual abundance of new information made available," and that "this flow of information easily exceeds investor's abilities to process it completely." They argue that because the object of technical analysis is to make sense out of this complex world of new and continual information, it has created rules that substitute simplified and "less complex for the intractable." Basic economic theory teaches that market players will continue the costly process of gathering and processing information only so long as the cost of doing so is less than the cost of being wrong. Technical analysis represents a rational choice for bounded rational investors; it can allow them to make reasonably well-informed decisions with relatively small information processing costs.

Interpretation is also subject to changes in risk preferences. In his 2004 article, "The Adaptive Markets Hypothesis: Market Efficiency from an Evolutionary Perspective," Andrew Lo argues that even in the rational market assumed in the EMH, risk aversion is not a constant. Risk aversion depends on the history of market behavior, and, thus, may be time-varying. For example, an investor who had never experienced a stock market collapse before might assume a different risk preference structure after losing money in the 1987 crash than he or she had before. This means that even under a rational decision-making assumption, the risk parameters are not constant. Time-varying risk assumption can also develop when investor's trade based on irrational expectations, and time-varying risk assumptions may arise from the interactions of heterogeneous investors. In short, the assumption that risk assessment is a constant has a few problems.

### **Are Investors Rational?**

This brings us to the subject of rationality. The EMH assumes that investors will act rationally. In its more recent version, it also assumes that there are irrational participants, called "noise" players, in the marketplace (Black, 1986). When noise players, who drive prices away from intrinsic value, are not counteracted by arbitrageurs, who are called "informed" players, the market is considered irrational. Thus, irrationality can exist in the marketplace, but it is usually nullified by rational arbitrage.

We will get to the subject of arbitrage shortly, but first let us look at the critiques of rationality. Most have centered on the subjects of behavior and preference of market participants.

Market participant actions depend on how individuals process information and make decisions. Information interpretation and decision making is subject to cognitive bias and limits. The new science of behavioral finance studies the irrational behavior of investors and how they interpret information. Some of the results have shown illogical behavior that would be undesirable in the marketplace, such as comfort in crowds called "herding" (Huberman and Regev, 2001), over-confidence based on little information (Fischhoff and Slovic, 1980; Barber and Odean, 2001;

Gervais and Odean, 2001), overreaction (DeBondt and Thaler, 1985), psychological accounting (Tversky and Kahnman, 1983), miscalibration of probabilities (Lichtenstein et al., 1982), hyperbolic discounting (Laibson, 1997), and regret (Bell, 1982; Clarke et al., 1994). More and more of these kinds of studies are demonstrating that investors act irrationally.

Preference in markets is directly related to the assumption that investors are risk averse. The EMH assumes that investors will be willing to take on more risk only if they are compensated by receiving a higher expected rate of return. Thus, the EMH assumes that investors will optimize their decisions based on their perception of and ability to assume risk. Many psychologists and experimental economists have found empirically "specific behavioral biases that are ubiquitous to human decision-making under uncertainty, several of which lead to undesirable outcomes for an individual's economic welfare . . ." (Lo, 2004).

The most famous early experiment was by Daniel Kahneman of the University of British Columbia and Amos Tversky (1979) of Stanford in which a number of participants were asked about preferences for different probability costs and outcomes. Invariably, they chose, when presented with potential gains, a risk-aversion strategy, and when presented with potential losses, a risk-seeking strategy. In the financial markets, this kind of decision making can be disastrous. It suggests that investors have a strong tendency to sell winning positions and to keep losing positions, quite contrary to the rationality assumption of the EMH. For the duo's work in behavioral finance, Kahneman received the Nobel Prize for Economics in 2002. Unfortunately, Tversky died in 1996 and was therefore ineligible.

Advocates of the EMH argue that while irrational players can sometimes affect prices for a short time, prices are quickly brought back into equilibrium to their true value by a rational arbitrage that profits at the expense of the players with irrational beliefs. Thus, prices may stray from their true value occasionally but will quickly return to them. The stray prices are "noise" about the true value and provide opportunity for the insightful arbitrageur. Prices always return to their true value, and irrationality, while it does occur, is never in control of prices because profitable, competitive arbitrage will always return those prices to their true value.

This brings us to the question of whether arbitrage actually does bring prices back to equilibrium or whether there are other forces, either of human bias or emotion, which can overwhelm the rational force of the arbitrageur.

## **Will Arbitrage Keep Prices in Equilibrium?**

Price equilibrium at the intrinsic value of a security in the EMH relies on arbitrageurs acting on a profit motive to bring prices back to equilibrium if they should stray. In practice, the ability for arbitrage is less likely than the EMH assumes. It is too risky for reasons other than volatility.

Ideally, risk-averse arbitrage is "the simultaneous purchase and sale of the same, or essentially similar, security in two different markets at advantageously different prices" (Sharpe and Alexander, 1990). In many market instances, there is no substitutable alternative for the arbitrageur; or arbitrageurs are unable to trade alternatives for practical reasons such as lack of liquidity, lack of margin, trading costs, and so on. Arbitrage depends on sufficient liquidity for the



arbitrageur to get into a position and most importantly, to get out. In periods of fast markets and emotional panic, liquidity is often absent, leaving the risk to the arbitrageur that a position cannot be closed. Trading costs, in addition to slippage from illiquidity, are a concern to the arbitrageur. Trading costs must be minimal because with the small spreads involved, they can reduce a large portion of potential profit. These factors of liquidity and costs often convince the potential arbitrageur to go elsewhere to make a profit

When there is no substitutable alternative for arbitrage, one side or the other of a run away from the theoretical intrinsic equilibrium value can continue. There is nothing to check it. The absence of a tradable vehicle to provide a risk-averse arbitrage may not be available. This is true, for example, in the entire stock and bond market. If "irrational exuberance" (a term used by Yale Professor Robert Shiller)<sup>1</sup> develops, as it did in the 1920s and 1990s, and prices rise significantly above their equilibrium value, there is no security that arbitrageurs can use to arbitrate prices back to their rational value without incurring substantial capital risk. Without an arbitrage vehicle, prices can trend in one direction without the arbitrage check to bring them back to rational values.

As opposed to the EMH, technical assumptions include the ability for prices to trend, in which case the arbitrageur, if he exists, may be overwhelmed by and may even join the consistent trend of prices away from true value. In addition, when a trend is completed and reverses, researchers such as DeBontd and Thaler (1985) empirically observe that those prices often trend in the opposite direction well beyond rational value. This cyclicity in price direction and extent is assumed by technical analysis to be due to irrational behavior overcoming rational arbitrage.

**BOX 4.2** A Case Study in the Failure of Financial Theory—The Long-Term Capital Management Debacle

The failure of rationality and arbitrage in the face of irrational behavior was empirically but unfortunately demonstrated by the collapse of Long-Term Capital Management (LTCM) in 1998. Managed by extremely knowledgeable and sophisticated professionals, this fund had two Nobel Prize winners, Scholes and Miller, on its advisory staff. It leveraged itself by avoiding Federal Reserve margin requirements and otherwise sane ratios of safety into almost 30 to 1 positions of investments to cash and controlled thereby over 300 billion dollars' worth of arbitrated positions. In addition, it held over a trillion dollars in derivative obligations that, had they failed, would have brought that amount of exposure to otherwise secure positions in the banks that were on the other side of these contracts, and it would have forced them to liquidate also. In other words, *LTCM was in a position to bring down the U.S. and perhaps world financial system if it failed.*

*(continued)*

1. "Shiller used the phrase during testimony before the Federal Reserve, and Alan Greenspan repeated it in his famous December 1996 speech." (Interview of Professor Shiller by Chris Rugaber. Motley Fool ([Fool.com](http://Fool.com)). April 11, 2001). The apparent origin of the term, however, goes back to Hamilton (1922).

One of the problems of pure arbitrage is that the marketplace, over very short time periods, is efficient enough that bid-ask spreads are extremely small and the potential profit so minimal that meaningful profit can only come from a very large position, similar to a grocery store making many small profits on high turnover. Leverage must then be used to increase the size of the position. The danger is that while leverage can increase profit, it can also increase the risk of capital loss to the point where, depending on the size of the leverage, a small movement against a position can wipe out the underlying assets. With a 30 to 1 leverage and 300 billion in contracts, a move of only 3.4% against the positions would be enough to wipe out the fund and force liquidation. This is essentially what happened to LTCM.

Here was a portfolio managed on the most modern versions of finance theory that collapsed because certain unrealistic assumptions were made, based on the EMH, and where "mispricing" became worse before it became better, forcing the covering of positions at the worst time and thus exacerbating the mispricing even more.

"Investors flocking to safety and liquidity in the aftermath of the Russian (debt) default in August 1998 were stronger, at least for several months, than the forces of rationality." —Lo (2004)

Thus, even when a series of theoretically riskless spread positions were entered with rational expectations, the reaction to an event overwhelmed those positions, and lack of liquidity as well as the pressure of margin calls created a substantial collapse. Finally, several major banks and brokerage firms, with the insistence and support of the Federal Reserve, had to take over the assets of LTCM, force it out of business, and gradually liquidate its positions over time as the market spreads improved.

The lesson learned from this expensive adventure into the EMH was that market forces may abide by the principles of efficiency a majority of the time, but occasionally and unexpectedly, irrational forces can overwhelm rationality and cause a disaster. Several months after the LTCM debacle, arbitrage professionals analyzed the LTCM portfolio and agreed that the positions were reasonable, and after a time the spreads initiated did return to their mean. In other words, had LTCM not been so highly leveraged and had it been able to withstand the short-term losses, it would eventually have profited. To achieve a high return on capital, however, LTCM needed leverage. Leverage introduced another risk, over the risk of volatility—the risk of ruin. And when the markets ran outside the normal distribution of returns and developed a "fat tail," LTCM was done for business. This is why the assumption of a normal distribution in price returns can be hazardous. It is also why the subject of behavioral finance was born.

## BEHAVIORAL FINANCE AND TECHNICAL ANALYSIS

If investors act irrationally, as studies show they have a propensity to do, and can drive prices away from the EMH true value, and arbitrage is a risky endeavor and not necessarily utilized to bring those prices back to equilibrium, a new model is necessary to either replace or adjust the EMH. The study of behavioral finance began as a means to resolve this mystery.

Because behavioral finance appears to contradict the EMH, it has come under considerable criticism by advocates of the EMH. For technical analysis, the eventual resolution is important. Behavioral finance has become the theoretical basis for technical analysis. Investor sentiment and price anomalies, either as trends or patterns, have been the bulk of technical analysis study. Sentiment and psychological behavior have always been the unproven but suspected reason for these trends and patterns, and human bias has always been in the province of trading system development and implementation. Thus, until the resolution between the EMH adherents and the behavior adherents arrives, technical analysis will wait. Theoretical evidence was against technical analysis 30 years ago with the advent of the EMH, but empirical studies since questioning the EMH in its purest form have bolstered the credibility of technical analysis with more sophisticated investigations of technical rules, and they have added hope that the academic world will eventually catch up to the real world of markets.

## PRAGMATIC CRITICISMS OF TECHNICAL ANALYSIS

In addition to the theoretical criticisms of technical analysis, there are some pragmatic criticisms of technical analysis.

Some investors incorrectly believe that technical analysis is only for the short-term trader and is not useful to the long-term investor. Because new and relevant fundamental information on a security doesn't change minute-by-minute or day-by-day, a short-term trader must rely more on technical analysis. The short-term trader must rely on an interpretation of market price behavior rather than on news and company announcements. In this instance, technical analysis gives the trader more of an advantage than fundamental analysis. This happenstance has led to the incorrect belief that technical analysis is only for the short-term trader. But, technical analysis is the study of price, and people determine prices. *People affect long-term prices as much as short-term prices.* Analysis of price behavior over the long-term is just as valuable to the investor as analysis over the short-term is to the trader. Indeed, the professional managers who have been the most successful have been so because they used technical analysis for long-term decisions.

Others opponents of technical analysis claim that if successful, technical analysis would cancel itself out by being self-fulfilling. A corollary to this claim is that technical rules that worked in the past may not work in the future. Many rules, both technical and fundamental, suffer the fate of becoming too popular. An example of this phenomenon is the small capital effect. For example, historically, smaller capitalized stocks tended to outperform larger capitalized stocks, but this fundamental rule no longer holds true. Likewise, in the technical realm, some methods of

pattern analysis seem not to work as well as in the past. This is a problem with all investment analysis. As markets become more efficient, competition becomes more fierce, and any method having some modicum of success is quickly jumped on until it becomes neutralized. Although it occurs with technical analysis, it is not unique to it. As for technical rules working in the future, who is to say? All rules are subject to change. At least technical analysis works with reliable data; most rules have been tested; and risk levels can be established to limit loss of capital.

An additional criticism of technical analysis is that most technical rules require subjective judgment and are thus fallible. What form of investment analysis doesn't require subjective judgment? Certainly, fundamental analysts must judge whether to buy, sell, hold, or ignore a security they are analyzing. It is true that technical analysis of charts is subjective, and some call it an "art" or "skill," but the demonstration of data on a chart is just another means of time series analysis. Most theoreticians also use charts to clarify their hypotheses. One sure aspect of technical analysis, unlike others, is that the data used is as timely and accurate as any data can be. Actually, technical analysis is becoming more "mechanical" as quantitative experts use computers to determine statistical rules for action and money management. Some believe this may "blow up" and denigrate technical analysis or at least drive it back to the subjective rules, as did the LTCM debacle for the EMH about arbitrage, but for now technical analysis is becoming the less subjective of the two major forms of investment analysis.

## WHAT IS THE EMPIRICAL SUPPORT FOR TECHNICAL ANALYSIS?

Despite the theoretical criticisms, can technical analysts use past price data to predict future price movement? Over the years, hundreds of studies have been conducted to test the efficacy of technical trading rules. Cheol-Ho Park and Scott Irwin conducted one of the most extensive reviews of these tests. In their 2003 report, they review 92 post-1986 academic studies that tested the profitability of technical analysis strategies.<sup>2</sup> Of the 92 studies reviewed, 58 of the studies concluded that positive results could be gained from using technical analysis; only 24 of the studies concluded that the use of technical strategies led to negative results. Under the Random Walk Hypothesis, because prices returns are independent of each other, no technical trading strategy can be consistently profitable. Believers in the Random Walk Hypothesis would admit that a strategy could appear to be profitable ex-post, but that this profitability was simply due to luck, not a successful technical trading rule. However, the fact that two-thirds of the studies that Park and Irwin reviewed showed positive results could not be attributed to luck. Of course, as Park and Irwin point out, criticism can be made of some of the reviewed studies in that the various testing methods used by the researchers were in some cases subject to data snooping and ex-post selection of trading rules; some of these studies may also be flawed due to difficulties in estimating risk and transaction costs. It is unlikely, however, that all 58 positive studies are at fault for testing deficiencies. Park and Irwin's summary results at least show possible refutation of the

**2. Many tests of technical trading strategies conducted before the mid-1980s focused on only one or two trading systems, did not test for statistical significance of trading profits, and did not correctly address issues of risk. Therefore, Park and Irwin concentrated on the newer studies that provide results that are statistically more valid.**

Random Walk and the Efficient Markets Hypotheses, something that until recently had not been accomplished with rigorous testing of trading rules.

## CONCLUSION

Like any practical discipline, especially one working with an indefinite and fickle subject such as the marketplace, technical analysis has problems. The Random Walk Hypothesis is not perfect; yet at many times prices appear to behave randomly. The EMH has many holes that cannot be explained, yet prices seem to be very efficient and the possibility of profit often slim. Fundamental analysis has its problems, most of which were exaggerated during the market decline in the early 2000s, but there is little question that stock prices, commodity prices, and currency rates change over the long-run due to the fundamental changes in the economy and structure of markets. Technical analysis is no different. It has many flaws, is difficult to learn, is subject to error and bias, and often falls on its face. Nevertheless, technical analysis can be extremely useful to investors wishing to profit from timing and trend riding while limiting risk.

## REVIEW QUESTIONS

1. You walk into a room where some friends have been playing a coin toss game. They ask you to guess whether the coin will land on heads or tails on the next toss. Does the fact that your friends have knowledge about how many heads and tails have already occurred in the game give them any advantage over you in guessing whether a coin will land on heads or tails on the next coin toss? Explain.
2. Supporters of the Random Walk Hypothesis claim that stock prices have no "memory." What do they mean by this claim?
3. What does the term "fat tails" mean? How do fat tails differ from the tails that would occur in a normal distribution?
4. If the probability of a 10% decline in stock prices occurring on any particular day is 1 in 1,000 and stock returns are random, explain why the probability of having a 10% decline in stock prices on two consecutive days is only 1 in 1,000,000.
5. What are some of the problems associated with information that bring the EMH into question?

# **MARKETS AND MARKET INDICATORS**

**CHAPTER 5 AN OVERVIEW OF MARKETS**

**CHAPTER 6 Dow THEORY**

**CHAPTER 7 SENTIMENT**

**CHAPTER 8 MEASURING MARKET STRENGTH**

**CHAPTER 9 TEMPORAL PATTERNS AND CYCLES**

**CHAPTER 10 FLOW OF FUNDS**

# AN OVERVIEW OF MARKETS

## CHAPTER OBJECTIVES

After studying this chapter, you should be familiar with

- The market characteristics required for investors to use technical analysis
- The types of markets in which technical analysis can be used
- The differences between informed, uninformed, and liquidity market players
- The differences between price-weighted, market capitalization weighted, and equally weighted averages

Technical analysis is widely used in freely traded markets. In the U.S. and most major industrial countries, technical analysis is used in the currency, equity, fixed income, and commodity markets. Professional traders and investors, as well as individuals who are investing their own funds, use the techniques of technical analysis. An obvious use of technical analysis is to make money. Investors attempt to buy a security at a low price and sell it at a high price; technical analysis helps identify profitable buying and selling opportunities. In addition to aiding the investor with determining profitable buying and selling opportunities, technical analysis can be used to manage risk.

For an investor to use technical analysis in a market, easy access, fungibility, sufficient liquidity, and continuous trading must characterize the market. Although there are many freely traded markets in the world in which technical analysis is used, the most common, and the one this book will most frequently address, is the U.S. stock market.

**BOXS.1** Fungibility

*Fungibility* is the interchangeability of financial assets on identical terms. Often a stock, future, or option will be traded on more than one exchange. It is especially important that the financial asset being purchased on one exchange and sold on another is fungible. In other words, if a trader buys an S&P contract on the Singapore exchange and sells the same contract (as defined by asset, amount, currency, and expiration) on the Chicago Mercantile Exchange, he or she must be sure that the contracts are fungible, that they are exactly interchangeable, and they can be cleared through either exchange. Some exchanges trade the same contracts, but they are not members of the same clearinghouse, the entity that makes and takes delivery. Thus, a purchase in one exchange would not be accepted for delivery in the other exchange. When trading in offshore markets, fungibility can become a serious problem.

## IN WHAT TYPES OF MARKETS CAN TECHNICAL ANALYSIS BE USED?

Markets are simply meeting places of buyers and sellers. Markets can be categorized in many ways. They can be categorized by the assets being traded, the manner in which the borrowers and lenders meet, or by the type of contract that is executed. Let us begin by dividing markets into categories based on how organized or integrated the market is. Using this type of division results in four different types of markets: direct search markets, brokered markets, dealer markets, and auction markets.

The direct search market is the least organized market structure. With this type of market, buyers and sellers must seek and find each other directly. For example, suppose that Elizabeth wants to buy a used washer and dryer for her new apartment. Elizabeth might search the classified ads in her local newspaper for a seller of a washer and dryer. Generally, low-priced, nonstandard goods are traded in the direct search market. This type of market is characterized by sporadic participation by the market players.

The next level of market organization, the brokered market, addresses the direct search market problem of the buyer and seller finding each other. In markets where the volume of



trading in a particular good is sufficiently high, brokers can specialize in bringing buyers and sellers together. One of the most familiar examples of a brokered market is the real estate market. Through specialization and economies of scale, the real estate broker is able to provide search and matching services to clients at a cost much lower than the clients' private search costs would be. The broker is able to earn a commission by providing these search and matching services for the buyer and seller. Brokered investment markets work similarly, with brokers matching buyers and sellers of financial assets for a commission.

A third type of market structure, the dealer market, arises when the trading in a particular type of asset becomes sufficiently heavy. Unlike brokers, dealers trade assets for their own accounts. Specializing in particular types of assets, these dealers post bid and ask prices and stand ready to buy and sell at these prices. The NASDAQ is an example of a dealer market for stocks. The dealer offers to buy securities at the "bid" price and offers to sell the securities at the "ask" price. The dealer's profit margin is known as the "bid-ask spread." The dealer market saves market players search costs by providing readily available information about the prices at which they can buy and sell securities. The securities traded in dealer markets are usually substitutable and liquid, with the dealers standing ready to purchase or sell securities providing the liquidity. Thus, dealer markets generally have the characteristics necessary to use technical analysis.

The most highly integrated market is the auction market. In an auction market, all participants converge at one place to buy or sell a good. The centralized facility can be a location, a clearinghouse, or even a computer. An important aspect of the auction market is that all information about offers and bids is centralized where it is readily accessible to all buyers and sellers. As all of the market participants converge, buyers and sellers need not search for each other, and a mutually agreeable price can be established, eliminating the bid-ask spread. Assets such as art, jewelry, and antiques are sold in periodic auction markets. The New York Stock Exchange is an example of a continuous auction market.

Some auction markets can be studied using technical analysis, while others cannot. For example, auction markets in paintings could not be subject to technical analysis because a painting is unique and not substitutable with another painting. The auction market for U.S. Treasury bills, however, can be analyzed with the tools of technical analysis because U.S. Treasury bills are highly liquid securities and are easily substitutable. Because organized exchanges are structured for continuous trading in liquid, substitutable assets, they are usually subject to technical analysis.

## **TYPES OF CONTRACTS**

Now let us look at categorizing markets by the type of contract that is executed. We will consider three basic types of markets using this division—the cash market, the futures market, and the options market. Table 5.1 shows the types of assets that might be bought and sold in each market category.

TABU 5.1 Asset Categories Traded in Cash, Futures, and Options Markets

Type of Asset Traded	Cash Market	Futures Market	Options Market
Common Stock	Yes	Yes	Yes
Commodities:			
Agricultural*	Yes	Yes	Yes
Metals	Yes	Yes	Yes
Energy	Yes	<tm	Yes
Interest Rates	Yes	fti	Yes
Foreign Exchange (FOREX)	Yes	Yes	Yes
Indexes	Yes	Yes	Yes
Annual Funds	Yes	No	No
Exchange Traded Funds (ETF)	Yes	No	Yes

## Cash Market

The cash, or spot, market is the oldest type of market. In the cash market, a contract is entered into that will result in immediate exchange of the agreed-upon items. Different rules and conventions regarding the meaning of "immediate" apply depending upon the type of asset being traded. For example, when foreign currencies are being exchanged, delivery is usually instantaneous or at least within two days. In the case of common stock, the delivery period is three days. In the case of cash commodities, each market has its own rules and conventions. Cash indexes trade almost exactly like common stocks, and their delivery is regulated by the exchanges upon which they are traded.

The stock market, the most widely recognized cash market, is open to the public. In the cash commodities markets, the prime producers or consumers of the commodity traded often dominate. For example, Nestle is a large participant in the cocoa cash market; Exxon is a major participant in the oil cash market; Citibank is a major participant in the financial cash market (bonds, notes, fed funds, etc.); and UBS First Boston is a principal participant in the FOREX (foreign exchange) cash market.

In sum, the cash markets in which we are principally interested are the common stock and index cash markets that are available on the public stock exchanges. Cash markets can be leveraged but not usually as much as the other vehicles. The amount of leverage in the stock market, as well as the option market, is controlled by the Federal Reserve and the Securities and Exchange Commission, but various ways of getting around the regulations have been developed through the use of derivative markets and private arrangements with lenders. Nevertheless, the average trader or investor is bound by the Federal Reserve regulations, which presently require that for stocks and indexes, a minimum of 50% of market value must be in cash. This means that the trader or investor can have a 2-to-1 margin for overnight holdings and a 4-to-1 margin for pattern trades intraday. For each \$1, up to \$2 in securities can be purchased or sold short overnight, and \$4 in securities can be held within the day. There are different rules for day traders, for

holders of U.S. Treasury securities, and for shares selling under \$5, and the various exchanges and brokerage firms can have tighter margin requirements if they wish. Before contemplating the use of margin, the investor or trader should inquire at the intended brokerage firm what rules and regulations would be applicable to the trading or investing style desired.

Liquidity in the cash stock markets is excellent. The volume of trades and amount of money transacted each day suggest that willing buyers and sellers can always be found. The only time that the U.S. exchanges adjust trading or close down is when the exchange's computers go down, when a major event or severe weather affecting the U.S. occurs, or when the stock averages rise or decline a certain large amount, say in a panic. In the instance of a large price change, the NYSE reacts in two ways depending on its severity. When predetermined limits, called "trading collars," are reached, index program trading, the arbitrage between futures and cash stock transactions, is redirected to placing certain types of orders that are more difficult and have minimum effects on prices. When more stringent limits, based on a percentage change in the Dow Jones Industrial Average, are reached, the exchange closes down all trading for a limited time. These closings are called "circuit breakers." As of the second quarter of 2005, for example, should the Dow decline more than 1,050 points in a day before 2:00 p.m. EST, the exchange would close for an hour. After 2:00 p.m. but before 2:30 p.m., it would close for an hour, and after 2:30 p.m., it wouldn't close at all. Should the Dow decline 2,150 points within a day, the exchange would stop trading for two hours unless it was after 2:00 p.m., in which case it would close for the day. Should the Dow decline 3,200 points within the day, the exchange would halt trading for the remainder of the day. The limits are adjusted each quarter based on the Dow level for the previous quarter and have only triggered a shutdown once, on October 27, 1997, when the Dow Jones Industrial declined 550 points by 3:30 p.m.

### **10X5.2** Exchange Traded Funds (ETFs)

In the past several years, a newly created security that replicates an index fund and other assets like gold, without the operating expenses and tax consequences of an index mutual fund, has become extremely popular as a trading vehicle and as a hedging vehicle. Nathan Most (who died in December 2004 at the age of 90), an executive of the American Stock Exchange, created in 1993 the first such fund to replicate the Standard & Poor's 500 Index. It was a Standard & Poor's Depository Receipt (SPDR), and the ticker symbol was SPY. Consequently, it earned the nickname "Spyder" that is now seen on the TV ads. ETFs are mutual funds, but unlike conventional mutual funds, they are priced throughout the day rather than once or twice and trade like stocks on the various exchanges. These "stocks" are Unit Investment Trusts (UIT) that expand and contract as the volume of purchases and sales increases or decreases. Their most important advantages are low expenses, because they are essentially computerized index funds, and maintaining parity with their respective markets almost instantaneously. In most cases, they distribute dividends (or reinvest them), thus eliminating the dividend spread seen in the index futures and options

*(continued)*

markets; they are taxed like stocks; and they do not require an uptick to be sold short. The largest ETF with the most trading volume is still the Spyder, but numerous others have come on the market. Close behind are the QQQs (the "Cubes"), replicating the NASDAQ 100, and the DIAs ("Diamonds"), replicating the Dow Jones Industrial Average. Some ETFs replicate foreign stock markets; some replicate industry sectors; some replicate corporate and Treasury bonds; some replicate commodity markets; some replicate environmental themes; and some replicate theoretical portfolios. There are more than 160 ETFs traded currently. Some other UTT types are called "HOLDRs," "Ishares," "VTPRs," "ADRs," or "BLDRs." They trade similarly to ETFs, but they have slightly different legal and portfolio rules.

## Futures Markets

Futures contracts that are traded in the futures markets are contracts in which the buyer and seller agree to trade at specific terms at a specific future date. Futures markets are often incorrectly called "commodity markets" more from historical usage than as a realistic description. Futures markets first developed in the agricultural markets as forward contracts, mostly in the grain markets, to provide a hedge for farmers and banks against crop failure or surplus. To understand the development of the futures market, suppose that you are a wheat farmer. You are concerned about the market price of wheat at harvest time. If the price is not as high as you anticipated because of a bumper crop of wheat, your profits will suffer. American Bread Company (ABC) is also concerned about the price of wheat, although ABC's concern is the opposite of yours. ABC's fear is that a poor wheat crop will lead to rising wheat prices, which translates into higher input costs and lower profits for ABC. You and ABC can ease your concerns by entering into a forward contract. In this forward contract, you would agree to sell a particular amount of wheat to ABC at a particular future date and at a price you set now. This reduces your risk and ABC's risk, you know what to expect as far as your income, and ABC locks in the price of its input.

Although individuals wrote forward contracts for many years, the contracts were first traded in the U.S. on the Chicago Board of Trade (CBOT) in 1848. However, the trading was cumbersome because the contracts were nonstandard: They each had different delivery dates and different commodity quality specifications. To address this issue, the CBOT developed the standardized contracts we know today as "futures contracts" in 1865 (Brecht, 2003).

The CBOT, often referred to as "The Board of Trade," is the oldest futures exchange in North America. Ironically, the largest is a relative newcomer, the EUREX, jointly operated by the Deutche Borse AG and the SWX Swiss Exchange (see Table 5.2). Today there are a number of futures exchanges throughout the world, many specializing in contracts of specific underlying assets. Futures exchanges are becoming a mini-growth industry as developing nations organizing markets to trade especially in local products. The second largest North American futures exchange, the Chicago Mercantile Exchange (CME), originally specialized in livestock futures. Today most trading at the CME, often called "The Merc," is in stock-index, interest rate, and foreign currency

futures. New York is home to the New York Board of Trade (NYBOT) and the New York Mercantile Exchange (NYMEX). The Kansas City Board of Trade (KCBT), the Winnipeg Commodity Exchange, and the Minneapolis Grain Exchange (MGEX) specialize in grain. As Table 5.2 demonstrates, some of the largest futures exchanges are outside of North America.

TABLE 5.2 Ten Largest Futures Exchanges in Futures Contract Trading Volume

Rank in 2004	Exchange	Volume (in Thousand Contracts)
1	EUREX (Germany and Switzerland)	684,630
2	Chicago Mercantile Exchange	664,884
3	Chicago Board of Trade	489,230
4	Euronext.liffe	310,673
5	Mexican Derivatives Exchange	210,355
6	Bolsa de Mercadorias and Futures (Brazil)	173,533
7	New York Mercantile Exchange	133,284
8	Dolian Commodity Exchange (China)	88,034
9	Tokyo Commodity Exchange	74,447
10	National Stock Exchange of India	67,406

Futures, unlike stocks, are contracts and represent an agreement to purchase or sell a very specific amount and quality of asset at the expiration date. Most nonfinancial contracts are either closed in the marketplace by selling or buying before their first delivery day or are "delivered." For example, if you own one contract in sugar and do not sell it before the delivery day, you are obligated legally to accept delivery of several railroad boxcar loads of sugar at your railhead. Major dealers in these commodities have the facilities to take or make delivery; most speculators do not. When a trader buys a futures contract then, he does not own anything other than an obligation to take delivery on the delivery day of the commodity underlying the contract. Because the contract is not a specific tide of ownership, it is never executed until the delivery day. It is traded back and forth between buyers and sellers, similar to how musical chairs are played, only the music stops on delivery day. Financial futures contracts are different from commodity futures contracts in that they settle on delivery day with cash based on the closing prices of the underlying securities or index.

When a position is initiated in a futures contract, the brokerage firm requires a "good-faith-deposit" that requires the trader to make good on any fluctuation in the contract price value. As the price of the contract rises and declines, the good faith deposit is increased or decreased by the amount of the price value change. When the deposit declines below a certain level, the brokerage firm requires that more funds be added to the account. Otherwise, the brokerage firm closes the position.

Margin requirements change as the price of the contract changes, as the price level or volatility changes, or if the exchange determines that the price may change significantly. Exchanges determine the minimum requirements for their contracts, and brokers may set rates

higher but not lower than the exchange requirements. There are two types of margin—initial and maintenance. Initial is the amount necessary in the account before an order can be placed. Maintenance margin is the minimum amount necessary to keep an account active. This margin changes each day with the movement of the contract price.

Futures contracts trade in a series of contract months, and each is a unique contract group. The May 2005 Heating Oil futures are different from the June 2005 Heating Oil futures. They are substitutable for their specific contract months but not for each other. On a futures contract, the expiration day, the specific description of the underlying, and the contract size are constants while the price fluctuates. Financial futures are the same in this respect. Their expiration months are quarterly (March, June, September, and December) for each year. Table 5.3 shows more specifics about the exact dates for expiration for stock futures.

TABLE 5.3 Stock Futures Expiration Dates

Instrument	Month	Day of Month	Underlying Priced at of
Stock Index Futures	Mar, Jun, Sep, Dec	3rd Thursday	Friday Open
Stock Options	Monthly	3rd Friday	Friday Close
Single Stock Futures	Monthly	3rd Friday	Next trading day at 10 a.m.
Options on Index Futures (S&P, NDX)	Mar, Jun, Sep, Dec	3rd Thursday	Friday Open
Options on Index Futures	Monthly	3rd Friday	Friday Close

The advantages of futures relative to stocks are many. Futures do not require an uptick for short-selling; they are highly leveraged; and they have a favorable tax benefit. Any futures trade is automatically allocated 60% to long-term gain/loss and 40% to short-term gain/loss. Furthermore, at year-end, the brokerage firm sends only one piece of paper with the net gain or loss for the year rather than a wheelbarrow full of transaction tickets needed to fill out the IRS Schedule D.

The danger of futures centers on its leverage and, in some instances, its illiquidity. The margin requirement for most futures contracts is less than 10%. It is not required that futures traders use all their margin. Indeed, prudent money management would suggest otherwise, but the danger of trading without protective stops (see Chapters 13, "Breakouts, Stops, and Retracements," 22, "System Design and Testing," and 23, "Money and Risk Management," for usage of stop orders) and a reasonable money management method (see Chapter 23) has been the ruination of many traders. The other major danger is in more illiquid futures markets where what is called a "limit" day occurs. Some futures have daily range limits. This practice has declined over the past few years to the point where some futures have limits only for contracts older than the spot month. Nevertheless, a daily price limit, when applicable, means that once the daily range limit from open to high or low is reached, trading in that contract is shut down. If one has a stop order that was not executed when the range was exceeded and the market shut down, too bad. Sometimes several range or daily limit days occur in a row and no trading takes place at all. On a highly leveraged position on the wrong side of the market, this can be ruinous. In the liquid markets such as the financial markets, a limit day is rarely seen because the liquidity of the market is so strong. Nevertheless, a limit day is a risk to be considered.

**BOX 5.3** Expiration of Option and Futures Contracts

One cross-vehicle effect that can influence price action in all three market vehicles in the stock market especially is the expiration of option and futures contracts. Table S.3 describes the expiration dates for stock market vehicles. On each date or shortly before, the prices of all three vehicles can be affected by the crosscurrents between each vehicle expiring and its underlying security. This is even more complicated when the underlying security is itself a derivative. For example, options on index futures expire on the same day and are priced at the same time. Depending on the number of options being exercised on that day and the number of futures also coming due that day, the markets in the underlying can become hectic. From the viewpoint of the technical analyst, almost none of the price action from such expiration activity has any meaning for the future of the underlying prices. Nevertheless, limit and stop orders can sometimes be triggered, causing necessary adjustments in a portfolio.

## Options Markets

An option contract gives the holder the right, but not the obligation, to complete the transaction stated in the contract before the expiration date of the contract. There are two basic types of options—call options and put options. The call option gives the owner the option to buy an asset at a particular price, known as the strike price, before the option's expiration date. The owner of a put option has the right to sell the stated asset at the strike price before the option's expiration date.

Technical analysis is useful in the cash and futures vehicles but not so much in the options markets. Option markets usually have a short lifespan and with certain exceptions, such as the index options, less liquidity than the other vehicles. Because options are derivatives of the cash or futures markets (the "underlying" markets), often these markets are analyzed first and then trading rules are applied to the options markets. For example, in the S&P 500 futures, a technical buy signal may be generated and the trader, instead of acting on the future, will buy the call, sell the put, or create some kind of combination of calls and puts. This is extremely dangerous for the novice because options include sizeable leverage risk and other complications. Options are a subject all their own and will not be covered in this book. Because options are derivatives of other vehicles, the student should well understand the cash and futures market before studying or entering the options markets.

## How DOES A MARKET WORK?

To understand the principles of technical analysis, we must be familiar with how markets work and who the players might be. To better understand how market prices are set, let us begin with a hypothetical trading example. Let us assume that we are watching the trading post on the New York Stock Exchange where the stock of an imaginary company International Business Products (IBP) is being traded during normal trading hours.

We will assume that a specialist who has an interest in the stock of IBP is present; this specialist's job is to stabilize the price of IBP's stock. In addition, several floor traders are present; these floor traders represent off-floor interests in the stock. The first off-floor interest is a mutual fund that wishes to purchase the stock because its analyst believes the company's earnings are going to rise suddenly and rapidly. The analyst has determined this expectation from studying the financial statements of IBP and from interviewing IBP's management. The second off-floor interest is a group of investors from a golf club in New Jersey who have heard of the profits one member of the club has gained from buying IBP earlier in the year. They also are interested in buying the stock but have no other information than what they have heard about their friend's profits. The third off-floor interest is a pension fund that currently owns IBP stock. This pension fund has made a substantial profit in IBP but now wishes to sell its holdings because it has determined that the stock is overpriced. The fourth off-floor interest is an estate that owns the stock and needs to liquidate the position to raise cash to pay taxes. The fifth off-floor interest is a hedge fund that has been watching the stock price change and is flexible enough to either buy or sell shares but has no particular opinion about the prospects for the company.

Thus, the players in this hypothetical marketplace can be summarized as

1. A specialist whose job is to stabilize the price of IBP.
2. A mutual fund that desires to accumulate shares of IBP because it believes the earnings of International Business Products will improve rapidly.
3. A group of investors acting on the fact that IBP's stock has risen in the past.
4. A pension fund that already owns shares of IBP and believes the current price is too high.
5. An estate that owns shares of IBP and must sell them to raise cash.
6. A hedge fund that is attempting to trade the shares of IBP but has no opinion about the prospects for IBP as a company.

Notice that the players have different sources of information, different interpretations of that information, different reasons for trading IBP's stock, and different expectations. The mutual fund believes in the analyst's recommendation that the prospects for the company will improve immediately and wants to buy because it expects the price to rise. On the other hand, the pension fund believes the price of the shares is already too high and wants to sell, not necessarily because it expects the price to decline but because the possibility of future rises is diminishing. One or the other will end up correct, depending on how the stock performs in the future. In addition to these major players is the estate that wishes to sell the stock to raise cash. It has no interest in the company and only wants the money from the sale. Its information is the necessity to raise cash and its interpretation is to sell the stock. The specialist may have an opinion and expectations about the company, but his responsibility is to stabilize the market for its shares. He will step in and buy or sell to provide liquidity and to keep the share price from rising or declining sharply. He will thus be acting contrary to the direction of the stock price, buying when it dips and selling when it rallies. The hedge fund will try to take advantage of anomalies, times when the stock seems to be out of balance with either its trend or its value. Finally, the golf club members are interested in



buying the stock only because someone they know has made money in it. They expect to realize a sizeable profit.

These different types of players are just examples. In real markets, of course, the number of players is huge, and information and interpretation of that information are equally as vast. Players buy and sell based on their interpretation of information. In some cases, that information may have nothing to do with the company and may not even be accurate. The estate sale, for example, is based on information that the estate needs cash, and the golf club members are buying stock purely on the information that someone else has made money in it. It is possible that the estate does not need the cash or that the member claiming the outstanding profit is lying. Players may interpret the information incorrectly; they may not care about the company at all; or they may act strictly emotionally, based on either greed or fear (in the case of a sudden and unexpected decline). The net result is a transaction between opposing players at a specific price. That price reflects the sum of all the information and interpretation by all players at that instant in time.

Now what happens to that price when the players interact over time? Obviously, each new price reflects a new sum of interpretation. Say the last price of IBP was \$50.0. The mutual fund is anxious to buy the stock and bids 50.0 for 20,000 shares. The pension fund, not being as anxious, offers 10,000 shares at 50.4 and 10,000 shares at 50.6, all it has to sell. This is a standoff, as a new price has yet to be established. The specialist, judging that the spread between the bid and offer is too wide and surmising from his information that the buyer is larger than the seller, offers 1,000 shares at 50.1 because he cannot outbid the buyer above the last price. At the same time, the golf club members enter an order to buy 1,000 shares at the market. This trades at 50.1 against the specialist's offer. Now a new price has been established at 50.1, higher than the previous price of 50.0. The sum of all expectations has changed slightly to the upside. Now the estate comes in and sells its 10,000 shares at the market, which is the 20,000-share mutual fund bid at 50.0. The new price is back to 50.0 on higher volume. The hedge fund, seeing that the 10,000 shares were easily traded at 50.0, believes there is a large buyer at 50.0 and buys the pension fund's 10,000 shares at 50.4. Remember that each time a trade occurs, one player is willing to buy at that price and another player is willing to sell an identical number of shares at the same price; there is always a buyer and a seller for every transaction that takes place. Also, it is important to remember that the individual players know their own motivation for buying and selling, but they do not know with whom they are trading or why the other party wants to enter the transaction. The players only see the price and the volume of shares traded.

We thus have a series of transactions at different prices and different volumes reflecting the interpretation of different information by the different players. The mutual fund and pension fund are interpreting fundamental information about the company and the value of its stock relative to that information. The specialist is using knowledge of what exists in the way of bids and offers; the hedge fund is watching the tape; and the estate and golf club members are acting without regard to price but on information having to do with practicality in the case of the estate and emotion in the case of the golf club members. As long as the players on both sides of the transaction are fairly balanced, the price of the stock will oscillate in a relatively small zone, as it has in our example. If one of the factions (buyers or sellers) overwhelms the other, the price will adjust accordingly. The reasons for the adjustment in price are unimportant. What is important to the

trader or investor is that the price moves in such a manner that its direction can be determined or confirmed from past experience. This is why technical analysts study price behavior. It discounts all known information and interpretation and considers only the price action and what that action might imply about future price action.

## WHO ARE THE MARKET PLAYERS?

From the preceding example, it is obvious that a number of different individuals participate in establishing the price of a security. Academia has divided these types of participants into three separate categories: informed, noise, and liquidity players.

The early Efficient Markets Hypothesis presumed that only "informed" investors acted within the marketplace to establish a price. These players supposedly interpreted new information rationally and adjusted the market price of a security to its equilibrium value immediately. This strict interpretation has been relaxed considerably. Now the "informed" investor is considered similar to the more historical type, called the "professional or smart money investor," who can be just as affected by bias and misinformation as any other investor or trader. Professional speculators, position traders, hedge fund managers, professional arbitrageurs, and insiders are considered to be in this category.

"Noise" is a term coined by Fisher Black (Black, 1986) and is used to describe the random activity around the equilibrium price. Academically, the "uninformed" market participants are the "noise players." A more widespread and older term is the "public." Most mutual fund managers, pension fund managers, traders, and technical analysts are considered also to be in this category, even if they are professionals. The distinction between informed and uninformed is blurry, of course, and it's only useful in certain sentiment statistics generated by each group (see Chapter 7, "Sentiment"). All types of participants are human and subject to the same universal human biases and cognitive limitations.

Liquidity players are market participants who affect prices in the markets for other reasons than investment or trading. An earlier example is the estate that wishes to liquidate securities for needed cash. This type of player makes no investment decision but affects the market for a very short time with its liquidation. Another example is the index fund that is forced to buy and sell a security based on its addition to or deletion from the index that the fund is following. This causes an outside effect on each security's price with no regard for its investment value by itself.

Too often, these three participant types are considered as separate and distinct groups. However, they are changing constantly. Arbitrageurs sometimes act as uninformed players, members of the public learn and change categories, insiders misjudge the marketplace, and so on. Experience, as well as knowledge, is important and also changing. In short, the marketplace is not a stable system headed in a straight line toward equilibrium. The interaction is dynamic and nonlinear. The system is complex.

## How Is **THE MARKET MEASURED?**

As more of the market players want to buy stocks and fewer want to sell their stock holdings, stock prices will be driven up. Likewise, if many market players want to sell their stocks relative to the number of participants who want to buy stocks, stock prices will fall. Looking at the increase or decrease in the price of one stock will tell us how strong the market for that one particular stock is. If we want to measure the overall direction of the stock market, however, we need a way of measuring the movement of the broad market that is composed of the stocks of many companies.

Although the origins of the U.S. stock market date back to 1792 when 24 New York City stockbrokers and merchants gathered under a buttonwood tree and signed the Buttonwood Agreement, it was almost 100 years later before the concept of a measure of overall market movement was developed. At the end of the nineteenth century, Charles H. Dow began publishing a representative average of stocks. Dow intended to gauge overall market trends by looking at the combined stock price movement of nine railroad stocks, the blue chips of the day. As we discussed in Chapter 3, "History of Technical Analysis," Dow's initial average developed into the Dow Jones Industrial Average that we have today. Dow's work also led to the development of the Dow Jones Railroad Average and the Dow Jones Transportation Average.

Building on Dow's initial concept, other individuals have also developed averages, or indices, to measure market movement. Today there are almost as many averages or indices as there are stocks. Although the concept of a market average or index might be simple, choosing a method to use to construct the index is complicated. There are three major types of index construction: price weighted, market capitalization weighted, and equally weighted.

### **Price-Weighted Average**

The Dow Jones averages are price-weighted averages. This means that the prices for each of the component stocks are added together, and the sum is divided by a divisor that has changed over the years to account for splits and stock dividends in each of the component stocks. To see how a price-weighted average is constructed, consider the four hypothetical stocks in Table 5.4. A price-weighted average for each trading day is calculated by simply adding the four prices and dividing by four. The problem with a price-weighted average is that a high-priced stock will have more influence on the average than a lower-priced stock. Note that between trading Day 1 and Day 2, the price of Alpha increased by 10%, while the price of the other three stocks remained constant; this led to a 3.8% increase in the value of the price-weighted index. On the following trading day, the price of Delta rose by 10% and the price of the other three stocks did not change. When the lower-priced Delta increased in value by 10%, the price-weighted index only changed by 0.9%. The price-weighted average does not represent the usual manner in which a portfolio is constructed. Investors rarely invest in an equal number of shares in each portfolio stock.

**TABLE 5.4** Calculation of Price-Weighted, Market Capitalization, and Unweighted Indexes

Company	Alpha		Beta		Gamma		Doha		Price-Weighted Index		Market Capitalization Weighted Index		Unweighted Average	
	VolunM of Shares Outstanding	5,000,000	8,000,000	6,000,000	3,000,000	Level	Change	level						
Day 1	80		85		25		20		52.50		100.00		100	
Day2	88	10.00%	85	0.00%	25	0.00%	20	0.00%	54.50	3.81%	103.15	3.15%	102.50	2.5%
Day3	88	0.00*	85	0.00%	25	0.00%	22	10.00%	55.00	0.92%	103.46	0.31%	105.06	2.5%
Day4	88	0.00%	85	0.00%	275	10.00%	22	0.00%	55.62	1.14%	104.65	1.14%	107.69	2.5%

### Market Capitalization Weighted Average

Another way to calculate a market index is to use market capitalization in the weighting scheme. The Standard & Poor's 500 Index is a market capitalization weighted index, in which each of the 500 stocks is weighted by its market value. The NYSE composite index, the NASDAQ composite index, and the Russell Indexes are also capitalization weighted. An interesting change in the Standard & Poor's 500 Index began in the spring of 2005. Rather than calculating the index based on the shares outstanding in each company, Standard & Poor's index will calculate based on the float of each stock. "Float" is a term used to describe the number of shares actually available to the marketplace for purchase or sale. In many companies, some stock is held in the treasury, some has been given to employees in the form of options, some has been reissued in secondary offerings, and some is held closely by entities such as pension funds, foundations, other companies, owners, or syndicates. These closely held shares are generally not available for normal day-to-day transactions and are thus eliminated from the calculation of the index. The purpose in this new calculation is to reduce the influence on the index by the amount of capital value that is locked up and not available to the market.

To compare how this index construction differs from price weighting, refer to Table 5.4. To begin creating a market capitalization weighted index, an initial market value of all the included stocks is calculated. In our example, this would be accomplished by multiplying each stock's price by the number of shares outstanding on Day 1. This gives a value of 1,270,000,000. This initial figure is the base and is assigned an index value, usually of 100. Then a new market value is calculated for all of the securities each trading day. This new value is compared to the initial base level to calculate a daily index value. The general formula for calculating the daily index level is

$$\text{Index}_t = \frac{\sum P_i Q_i}{\text{BeginningIndexValue}} \times 100$$

**Index<sub>t</sub>** = Market capitalization weighted index on Day *t*

**P<sub>t</sub>** = Closing stock prices on Day *t*

**Q<sub>t</sub>** = Number of outstanding shares for stocks on Day *t*

**P<sub>b</sub>** = Closing stock prices on initial base day

**Q<sub>b</sub>** = Number of outstanding shares for stocks on initial base day

Because of the weighting scheme used, stocks with a large number of shares outstanding and high prices have a disproportionate influence on a market capitalization weighted index. In our Table 5.4 example data, one stock increased in value by 10% while all of the other stocks remained the same on Days 2, 3, and 4. Look at how much more sensitive the index was to changes when the stock had a relatively high price or number of shares outstanding. Just as the price-weighted index is not representative of how most investors purchase stocks, neither is the market capitalization weighted index. An investor seldom invests in stocks in proportion to their market capitalization.

### Equally Weighted (or Geometric) Average

A third method of calculating an index uses equal weighting of all included stocks. Sometimes, the term "unweighted index" is used to refer to this type of average because all stocks carry equal weight, regardless of their price or market value. This index is calculated by averaging the percentage price changes of each of the stocks included in the group. As you can see in Table 5.4, it does not matter which stock increases by a particular percent. For each of the example trading days, one stock increased in value by 10% while the other three stocks remained unchanged; each day, the equally weighted average index increased by 2.5%.

This index calculation is a dollar-weighted average; in other words, it assumes that an investor invests equal dollar amounts in each stock. For example, an investor with \$10,000 would purchase \$2500 worth of each of the four stocks in our example. Thus, the investor would be purchasing fewer shares of the high price per share stocks and more shares of the low price per share stocks. This calculation most closely represents how the typical investor goes about organizing a portfolio.

Several of the Value Line averages are equal weighted averages that are calculated using an arithmetic average of the percent changes. However, one of the Value Line averages, the Value Line Industrials Average, and the *Financial Times* Ordinary Share Index are equally weighted averages that are constructed in a slightly different manner. These two indices are computed using a geometric average of the holding period returns. Table 5.5 demonstrates the calculation of a geometric average for the four-stock portfolio example.

**TABLE 5.5** Calculation of a Geometric Average Calculation

Day	Alpha		Beta		Gamma		Delta		Geometric Average Calculation		
	Price	HPR	Price	HPR	Price	HPR	Price	HPR	$\prod$	$\sqrt[n]{\prod}$	Index Value
Day 1	80		85		25		20		(Product of HPRs)		100
Day 2	88	1.1	85	1	25	1	20	1	1.1	1.024	102.411
Day 3	88	1	85	1	25	1	22	1.1	1.1	1.024	104.881
Day 4	88	1	85	1	27.5	1.1	22	1	1.1	1.024	107.410

Comparing this geometric average with the equally weighted average calculated for the same stocks shows a downward bias when using a geometric average rather than an arithmetic average. An investor who had purchased \$100 of each of these four stocks on Day 1 and held each of these stocks for all four days would have an ending wealth of \$430, or 7.5% greater than the beginning wealth level of \$400. The geometric weighted index shows a change of 7.41%.

## CONCLUSION

In this chapter, we have explored the basics of how markets work. Because our interest lies in the area of using technical analysis, we have focused on markets in which substitutable, liquid, continuously traded assets are bought and sold. In these markets, we find informed, uninformed, and liquidity players buying and selling securities and, thus, affecting the price of these securities. As technical analysts, we are concerned with observing and predicting price movements as these various market players go about their trading. Market indices are used to measure the overall price movement in the marketplace.

As we continue through Part II, "Markets and Market Indicators," we will build upon these basic ideas. The focus of Chapter 6, "Dow Theory," is Dow Theory and the basic fundamental relationships between markets and the economy. In Chapter 7, "Sentiment," we focus on the market players; we examine the notion of sentiment: how emotions and human biases impact the behavior of both the informed and uninformed market participants. Chapter 8, "Measuring Market Strength," focuses on measuring the strength of the market. Going beyond the indices we use to measure historical market performance, we will examine indicators that measure the market's ability to maintain its performance into the future. Chapter 9, "Temporal Patterns and Cycles," addresses temporal tendencies; historically, analysts have found seasonal and cyclical tendencies in the marketplace that impact price movements. Finally, in Chapter 10, "Flow of Funds," we address the movement of money in the marketplace, known as the "flow of funds."

## REVIEW QUESTIONS

1. For technical analysis to be used, the asset being traded must be substitutable. Explain what "fungibility" means and why fungible assets are a prerequisite for technical analysis.
2. For technical analysis to be used, the market in which the security is trading must be sufficiently liquid. Explain what "liquid" means in this context and why Liquidity is a prerequisite for technical analysis.
3. Explain the differences among informed, uninformed, and liquidity market participants.

4. Classify each of the following market participants as an informed, uninformed, or liquidity player, and explain the reasons for your classification:
  - a. Raymond is 18 years old and ready to begin college. His parents are selling shares of MSFT and KO to pay the tuition bill.
  - b. Sandra just read a *Wall Street Journal* article about how successful Wal-Mart has been at managing costs. Impressed by what she read, she calls her broker and puts in an order to buy 100 shares of WMT.
  - c. Michelle, the CEO of Led Computers, purchases 5,000 shares of LED.
5. Explain what is meant by an index being "price weighted." In a price-weighted average, would you expect a \$10 stock or a \$50 stock to be more important? Why?
6. Explain how to compute a market-weighted average.
7. Explain how to calculate an unweighted average index.
8. The following table contains six daily closing prices for four stocks.
  - a. Calculate the daily percentage change in price for each stock.
  - b. Calculate a price-weighted average for Days 1-6.
  - c. Calculate a market-weighted average for Days 1-6.
  - d. Calculate an unweighted average index for Days 1-6.
  - e. Compute the daily percentage change for the price-weighted, market-weighted, and unweighted average indices.
  - f. Explain the differences in the results among the three types of indices.

Company	BCD		EFG		HIJ		KIM	
Volume of Shares Outstanding	2,000,000		3,000,000		7,000,000		9,000,000	
	Price	% Change	Price	% Change	Price	% Change	Price	% Change
Day 1	60		85		53		16	
Day 2	63		88		52		19	
Day 3	60		91		51		15	
Day 4	61		85		53		16	
Day 5	58		87		50		17	
Day 6	60		88		53		18	

**Part II Markets and Market Indicators**

Choose five stocks that are included in the DJIA. Download the daily closing prices for these five stocks for the past 30 days from the Yahoo! Finance Web site at <http://finance.yahoo.com>.

- a. Compute and graph a daily price-weighted index for these five stocks over the past month. What was the return on the index over the 30-day period?
- b. Find the number of shares outstanding for these five companies. Using this information, calculate a market-weighted index for the 30-day period. Graph the index and compute the return on this index over the past month.
- c. Construct and graph an unweighted average index for this five-stock portfolio. Compute the rate of return on this index for the 30-day period.
- d. Compare and contrast the graphs that you created and the 30-day returns you calculated.
- e. How do you explain the differences among the graphs and the return calculations?



# Dow THEORY

## CHAPTER OBJECTIVES

By the end of this chapter, you should know

- A brief history of the development of Dow Theory and the major contributors to this development
- The three Dow Theory hypotheses presented by Rhea
- Theorems of Dow Theory
- The three types of trends—primary, secondary, and minor—of Dow Theory
- The concept of confirmation in Dow Theory
- The role of volume in Dow Theory
- The criticisms of Dow Theory

"Charles H. Dow was the founder of the Dow-Jones financial news service in New York, and founder and first editor of the *Wall Street Journal*. He died in December, 1902, in his fifty-second year. He was an experienced newspaper reporter, with an early training under Samuel Bowles, the great editor of the *Springfield [MA] Republican*. Dow was a New Englander, intelligent, self-repressed, ultra-conservative; and he knew his business. He was almost judicially cold in the consideration of any subject, whatever the fervor of discussion. It would be less than just to say that I never saw him angry; I never saw him excited. His perfect integrity and good sense commanded the confidence of every man in Wall Street, at a time when there were few efficient newspaper men covering the financial section, and of these still fewer with any deep knowledge of finance." (Hamilton, 1922)

Charles Dow, the father of modern technical analysis, was the first to create an index to try to measure the overall price movement of U.S. stocks. However, he never specifically formulated what has become known as the Dow Theory. Indeed, he likely never intended his disjointed statements and observations in the *Wall Street Journal* to become formalized. He wrote editorials about what he had learned in his experience as a reporter and advisor on Wall Street but never organized these individual pieces into a coherent theory. In fact, he only wrote for five years before his sudden death in 1902. The term "Dow's Theory" was first used by Dow's friend, A. C. Nelson, who wrote in 1902 an analysis of Dow's *Wall Street Journal* editorials called *The ABC of Stock Speculation*.

After Dow's death, William Peter Hamilton succeeded him as editor of the *Wall Street Journal*. For over a quarter of a century, from 1902 until his death in 1929, Hamilton continued writing *Wall Street Journal* editorials using the tenets of Dow Theory. Hamilton also described the basic elements of this theory in his book, *The Stock Market Barometer*, in 1922.

Alfred Cowles III (1937) performed the first formal test of the profitability of trading using the tenets of Dow Theory in 1934. Cowles was one of the first theoreticians of the stock market and used statistical methods to determine if Hamilton could "beat the market." Cowles found that a portfolio based on Hamilton's theory lagged the return on a portfolio fully invested in a market index that Cowles had developed. (Cowles's index was a predecessor of the S&P 500.) Therefore, Cowles determined that Hamilton could not outperform the market and concluded that Dow's theory of market timing results in returns that lag the market. Cowles's study, considered a seminal piece in the statistical testing of market-timing strategies, provided a foundation for the Random Walk Hypothesis and the Efficient Markets Hypothesis.

In recent years, however, researchers have reexamined Cowles's work using more sophisticated statistical methods. In the August 1998 *Journal of Finance*, an article by Brown, Goetzmann, and Kumar demonstrates that adjusted for risk (Hamilton was out of the market for a portion of his articles), Hamilton's timing strategies yield high Sharpe ratios and positive alphas for the period 1902 to 1929. In other words, contrary to Cowles's original study, Brown, Goetzmann, and Kumar conclude that Hamilton could time the market very well using Dow's Theory. In addition, they found that when Hamilton's decisions were replicated in a neural network model of out-of-sample data from September 1930 through December 1997, Hamilton's methods still had validity. His methods worked especially well in sharp market declines and considerably reduced portfolio volatility.

After Hamilton's death, Robert Rhea further refined what had become known as Dow Theory. In 1932, Rhea wrote a book called *The Dow Theory: An Explanation of Its Development and an Attempt to Define Its Usefulness as an Aid to Speculation*. In this book, Rhea described Dow Theory in detail, using the articles by Hamilton, and formalized the tenets into a series of hypotheses and theorems that are outlined next.

Rhea presented three hypotheses:

1. The primary trend is inviolate.
2. The averages discount everything.
3. Dow Theory is not infallible.

The first of these hypotheses dealt with the notion of manipulation. Although Rhea believed that the secondary and the minor, day-to-day, motion of the stock market averages could possibly be

manipulated, he claimed that the primary trend is inviolate. The second hypothesis, that the averages discount everything, is because prices are the result of people acting on their knowledge, interpretation of information, and expectations. The third hypothesis is that Dow Theory is not infallible. Because of this, investment requires serious and impartial study.

**BOX 6.1** Some of William Hamilton's Thoughts on the Stock Market and the Dow Theory

"The sum and tendency of the transactions in the Stock Exchange represent the sum of all Wall Street's knowledge of the past, immediate and remote, applied to the discounting of the future." (Hamilton, 1922, p 40)

The market is not saying what the condition of business is today. It is saying what that condition will be months ahead." (Hamilton, 1922, p 42)

"The stock barometer [the Dow-Jones averages] is taking every conceivable thing into account, including that most fluid, inconsistent, and incalculable element, human nature itself. We cannot, therefore, expect the mechanical exactness of physical science." (Hamilton, 1922, p 152)

"Let us keep in mind that Dow's theory is not a system devised for beating the speculative game, an infallible method of playing the market. The averages, indeed, must be read with a single heart. They become deceptive if and when the wish is father to the thought. We have all heard that when the neophyte meddles with the magician's wand, he is apt to raise the devil." (Hamilton, 1922, p 133)

These three hypotheses are very similar to those of technical analysis today. They show how prescient Dow was and how universal and persistent his theories have been. As markets have become more efficient there is some question about how much manipulation can and has occurred. Recent untruths by major corporations concerning their earnings have shown that the desire to manipulate still exists. Dow's tenet, however, stated that the primary direction of stock prices could not be manipulated and therefore should be the primary focus of all serious investors.

The concept that prices discount everything, including expectations, to the point that they are predictive of events is the most revolutionary of Dow's hypotheses. Until then, most investors looked at individual stock prices and studied what was available about individual companies. Dow believed that the averages of stocks foretold the shape of industry and were thus valuable in understanding the health of the economy.

Dow was under no illusion that he had found the magic formula for profit, nor were Hamilton or Rhea. Nevertheless, they did believe that by careful and unbiased study of the market averages, they could interpret in general terms, the likelihood of the markets continuing or reversing in direction and thereby could anticipate similar turns in the economy. Their emphasis on study and lack of emotional reaction is still important today. Ignoring this point is one of the most widespread causes for investor failure.

## Dow THEORY THEOREMS

One of the theorems of Dow Theory is that the ideal market picture consists of an uptrend, top, downtrend, and bottom, interspersed with retracements and consolidations. Figure 6.1 shows what this ideal market picture would look like. This market picture, of course, is never seen in its ideal form. Consider Hamilton's quote, "A normal market is the kind that never really happens" (Hamilton, May 4, 1911). The purpose of the ideal market picture is to provide a generalized model of the stock market's price behavior over time. It is very simple and resembles a harmonic without a constant period or amplitude.

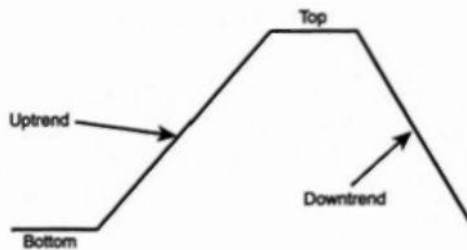


FIGURE 6.1 The Dow Theory ideal market picture

From the modern standpoint of the Efficient Markets Hypothesis (EMH), this ideal picture is interesting because it presumes that prices oscillate over long periods based on the accumulated emotion of investors as well as the facts of the business cycle. Were market prices to duplicate the business cycle precisely, prices would not oscillate as widely as they do nor lead the business cycle by as much as they do. Indeed, some theorists argue that the markets actually cause the business cycle, that confidence or lack of confidence from the markets translates into buying and selling of products (Szala and Holter, 2004). However, for Dow Theory, the picture of the ideal market remains the same regardless of cause.

A second theorem of Dow Theory is that economic rationale should be used to explain stock market action. Remember that Dow created both an industrial average and a railroad average. Although we have no record of Dow's precise reasoning for doing so, Rhea posited that Dow believed that industrial stocks represented the trend of industry profits and prospects and that railroad stocks represented railroads profits and prospects. The profits and prospects for both of these sectors must be in accord with each other. For example, industry may be producing goods, but if railroads are not shipping these goods, then industry must slow down. Goods produced must be shipped to the customer. Railroads must confirm that produced goods are being sold and delivered. Today, of course, the railroad average has been changed to the transportation

average to represent airlines, truckers, and other means of shipping goods. Nevertheless, the economic rationale of goods produced being shipped is still valid in the industrial sector of the economy. Where Dow's economic rationale differs from the present is in the service and technology sectors, which have become larger in dollar volume than the industrial sector. Some analysts use representations of these newer sectors to form an economic rationale for stock market action.

A third theorem of Dow Theory is that prices trend. A *trend* is defined as the general direction in which something tends to move. Because we are talking about markets, that "something" is price.

**BOX 6.2** Some of William Hamilton's Thoughts on Trends

"... on the well-tested rule of reading the averages, a major bull swing continues so long as the rally from a secondary reaction establishes new high points in both averages..." —Hamilton (December 30, 1921)

"An indication [of price trend] remains in force until it is cancelled by another..." —Hamilton (September 23, 1929)

As we saw in Chapter 2, "The Basic Principle of Technical Analysis—The Trend," the concept that prices trend is one of the fundamental assumptions of technical analysis. It is the reason why technical analysts can profit. A trend is the basic pattern of all prices. A trend can be upward, downward, or sideways. Obviously, a sideways trend is more difficult to profit from than an upward or downward trend. Technical analysts endeavor to forecast the direction of the market trend. Because trends are the central principle in technical analysis, Chapters 12, "Trends—The Basics," and 14, "Moving Averages," will focus on how trends are defined, measured, and analyzed by modern-day technical analysts. Right now, we will focus on the notion of trend within the Dow Theory.

Dow's theory posited that there are three basic trends in price motion, each defined by time:

"There are three movements of the averages, all of which may be in progress at one and the same time. The first, and most important, is the primary trend: the broad upward or downward movements known as bull or bear markets, which may be of several years duration. The second, and most deceptive movement, is the secondary reaction: an important decline in a primary bull market or a rally in a primary bear market. These reactions usually last from three weeks to as many months. The third, and usually unimportant, movement is the daily fluctuation." (Rhea, 1932)

Figure 6.2 shows graphically how these three trends are interrelated. Let us look at each of these three types of trends—the primary, secondary, and minor—a bit more closely.

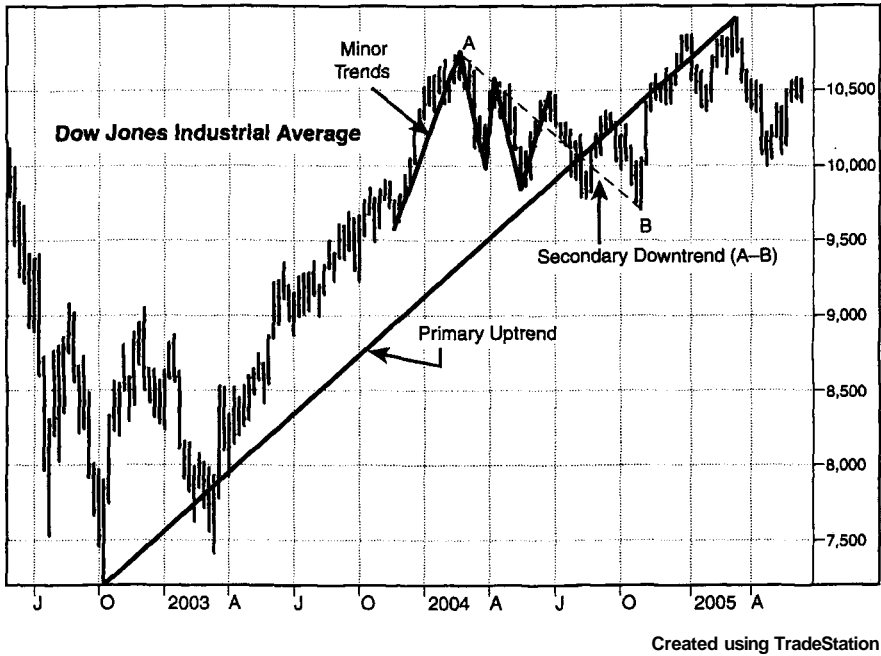


FIGURE 6.2 Dow Theory three trend types fWeekly: May 2002-May 2005)

## The Primary Trend

"Correct determination of the primary movement (or trend) is the most important factor in successful speculation. There is no known method of forecasting the extent or duration of a primary movement." —Rhea (1932)

The primary trend is the longest of the three trend types. It represents the overall, broad, long-term movement of security prices. The duration of this long-term trend can be several years. The primary trend may be an upward trend, which is known as a primary bull trend, or it may be a downward trend, referred to as a primary "bear" trend. The general long-run upward trend in Figure 6.2 indicates a primary "bull" trend.

Primary bull markets are characterized by three separate phases: The first represents reviving confidence from the prior primary bear market; the second phase represents the response to increased corporate earnings; and the third is when speculation becomes dominant and prices rise on "hopes and expectations."

Primary bear markets are long downward price movements, interrupted by occasional rallies, that continue until prices have discounted the worst that is apt to occur. They, too, are characterized by three separate phases: first, abandonment of hopes upon which stocks were

purchased; second, selling-due to decreased earnings; and third, distress selling, regardless of value, by those who believe the worst is yet to come or who are forced to liquidate.

## The Secondary Trend

"... a secondary reaction is considered to be an important decline in a bull market or advance in a bear market, usually lasting from three weeks to as many months, during which intervals the price movement generally retraces from 33 percent to 66 percent of the primary price change since the termination of the last preceding secondary reaction." —Rhea (1932)

The secondary trend is an intermediate-term trend that runs counter to the primary trend. For example, during a several-year primary uptrend, prices may fall for a few weeks or a few months. During this secondary trend market decline, prices fall often, erasing 33 to 66 percent of the gain that has occurred since the completion of the previous secondary uptrend. Points A to B in Figure 6.2 represent a secondary downtrend.

Being able to anticipate or recognize secondary reactions would increase profit capabilities by taking advantage of smaller market swings, but Dow believed this exercise was too dangerous. Because the primary trend and secondary trend reversal have similar characteristics, secondary reactions are often initially assumed as changes in primary trends or are mistakenly thought to be only reactions when the primary trend is changing.

## The Minor Trend

"Inferences drawn from one day's movement of the averages are almost certain to be misleading and are of but little value except when 'lines' are being formed. The day to day movement must be recorded and studied, however, because a series of charted daily movements always eventually develops into a pattern easily recognized as having a forecasting value." —Rhea (1932)

"The stock market is not logical in its movements from day to day." —Hamilton (1929)

Dow, Hamilton, and Rhea would likely be horrified at today's preoccupation with minute-to-minute "day trading" and would likely consider such activity too risky. (Based on the percentage of day traders who currently fail, they would be right.) Their observation essentially states that prices become more random and unpredictable as the time horizon shrinks. This is certainly true today as

**1. A line is two to three weeks of horizontal price movement in an average within a 5% range. It is usually a sign of accumulation or distribution, and a breakout above or below the range high or low respectively suggests a movement to continue in the same direction as the breakout. Movement from one average unconfirmed by the other average is generally not sustained. (Rhea, 1932); "The portion of the Dow Theory which pertains to 'lines' has proved to be so dependable as almost to deserve the designation of axiom instead of theorem." (Hamilton, September 23, 1929)**

well and is one reason why, as during Dow's, Hamilton's, and Rhea's time, investors today should concentrate on longer-term time horizons and avoid the tempting traps in short-term trading.

### Concept of Confirmation

"Dow always ignored a movement of one average which was not confirmed by the other, and experience since his death has shown the wisdom of that method of checking the reading of the averages. His theory was that a downward movement of secondary, and perhaps ultimately primary importance, was established when the new lows for both averages were under the low points of the preceding reaction."  
—Hamilton (June 25, 1928)

In line with the economic rationale for the use of the industrial and railroad averages as proxies for the economy and state of business, Dow Theory introduced a concept that also is important today, namely the concept of "confirmation." Confirmation has taken new directions, which this book will cover later, but in Rhea's time, confirmation was the consideration of the industrial and railroad averages together. "Conclusions based upon the movement of one average, unconfirmed by the other, are almost certain to prove misleading." (Rhea, 1932)

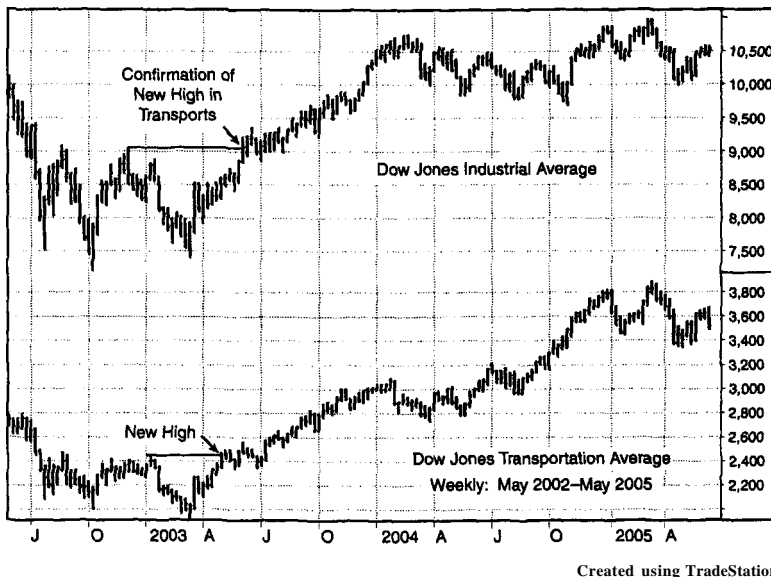


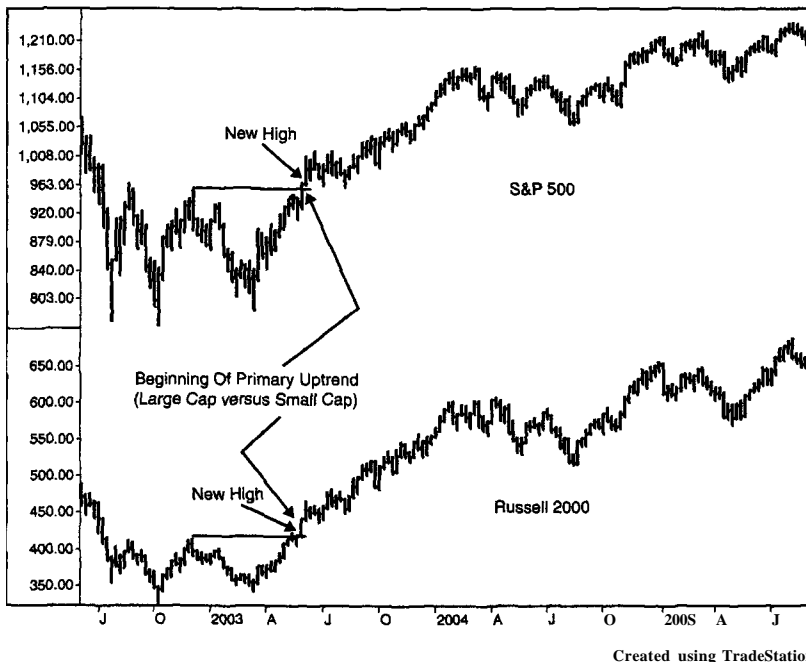
FIGURE 6.3 Dow Theory of "Confirmation"

Confirmation in the Dow Theory comes when both the industrial and railroad averages reach new highs or new lows together on a daily closing basis. These new levels do not necessarily have to be reached at exactly the same time, but for a primary reversal, it is necessary that each average



reverses direction and reaches new levels before the primary reversal can be recognized. Confirmation, therefore, is the necessary means for recognizing in what direction the primary trend is headed. Failure to reach new levels during a secondary reaction is a warning that the primary trend may be reversing. For example, when there is a primary bull market, the failure of the averages to reach new highs during a secondary advance alerts the analyst that the primary trend may be reversing to a bear market. In addition, if lower levels are reached during the secondary bear trend, it is an indication that the primary trend has changed from an upward bull trend to a downward bear trend. Thus, more extreme levels occurring during a secondary retracement in the opposite direction of the primary trend are evidence that the primary trend has changed direction. When confirmed by the other average, the technical analyst then has proof that the primary trend has reversed and can act accordingly.

Today, because the make-up of the economy is so different than in Dow's and Hamilton's time, with the advent of a wider base of industrial stocks and high technology stocks, the usual method of confirming a primary trend is to use confirmation between the two indexes: Standard & Poor's 500 and the Russell 2000. The economic rationale is that the Standard & Poor's 500 represents the largest, most highly capitalized companies in the U.S., and the Russell 2000 represents smaller companies with higher growth and usually a technological base. When these two indexes confirm each other, the primary trend is confirmed. Figure 6.4 shows the more modern application of Dow's theory of confirmation.



**FIGURE 6.4** Confirmation between the Standard & Poor's 500 and the Russell 2000 (Weekly: May 2002 - September 2005)

## Importance of Volume

"Various meanings are ascribed to reductions in the volume of trading. One of the platitudes most constantly quoted in Wall Street is to the effect that one should never sell a dull market short. That advice is probably right oftener than it is wrong, but it is always wrong in an extended bear swing. In such a swing . . . the tendency is to become dull on rallies and active on declines." —Hamilton (May 21, 1909), as quoted by Rhea (1932)

Although volume of transactions cannot signal a trend reversal, it is important as a secondary confirmation of trend. Excessively high market prices that are accompanied by less volume on rallies and more activity on declines usually suggest an overbought market (see Figure 6.5). Conversely, extremely low prices with dull declines and increased volume on rallies suggest an oversold market. "Bull markets terminate in a period of excessive activity and begin with comparatively light transactions." (Rhea, 1932)

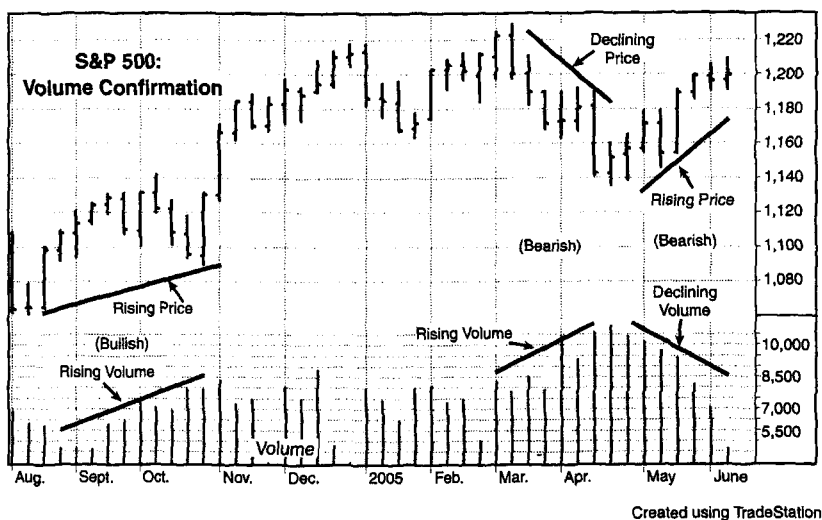


FIGURE 6.5 Volume confirmation (Weekly: August 2004-May 2005)

The originators of Dow Theory were quick, however, not to overstate the importance of volume. Although volume was considered, it was not a primary consideration. Price trend and confirmation overrode any consideration of volume.

"The volume is much less significant than is generally supposed. It is purely relative, and what would be a large volume in one state of the market supply might well be negligible in a greatly active market." —Hamilton (1922, p 177)

## CRITICISMS OF THE DOW THEORY

Although Dow Theory forms the building blocks for modern-day technical analysis, this theory is not without criticisms. One of the criticisms is that following the theory will result in investors acting after rather than before or at market tops and bottoms. With Dow Theory, there is an inevitable lag between the actual turn in the primary trend and the recognition of the change in trend. The theory does not recognize a turn until long after it has occurred and has been confirmed.

On the other hand, the theory, if properly interpreted, will recognize that primary trend change and will thus never allow a large loss. Dow's contention was that concentrating on any direction change of shorter duration than the primary trend increased the chances of having one's portfolio whittled away by high turnover, many errors in judgment, and increased transaction costs. Therefore, Dow Theory is biased toward late recognition of a change in trend to minimize the costs of wrongly identifying a change in trend.

A second criticism of Dow Theory is that the different trends are not strictly defined. Often the interpretation of price swings is difficult to assign to a specific trend type. Secondary trend beginnings often appear like primary trend beginnings, for example. This makes the determination of the primary trend unclear at times and can incite investment in the wrong direction.

Others, however, criticize Dow Theory for being too specific about the requirements needed to identify a change in trend. Requiring that only closing prices be used or that any break to a new level no matter how small is significant often places too much emphasis on a small change in price.

### *Summary of Dow's Wisdom*

". . . the Dow-Jones averages . . . have a discretion not shared by all prophets. They are not talking all the time." —Hamilton (December 17, 1925)

## CONCLUSION

Even though Charles Dow never formalized the Dow Theory, his work has formed the basis for modern-day technical analysis. Despite the many changes that have occurred in the securities markets over the past century, much of Dow's basic work and ideas remain pertinent today. Although Dow might be surprised at the analysis that more advanced tools and computer power allow, his classic work provides the basic theory that these contemporary models build upon.

Although the specific economic relationships that were valid in Dow's lifetime, such as the relationship between industrial stocks and railroad stocks, may need to be altered to represent today's economy, basic economic relationships such as these are still fundamental to market activity. Despite the fact that today's technical analyst can build sophisticated, complex mathematical models and run complicated computer tests of trading strategies, it is important to remember that a thorough grounding in the basics of market activity is necessary for any trading philosophy to stand the test of time and remain profitable.

## REVIEW QUESTIONS

1. What were the three hypotheses of Dow Theory presented by Rhea? How is each of these hypotheses relevant for the modern investor?
2. Describe what the Dow Theory ideal market pattern of an uptrend, top, downtrend, and bottom looks like.
3. Why did Dow think there was an important economic relationship between the stocks of industrial companies and the stocks of railroads? How do you think this general relationship between economic activity and sectors of the economy might be seen and measured in today's economy?
4. What are the three major trends in Dow Theory? Which is the most important? Why?
5. Dow Theory teaches that, while the investor is foregoing potential profit, the investor should avoid trying to make money by attempting to predict the secondary trend. Why did Dow and his followers think that trading with the secondary trend was too risky?
6. How would Dow and his followers react to the modern-day practice of day trading? According to Dow Theory, what trend are these day traders following?
7. What is meant by the term "confirmation" in Dow Theory?
8. What role does volume play in Dow Theory?
9. According to Dow Theory, what signals would an investor watch for that would indicate a reversal in the primary trend?
10. One of the criticisms of Dow Theory is that it calls market reversals long after they occur. Explain why Dow Theory makes these market calls late. What are the tradeoffs that investors make with a system that tends to make late calls of market reversals?

# SENTIMENT

## CHAPTER OBJECTIVES

After studying this chapter, you should

- Understand what is meant by the term "sentiment"
- Understand the concept of contrary opinion
- Be familiar with methods for measuring sentiment of uninformed and informed market players

"As a general rule, it is foolish to do just what other people are doing, because there are almost sure to be too many people doing the same thing."—William Stanley Jevons (1835-1882), as quoted in Neill (1954)

The focus of this chapter is market sentiment. Market sentiment refers to the psychology or emotions of market participants. At times, investors are acting on feelings of fear and pessimism. At other times, hope, overconfidence, and greed characterize investor psychology. Investors react emotionally to the market, and these reactions affect the market. Thus, investor psychology is both influenced by and an influencer of market activity.

From a simplistic point of view, consider a bull market in which stock prices have been rising. Investors see their portfolio values increasing. Those who have been sitting on the sidelines hear how their friends have made money in the stock market. Not wanting to miss out on these returns, they join in. The average investor is hopeful and confident that the trend of rising stock prices will continue. Of course, as these investors place more and more money in the market, stock prices do rise; in economic jargon, as the quantity of investors in the marketplace increases, the demand for stocks increases, driving stock prices higher. The optimistic view of the market participants drives prices even higher. Seeing that they were correct, investors become overconfident and greedy and purchase even more stocks. At the peak of optimism, investors have placed all of their available money in the stock market. At this point, there is no new money coming into

the market to continue fueling the increase in demand that has been driving price upward. Thus, there is no more fuel to keep stock prices rising, and the stock market reaches a peak.

Conversely, when investors are pessimistic and fearful, they begin to sell stock. As the level of pessimism rises in the market and more investors sell, stock prices fall. These falling prices lead more and more investors to feel fearful and decide to sell their shares. When investors are the most pessimistic and fearful, they have withdrawn all of their money out of the market. The downtrend that has been fueled by investors leaving the market ends, and the market reaches a bottom.

## WHAT IS SENTIMENT?

Sentiment is defined as the net amount of any group of market players' optimism or pessimism reflected in any asset or market price at a particular time. When a stock or commodity is trading at a price considerably above or below its "intrinsic value," something we often will not know until considerably later, the difference or deviation from that value often will be accounted for by sentiment. It is the collective emotion and other intangible factors that come from the human interaction involved in determining a price over or under the supposed "value." It is the subject of study by behavioral finance departments, which are interested in the ways that human bias affects prices, and it is a staple in technical analysis, for technical analysts have long held that prices are a combination of fact and emotion. When emotion becomes excessive and prices thereby deviate substantially from the norm, a price reversal is usually due, a reversion to the mean. It is thus important for the technical analyst to know when prices are reflecting emotional extremes.

### BOX 7.1 The Theory of Contrarian Investing

"Whenever nonprofessional investors become "significantly" one-sided in their expectations about the future course of stock prices, the market will move in the direction opposite to that which is anticipated by the masses.

"Suppose the overwhelming numbers of investors (call them 'nonprofessionals') become rampantly bullish on the market. The logical extension of highly bullish expectations results in the purchase of stocks right up to the respective financial limits of the masses. At the very moment when the masses become most bullish, they will be very nearly fully invested! They won't have the financial capacity to do more buying. Who then is left to create demand? Certainly not the minority of investors we call professionals. It is that group which recognizes over-valuations and presumably has been the supplier of stock to the nonprofessionals during the time that both prices and the optimism of the masses were rising.

"Thus, when the crowd has become extraordinarily bullish, a dearth of demand exists. The nonprofessionals are loaded with stocks and are cash-poor, while the professionals are liquid, but in no frame to buy. Demand is saturated, and even minor increases in supply will cause stock prices to tumble. At this point, prices are a strong bet to go (nowhere) but down." —Marty Zweig in the foreword to Ned Davis' *The Triumph of Contrarian Investing*, McGraw-Hill, New York, 2004

## MARKET PLAYERS AND SENTIMENT

"The appropriate corresponding timing strategy is to follow informed trader sentiment, act against positive feedback trader sentiment, and ignore liquidity trader sentiment." —Wang (2000)

Remember from Chapter 5, "An Overview of Markets," that there are three types of players in any market: the informed, the uninformed, and the liquidity players. The estate that needed to sell stock to raise cash in the discussion of market players in Chapter 5 would be an example of a liquidity player. These liquidity players have only a cursory interest in the markets and do not have an important role in determining price trends. Because the interactions between the informed and uninformed players determine prices, we will focus our discussion on those two groups.

The uninformed players are those participants who, because of emotions and psychological reasons, tend to be optimistic and buy, thus creating market peaks, and to be pessimistic and sell, thus creating market bottoms. Although the uninformed players are often called the "public," even professionals can be part of this group. It is not simply the professional or career standing of a market player that classifies the individual as an informed or uninformed player—it is the timing of the player's optimistic buying and pessimistic selling relative to market highs and lows. Research has found that even professionals such as mutual fund managers, Wall Street strategists, and investment advisory newsletter writers behave as uninformed participants. In other words, *the majority of market players are uninformed players.*

The informed market players tend to act in a way that is contrary to the majority. That is, the informed market participants tend to sell at the top, when the majority is optimistic and buying, and buy at the bottom, when the majority is fearful and selling. Just as uninformed players need not be amateurs, informed players need not be professionals. They can be corporate insiders or day traders sitting in their dens in the Caribbean.

By and large, the uninformed players have considerably more money than the informed players. While day-to-day the informed players stabilize the markets by spotting and acting upon small anomalies in prices or as contrarian investors invest in undervalued assets, over longer periods, the uninformed tend to overwhelm the price action with their positive feedback—in many instances, forcing the informed to ride the trend of emotion.

If the technical analyst can determine how each group is acting, some knowledge of the future direction of prices can be gained. Presumably, the informed professional will act correctly, and the uninformed public will act incorrectly, especially at emotional extremes. If we know that a majority of those participating in the market are extremely optimistic about stock prices continuing on an uptrend, we can conclude that these investors are near fully invested in the market and that stock prices are close to a peak. The sentiment indicators that we discuss in this chapter are designed to measure the extent of investor optimism or pessimism. By using sentiment indicators, the technical analyst is attempting to separate the opinions and actions of the informed players from the uninformed players. The analyst wants to make investment decisions contrary to those that the uninformed group is making and wants to mimic the actions of the informed players.

## How DOES HUMAN BUS AFFECT DECISION MAKING?

Remember that the Efficient Markets Hypothesis (EMH) suggests that enough investors are acting rationally at any particular point in time to make it impossible for a technical analyst to profit from security mispricing due to the emotions of the uninformed players. However, the field of behavioral finance has defined numerous ways in which investors act less than rational. These biases are common not just to the occasional investor or uninformed public but to professionals as well. Just look at how many professional securities analysts were caught in the late 1990s stock market euphoria. These were not stupid, irrational people, but their inherent biases, those common to all humans, overcame their ability to reason, and they became caught up in the optimism of the time, to tragic effect.

Those who study behavioral finance attribute some of the biased behavior of financial market players to crowd behavior. These researchers have found that crowd opinions are formed by several biases. People tend to conform to their group, making the taking of an opposite opinion sometimes difficult and dangerous. People do not like rejection or ridicule and will stay quiet to avoid such pressure. People often meet hostility when going against a crowd. Another bias is that people gain confidence by extrapolating past trends, even when doing so is irrational, and thus they tend to switch their opinions slowly. Also, people feel secure from accepting the opinions of others, especially "experts," and tend to believe the establishment will take care of them.

Understanding that investor emotion and bias affect investment decisions is important for two reasons. First, understanding the links between emotions, investment behavior, and security prices can help the technical analyst profit by spotting market extremes. Second, technical analysts must remember that they are subject to the same human biases as other investors. This set of human biases is so strong that even those who recognize them still are affected by them and must constantly fight against them. Successful traders and investors often say that the worst enemy in investment is oneself. Technical analysts hope to profit from understanding how human bias can cause people to pay prices greater than the intrinsic value for a stock, but if they are not careful, their own biases may cause them to do the same.

For example, the behavioral finance principle of "representation" suggests that people often recognize patterns where they do not actually exist. Although it is the technical analyst's strategy to attempt to recognize patterns, an analyst must be certain not to "see" patterns that do not really exist. Therefore, an investor or trader must not only understand our human foibles but must also find a way to either fight against them or avoid them.

At times, emotional excess leads to extraordinary rises in prices (and sometimes to extraordinary declines, called "crashes" or "panics"). These periods of extraordinary price increases, whether in the stock market, gold, or tulip bulbs, are called "bubbles." During a bubble, stock market returns are much higher than the mean, or average, return. Bubbles are part of that "fat tail" mentioned in the discussion of the nonrandomness of prices in Chapter 4, "The Technical Analysis Controversy." Although bubbles occur infrequently, they occur considerably more often than would be expected under an ideal random walk model.



For the current discussion, the existence of bubbles is proof that prices are not always determined rationally; emotion can get hold of the market and, through positive feedback, run prices far beyond any reasonable value before reversing. This type of bubble is visible in Figure 7.1. During the late 1990s, security prices were rapidly increasing. By 2000, security prices were extremely high, especially in the technology sector. The price earnings ratios for many companies were at record highs. For some companies, the price earnings ratios were infinite because there were no earnings at all. In fact, investors would have to assume that earnings would grow at an astounding 100% a year for 20 years to justify the stock prices using traditional stock valuation models. According to investment analyst David Dreman, "This seems to be a classic pattern of investor overreaction" (Dreman, 2002). Nevertheless, the bubble occurred, indicating that investors of all kinds can become blind to reality when greed and other psychological biases influence decision making.

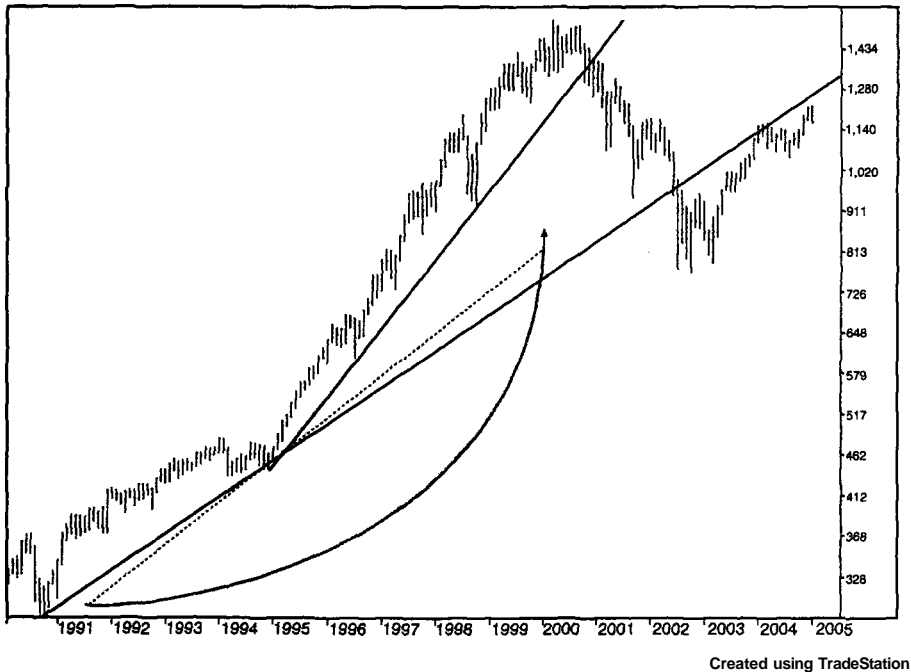


FIGURE 7.1 The late 1990s bubble (S&P 500 Index: 1990-2004)

**BOX 7.2** Books on the History of Manias and Panics

A number of excellent books have been written about the manias and panics that characterize the financial markets. For further information about this phenomenon, you can read the following:

Allen, Fredrick Lewis. *Only Yesterday*. New York, NY: First Perennial Classics, 2000.

Amyx, Jennifer. *Japan's Financial Crisis: Institutional Rigidity and Reluctant Change*. Princeton, NJ: Princeton University Press, 2004.

Galbraith, John K. A Sriorr *History of Financial Euphoria*. New York, NY: Penguin House. 1994.

Kindleberger. Charles P. *Manias, Panics, and Crashes: A History of Financial Crises*. New York, NY: John Wiley & Sons, Inc., 2005.

Mackay, Charles. *Extraordinary Popular Delusions and the Madness of Crowds*. Petersfield, Hampshire, UK: Harriman House, 2003.

Sobel, Robert. *Panic on Wall Street: A History of America's Financial Disasters*. New York, NY: Macmillan, 1968.

## **CROWD BEHAVIOR AND THE CONCEPT OF CONTRARY OPINION**

"The art of contrary thinking may be stated simply: Thrust your thoughts out of a rut. In a word, be a nonconformist when using your mind.

"Sameness of thinking is a natural attribute. So you must expect to practice a little to get into the habit of throwing your mind into directions that are opposite to the obvious.

"Obvious thinking—or thinking the same way in which everyone else is thinking—commonly leads to wrong judgments and wrong conclusions.

"Let me give you an easily remembered epigram to sum up this thought:

"When everyone thinks alike, everyone is likely to be wrong." —Humphrey B. Neill(1954)

When individuals think by themselves, they can be very logical and reasonable, but when joined with a crowd, they tend to let certain cognitive biases affect their decision making. History is replete with examples of financial manias, those periods when in retrospect the crowd of investors became overly irrational. During those periods, the irrationality is met with a new hysteria, the belief that "things are different this time." We have seen this emotional excess just recently in the Internet stock-price bubble in the late 1990s. At the time, it was very difficult to argue, much less invest, against the prevailing trend of emotion. Too many were making too much money regardless of their reasoning. Of course, such times eventually reverse and return to normal and often decline to an opposite excess. Not believing that they are personally caught in a mania, when prices reverse, people blame others for their own irrationality. Denying their own responsibility for being duped by the emotions of the crowd, they demand new laws be passed to prevent "evil" corporations or government laxity from causing another bubble. Such behavior is not limited to financial markets. Manias occur in politics, religion, philosophy, education—almost every human endeavor. They are often manmade, as in either the Tulip Bulb mania or as in politics through propaganda and "spin." The Theory of Contrary Opinion is an attempt to teach individuals how to recognize and profit from such excesses in emotional fervor and to look at all sides of a belief before committing to it or rejecting it.

"The crowd thinks with its heart; the individual thinks with his brain."  
—Neill (1954)

Contrary opinion is a "way of thinking . . . It is more of an antidote to general forecasting than a system for forecasting. In a word, it is a thinking tool, not a crystal ball," Neill (1954). To be a contrarian, an investor must sell (be pessimistic) when the overall market mood is optimistic and buy (be optimistic) when most investors are pessimistic. Although this may sound easy enough, the problem with implementing a contrarian strategy is that it is indefinite. Remember that one of the basic tenets of Dow Theory is that prices trend. When prices are trending upward, we want to be in a long position, riding the trend. The goal of understanding sentiment is to discern when that trend is losing energy and will reverse. Therefore, the task of the contrarian player is to find a way in which to quantify which direction the majority of market players is headed and to question whether there is enough energy to keep the market moving in that direction. Remember that so long as players still have money to invest in the market, their optimism will drive prices higher. It is only when players are fully invested that their optimism will not be accompanied by security purchases. At this point, the market is at an excess and the trend often ends. To quantify these excesses, the technical analyst uses publicly available data to construct indicators of emotional excess. Now that we have looked at some of the theoretical underpinnings, let us look at how these sentiment indicators are typically constructed.

## How Is SENTIMENT OF UNINFORMED PLAYERS MEASURED?

"A top in the market is the point of maximum optimism, and a bottom in the market is the point of maximum pessimism." —Ned Davis (1991)

### The Concept of Sentiment Indicators

Sentiment indicators are data series that give the technical analyst some feeling for how much prices are at an excessively emotional level. With that information, potential future reversals in trend can be better anticipated. Generally, sentiment indicators are more useful in analyzing markets than individual issues. Individual issue prices have their emotional component, of course, but ways to measure that component are much less reliable than those of measuring overall market sentiment. Therefore, we will focus our discussion on indicators that reflect overall market optimism.

Remember, we are interested in the two broad categories of players—the uninformed and the informed. Most sentiment indicators focus on the uninformed. These uninformed players are usually wrong at major market turns. Therefore, if we know what the uninformed are doing, we have a clue about what not to do. On the other hand, some sentiment indicators attempt to measure the action of informed players, who generally are accurate in their assessment of market prospects. These indicators are based on watching professional traders and corporate insiders and following their lead.

Fear and greed are not mirror images of one another. Emotional excess is often the sharpest at market bottoms when panic has occurred. On the other hand, optimism can last for a long while. Most sentiment indicators are therefore useful in detennining market bottoms when the fear reaches its highest level. These indicators can often be deceiving on the rise in prices, however, because the extreme in greed, the converse of fear in markets, will place them at high levels during which the market will continue to rise. A sell signal generated by a specific sentiment indicator is thus less likely to be as valid as a buy signal.

### Sentiment Indicators Based on Options and Volatility

#### Option Trading and Sentiment

Traditionally, odd lot statistics were a reliable indicator of the sentiment of uninformed, small investors. That small investors, who did not have enough capital to purchase round, 100-share lots, were heavily buying stocks was an indication that the uninformed public was overly optimistic. When small, uninformed investors were highly pessimistic, they would short-sell odd lots. The odd lot figures represented a measure of uninformed, public speculation, which tended to be highest at market turning points.

Today, listed options data has replaced the old odd-lot figures as one of the best measures of public speculation. A call option is an option to buy an asset, usually a stock or commodity, at a fixed price for a specific period. A put option is an option to sell an asset at a fixed price for a specific period to time. Some options, by expanding on the basics of time and price, can become very complex. However, the standard call and put option is the most widely traded and has the highest volume of any option type. The option market, by its very nature, is a speculative market. It depends on leverage for maximum gains, and positions can close worthless on the expiration of options. As such, it has become a speculative vehicle for the uninformed public.

Let us look at how the options market can measure sentiment. Let us assume that Jerry thinks that the price of stock XYZ will increase above its current level of \$20 per share. Jerry can purchase a call option in which he has the option to buy 100 shares of XYZ at a price of \$20 per share anytime in the next three months. The option price and premium—say, \$2 per share—is much less than the outright purchase price of the stock. If the price of XYZ rises above \$20, Jerry can exercise his option and purchase shares at the guaranteed, and now very favorable, \$20. If instead, the price of XYZ declines or remains flat during the three-month period, Jerry will allow the option to expire and he will lose his investment. Thus, the option market gives Jerry, an uninformed player, a way to speculate about the movement of the price of a stock by paying a small fee for the option. When investors think that stock prices will rise, they speculate by purchasing call options. When investors are bearish, they speculate by purchasing put options. When investors are very bullish, they buy out-of-the-money call options—those that have a striking price above the current stock price.

Owners will exercise their call options when they correctly project price increases and their put options when they correctly anticipate price decreases. When investors incorrectly predict market moves, exercising their options is unprofitable. If the owner of an option does not exercise the option by the expiration date, then the option expires worthless.<sup>1</sup>

Because the purchase of a call represents one who believes the stock market will rise and a put reflects a bearish opinion, the ratio of calls to puts represents the relative demand for options by speculators and thus is a hint as to their disposition toward the market. The more call buyers relative to put buyers, the more optimistic are the speculators.

#### Using Put-Call Ratios to Gauge Sentiment

There are several ways to calculate a ratio between puts and calls. Some have used a ratio of the average premium paid for calls versus the average premium paid for puts. In theory, the premium represents the anxiousness of the buyer and the reticence of the seller. Statistically, however, this has not been reliable for indicating sentiment. Some analysts have added the price of all options

1. It has long been thought that most options expire worthless, indicating that most people purchasing options have incorrectly predicted the direction of market moves. However, recent research indicates that more options are exercised than had been thought. In the November 2004 issue of *Technical Analysis of Stocks and Commodities*, Tom Gentile reports on a study of 30 years of option data conducted by Alex Johnson of the International Securities Exchange who found that only 30% of options expire worthless. Roughly 10% are exercised, and the remaining 60% are closed through offsetting transactions. The percentage expiring worthless, nevertheless, is large and still suggests that many option buyers are uninformed.

traded each day multiplied by the volume of each trade to arrive at a dollar volume ratio between calls and puts. Not only does this calculation require accurate data and significant computing power, but the information provided by this calculation also has not seemed to be particularly useful. Others have calculated a ratio based on the open interest in calls and puts. Unfortunately, this has also turned out to be a mediocre indicator of contrary opinion.

The final, simplest, and most consistent method of calculating puts to calls is to calculate a ratio of the total volume of puts traded in a day versus the total volume of calls (McMillan, 1996). For the stock market, the raw volume statistics as well as the ratio are available in Excel format on the web site of the Chicago Board Options Exchange ([www.cboe.com](http://www.cboe.com)), known as the CBOE, the largest option exchange in the world according to the Futures Industry Association. Figure 7.2 shows the relationship between the CBOE put-call volume ratio and the S&P 500. The relationship between put and call volume is useful in other markets as well.

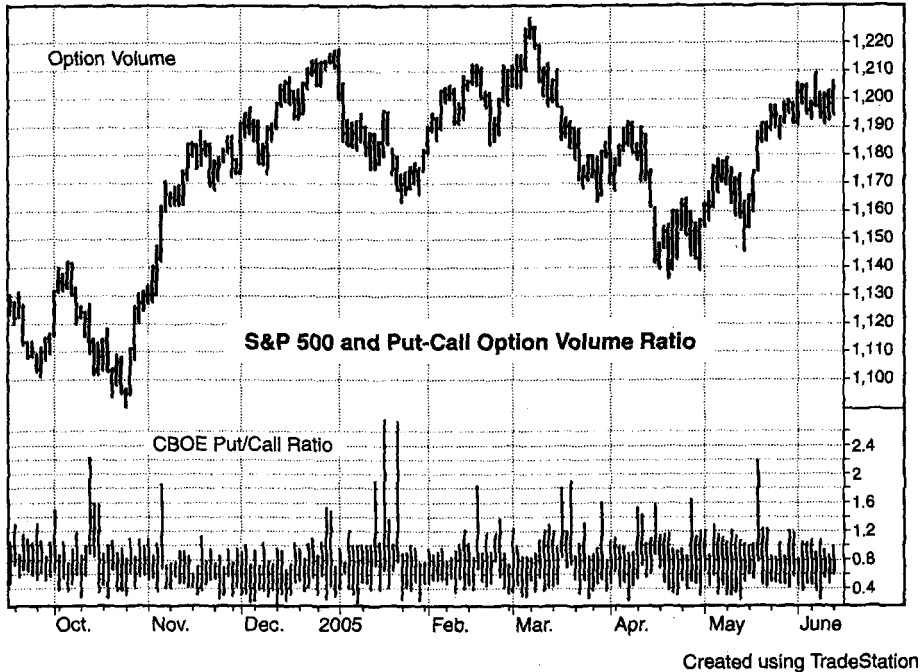


FIGURE 7.2 Put/call volume ratio and the S&P 500 (daily, September 20, 2004-June 13, 2005)

Option volume ratios have changed over the 30 years that options have been traded in exchanges. It is thus imperative to smooth the raw volume data using moving averages to reduce the effect of this long-term relationship change. Ken Tower, CMT, Chief Market Strategist at CyberTrader, Inc., uses a ratio of the ten-day moving average of the put/call volume to the 126-day moving average, roughly equivalent to a 2-week versus a 26-week moving average. Deviations between these two averages determine the extremes in option emotion. A high ratio suggests more put buyers than call buyers, indicating that the uninformed players are pessimistic. Because this ratio is a contrarian indicator, a high put-call ratio is generally favorable for the future market direction.

The most successful methods of using put and call information that have been developed to date are those used by Ned Davis Research ([www.ndr.com](http://www.ndr.com)). This company has developed a strategy that uses three different ratio periods on total option volume, equity volume, and index volume. Between 1987 and 2004, a series of signals would have generated a 21.3% annual return when at least two out of the three calculations were positive (above its standard deviation) and a 9.2% loss when two out of three were negative.

By adding futures premiums on the NASDAQ and S&P 500 futures to data on put/call volume, they found a superior result in performance, as is done on Figure 7.3. This combination of contrary opinion indicators produced a 37.6% gain per annum when favorable and a 12.2% loss when unfavorable. It appears that option volume and futures premiums are an excellent method of measuring speculator opinion.

#### Volatility and Sentiment

Another strategy for analyzing the behavior of the uninformed market participants is looking at volatility. Volatility is a measure of the amount by which a security price oscillates, usually about its mean, without regard to its trend over a specified period. The most common calculation for volatility is the standard deviation about the mean. Historical volatility is the standard deviation of prices in the underlying security about its mean over some marked period. The 100-day volatility, for example, is the amount by which a security oscillated over the past 100 days about its mean.

Volatility is mean reverting. Therefore, when it gets out of alignment with what it has been on average, we can assume that it will return to its mean. As in security returns, however, this is not an absolute. Just as there are fat tails in the distribution of price returns, fat tails also occur in volatility distributions.

Another common assumption is that volatility is independent of price return. In other words, adherents to this assumption claim that the ability to predict the volatility of a security will not aid in predicting the future price direction or return. Some evidence refutes this hypothesis. Volatility is often a measure of the anxiousness of the players in the security market, increasing as they become nervous and decreasing as they become complacent. Because the players act as a crowd and are often uninformed, volatility can be a predictive factor in markets. Let us look at some of the ways to measure volatility.

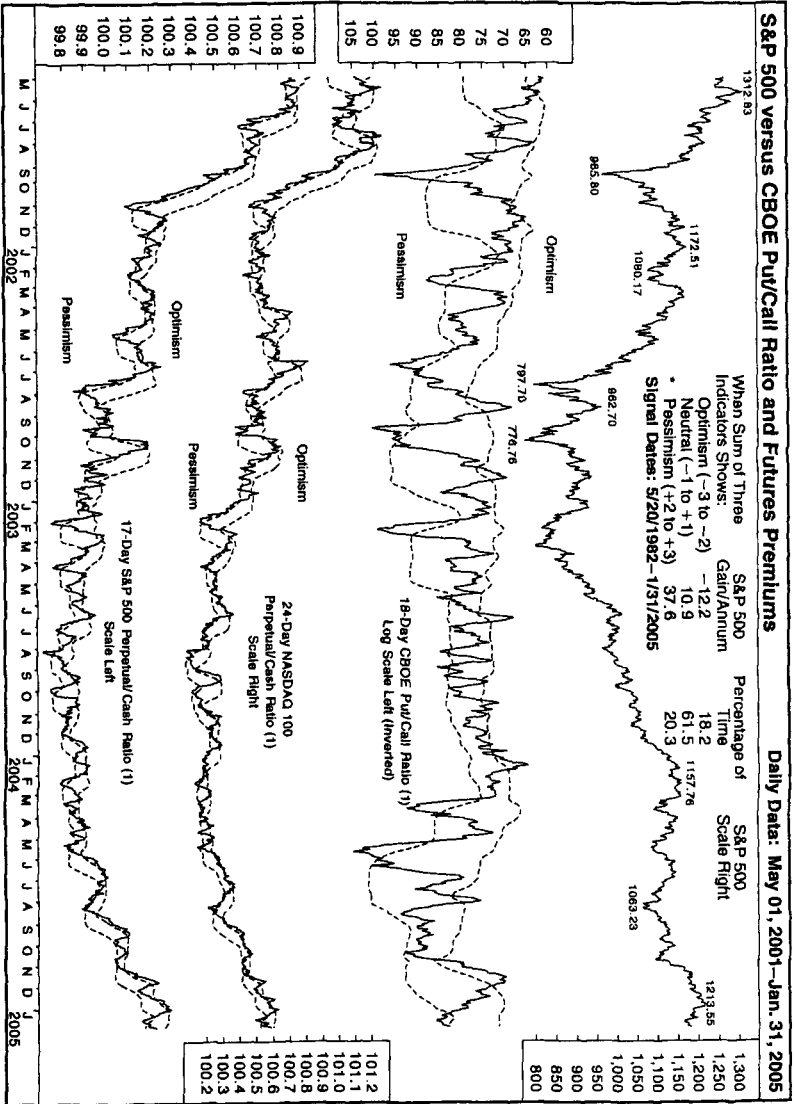


FIGURE 7.3 Combining put/call ratio with futures premium to gauge sentiment

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## Using Volatility to Measure Sentiment

VIX is the exchange symbol for an indicator of volatility in the trading of Standard & Poor's 500 options. Volatility in the trading of the NASDAQ Composite and the S&P 100 Index are represented by VXN and VXO, respectively. VTX, VXN, and VXO are traded on the CBOE. Instead of measuring historical volatility, these indicators measure what is known as implied volatility. Historical volatility generally oscillates with past anxiousness. By looking at implied volatility, the analyst hopes to measure market participants' anxiousness about the future. Figure 7.4 shows the relationship between the S&P 500 and VIX.

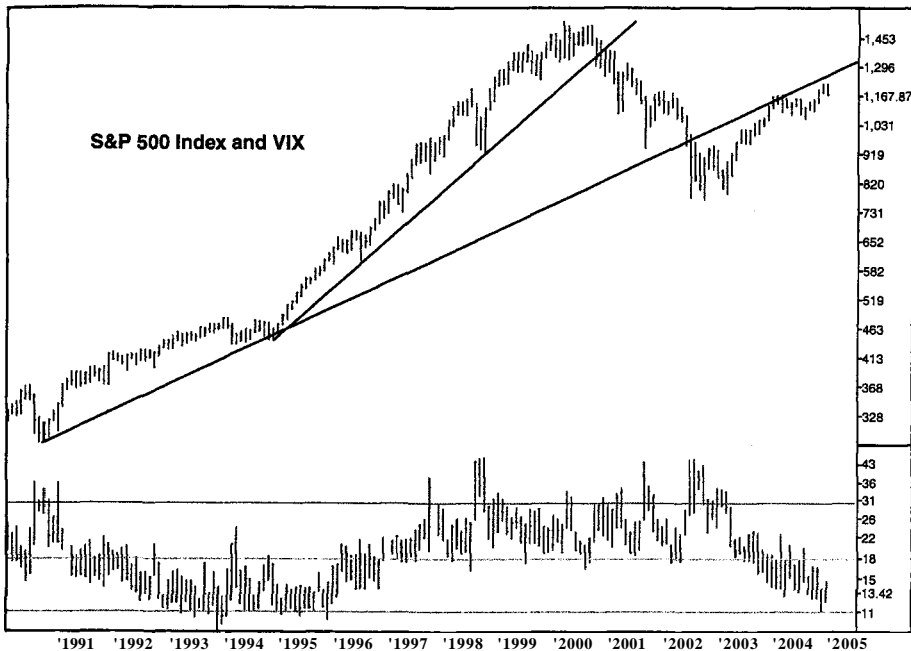


FIGURE 7.4 The S&P 500 and VIX (1990-2004)

Implied volatility is a figure derived from the Black-Scholes option formula. The Black-Scholes option-pricing model suggests that the price of an option is a function of the spread between the underlying security price and the strike price of the option, the time remaining in the option, the prevailing interest rate, and the volatility of the underlying security. If we know the price of an option, the option strike price, the price of the underlying security, the interest rate, and the time remaining in the options, we can calculate the only missing variable—the volatility. Thus, implied volatility is the volatility implied by the option traders in their pricing of the options in the marketplace. Implied as well as historic volatility correlates to some extent with market prices. High volatility tends to occur at periods of stress, emotion, uncertainty, fear, and

nervousness, most often peaking at a panic bottom. On the other hand, low volatility seems to occur during market rises and market peaks when emotions are calm, content, and relaxed. By looking for extremes in implied volatility then, because implied volatility expresses the expectations of those option traders, we can determine market emotion.

#### **BOX 7.3** Calculation of VIX—Volatility Index Sentiment

In his book, *The Encyclopedia of Technical Market Indicators*, Robert Colby provides the following formula for using VIX to generate buy and sell signals:

Formula:  $X =$  Ten-day exponential moving average of VIX

- Buy: When  $X$  today is greater than  $X$  yesterday.
- Close Long: When  $X$  today is less than  $X$  yesterday.
- Sell Short: Never.

Colby found that using this strategy during the January 1968-September 2000 period would have resulted in returns 46.65% greater than a buy-and-hold strategy and a maximum trade drawdown of 46.69%.

#### Combining Put/Call Ratio and Volatility

One final method of using option data is using the CBOE put/call volume ratio for all stocks and the VXO, the implied volatility index for the Standard & Poor's 100 Index, the OEX. By calculating the ratio of a ten-day moving average to a 65-day moving average for each figure to normalize the data and averaging it by summing the two calculations and dividing by two, Kaeppel (2004) developed an option sentiment index that signaled intermediate market rums during the period from January 1997 through February 2003. As with many other indicators, the long, sustained rise into 2000 was partially missed with early sell signals. Option sentiment and other measures of sentiment tend to work more reliably at bottoms when investors panic than during an advance when greed develops more slowly.

## **Polls**

One way to measure the sentiment of market participants is simply to ask the players if they are bearish or bullish. Although this might appear to be the most straightforward way of gathering information about expectations, sampling problems and other biases associated with poll taking exist. Despite these biases, poll results if measured over a constant time interval can give some idea of the public mood. Poll results are contrary indicators because they express optimism at market tops and pessimism at market bottoms. Thus, polls gather information and measure the

sentiment of the uninformed investors. Several different companies collect and publish sentiment information based on polls. Let us look at a few of these.

#### Advisory Opinion

Investors Intelligence ([www.investorsintelligence.com](http://www.investorsintelligence.com)), located in Larchmont, New York, provides sentiment information in its Advisory Service Sentiment survey. Since 1962, the company has read approximately 100 investment advisory newsletters every week and determined the percentage of those that are bullish, bearish, or expecting a correction. Intuitively, it seems that newsletter writers would be more sophisticated and thus more in tune with the market than the public they advise, but the numbers over the past 40 years instead show a tendency to be incorrect, especially at market extremes. Thus, this survey provides information about the uninformed players and works as a contrarian indicator.

The profitability of using this information to make trading decisions is questionable. Solt and Statman (1988) found no statistically significant relation between the sentiment of investment newsletters and stock returns: The raw numbers and several ways of looking at them have not proven to be informative in the past. Colby (2003) found no profitable results in the crossing of advisory data exponential moving averages between 1 and 1,000 weeks.

However, several studies by others have shown that with certain modifications, the advisory sentiment in the past has been a somewhat reliable indicator of future stock market price action. Ned Davis Research, for example, uses an adjustment for the monetary background. Figure 7.5 shows even moderately profitable results between 1971 and 2004 without the monetary background. Colby (2003) suggests that when a large percentage of the advisors are bearish, market prices will rise. Therefore, he suggests using advisory sentiment to find these periods of extreme pessimism by using an optimistically skewed decision rule. In this decision rule, investors take a short position whenever the percentage of bearish newsletters is greater than the 54-week exponential moving average of bears plus ten percentage points. Following this strategy over the 1982-2001 period would have resulted in a net profit of 70.3% over the profits of a buy-and-hold strategy.

#### American Association of Individual Investors

The American Association of Individual Investors (AAII) ([www.aaii.com](http://www.aaii.com)) compiles a daily poll from its 170,000 members on what they believe the stock market will do over the next six months. The results are published in *Barron's* (with a suitable lag). DeBondt (1993) found that the members polled by the AAII tended to forecast the future as though they expected a continuation of the past stock returns. Ned Davis Research found that over the July 1987-January 2005 period, when a two-week moving average of the bullish investor percentage divided by the sum of the bullish and bearish percentages rose above 67.5 (that is, the AAII investors are too optimistic) the stock market had a tendency to decline 2.8% per annum. When the ratio declined below 49.0, the stock market had a tendency to rise 20.6% per annum (see Figure 7.6).

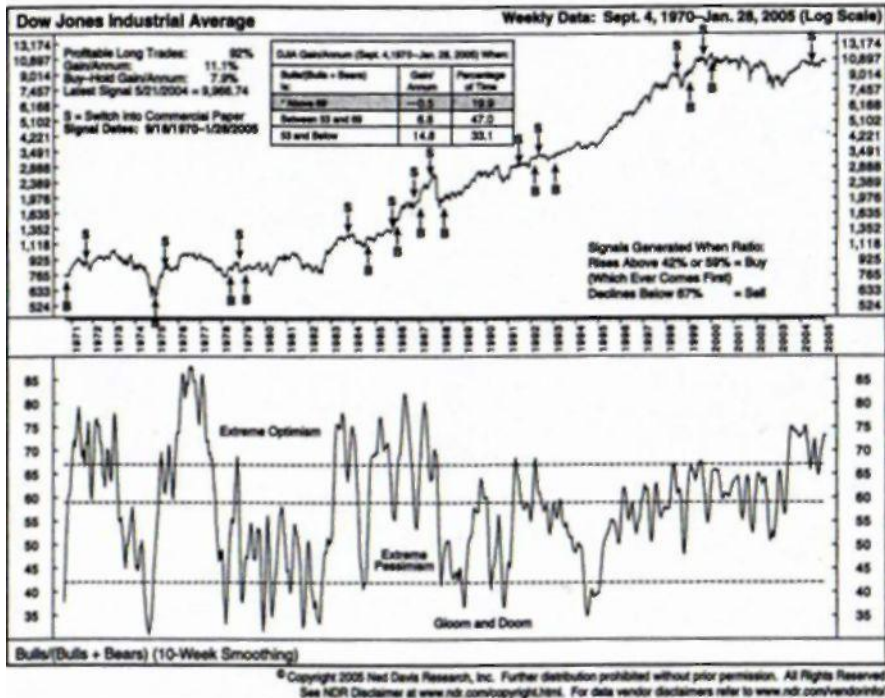


FIGURE 7J Advisory opinion

Consensus Bullish Sentiment Index

Consensus Inc. ([www.concensus-inc.com](http://www.concensus-inc.com)) of Independence, Missouri, draws from an extensive mix of both brokerage house analysts and independent advisory services, from both contributors and noncontributors, to compile the Consensus Bullish Sentiment Index. The data covers a broad spectrum of approaches to the market, including the fundamental, technical, and cyclical. Consensus, Inc. considers only opinions that have been committed to publication and therefore have an influence on the trading public. They thus exclude opinions that brokers or advisors may hold but have not publicly disclosed.

Using readings above and below two standard deviations, Ned Davis Research (Colby, 2003), reported that in the period from 1983 to 1998, a 25.1% gain occurred from buy signals when the index rose above two standard deviations. Sell signals were also profitable, but the gain over buy-and-hold was only 6%.

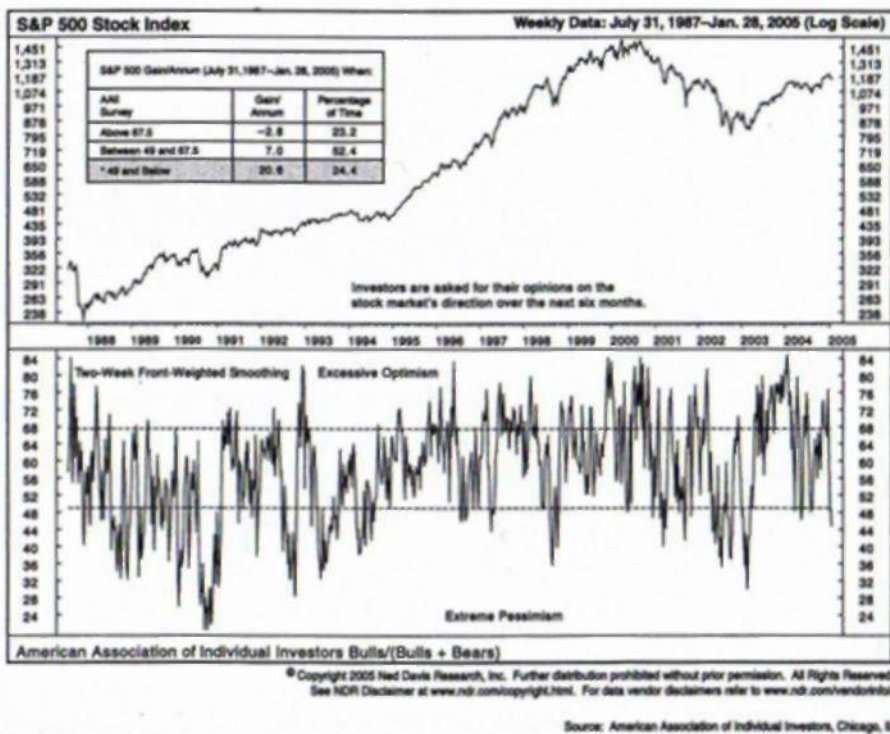


FIGURE 7.6 American Association of Individual Investors Bulls and Bears

### Market Vane

Market Vane Corporation ([www.marketvane.net](http://www.marketvane.net)) of Pasadena, California, polls 100 brokerage firm investment advisory letters every week for their opinion of the stock market, giving weight for the number of subscribers. This data is then used to construct the Bullish Consensus of Stock Index Futures, which is published in *Barron's* every week. Ned Davis Research uses a standard deviation band about a 15-day moving average for signals (Colby, 2003). From 1988 through 1998, when the moving average rose above the lower standard deviation, a buy signal was generated. During that period, 82% of the buy signals produced a profit for an average of 17.8% annual gain versus the buy-and-hold gain of 13.3%.

### The Sentlx Index

Originated in February 2001, the relatively new Sentlx Index ([www.sentlx.de](http://www.sentlx.de)) is a comprehensive poll of German investors about their opinion of the markets, including the U.S. stock and bond markets. The poll is taken every week on Friday, and the results are published each Monday

morning in Germany. About 1,200 people (among them more than 200 institutional investors) are asked about their opinion on ten different markets: DAX-Index, TecDAX (German technology stocks), EuroSTOXX 50, S&P 500, NASDAQ Composite, Nikkei-Index, Bund-Future, T-Bond-Future, EUR-USD currency, and USD-JPY currency. The poll includes the investors' expectations for one month (short-term) and six months (medium-term). The information is too new for statistical analysis, but this well-organized and sound data could be useful in the future.

### Consumer Confidence Index

The Conference Board ([www.conference-board.org](http://www.conference-board.org)), producers of the index of leading economic indicators and the help-wanted index, each month reports on consumer confidence. The Consumer Confidence Index is based on a representative sample of 5,000 U.S. households. The survey is based on consumer expectations for the U.S. economy. Like most other opinion polls, the survey has been a contrary indicator to the stock market. As seen in Figure 7.7, Ned Davis Research found that between 1970 and 2005, when the survey number rose above 113, demonstrating that consumers were overly optimistic, the stock market remained relatively flat. However, when consumers were predominately pessimistic and the survey number declined to below 66, the stock market rose on average 27.3% per annum.

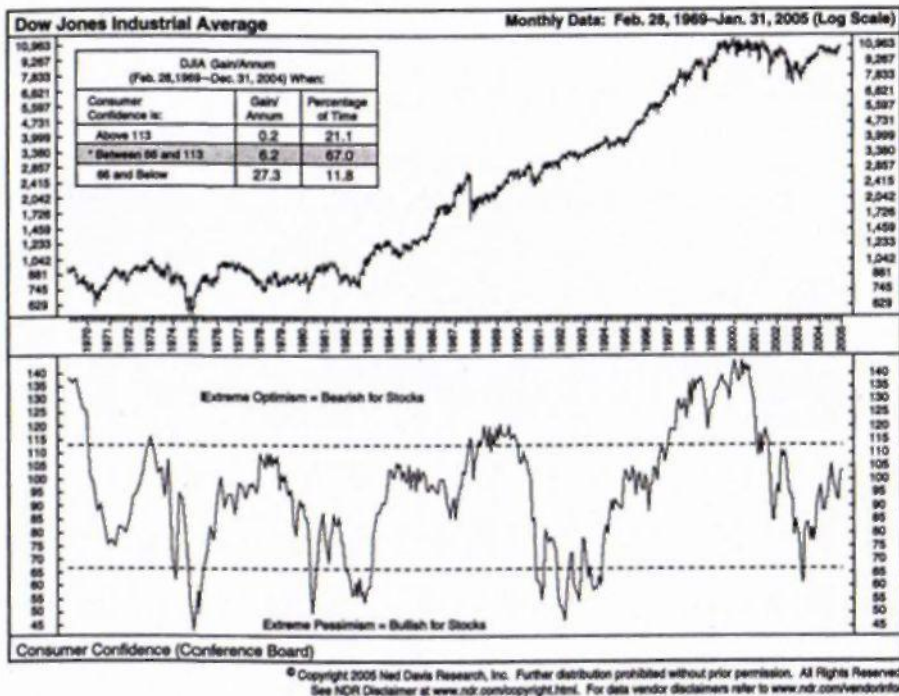


FIGURE 7.7 The Consumer Confidence Index

## Other Measures of Contrary Opinion

### Buying and Selling Climaxes

Investors Intelligence uses the term "climax" to describe a specific event that occurs over a one-week period. A buying climax occurs when a stock makes a new 52-week high but then closes below the previous week's close. A selling climax occurs when a stock makes a new 52-week low and then closes above the previous week's close. "The reason for such a rigid definition for climaxes is that this enables us to classify accurately and consistently what is and what isn't a climax. This is important as we maintain historic records of the climaxes generated each week and have noted that important market turning points are often accompanied by a sudden rise in the number of buying or selling climaxes," states Investors Intelligence. Figure 7.8 shows the buying and selling climaxes from February 2004 through the beginning of February 2005. Their work shows that sellers into buying climaxes and buyers into selling climaxes are correct in direction about 80% of the time after four months.

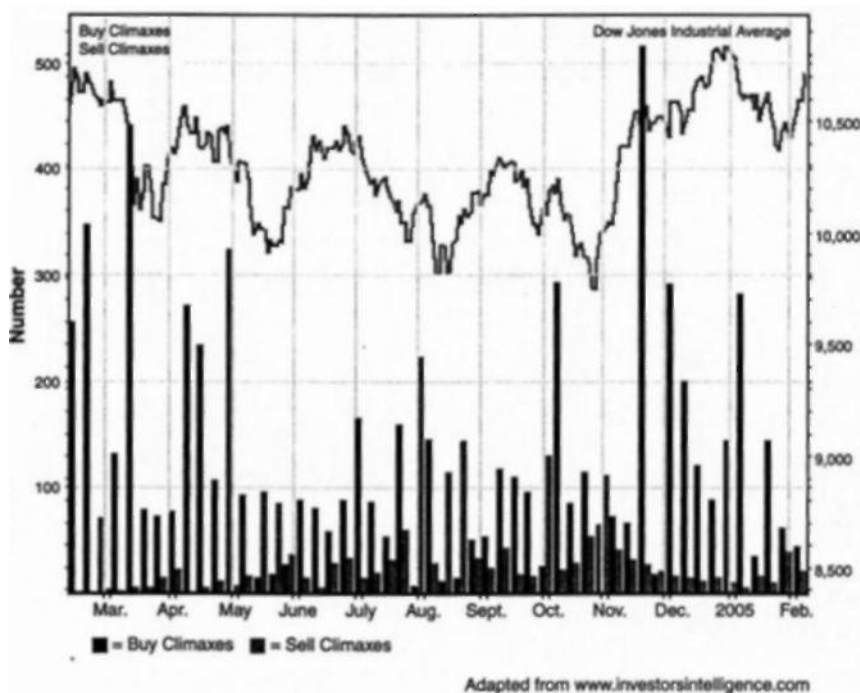


FIGURE 7.8 Buy and sell climaxes (versus DJIA)

### Mutual Fund Statistics

Because mutual fund investors are mostly from the uninformed public sector, mutual fund statistics can often be useful in determining what the uninformed is thinking and doing. The most reliable statistic is the cash reserves in stock mutual funds as a percentage of the assets and adjusted for interest rates.

#### *Mutual Fund Cash as a Percentage of Assets*

It has long been known that mutual fund cash holdings are contrary indicators for the stock market. There are many reasons for mutual funds to hold cash, but the bottom line is that high levels of cash usually occur at stock market bottoms. Jason Goepfert (2004), in his Charles H. Dow Award paper, building on earlier work by Fosback (1976) and Ned Davis Research, found that adjusting mutual fund cash for the interest rate is an even more reliable indicator than the cash percent position by itself. He found that when mutual fund cash, adjusted for interest rates, during the period from January 1981 through June 2004, declined to below its lowest threshold, the stock market rose on average 8.1% over the following year. When the cash level was at its highest, the stock market declined by an average 6.1% over the year following.

Ned Davis Research found essentially the same relationship with mutual fund cash percentage, adjusted for interest rates, and the stock market (see Figure 7.9). By measuring the deviation from the 13-month average of the stock mutual fund cash/assets ratio, adjusted for interest rates and during the period from 1965 through 2004, a level above 0.1 produced an annual gain of 11.1%, and a level below -0.7 produced a loss of 0.1%.

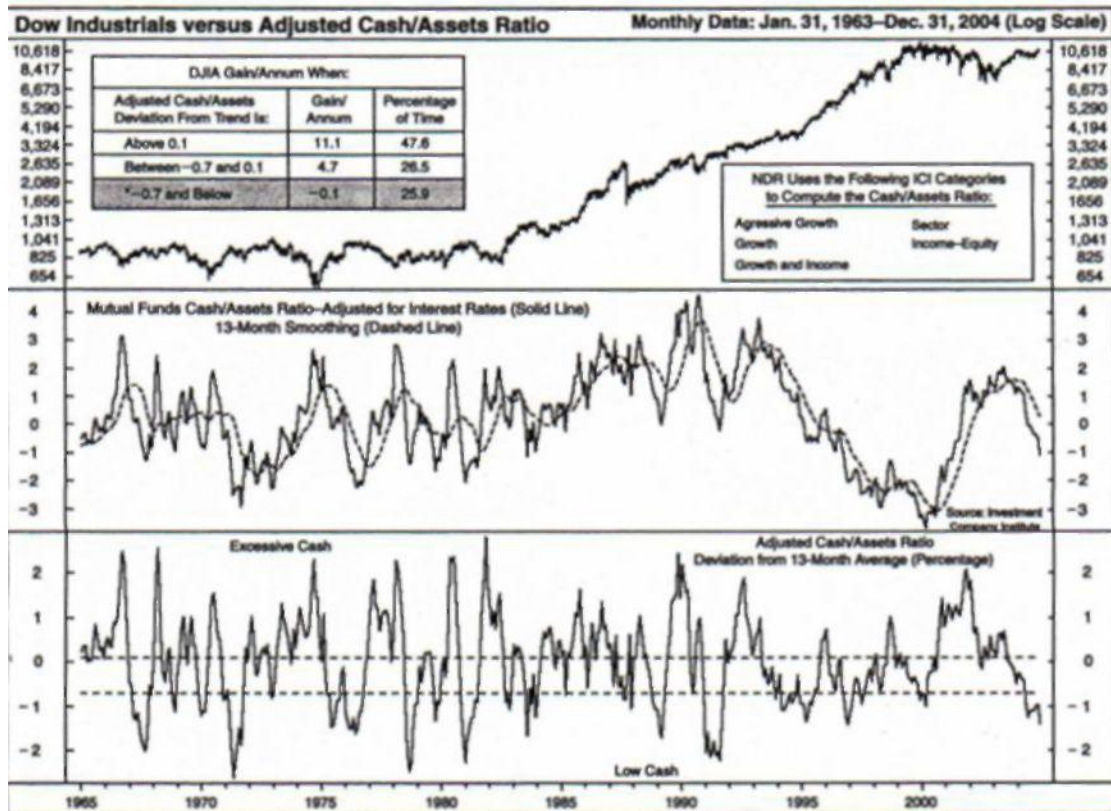
In neither instance are the results exceptional. Although some watch the mutual fund cash/assets ratio, it appears to be only a marginal indicator of uninformed sentiment.

### Rydex Funds

Among the specialized mutual funds offered by Rydex Investments ([www.rydexfunds.com](http://www.rydexfunds.com)) are the Nova fund and the Ursa fund. The Nova fund is a leveraged index fund that replicates the Standard & Poor's 500 index. The Ursa fund is an index fund that replicates being short the Standard & Poor's index; it declines in value in proportion to each rise in the Standard & Poor's 500 and vice versa. If the public expects the market to rise, they will purchase the Nova fund and sell the Ursa fund, and vice versa. Therefore, the ratio of the assets held by these two funds provides an indication of the direction that the uninformed members of the public expect.

Ned Davis Research has found that when these investors become optimistic, invariably the market performs oppositely. Indeed, when the ratio is above 63—that is, more people are purchasing the Nova fund than the Ursa fund—the stock market has declined 15.6% per annum, and when these investors have loaded up on the bearish fund, Ursa, the stock market has risen 29.6% (see Figure 7.10).





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FIGURE 7.9 Stock mutual fund cash/assets ratio

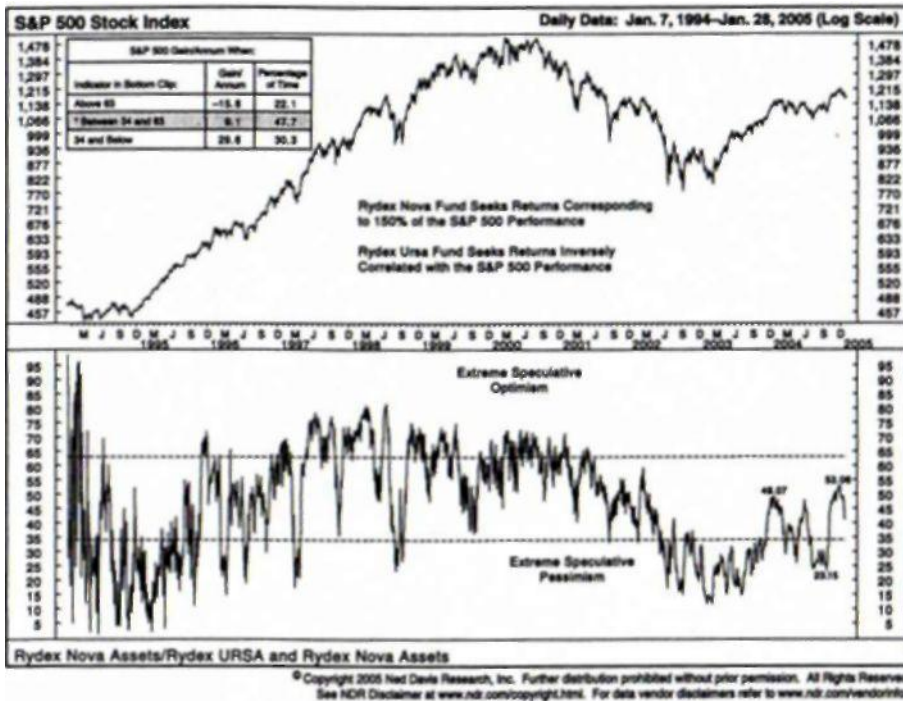
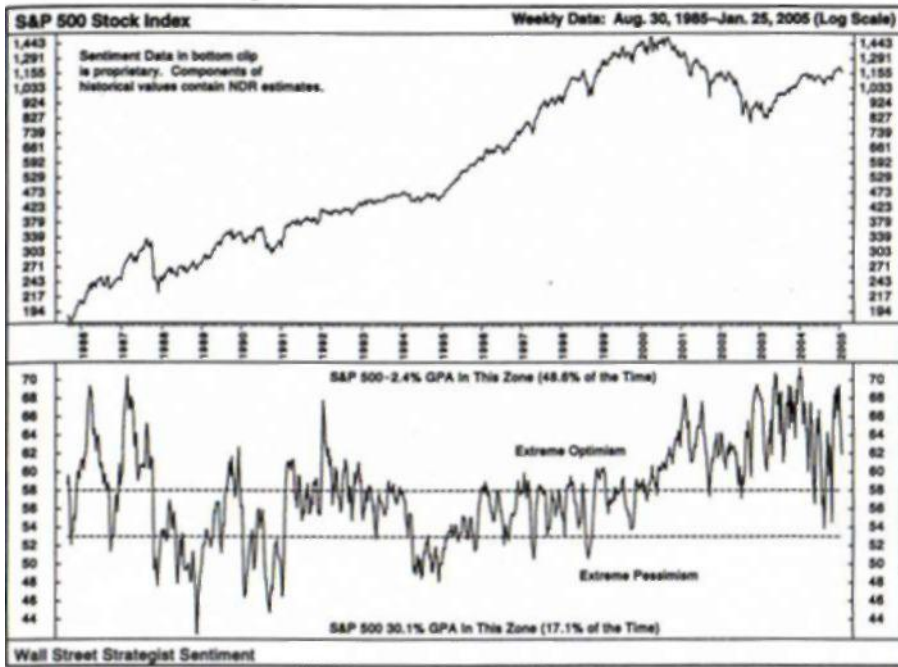


FIGURE 7.10 Rydex Investments' Novo and Urss funds

### Wall Street Strategists

If newsletter investment advisors, individual investors, brokerage firm investment advisors, and mutual fund investors are uninformed investors, what about the professional strategists at major Wall Street brokerage houses? Intuitively, one would think that they had some informed judgment, especially because they have the information provided to Wall Street at their fingertips. However, it turns out that they are equally as uninformed as the public.

In fact, a Ned Davis Research study covering the 1985-2004 period found that when these strategists have been predominately pessimistic, the stock market has risen 30.1% per annum (see Figure 7.11), and when they were optimistic, the stock market declined 2.4% per annum.



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FIGURE 7.11 Sentiment of Wall Street strategists

### Brokerage Firm Hiring

As it turns out, the brokerage firms with the strategists who are most optimistic when the market is headed for a decline also hire new brokers at just the wrong time. Again, according to a study by Ned Davis Research, in the rare instances when brokerage firms hire new brokers at a rate above 3.6%, the stock market declines 34.0% per annum, and when these brokerage firms are letting brokers go, the stock market generally rises. Figure 7.12 displays this relationship.

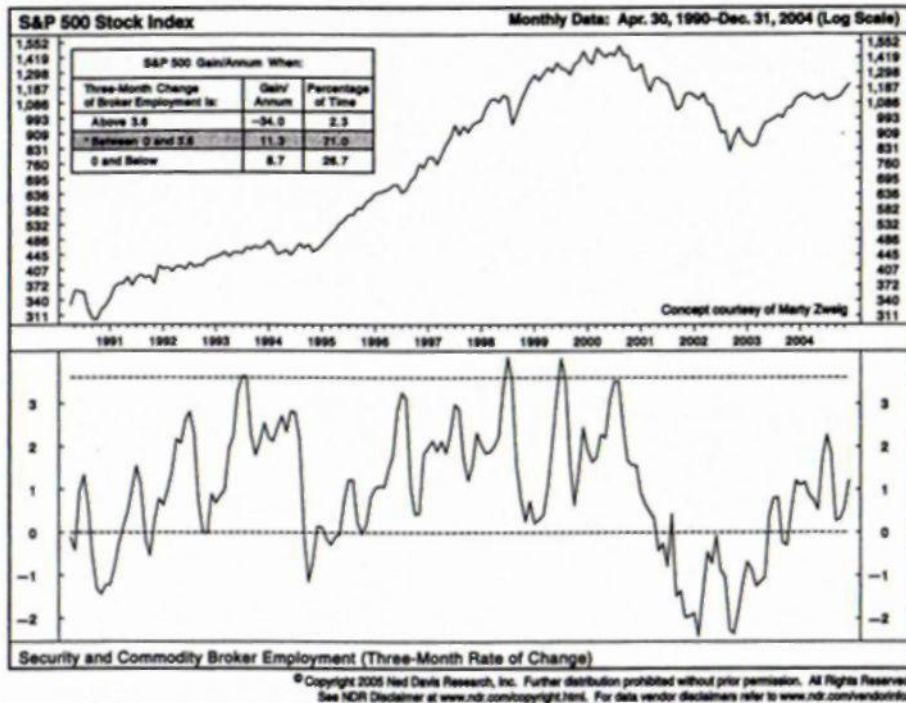
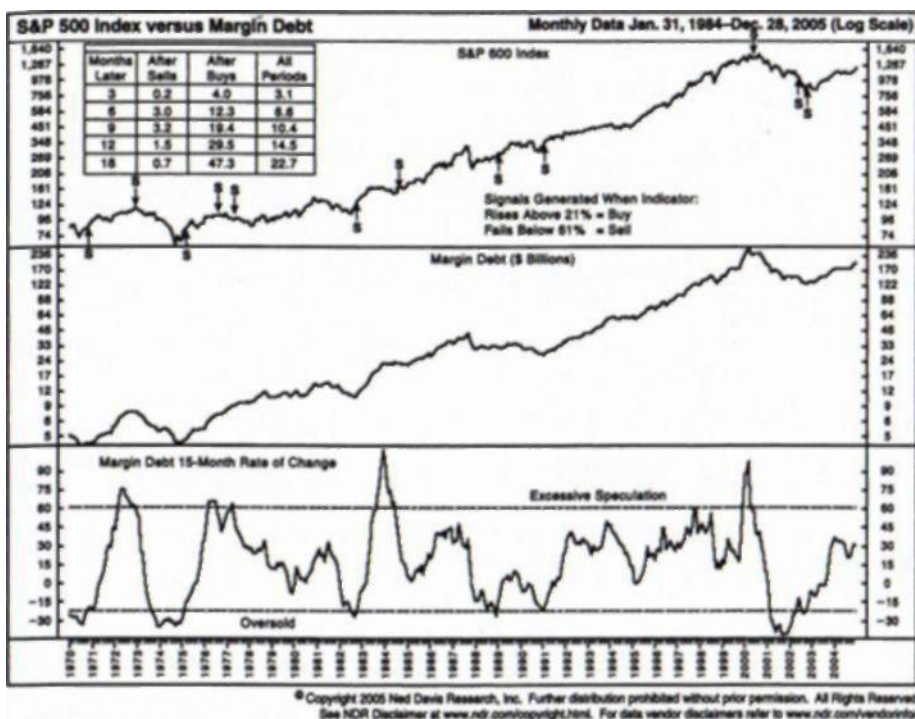


FIGURE 7.12 Security and commodity broker employment

### Margin Balances

Each week, **Barron's** reports the NYSE margin debt for the previous month. Traditionally, analysts have considered margin balances evidence of what the uninformed speculator is doing, especially at market peaks. Remember that when uninformed investors are most optimistic, they have placed all of their capital in the market and may buy stocks on margin to leverage their position. More recently, margin debt reflects professional speculators and may not be as useful as before. Taking away from the usefulness of margin debt for market forecasting is the ability through derivatives of holding positions outside the Federal Reserve requirements for margin, which only apply to banks. Part of the risk incurred by the Long Term Capital Management (LTCM) operation was over a trillion dollars in derivative contracts, most of which required very little margin. Thus, **Barron's** weekly report of margin debt, which at one time was a very reliable indicator, is no longer an accurate gauge of market sentiment. The relationship between margin debt and the S&P 500 from 1970-2004 is shown in Figure 7.13.



FrGURf 7.13 -Margin debt and the S&amp;P 500

### Relative Volume

Another indicator of uninformed sentiment is the ratio of NASDAQ to NYSE volume (see Figure 7.14). This ratio gradually increases as public enthusiasm for speculative stocks on the NASDAQ increases, and NASDAQ volume increases relative to NYSE volume. The peak in a trend seems to occur when the ratio peaks, and the bottom of the trend occurs after the bottom in the ratio.

### Uninformed Short Selling

Historically, short selling has been predominately a professional activity. It is even more so today with the many derivative securities traded. The modern use of derivatives requires short selling to reduce risk. Thus, the old relationship of short selling having to do solely with opinion about the prospect for companies has diminished. On the other hand, the total amount of short selling seems to increase with an increase in the market direction and is thus a contrary opinion indicator.

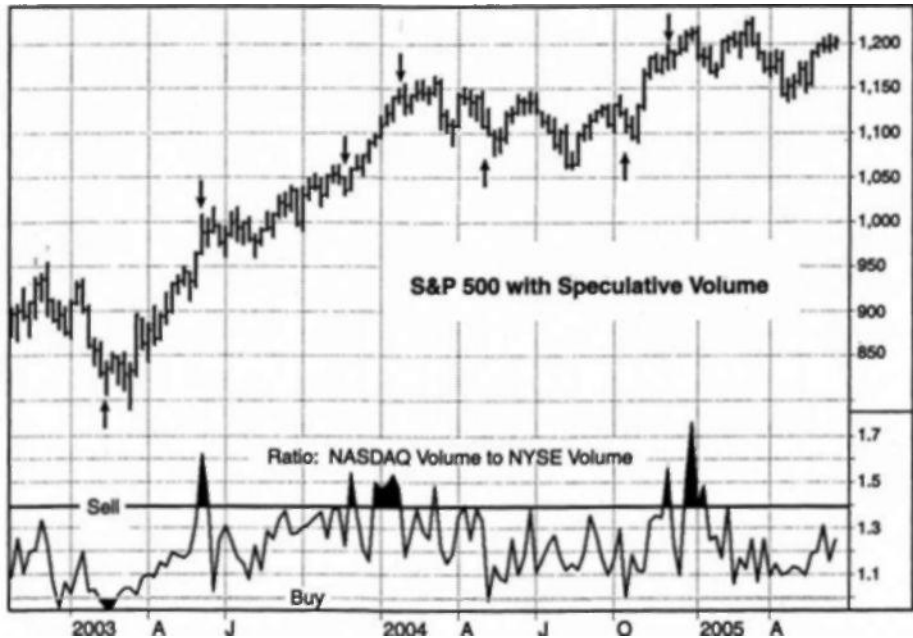


FIGURE 7.14 The ratio of NASDAQ to NYSE volume (weekly: October 2002–June 2005]

The Short Interest Ratio is calculated from data provided by the major exchanges, traditionally the New York Stock Exchange, on a monthly basis, and reported in *Barron's* and other financial papers. It is calculated by taking the total amount of stocks sold short as of the specific day of the report divided by the average volume for the month. Colby (2003) reports that over the 69 years of data from 1932 to 2000, using a buy signal when the current ratio was greater than its 74-month exponential moving average, and a sell signal when the 74-month average was broken, a sizeable return resulted but one below the buy-and-hold strategy. This signal worked only for long positions and was out of the market for 457 months, more than half the time.

Ned Davis Research (see Figure 7.15) found that the spread from the 16-month moving average was a useful indicator of future market performance during the 1945–2004 period. When the spread rose above 0.19 and investors were generally pessimistic, the market advanced 13.5% per annum, and when the spread declined below -0.1, the market only advanced 3.5%. These are not outstanding results, and combined with those of Colby (2003), they suggest that the Short Interest Ratio is only a marginally useful indicator of contrary opinion.



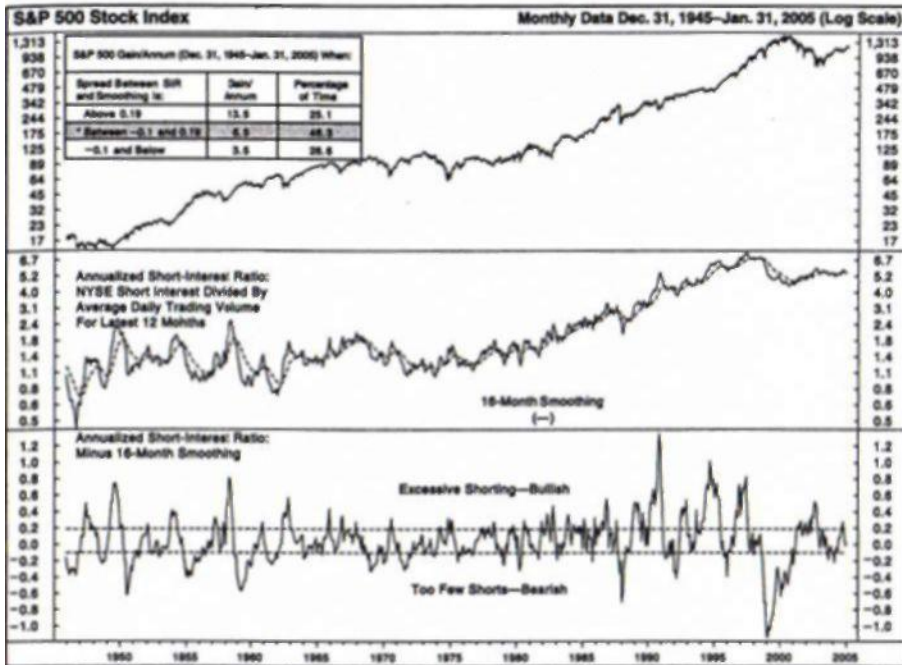


FIGURE 7.15 Short interest ratio and the S&P 500 from 1945 to 2004

As for the usefulness of short selling data on individual stocks and determining the potential for a "short squeeze," which is the rapid rise in a stock's price as short-sellers scramble to cover, data on individual stocks is available but is often clouded by many variables. To get at information that is more useful on a company basis, considerable digging and filtering must be done to eliminate the influence of derivative transactions that may have little to do with the prospects for the firms. Phil Erlanger ([www.erlanger.com](http://www.erlanger.com)) accomplishes a considerable amount of work in this area and publishes results periodically on his web site. He has found several filters that must be applied to individual stock short sale data: 1) the data must be adjusted for splits—not only price adjustments but volume and short interest; 2) it must be normalized to adjust for short-term volume fluctuations; and 3) it must be normalized to adjust for historic volatility. A ranking is established, placing the stock within its smoothed, historical context over a five-year period. This ratio establishes the potential attractiveness of the stock. This number should not be used as a mechanical buy signal, however, because the short-sellers may be correct in anticipating the stock to decline.

## Unquantifiable Contrary Indicators

Over the years, analysts have watched a number of developments in the society around them in an attempt to gauge the overall mood, emotion, and sentiment of market participants. Many of these indicators are qualitative and not quantitative. Although these indicators are not easily quantifiable and do not lend themselves to traditional statistical testing, they still provide important information to the technical analyst.

One of these unquantifiable indicators is the magazine covers theory. The media covers the news but with a strong bias. It is selling news to those who are interested. If the stock market is high and ready to decline, the media would be unlikely to report the danger even if they know it. Instead, they will emphasize the fact that the market has risen and is strong. They want people to listen, to subscribe, and to read their output, and they will not get business if they report contrary to the popular beliefs of the day. Their business is providing their subscribers with what they want. Thus, when major news magazines such as *Time*, *Newsweek*, *U.S. News and World Report*, *Barron's*, the *Economist*, or *BusinessWeek* include on their cover an article on the stock market, up or down, they are emphasizing what the public believes and already knows—and as has been shown previously, the public is generally wrong, at least at extremes. For this reason, these stories usually occur at or before major turning points in the stock market.

Paul M. Montgomery, formerly of Legg Mason in Newport News, Virginia, and currently with Universal Economics, has studied magazine covers back at least to 1923. He has observed that after a positive major magazine cover story on the stock market, 60 to 65% of the time the market has gained about 30% per annum over the first one to eight weeks. 80% of the time, however, the market has then reversed within a year and sustained significant losses (Baum, 2000).

Not only does the media report about the market (which provides some idea about the sentiment of the market players), but the reports of the media also impact the mood and emotions of investors. A study commissioned by the *Wall Street Journal* (Klein and Prestbo, 1974, as reported in Kaufman, 1998) found that 99% of financial analysts read a newspaper regularly. 92% of these analysts considered the newspaper the "most valuable" publication they read. Obviously, the news is important. However, rapid and correct interpretation of facts is difficult. Sometimes factual news is immediately interpreted by the market incorrectly. For example, when Saddam Hussein was captured, the stock market opened up with a large gap just from the joy of the news. When investors thought about the consequences of that news, they realized it did not change anything, and the stock market closed down that day. Informed traders in a method called "event trading" likely sold into this emotional opening. It is a method of rapidly gauging the sentiment produced by a news announcement, determining whether the market is overreacting, and if it is, acting contrarily. Another aspect of event trading is gauging whether the market or a stock is acting as it should on particular news, and if it is not, perhaps the news was already discounted in the price and a change in direction is due. Event trading or news trading is a very short-term use of contrary opinion.



**BOX 7.4 Eccentric Sentiment Indicators**

Over the years, stock market followers have developed a number of "eccentric indicators" to predict stock market movements. Not based on economic or financial data, these indicators are "feel good" or "hype" indicators that attempt to measure the overall morale of the investing population. One of oldest feel good indicators, first suggested by the late Ralph Rotnem of Harris, Upham & Company (now, after a long string of mergers, Citibank), follows women's hemlines—as hemlines rise, so does the stock market, and as hemlines fall, so does the stock market. Consider the Roaring 20s, when women wore short flapper skirts and a stock market rise followed. When the stock market crashed during the great depression, long, modest skirts followed. The hemline index implies that as people become more exuberant, stock prices rise and clothing becomes more daring, and as society becomes more pessimistic, people become more conservative with their clothing and investment choices. Market and economy watchers have also considered beer versus wine sales (people drink more beer when the market is down and approaching a low), sedans versus coupes (people buy more sedans and fewer coupes when the market is down), lipstick sales (when the market is down, women buy cheaper brands), aspirin (a rise in sales correlates with distress about the market), and the number of golf balls left at the driving range (people don't leave balls when the market is declining).

It must be emphasized that none of these indicators has an affect on stock prices. If a direct relationship exists, it exists only as correlation without a direct link to the markets. Indicators, to be truly useful, must have a rationale for their existence. Correlations may be purely accidental and thus meaningless. For a discussion of how some of these offbeat indicators have performed, go to [www.Forbes.com/2001/06/28/exotics.htmI](http://www.Forbes.com/2001/06/28/exotics.htmI).

**Historical Indicators**

There are several indicators that technical analysts have used historically that you may see discussed in the literature. Although these indicators have little relevance today, they have played a prominent historical role in the measurement of market sentiment. The first is odd lot statistics. As we mentioned earlier in this chapter, odd lot statistics were traditionally an important measure of the uninformed public's interest in stocks. The small investor who could not afford to invest in 100 shares of stocks would purchase less than 100 shares—known as an "odd lot." Today, small investors can purchase options with a small outlay of investment dollars. Thus, options statistics are now a better measure of the small investors' speculation than are odd lot statistics.

The second historically important indicator is the Barron's Confidence Index. This index, developed in 1932, measures the ratio of yields on high-grade bonds versus yields on speculative

bonds. Although it is still published today, it seems no longer to have relevance for measuring stock market sentiment.

## **How Is THE SENTIMENT OF INFORMED PLAYERS MEASURED?**

Thus far, we have focused mainly on the sentiment of the uninformed market players. Remember that these market participants often make incorrect market decisions, especially at market extremes. Therefore, the sentiment of the uninformed players is used in a contrarian strategy. Now, we will center our attention on the sentiment of informed players—those most likely to make correct market decisions.

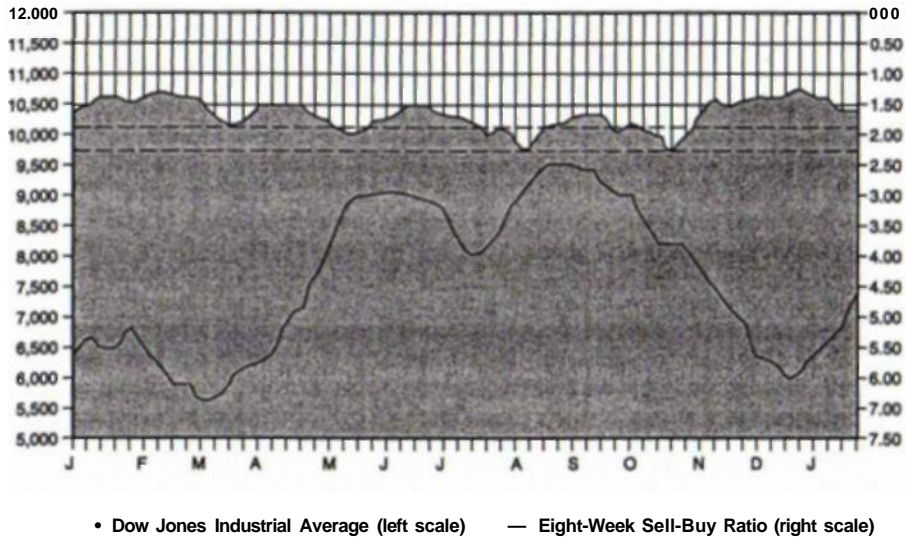
### **Insiders**

The ultimate informed player, at least in individual stocks or commodities, is the insider. An insider is anyone who is a knowledgeable member of a firm that either trades in the commodity underlying the future most important to the firm's business, such as oil to an oil company or cocoa to a candy company, or who has knowledge of a company's internal business prospects and results and is a stockholder. Naturally, these people will act for their own benefit, hopefully within the law, and buy and sell based on their knowledge. Under SEC regulations, corporate insiders must report any stock transactions they make within a month, and in turn the SEC reports these transactions weekly. Because insiders are not allowed to profit from transactions in their company's stock for six months, their actions are a long-term indicator of prospects for the company beyond six months. Investors Intelligence has found that the compilation of all insider transactions is useful for forecasting the stock market a year out from the reports.

#### **Sell/Buy Ratio**

The Sell/Buy ratio is compiled by Vickers Stock Research Corporation, a subsidiary of Argus Research Group ([www.argusgroup.com](http://www.argusgroup.com)). It takes into account the total number of insider buy and sell transactions for each company, the percentage of change in insider holdings, the unanimity of the transactions within each company, reversals in transaction patterns, and very large transactions. A plot of the Sell/Buy ratio for 2004 is shown in Figure 7.16.

Vickers considers a ratio under 2.25 a portent of a higher stock market, and a ratio greater than 2.25 as a sign of impending market problems. Colby (2003) found that between 1971 and 2000, the ratio averaged over five weeks produced for longs only when the smoothed ratio declined below 2.25, a 29.2% profit over buy-and-hold. Bjorgen and Leuthold (2002), using only large insider block transactions, found that from 1983 to 1999, only a small percentage of the time do insiders transact their shares in a one-sided direction, but the three times that they showed excessive buying, the stock market bottomed within several weeks. On the sell side, when excessive selling occurred, the market peaked, and it either declined or consolidated approximately a year later, thus corifirming the observations of Investors Intelligence outlined next.



Adapted from Vickers Stook Research Corp. ([www.argusgroup.com](http://www.argusgroup.com))

FIGURE 7.16 Insider Sell/Buy ratio for January 2004-January 2005

#### Investors Intelligence Method

"We have observed that insiders tend to be right, but are way too early. Using this premise, we have developed a one-year forward-looking market forecast that provides not only a very different perspective from traditional trend-following forecasts but also a valuable input for our overall market view.

"We report insider activity a number of ways. We view stocks and industry groups on a quarterly basis. First, we compare the total buying and selling for each stock, to that shown for the stock three months ago, to see if there is a majority of insider buying or selling decisions, and looking for any shifts in direction. Second, we count the number of stocks with insiders on the buy or sell side, and also total all the individual buy and sell side decisions. We weight these to compile the group rankings. The rankings compare the relative buying among the 92 groups, and also compare any group's individual buying to that shown for the same group over the prior five years." ([www.investorsintelhgence.com](http://www.investorsintelhgence.com))

### New York Stock Exchange Member and Nonmember Transactions

Members, including specialists, of the New York Stock Exchange must report each week the amount of stock they purchased, sold, and sold short for their customers and themselves. This information is made public two weeks later. Because the members, especially the specialists, are informed players, various ratios between their action and the action of nonmembers, the uninformed players, measure the directional leaning of the informed versus the uninformed. Short sale data is usually emphasized because nonmembers short sales show speculation and are an indication of when the public is particularly nervous, particularly after a substantial market decline, and thus are willing to go short.

#### *Public (Nonmember) Short Sale Ratio*

Public short sales are the difference between the total short sales and the member short sales. It is often called "nonmember short sales." The ratio is calculated as the public short sales to total sales. The presumption is that the public is generally wrong at major turning points and especially wrong when it resorts to short selling. Empirically this rums out to be correct. Colby (2003) found that using weekly data from 1946 to 2000, when the current ratio exceeded by 45.7% its 50-week exponential moving average, a buy signal was generated, and when the current ratio declined to 45.7% below its 50-week exponential moving average, a sell signal was generated. These signals were particularly long-term, averaging 557.5 calendar days between them, were accurate 78% of the time, had only a 4.6% drawdown, and generated a return greater than the buy-and-hold strategy by 123%.

#### *Public to Specialist Short Sale Ratio*

If the nonmember short sellers are amateurs and uninformed, the specialist should be just the opposite: professional and informed. Many analysts have combined the nonmember short sales with specialist short sales in a ratio that reflects when the public is selling short and the specialist is not. Colby (2003) found that this ratio was not quite as useful as the public short sale ratio. The results showed from 1946 to 2000 that the signals were far apart by over 2,000 calendar days, the return was less than 65% over the buy-and-hold strategy, and the drawdown was close to 20%. The slightly greater than buy-and-hold return with the large drawdown makes this system less desirable than the public short sale ratio alone.

#### *Specialist Short Sale Ratio (Not to Be Confused with the Short Sale Ratios Mentioned Earlier)*

If the specialist is an informed player, the presumption is that he or she will sell short at the correct time. The ratio is determined by dividing total specialist short sales by total short sales. The ratio is normalized over some period to reduce the effect of the change in overall levels of each component. Colby (2003) found that using the current ratio relative to 28.5% above and below its previous week's 21-week exponential moving average would have produced 100% accurate signals from 1946 to 2000, but the gain would have been slighdy below the buy-and-hold strategy. Thus, although the ratio is accurate in anticipating the market direction, it is only of marginal value.

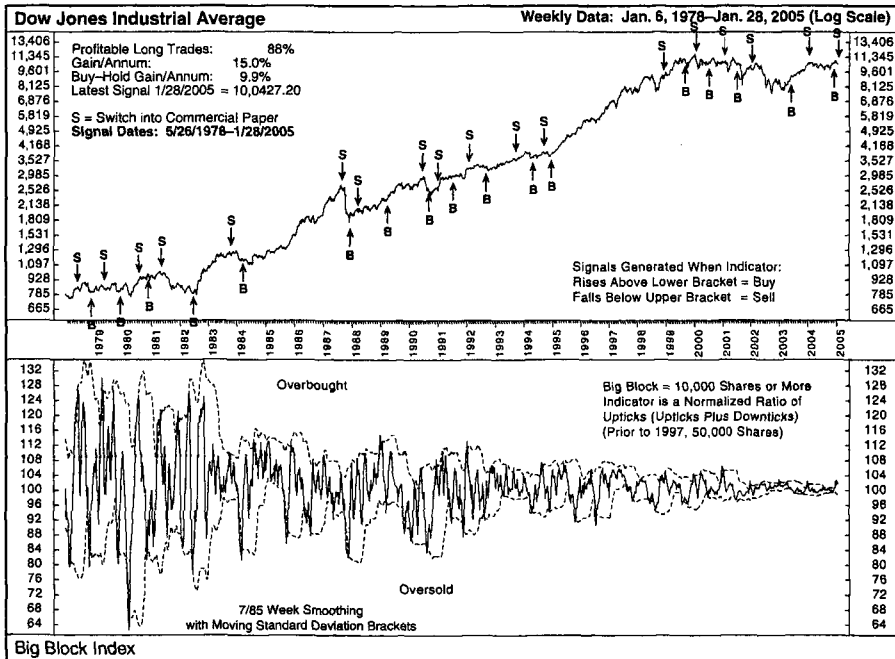
### Large Blocks

Large blocks tend to be transacted on behalf of professionals. There are several ways that large block data is used. The first is the use of the total number of large block volume relative to the total volume traded. This figure gives an indication of when the large block trader is transacting

the most number of shares relative to the market as a whole. Colby (2003) found that when the large block ratio crossed above its 104-week exponential moving average, a buy signal was generated that was profitable 70% of the time with a net profit of 511% over the period from 1983 to 2001. This strategy was only successful on the long side. The short side, which was triggered by the ratio declining below its 104-week average, ended with a loss.

The anxiousness with which stocks are traded is shown by whether buyers trade on upticks or downticks. Aggressive buyers anxious to get a position in a stock will buy large blocks on upticks. The ratio of blocks traded on upticks to those on downticks is therefore an indicator of this professional interest in owning stocks.

Ned Davis Research found that when large blocks transact predominately on downticks and then reverse direction, a profitable signal was generated in a study from 1978 through 2004 (see Figure 7.17). This seems to suggest that although large blocks trade at a market bottom on downticks during the latter stages of panic, when that panic is over and substantial investors begin to take offers on upticks, they know what they are doing and the stock market is invariably at a bottom. The results of the study showed an annual gain of 15.0% over the buy-and-hold of 9.9% per annum on the long side only. Using large block tick data on the short side was unproductive, thus confirming the directional bias observed by Colby (2003).



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FIGURE 7.17 Big block trades from 1978-2004

Art Merrill studied transactions of large blocks of 50,000 or more shares. Merrill divided the blocks into categories of upticks, downticks, and flat, smoothing each category's data. He ran a ratio of the uptick average to the downtick average, smoothing that ratio over 52 weeks and calculating the running standard deviation from the smoothed average. This provided significant directional signals of 66%, 81%, and 76% over the next 13 weeks, 26 weeks, and 52 weeks, respectively. (Colby 2003)

#### Commitment of Traders (COT) Reports

"With regard to S&P 500 Index futures, we find that large speculator sentiment is a price continuation indicator, whereas large hedger sentiment is a weak contrary indicator. Small trader sentiment does not forecast returns. We show that extreme levels and the combination of extreme levels of sentiments of the two types of large traders may provide a more reliable tool for forecasting. Our result suggests that large speculators may be associated with superior forecasting ability, large hedgers behave like positive feedback traders, and small traders are liquidity traders."  
—Wang (2000)

Each week, the Commodity Futures Trading Commission (CFTC) ([www.cftc.gov](http://www.cftc.gov)) reports on the large positions held in 20 different futures markets, including stock and bond futures, metals, currency exchange rates, and agricultural. The reports are for positions held as of Tuesday's close and are published on Friday. Only those traders with positions above these thresholds are required to report their positions. This threshold changes periodically, with the most recent change occurring on January 20, 2005. The "public" position is then taken as the difference between total open interest in each future less those positions held by the traders required to report. The trading positions are divided into two major categories: commercial and noncommercial. This nomenclature is an outgrowth of the agricultural origins of the reports. In the financial markets, the commercial traders, individual or institutional, are those who operate in the cash market and are thus called "hedgers." The noncommercial participants take speculative positions, change positions more frequently, and are called "large speculators." Traditionally and empirically, in the stock market, the large speculators have a better record of anticipating market moves, while the hedgers tend to lag behind and follow the trend (Wang, 2000). Thus, an indicator should consider the spread between the large speculator and the hedger. The small speculators tend to be dysfunctional, and their statistics are of little value.

Ned Davis Research considers only the commercial (hedger) positions and has found a correlation between their changes in position and the subsequent market gain or loss (see Figure 7.18).

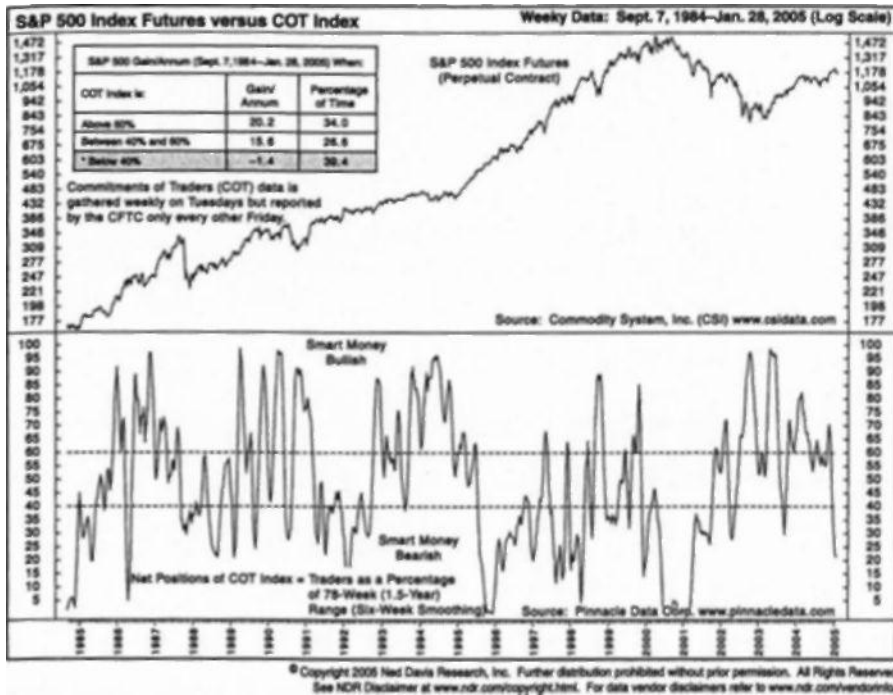


FIGURE 7.18 Commitment of Traders (COT) and the S&P 500 Index futures

Because the futures market in the stock market is fractionalized by hedging between markets and other financial instruments, the COT figures for any one market may not be reliable. Tom McClellan, editor of *The McClellan Market Report* (www.jxoscillatrx.com), combines all the stock futures data into one series of indicators on a dollar-weighted basis and then watches the Commercials (Hedgers) net long positions as a percentage of the total. He finds that it has recently had a three-week lead to cash stock prices.

A number of tests have used COT data in stock futures, as well as data reported by the CFTC. The most workable systems appear to use smoothed data to normalize the longer-term trends and find that the relationship between commercials and noncommercials are different over time and between futures contracts. It thus behooves the technical analyst to experiment with the different methods for each futures contract to see what works best and to continually update that work to expose any changes in relationships between the major players in each market

## SENTIMENT IN OTHER MARKETS

Given the subject matter of this book, our focus thus far in this chapter has been on the stock market. However, we will complete our discussion of sentiment by presenting a few major measures of sentiment in the bond market.

### Treasury Bond COT Data

The spread between large speculators and commercial hedgers is positively correlated with bond prices and inversely related to long-term interest rates (see Figure 7.19). Ned Davis Research found that in the period between August 1992 and December 2004, when large speculators were net long, the bond market rose on average 13.8% per year and declined 3.3% per year when the relationship was inverted.

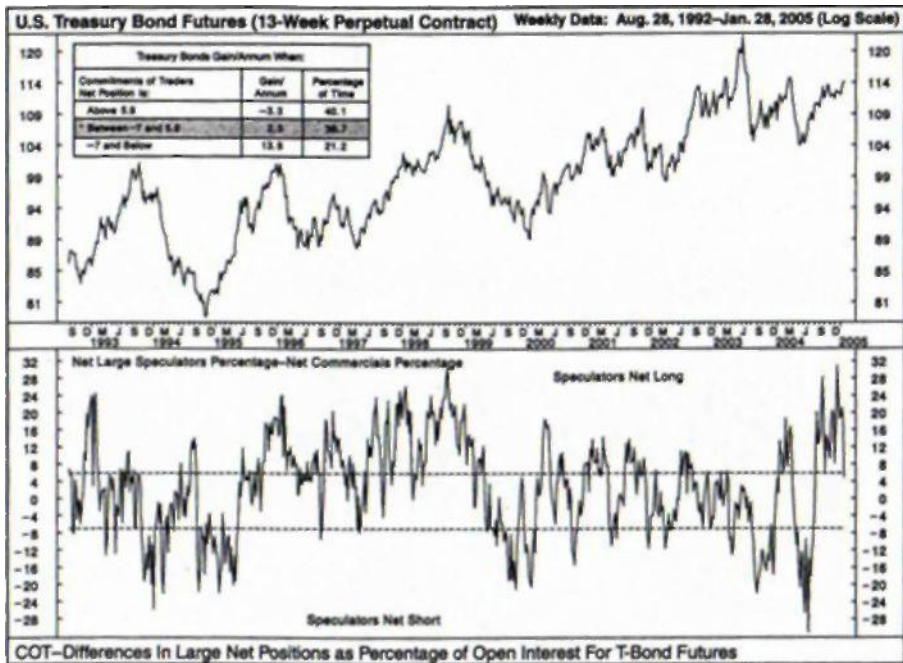
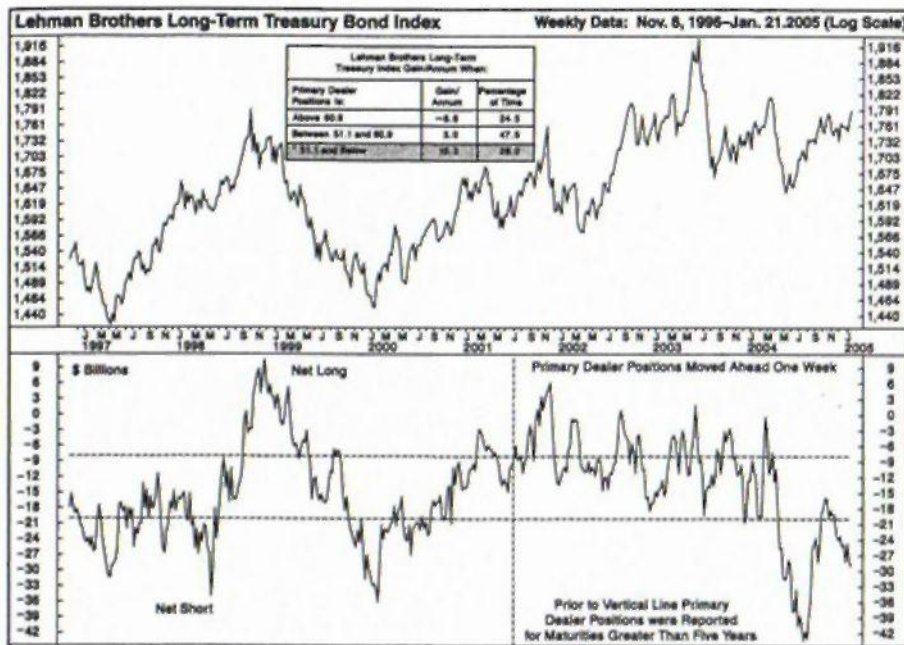


FIGURE 7.19 Large speculators' positions and U.S. Treasury bond futures



### Treasury Bond Primary Dealer Positions

Contradicting the preceding relationship between commercials and the future for the bond market is the relationship between primary dealer inventories and the future for bond prices. One would think that primary dealers in bonds, those who can deal with the Treasury Department directly, would have hedged inventory positions in long-term bonds and would thus be considered part of the commercial hedger designation by the CFTC in the COT reports. Further, this would suggest that the dealers would be net long at bond market bottoms and net short at tops. The opposite seems to be the case. Primary dealers have tended to have the most long positions at tops and the most short positions at bottoms (see Figure 7.20). The reason for this logical disparity is likely that dealers must anticipate customer demands. They buy issues from the auction and then sell them to customers. If customers have been bullish, dealers must have an inventory. Thus, they tend to be long at the top when they believe their customers are bullish and willing to pay extra for bonds. Likewise, when pessimism reigns, dealers are hesitant to build inventory and instead hold net short positions, believing that the pessimism will cause customers to sell to them. Thus, at bottoms, dealers become net short.



Primary Dealer Positions In Treasury Coupons Greater Than Six Years: Mode Basis

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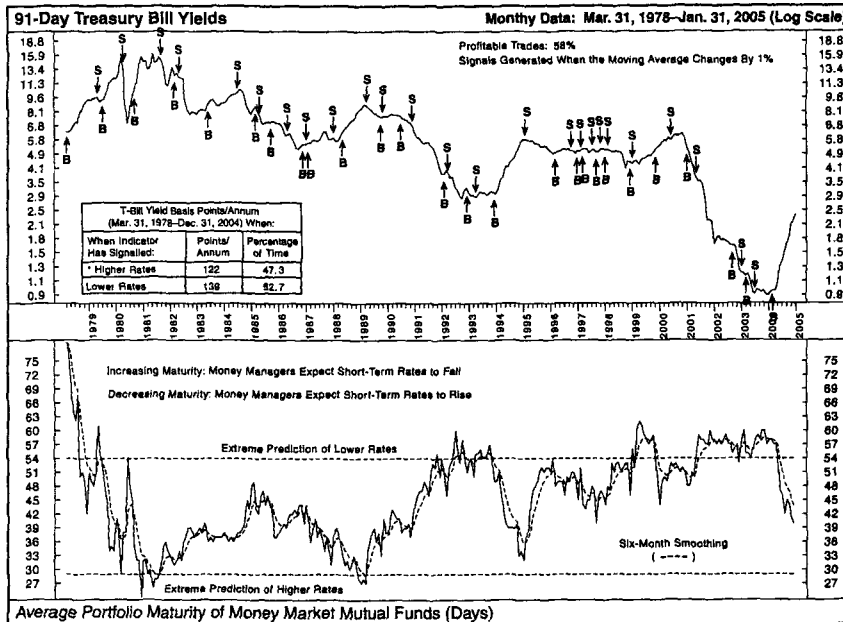
FIGURE 7.20 Positions of Treasury primary dealers from 1997-2004

### Bond Market Fear Index

Risk in the bond market is often measured by ratings given by companies such as Moody's or Standard & Poor's. When investors become nervous about risk, usually after an economic contraction when the fear of default is greatest, the most risky bonds trade at considerably higher interest rates than riskless bonds such as Treasuries. A ratio of BBB grade bonds, for example, to AAA grade bonds will thus oscillate as bond investors become more anxious about the possibility of defaults on BBB grade bonds versus AAA grade bonds. This relationship is usually at its extreme fear level at the height of long-term interest rates and the bottom of the stock market cycle.

### T-Bill Rate Expectations by Money Market Fund Managers

The money market fund business is highly competitive. Money managers, in order to compete on yield, tend to anticipate future short-term interest rates by lengthening or shortening the duration of their T-bill positions. Longer maturity positions suggest that money managers believe that short-term rates will decline, and shorter positions indicate a belief that short-term interest rates will rise. This has turned out to be a contrary indicator for the T-bill market yield. Money managers have tended to be generally incorrect in their assessment of the future for short-term rates. As seen in Figure 7.21, when money managers increase the maturity of their positions in anticipation of lower rates, the rates generally rise instead, and vice versa when they shorten their positions in anticipation of a rise in rates.



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Sources: Investment Company Institute

FIGURE 7.21 Average portfolio maturity of money managers and U.S. T-bill yields

## CONCLUSION

In this chapter, we have focused on the idea of market sentiment—the overall psychology of the market players. Emotions play an important role in determining the actions of market participants. Market participants demonstrate periods of both extreme optimism, when bubbles occur, and periods of extreme pessimism, when crashes or panics occur. The uninformed market players tend to be most optimistic as the market reaches a peak and is ready for a downturn. These same individuals tend to be most pessimistic when the market is at its lowest point in a downturn and poised for a rebound. In other words, most investors are fully invested just at the time they should liquidate their holdings and out of the market just at the point when they could be buying stocks at a low price. Sentiment indicators help the technical analyst pick these points of market extreme. By following a contrarian strategy, the technical analyst hopes to act opposite of the uninformed, majority of market players.

## REVIEW QUESTIONS

1. How would you define the term "sentiment" as it relates to the financial markets?
2. Warren is searching for a good trading rule to follow. He says, "I would be just as happy to get information from someone who always makes the wrong investment decision as someone who always makes the right investment decision to use in devising my trading strategy." Explain why Warren would find it helpful to have information about someone's bad trading decisions.
3. Explain why extremely high investor optimism is associated with market peaks.
4. Sandra thinks Microsoft (MSFT) is currently overpriced, while Tony thinks MSFT is underpriced. Which of these two investors would be more likely to buy a put, and which one would be more likely to buy a call? Explain your answer.
5. You hear a report that the ratio of put to call volume is extremely high. How would you interpret this high put/call ratio? What would you conclude about investor sentiment given this high ratio? What investment strategy would you want to follow given this high ratio?
6. Explain what is meant by a contrarian investment strategy. What are some market signs that the contrarian investor might watch for?
7. What information might polls give you about sentiment? What are some sources of poll data, and what general conclusions can you make about how to use poll data?
8. What type of relationship is generally seen between news reporting and market sentiment?

# MEASURING MARKET STRENGTH

## CHAPTER OBJECTIVES

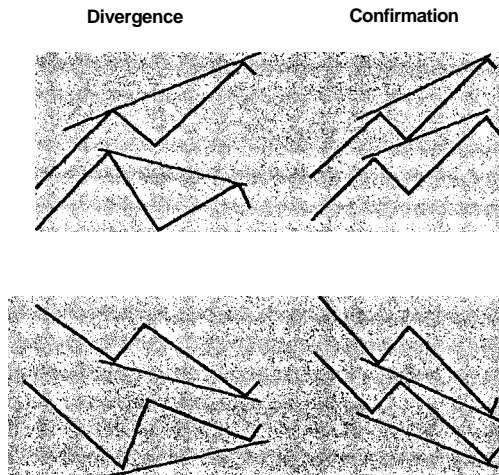
By the end of this chapter, you should

- Understand the importance of measuring internal market strength
- Understand what is meant by market breadth
- Be familiar with how the advance-decline line measures market breadth
- Be familiar with how up and down volumes relates to market strength
- Be familiar with how new high and new low statistics measure market strength
- Be familiar with the relationship between the number of stocks above their historical moving average and market strength

In the previous chapter, we looked at the importance of market player sentiment in determining potential market trends. In addition to measuring the attitudes of market players, the technical analyst needs to look at the internal strength of a market. By looking at data specific to each market, the analyst determines whether the internal strength of the respective market is improving or deteriorating. In this chapter, we will examine how the analyst looks at market data such as the number of stocks advancing and declining, the volume of the winners and losers, the new 52-week highs and lows, and the position of the averages relative to moving averages. These measures help to gauge the stock market's underpinnings. The data needed to calculate the indicators studied in this chapter is publicly available in most financial newspapers.

### 10 X 8. 1 What is 'Confirmation and Divergence?'

- the most important technical concept for continuation of a trend is called a "divergence." As long as an indicator—especially one that measures price or other data rate of change (called "momentum")—corresponds with the price trend, the data is said to "confirm" the price trend. When an indicator or oscillator fails to confirm the trend, it is called a "negative divergence" or "positive divergence," depending on whether peaks or bottoms, respectively, fail to confirm price peaks or bottoms. A divergence is an early warning of a potential trend change. It means the analyst must watch the price data more closely, than when the indicators are confirming new highs and lows. Divergence analysis is used between price and volume. A divergence can occur more than one time before a price reversal.



*WBmmms*

As an example, one of the tenets used in analyzing trading volume is that in a rising trend, volume should expand with the price rise. Thus, if at a short-term peak in prices, the trading volume fails to expand above its earlier high, a negative divergence has occurred that should warn the analyst that the new price high is occurring on less enthusiasm, as measured by volume, and soon may be ending its uptrend.

It should be noted that knowledge of a wide array of technical indicators does not make an analyst valuable or cause him or her to profit, but knowing when to apply which indicator does. Because it is almost impossible to understand all indicators, the technical analyst often selects just a few and studies them intently.

When looking at indicators, the analyst is generally looking for confirmation or divergence. Confirmation occurs when prices are rising and these indicators rise, signaling strong market internals. Confirmation also occurs when falling prices are accompanied by an indication of weak market internals. In other words, confirmation occurs when price movement and market internals appear to agree.

When a market indicator does not support the direction of price movement, the analyst has a strong warning that the trend may be in the process of reversing. This lack of confirmation is referred to as a "divergence."

One quick example is an indicator called the rate of change indicator (ROC). It is merely a plot of the ratio or difference between today's closing price and the closing price at some specified time in the past, such as 20 days. When the market or stock is hitting a new high and the 20-day ROC is hitting a new high, we have a confirmation of the price action. Should the ROC not be hitting a new high at the same time as the market or stock, we have a negative divergence, a warning that the upward momentum in price is slowing down.

## **MARKET BREADTH**

On any given day, a stock price can do one of three things—close higher, lower, or unchanged from the previous day close. If a closing price is above its previous close, it is considered to be advancing, or an "advance." Similarly, a stock that closes below the previous day's close is a declining stock, or a "decline." A stock that closes at the exact price it closed the day before is called "unchanged."

Prior to July 2000, all less than one dollar (or point) changes in common stock prices were in fractions based on the pre-Revolutionary practice of cutting Spanish Doubloons to make change. By February 2001, the old system of quarters, eighths, and sixteenths was replaced with the decimal system. The use of decimals may have affected some historic relationships. Some studies suggest that the resulting smaller bid-ask spreads may have reduced the number of stocks that are unchanged at the day's end.

Advance/decline data is called the "breadth" of the stock market. The indicators we will focus on in this section measure the internal strength of the market by considering whether stocks are gaining or losing in price. In this section, we will consider the cumulative breadth line, the advance-decline ratio, breadth differences, and the breadth thrust.

Before we begin looking more closely at these particular indicators, we must, however, mention a change that has recently occurred. Since 2000, the parameters of many breadth indicators thought to provide accurate signals have changed significantly. Applying standards that had excellent records for identifying stock market reversals, now proves to be less than satisfactory. There is likely more than one reason for this sudden change, and some reasons are unknown.

One factor that has caused the old parameters to change is the proliferation on the New York Stock Exchange of bond funds, Real Estate Investment Trusts (REITs), preferred shares, and American Depositary Receipts (ADRs) of foreign stocks. These do not represent domestic operating companies and therefore are not directly subject to the level of economic activity. They are subject to a wide variety of influences, which means they are not reflecting the market's traditional discounting mechanism.

Another possible factor is the implementation of the aforementioned decimalization. Many of the indicators using advances and declines are calculated as they were before decimalization, even though their optimal parameters may have changed. Another possibility, one more likely, is that the aberrant indicators were tested mostly during the long bull market from 1982 through 2000. The important lesson for the technical analyst, however, is that indicators do not remain the same. Parameters for known indicators change over time and with structural changes in the markets. The analyst must frequently test indicators and make appropriate adjustments in the types and parameters used.

### The Breadth Line or Advance-Decline Line

The breadth line, also known as the advance-decline line, is one of the most common and best ways of measuring breadth and internal market strength. This line is the cumulative sum of advances minus declines. The standard formula for the breadth line is as follows:

$$\text{Breadth Line Value}^y_t = (\# \text{ of Advancing Stocks}^x_t - \# \text{ of Declining Stocks}_{n,y,t}) + \text{Breadth Line Value}^y_{t-1}$$

Thus, on days when the number of advancing stocks exceeds the number of declining stocks, the breadth line will rise. On days when more stocks are declining than advancing, the line will fall.

A breadth line can be constructed for any index, industry group, exchange, or basket of stocks. In addition to being calculated using daily data, it can be calculated weekly or for any other period of time for which breadth data is available. It is not often applicable to the commodity markets where baskets or indices of commodities are rarely traded, though this is now changing with the advent of the CRB, Goldman Sachs, and Dow Jones futures index markets.

Ordinarily, the plot of the breadth line should roughly replicate the stock market averages. In other words, when the stock market averages are rising, the breadth line should be rising. This would indicate that a market rally is associated with the majority of the stocks rising.

The importance to technical analysts of the breadth line is the time when it fails to replicate the averages and, thus, diverges. For example, if the stock market average is rising but the advance-decline line is falling, the rally likely is being fueled by a few big company stocks, but the majority of stocks are either not participating or declining in value.

When the averages are reaching new price highs and the breadth line is not, a "negative divergence" is occurring (see Figure 8.1). This signals weak market internals and that the market uptrend is in a late phase and may soon end. In 1926, Colonel Leonard P. Ayres of the Cleveland Trust Company was one of the first to calculate a breadth line and the first to notice the importance of a negative breadth divergence from the averages. His theory was that very highly capitalized stocks influence the averages, while the breadth line includes all stocks regardless of capitalization. Sometimes at the end of a bull market, the large stocks continue to rise, and the smaller stocks begin to falter.

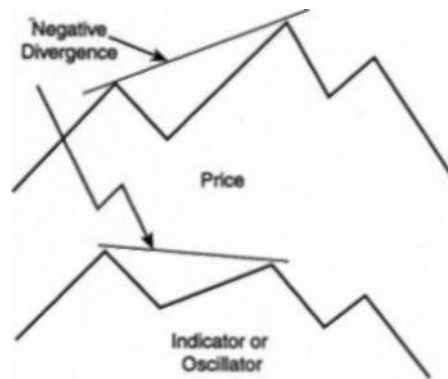


FIGURE 8.1 What does negative divergence look like?

Other market analysts, such as James F. Hughes (Merrill, *Stocks and Commodities Magazine* V6: 9, p 354—5), argued that the rise in interest rates accompanying an economic expansion reflected in the stock market causes the interest-related stocks—such as utilities, which have large capital borrowing costs and of which there are many—to falter and thus causes the breadth line to lose momentum. Regardless of the cause, since May 1928, when a negative breadth divergence warned of the 1929 crash more than a year later, the observance of a negative divergence has invariably signaled an impending stock market top.

Although a negative divergence signals a market top, a primary stock market top can occur without a divergence. In other words, a breadth divergence is not necessary for a market peak. The peaks in 1937 and 1980, for example, occurred without a breadth divergence. After a sizable, lengthy advance, participants should be on guard and use a breadth divergence to help spot a potential market reversal. However, the investor should not be adamant about requiring a breadth divergence to occur to prepare for a top.

At market bottoms, especially those that are characterized by climactic price action, a positive divergence in the cumulative breadth line rarely has been reliable in signaling a major reversal upward. However, there have been positive breadth divergences on either tests of major lows or so-called secondary lows that were useful signals of increasing market strength.

A characteristic of the breadth line that the analyst needs to recognize is that there is a downward bias to the line. Therefore, a new cumulative breadth line, one that has no relationship to the previous breadth line, begins once the market reaches a major low. For example, calculating a historical cumulative breadth line for the NYSE data resulted in an all-time peak in 1959. Although the cumulative breadth line has never reached the same 1959 level, there was a considerable rise in the market averages through 2000. This does not indicate a very large negative divergence over a 40-year time span. The cumulative breadth line, for divergence analysis, starts again once a major decline has occurred. When the market declines into a major low, one of the



four-year varieties (see Chapter 9, "Temporal Patterns and Cycles"), analysis of the cumulative breadth line begins anew, and the line has no relationship to the peak of the previous major market cycle. It is as if a major decline wipes out the history of past declines, and the market then begins a new cycle and new history.

A negative divergence, while not being required, has been the most successful method over the past 50 or more years for warning of a major market top. As with most indicators, different technicians use the breadth indicators in slightly different ways. For example, James F. Hughes, who published a market letter in the 1930s, learned of the breadth divergence concept from Col. Ayres (Harlow, 1968 and Hughes, 1951). He used the negative breadth divergences as a major input to his stock market forecasting. Hughes required that at least two consecutive negative breadth divergences, called "double divergences" (see Figure 8.2), must occur before a major top was signaled. This requirement prevented mistakes in forecasting from the appearance of a single minor divergence that could later be nullified by a new high in both the averages and the breadth line. Often, more than two divergences occur at major market tops.

When the double breadth divergence warning occurs, it traditionally signals an actual market peak within ten months. Beginning with 1987, for example, a double breadth divergence correctly anticipated the 1987 crash when the breadth line peaked in April 1987. The market averages continued to new highs into September 1987 and then collapsed. In addition, the breadth line peaked in the fall of 1989 and later the averages in the summer of 1990.

The last important peak signaled by a double breadth divergence was the 1998 peak in breadth and the 2000 peak in the averages, as shown in Figure 8.2. As in the 1928-1929 double divergence, the time between the breadth peak and the market peak stretched to 15 months, considerably longer than the traditional ten months. This deviation from the norm should possibly have been a warning to technical analysts that something was going awry with the use of breadth figures, and it has led some technicians to wonder if the breadth divergence will continue to be a strong predictor of market tops.

Analysts point to several reasons why breadth divergence may not be as powerful of an indicator in the future as it has been in the past. The first reason is the previously discussed proliferation of nonoperating company listings.

Second, there appears to have been a decoupling of the stock market from long-term interest rates in recent years. Although there is no direct evidence that the breadth line is now unreliable, the suspicion exists because breadth ratio and thrust signals have become less reliable or their signal thresholds have required adjustment since 2000.

To deal with the issue of the bias from including stocks that do not represent ownership in operating companies, technical analysts often use only those breadth figures from common stocks that represent companies that actually produce a product or service. For example, the New York Stock Exchange also reports breadth statistics for only common stocks, disregarding the numerous mutual funds, preferred stocks, and so on. This additional breadth information is available daily in most financial newspapers. The breadth line derived from this list of common stocks generally has been more reliable than the one including all stocks.

However, a major change recently occurred in how the NYSE reports breadth statistics for common stocks. Beginning in February 2005, the NYSE decided to include only those stocks with three or less letters in their stock symbols and those that are included in the NYSE Composite Index, its common stock list. Because of this change, figures since that decision will be incompatible with the prior figures.

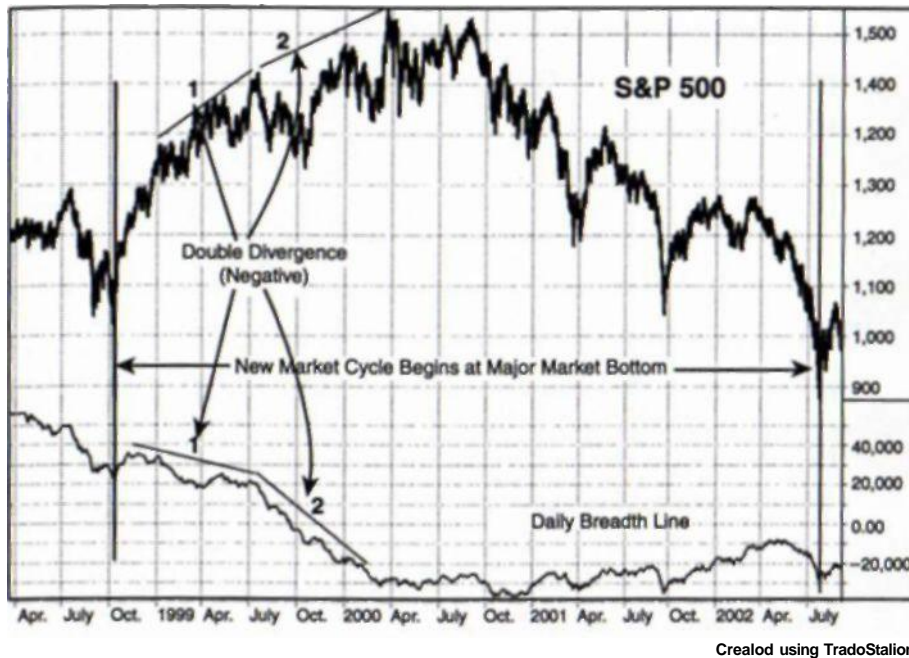


FIGURE 8.2 Double negative divergence in breadth line and S&P 500 (daily: April 1998-July 2005)

Instead of relying on the publicly available statistics, proprietary breadth statistics also are available on a subscription basis. For example, Lowry's Reports Inc. ([www.lowryreports.com](http://www.lowryreports.com)) calculates proprietary breadth statistics that eliminate all the preferred stocks, ADRs, closed-end mutual funds, REITs, and others representing nonproductive companies.

Another difficulty with the breadth line has arisen since the year 2000. Colby (2003) and others, using data up through 2000, determined trading rules used with the publicly available breadth statistics that, despite the known problems with the types of stocks listed, showed relatively attractive results. However, using those same rules since the year 2000, we find much less attractive results in many of these indicators. Indeed, the difference is so large and consistent throughout the trading methods mentioned by Colby that it could not be attributed to the trading rules themselves or to problems connected with optimizing. The difference between then and more recently must have to do with a change in background, character, leadership, or historic relationships.

Why this change? The most obvious economic change is that of the decoupling of the stock market from long-term interest rates. From the Great Depression of the 1930s to the last decade of the last century, the business cycle was characterized by the bond market and the stock market reaching bottoms at roughly the same time, and the bond market reaching peaks earlier than the stock market reached peaks. In the late 1990s, this business-cycle relationship broke

down, switching to almost the exact opposite relationship, whereby the bond market tended to trend oppositely from the stock market. Because the breadth statistics include a large number of interest-related stocks that are not included in the popular averages, this change in relationship may be the cause for the difference in trading rules using breadth, giving the breadth line more strength at tops and more weakness at bottoms.

In the NASDAQ, a cumulative breadth line constructed of only NASDAQ stocks advances, declines, and unchanged has been declining at least since 1983 (earlier figures are difficult to obtain), and even when looked at over shorter periods seems to have a very strong negative bias. This negative bias is likely due to the "survivor effect," whereby from 1996 to 2005, stocks listed on the NASDAQ declined from 6,136 to 3,440. The loss of issues from the list suggests that a large number of listings went broke during that time were trending downward even when the larger survivors were advancing and were unavailable during the rebound in stock prices from 2002 through 2005. The NASDAQ index is a capitalization-weighted index where the survivors have considerable influence on price but little influence on breadth. This weighting bias implies that a NASDAQ breadth line is useless as a divergence indicator in its absolute form and must be analyzed instead for changes in acceleration rather than direction.

Several indicators using the advance-decline line concept appear in the classic technical analysis literature. Although these indicators have not performed well in recent market conditions, it is important for the student of technical analysis to be aware of these traditional indicators because they may become productive sometime in the future.

### The Advance-Dcline Line Moving Average

One method of deriving signals using the advance-decline line is to use a 30-day moving average of the breadth line to smooth the data. However, the advance-decline line moving average signal has not been so successful recently. The use of a 30-day moving average in the Standard & Poor's 500 and the breadth line (including all stocks) from April 2000 to February 2005 declined approximately 13.6% but outperformed the buy-and-hold, which declined 18.2% during the same period. The signals were generated when both the S&P and breadth were above or below their respective 30-day simple moving averages and were adjusted for minimal commissions and slippage. This discrepancy may be due solely to the use of the total breadth rather than that reduced by the preferred stocks and other nonproducing company stocks. However, it is a warning not to use prior trading signals without first testing them against more recent data.

#### **BOX 8.2** What Is an Equity Line?

An equity line is a graph of a potential account value beginning at any time adjusted for each successive trade profit or loss. It is used to measure the success of a trading system. Ideally, each trade is profitable and adds to the value of the account each time a trade is closed. Any deviation from the ideal line is a sign of drawdown, volatility, or account loss, all of which are unavoidable problems with any trading or investment system.

## One-Day Change in the Advance-Decline Line

The one-day change in the advance-decline line signal, using simply the one-day change in direction of the cumulative advance-decline line as a signal to buy or sell, is the most basic kind of signal using advance and decline data. Colby (2003) reports an excellent series of results, most very short-term, going back to the 1930s. However, the equity line of a theoretical portfolio, either long or short one "share" of the DJIA and created using this classic signal, shows a sudden decline in performance between 1998 and late 1999 (see Figure 8.3). This deterioration in performance occurred when the breadth line signaled an impending market peak far too early. After a brief period of renewed positive performance, the signal continued to fail from April 2000 on to the end of our test period (February 2005). This anomaly may correct itself at some time in the future, of course, but for now the traditional one-day breadth line signals are of little use.

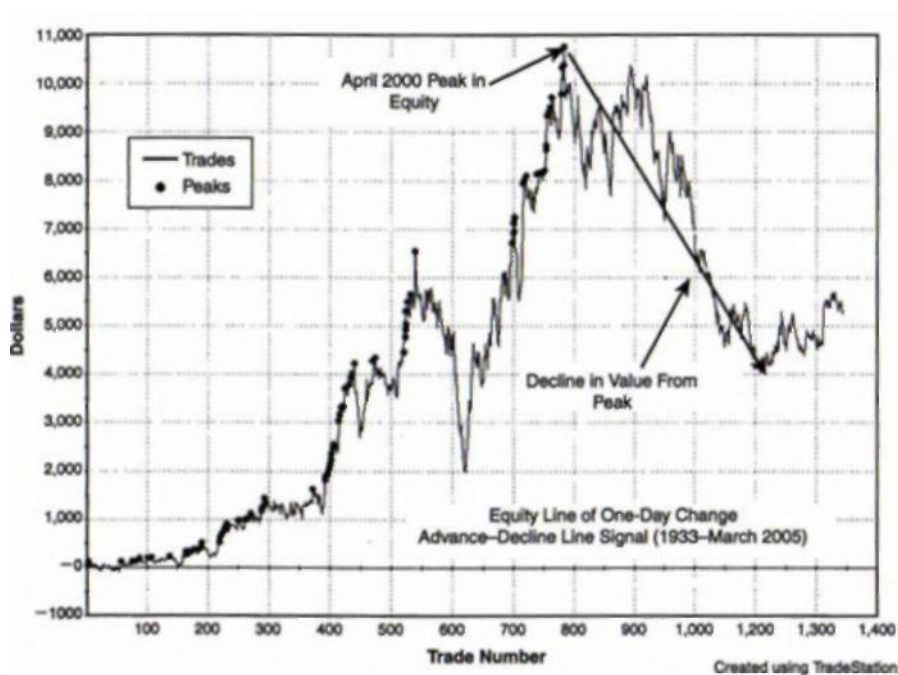
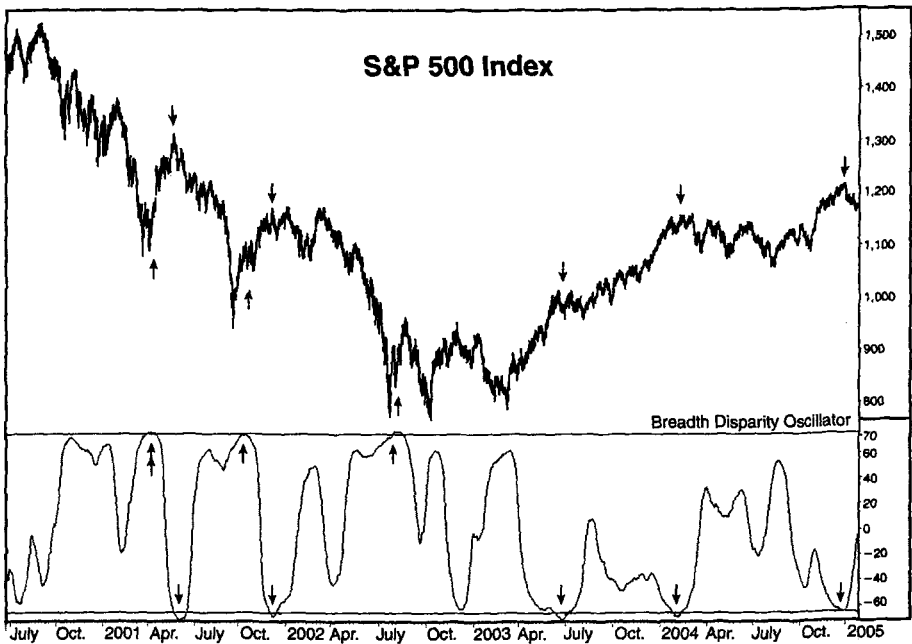


FIGURE 8.3 Equity line using one-day change in the advance-decline line signal

### Breadth Disparity Index

John Stack, in an interview with *Technical Analysis of Stocks & Commodities* (Hartle, 1994), mentions using an index that compares the breadth line and a major market index. His purpose is

to reduce the necessity of looking at an overlay of an indicator on the price chart to discern when a divergence has occurred. Instead, he calculates an index that tells whether breadth is improving or diverging from the market index and thus whether a warning of impending trouble is developing. Arthur Merrill also devised a numerical method to determine the relative slope of the breadth line versus a market index. By following the slope over time, we can calculate periods in which the breadth line is gaining or losing momentum. The advantageous aspect of this type of indicator is that it also measures the relative *momentum* when prices are declining. Using Merrill's method as a base, we devised an oscillator based on relative slope that, when used mechanically as a sign of impending trend reversal in the stock market, has been reliable. This oscillator is pictured in Figure 8.4.



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FIGURE 8.4 Oscillator based upon breadth disparity [June 2001-February 2005]

### BOX 8.3 What Is an Oscillator?

At times, you will see us referring to a particular indicator as an "oscillator." Oscillators are indicators that are designed to determine whether a market is "overbought" or "oversold." Usually, an oscillator will be plotted at the bottom of a graph, below the price action, as shown in Figure 8.4. As the name implies, an oscillator is an indicator that goes back and forth within a range. "Overbought" and "oversold" conditions (the market extremes) are indicated by the extreme values of the oscillator. In other words, as the market moves from overbought, to fairly valued, to oversold, the value of the oscillator will move from one extreme to the other. Different oscillator indicators have different ranges in which they vary. Often, the oscillator will be scaled to range from 100 to -100 or 1 to -1, but it can also be open-ended.

## Breadth Differences

Indicators using breadth differences are calculated as the net of advances minus declines, either with the resulting sign or with an absolute number. The primary problem with using breadth differences is that the number of issues traded has expanded over time. For example, in the 40-year time period from 1960-2000, the number of issues on the New York Stock Exchange doubled from 1,528 issues to 3,083 issues. By 2004, the number had fallen slightly to 2,970 issues. More issues means larger potential differences between the number of advances and declines. Any indicator using differences must therefore have its parameters periodically adjusted for the increase in issues traded. Examples of indicators using breadth differences are listed next.

### Haurlan Index

Peter N. Haurlan worked as a rocket scientist for the Jet Propulsion Laboratory in the 1960s, where he projected trajectories of satellites. Haurlan was one of the first to use a computer to analyze stock data. Combining his knowledge of mathematics, his access to a computer (which was extremely rare at the time), and his interest in the stock market, Haurlan began calculating exponential moving averages (see Chapter 14, "Moving Averages") in stock data. Haurlan published his methodology in a pamphlet (*Measuring Trend Values*) and began privately publishing the *Trade Levels Reports*.

The Haurlan Index is calculated very simply. The basic index is just advances minus declines exponentially smoothed to an equivalent of a three-day average (Haurlan, 1968). Haurlan generated trading rules with this three-day exponential moving average index. The index did not produce positive results during our tests between April 2000 and February 2005, and must be discarded as a viable market indicator.

Haurlan also considered several longer-term exponential moving averages. He calculated a 20-day exponential moving average of advances minus declines data to identify divergences. He

also considered a 200-day exponential moving average to determine the primary trend. These longer averages, however, were not used to generate mechanical trading signals.

Paul Carroll, in an article in *Stocks & Commodities* (1994) indicates that crossovers in each of the Hauran averages through zero give reliable signals. He also indicates that reliable extreme signals occurred at specific levels in each average. These levels were +/- 200 for the 20-day and +/-550 for the 200-day.

We have tested Carroll's strategies with more recent data (April 2000 through January 2005) and have found the results still to be somewhat impressive. The best of the suggested strategy rules was for the 20-day average. Buying when the averages declined below -200 and selling when they exceeded +200 brought 303.6% return versus a -17.3% return on the buy-and-hold. In addition, the drawdown seemed to be controlled such that a RINA ratio, which takes into account drawdown efficiency, was positive at 6.78, and the Sharpe ratio was positive. The 200-day signals were not as successful until a 50-bar time stop was introduced. This kind of stop closes the position in 50 periods regardless of the gain or loss. Its advantage is that the system need not wait for an opposite signal to close out. Sometimes one side of the transaction is a good signal but still loses in the end because an opposite good signal does not occur. The time stop eliminates this problem and measures just the initial signal's performance over the period selected.

#### McClellan Oscillator

In 1969, based on Hauran's use of exponential moving averages, Sherman and Marian McClellan developed the McClellan Oscillator. This oscillator is the difference between two exponential moving averages of advances minus declines. The two averages are an exponential equivalent to a 19-day and 39-day moving average. Extremes in the oscillator occur at the +100 or +150 and -100 or -150 levels, indicating respectively an overbought and oversold stock market.

#### BOX 8.4 McClellan MTA Award

In 2004, Sherman and Marian McClellan were honored as recipients of the Market Technicians lifetime Achievement Award. For more information about the McClellan's work, go to [www.mcoscillator.com/user/McClellan^MTAaward.pdf](http://www.mcoscillator.com/user/McClellan^MTAaward.pdf).

The rationale for this oscillator is that in intermediate-term overbought and oversold periods, shorter moving averages tend to rise faster than longer-term moving averages. However, if the investor waits for the moving average to reverse direction, a large portion of the price move has already taken place. A ratio of two moving averages is much more sensitive than a single average and will often reverse direction coincident to, or before, the reverse in prices, especially when the ratio has reached an extreme.

Mechanical signals occur either in exiting one of these extreme levels or in crossing the zero line. A test of the zero crossing by the authors for the period April 2000 to February 2005, to see if the apparent changes in the breadth statistics had any effect on the oscillator, proved to be profitable. A test of crossing the +100 and -100 levels proved to be unprofitable largely

because these extremes were not always met. By using stops, however, the performance improved. Divergences at market tops and bottoms were also informative. The first overbought level in the McClellan oscillator often indicates the initial stage of an intermediate-term stock market rise rather than a top. Subsequently, a rise that is accompanied by less breadth momentum and thus a lower peak in the oscillator is suspect. At market bottoms, the opposite appears to be true and reliable. Finally, trend lines can be drawn between successive lows and highs that, when penetrated, often give excellent signals similar to trend line penetrations in prices.

#### McClellan Ratio-Adjusted Oscillator

Because he recognized that the use of advances minus declines alone can be influenced by the number of issues traded, McClellan devised a ratio to adjust and to replace the old difference calculation. This ratio is the net of advances minus declines divided by the total of advances plus declines. As the number of issues changes, the divisor will adjust the ratio accordingly. This ratio is usually multiplied by 1,000 to make it easier to read. The adjusted ratio is then calculated using the same exponential moving averages as in the earlier version of the oscillator.

#### McClellan Summation

The McClellan summation index is essentially a measure of the area under the curve of the McClellan oscillator. It is calculated by accumulating the daily McClellan oscillator figures into a cumulative index. The McClellans found that the index has an average range of 2,000 and added 1,000 points to the index such that it now oscillates generally between 0 and 2,000, and neutral is at 1,000. Originally, the summation index was calculated with the differences between advances and declines, but to eliminate the effect of increased number of issues, the adjusted ratio is now used. This is called the ratio-adjusted summation index (RASI). It has zero as its neutral level and generally oscillates between +500 and -500, which the McClellans consider to be overbought and oversold, respectively. Although no mechanical signals are suggested, the McClellans have mentioned that overbought readings are usually followed by a short correction that is followed by new highs. A failure to reach above the overbought level is a sign that a market top is forming. Colby reports that only on the long side are profitable intermediate-term signals (with an average holding of 172 days) given when the summation index changes direction.

#### Plurality Index

This index is calculated by taking the 25-day sum of the absolute difference between advances and declines. Because the calculation accounts only for the net amount of change independent of the directional sign, it is always a positive number. The stock market has a tendency to decline rapidly and rise slowly. Therefore, high numbers in the plurality index are usually a sign of an impending market bottom, and lower numbers suggest an impending top. Most signals have been reliable only on the long side because lower readings can occur early in an advance and give premature signals. Traditionally, the signal levels for this indicator were 12,000 and 6,000, but the increase in the number of issues has made these signal numbers obsolete (Colby, 2003). Colby uses a long-term (324-day) Bollinger Band (see Chapter 14) breakout of the upper two standard deviations for buys and below two standard deviations for a sell to close. This method produced admirable results and has continued to do so since 2000. There are very few signals, and a 15- or 30-day time stop should be used for longs only.



One additional suggestion for eliminating the effect of the increase in the number of issues listed over time is to use the McClellan ratio method of dividing the numerator by the sum of the advances and declines. Thus, the 25-day plurality index raw number becomes the absolute value of the advances minus declines divided by the sum of the advances and declines. This can then be summed over 25 days. One problem both for accuracy of testing and for usefulness of the plurality index is that very few trades are initiated or held for long, and not all major market bottoms are signaled.

## Breadth Ratios

Instead of using the difference between daily or weekly advances and declines, which can be overly influenced by the increase or decrease in the number of issues listed, breadth ratios use a ratio between various configurations of advances, declines, and unchanged to develop trading indicators and systems for the markets. Using ratios has the advantage of reducing any long-term bias in the breadth statistics. These ratios usually project very short-term market directional changes and are of little value for the long-term investor. They have also changed character and reliability since the year 2000.

### Advance-Decline Ratio

This ratio is determined by dividing the number of advances by the number of declines. The ratio or its components are then smoothed over some specific time to dampen the oscillations. Figure 8.5 presents testing of the successfulness of using the advance-decline ratio over the 1947 to 2005 period by Ned Davis Research. Using daily breadth statistics, 26 buy signals were generated when the ratio of ten-day advances to ten-day declines exceeded 1.91. These signals averaged a 17.6% return over the following year. In only one of the 26 instances did the signal fail, and the loss then was only 5.6%.

Colby (2003) reports that taking a one-day advance-decline ratio and buying the Dow Jones Industrial Average (DJIA) when the ratio crossed above 1.018 and selling it when the ratio declined below 1.018, in the period from March 1932 to August 2000, would have turned \$100 into \$884,717,056, assuming no commissions, slippage, or dividends. Turnover, of course, would have been excessive—an average of one trade every 3.47 days—but the results were excellent for both longs and shorts. We tested this system for the period from April 2000 to February 2005 and found that, as in the other short-term breadth signals, performance was good. The return on the account, adjusted for \$1/share commission and ten cents per share for slippage, was 56.1% versus a buy-and-hold of -18.4% for the period between April 2000 and February 2005, still respectable and accounting for commissions and slippage. The average holding period remained very low at 3.23 days, and most of the performance was gained on the short side.

### Hughes Breadth Oscillator

As mentioned earlier, James Hughes was a friend and protege" of Col. Ayres, the inventor of the breadth divergence hypothesis. Hughes published a market letter in the 1930s and provided many indicators «jsing breadth statistics. One was the Ayres concept of negative divergences, and for shorter period signals, he developed what has since become known as the Hughes breadth oscillator (see Figure 8.6).

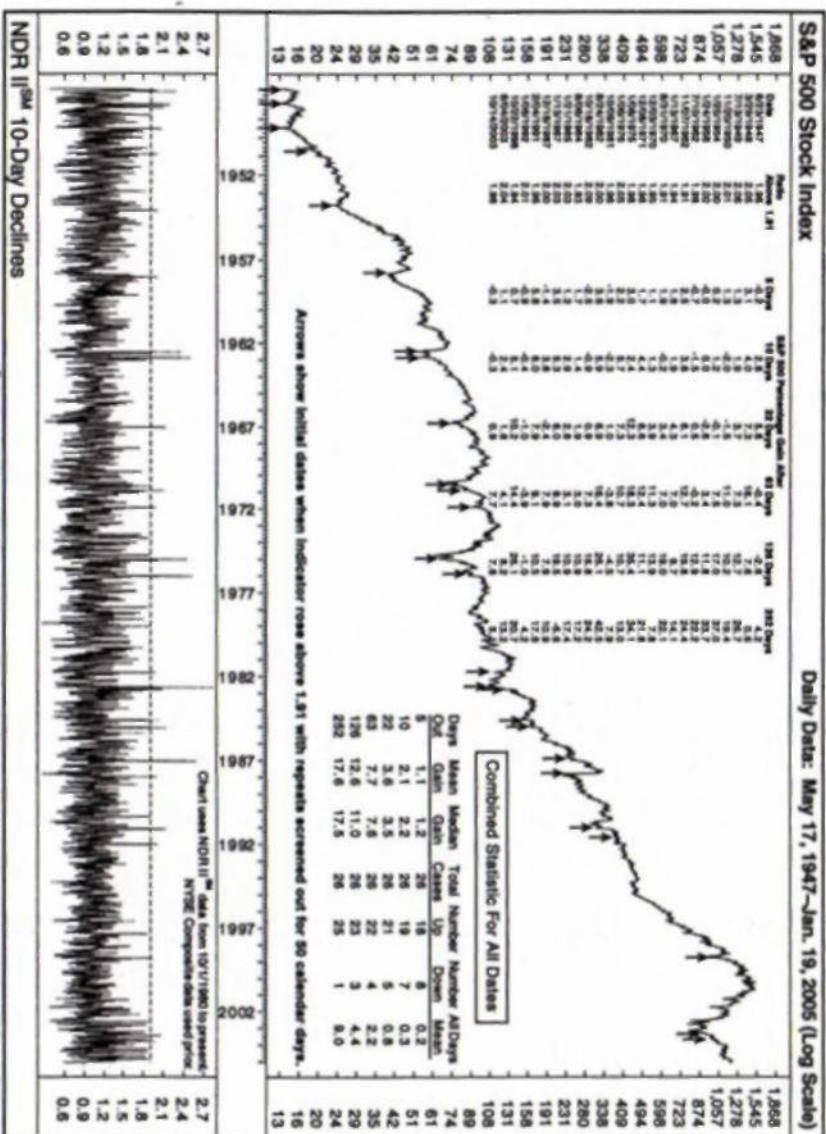


FIGURE 8.5 Signals generated using the advance-decline ratio

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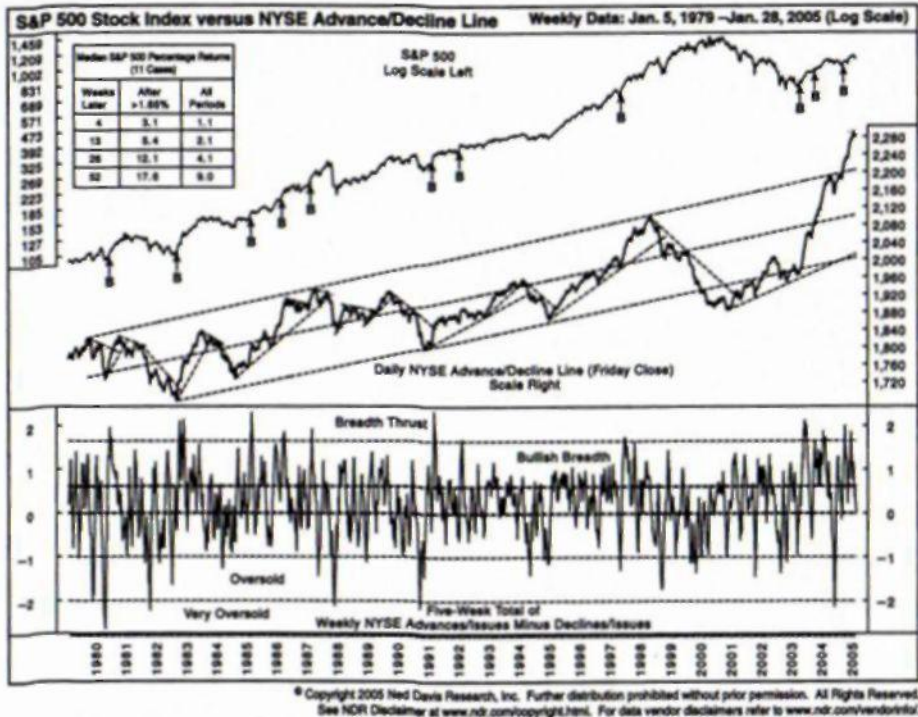


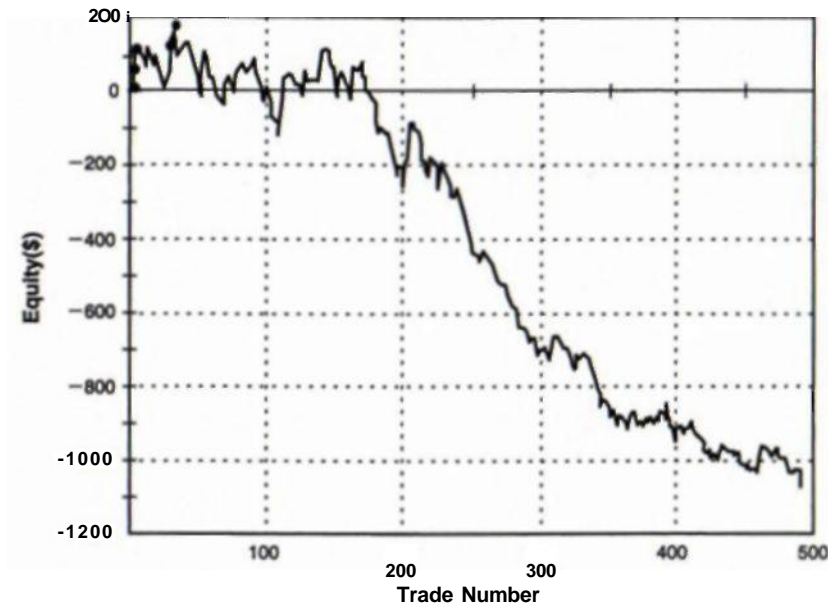
FIGURE 8.6 The Hughes breadth oscillator

The Hughes breadth oscillator is a ratio of the difference between advances and declines divided by the total issues traded. This ratio is traditionally smoothed with a moving average. When the ratio rises above or declines below zero, a buy or sell signal is generated respectively. Colby (2003) calculated that in the period from 1932 through 2000, an enormous gain not including commissions and slippage would have occurred, but the average holding period would have been 3.56 days. Since then, however, performance has reversed. On the performance equity line (see Figure 8.7), we have calculated for the period following Colby's analysis that a peak in return occurred in April 2002, not including commissions and slippage. With the transaction costs included, due to the high turnover, the return would have been negative since April 2002 and would have lost roughly 28% from that peak in performance.

#### Absolute Breadth Index

Whereas the Hughes breadth oscillator uses a ratio of the raw difference between advances and decline divided by the total issues traded, the absolute breadth index uses the absolute difference of the advances minus declines divided by the total issues traded. Thus, the index is always

Equity Curve Line: S&amp;P 500 Daily (April 10, 2000-February 23, 2005; 14:00)



Created using TradeStation

FIGURE 8.7 Equity line using the Hughes breadth oscillator (April 2000-February 2005)

a positive number. By experiment, Colby (2003) found that from 1932 to 2000, a profitable signal was generated when this index crossed the previous day's two-day exponential moving average plus 81%. His report for longs only, which were held for an average of 13 days, only beat the buy-and-hold by 35.1% over the entire 68-year period, without commissions or slippage. Since then, however, the profitable trades have been on the short side, the time held shortened to 2.6 days, and when commissions and slippage are added, they have beaten the buy-and-hold by 153.4% versus -18.9% over the period from April 2000 through January 2005. This method, therefore, shows continued profits and is one upon which the student could potentially improve.

#### Unchanged Issues Index

The unchanged issues index uses a ratio of the number of unchanged stocks to the total traded. The theory behind it is that during periods of high directional activity, the number of unchanged declines. Unfortunately, with the decimalization of the stock quotes, the number of unchanged has declined, and the ratio now appears to have almost no predictive power. Testing this indicator, we have found negative results in almost all instances since April 2000.

## **Breadth Thrust**

A "thrust" is when a deviation from the norm is sufficiently large to be noticeable and when that deviation signals the beginning of a new trend, usually upward. Figure 8.6 shows that during the period from 1979 to 2004, when the breadth ratio thrust above 1.65, the stock market rose an average of 17.6% over the next 52 weeks. The thrust in this example is calculated as the five-week total of the weekly advances to total issues ratio less the weekly declines to total issues ratio. It appears still to be valid in 2005.

Martin Zweig devised the most common breadth thrust indicator, calculating a ten-day simple moving average of advances divided by the sum of advances and declines. Traditionally, the long only signal levels in this oscillator were to buy when the index rose above 0.659 and sell when it declined below 0.366. With these limits, however, this method has not had a signal since 1994. In testing the calculation using a moving average between four and six days, we found that the original signal limits were profitable again for longs only. Why did the results for this indicator suddenly change in 1994? We do not know. Again, these changes are excellent examples of why the analyst must frequently review the reliability of any indicator being used.

One other way to use Zweig's calculation is to generate a signal when the ratio reverses direction (Colby, 2003). Although this method continues to be profitable, it suffered a severe drawdown from October 2002 to October 2003, bringing into question its long-term viability.

## **Summary of Breadth Indicators**

It appears that since 2000, a period of declining then rising stock prices, the breadth indicators for short-term signals that had previously had admirable records mostly failed. These failures are the reason why technical analysts must constantly test and review their indicators. Many changes occur in the marketplace, both structurally—as, for example, the change to decimalization and the inclusion of many nonproducing stocks in the breadth statistics—and marketwise—as, for example, the disconnection between stock prices and interest rates. No indicator remains profitable forever, both because of these internal changes, as well as the overuse by technical analysts who recognize their value. Apparently, the best remaining breadth usage is the old Ayres-Hughes negative divergence analysis. It has yet to fail. Before an indicator is used in practice, however, it must be tested objectively. No indicator should be used just because it has demonstrated positive results in the immediate past.

## **UP AND DOWN VOLUME INDICATORS**

Breadth indicators assess market strength by counting the number of stocks that traded up or down on a particular day. An alternative way to gauge market internals is to measure the up volume and down volume. Daily up volume is the total amount of volume traded in advancing stocks, and down volume is the total amount of volume traded in declining stocks. Up and down volume figures are reported in most financial media.

Considering the volume, rather than only the number of shares traded, places more emphasis on stocks that are actively trading. With the breadth indicators, a stock that moves up on very light trading is given equal importance to one that moves up on heavy trading. By adding volume measures, the lightly traded stock does not have as much influence on the indicator as a heavily traded stock.

## The Arms Index

One of the most popular up and down volume indicators is the Arms Index, created by Richard W. Arms, Jr. (winner of the MTA 1995 Annual Award). The Arms Index (Arms, 1989), also known by its quote machine symbols of "TRTN" and "MKDS," is reported daily in the financial media.

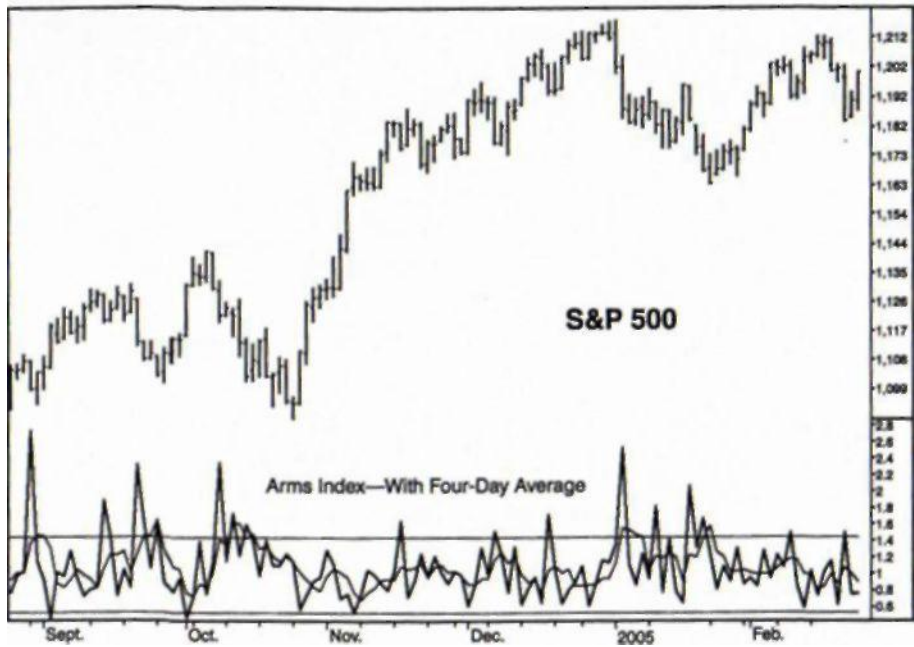
The Arms Index measures the relative volume in advancing stocks versus declining stocks. When a large amount of volume of declining stock occurs, the market is likely at or close to a bottom. Conversely, heavy volume in advancing stocks is usually healthy for the market. The Arms Index is actually a ratio of two ratios, as follows:

$$\text{Arms Index} = \frac{\frac{\text{Advances}}{\text{Declines}}}{\frac{\text{UpVolume}}{\text{DownVolume}}}$$

The numerator is the ratio of the advances to declines, and the denominator is the ratio of the up volume to the down volume. If the absolute number of advancing shares increases on low volume, the ratio will rise. This higher level of the Arms Index would indicate that although the number of shares advancing is rising, the market is not strong because there is relatively low volume to support the price increases. Thus, this ratio travels inversely to market prices (unless plotted inversely), tending to peak at market bottoms and bottom at market peaks. This inverse relationship can initially be confusing to the chart reader. Figure 8.8 shows the Arms Index for the August 2004-February 2005 period.

Similar to breadth ratios, the Arms Index can be smoothed using moving averages and tested for parameters at which positions can be entered. An Arms Index greater than 1.0 is considered to be a bearish signal, with lower levels of the index indicating a more favorable market outlook. Generally, the buy signals are better because the extremely high levels of the Arms Index are usually a sign of panic, indicating a market bottom. On the sell side, low levels of the Arms Index can remain for considerable time while prices continue to rise. The index is not, in its raw state, a reliable signal of tops.

Colby (2003) introduced a number of calculations that showed promise until the year 2000. A long-standing panic signal, devised by Alphier and Kuhn (1987), is to buy the stock market when the Arms Index exceeds 2.65 and hold it for a year. This signal has occurred twice since 2000, with one win and one loss. The win, however, was considerably larger than the loss. When we shortened the holding period to 40 days rather than the original 252 days, the performance of the signals was outstanding, a return of 223% versus a 1.7% buy and hold. It appears then that the signal is still valid, but the analyst must watch the holding period after the signal.



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FIGURE 8J The Arms Index (August 2004-february 2005)

One method that no longer seems to be valid but is still in the literature is to buy when the Arms Index declines below 0.523 or rises above 1.444 and hold for a year. Colby (2003) was very enthusiastic about this method because it showed outstanding results for 35 years. The rule also states that if the year runs out but a later signal is still active, the position should be held until a year after the final signal. Although this was valuable during the long rise between 1974 and 2000, it no longer holds today. Too many signals have been generated, meaning that the position would have been held during the entire period of the decline from 2000 to 2002. Using the same buy rules, we shortened the holding period to ten days and found poor results. We then smoothed the Arms Index over four days and, finally, meaningful results occurred. This manipulation of the parameters is often dangerous, however, because of the risk of just fitting a formula to the data. It does not suggest that these parameters will necessarily work in the future. What the different parameters do suggest is that the basis of the indicator is likely valid but that the analyst must experiment with different parameters to determine a consistently profitable system.

Another popular method has been to buy the market and hold for a year when the ten-day simple moving average of the Arms Index breaks above 1.266. This method no longer works, either. It proved disastrous during the 2000-2002 stock market decline.

Finally, the method proposed by Colby (2003) is to buy and sell the market as the 11-day moving average of the Arms Index crosses 0.800. Since 2000, unfortunately, this method has consistently lost money and underperformed the buy-and-hold strategy through February 2005. There is little question that something significant occurred in the breadth and volume figures after the year 2000. However, the problems seem to revolve around the holding periods. As with most indicators, it is a mistake to apply short-term or medium-term indicators to long-term holding periods, and of course, the opposite also applies.

#### Modified Arms Index

Generally, a high number above 1.0 in the Arms Index is bearish and a low number bullish. However, take an example of a hypothetical day when 1,000 issues advance and 100 decline with 1m up volume and 200,000 down volume. From these numbers, the Arms Index would be calculated as 2.00, a bearish number, yet the market action was obviously bullish (1,000/100 advances to decline). To combat this problem, Dave Steckler calculates a modified index by multiplying advance issues times advancing volume and subtracting from that figure the product of declining issues times declining volume. This index can sometimes be negative. Then he sums the modified index over 11 days, smoothes the total with a ten-day moving average, and plots the result. He claims that it often diverges a few days earlier at market tops and bottoms.

### **Ninety Percent Downside Days (NPDD)**

Paul F. Desmond in his Charles H. Dow Award paper (Desmond, 2002) presents a reliable method for identifying major stock market bottoms that uses daily upside and downside volume as well as daily points gained and points lost. The volume figures are reported in the financial media, as are the stock tables. Unfortunately, the sum of points gained and lost is not reported publicly and requires considerable handwork or a computer. A ninety percent downside day occurs when on a particular day, the percentage of downside volume exceeds the total of upside and downside volume by 90 percent *and* the percentage of downside points exceeds the total of gained points and lost points by 90 percent. A ninety percent upside day occurs when both the upside volume and points gained are ninety percent of their respective totals. What he found was that

- An NPDD in isolation is only a warning of potential danger ahead, suggesting, "Investors are in a mood to panic." (Desmond, 2002)
- An NPDD occurring right after a new market high or on a surprise negative news announcement is usually associated with a short-term correction.



- When two or more NPDDs occur, additional NPDDs occur, often 30 trading days or more apart.
- Big volume rally periods of two to seven days often follow an NPDD and can be profitable for agile traders but not for investors.
- A major reversal is signaled when an NPDD is followed by a ninety percent upside day or two eighty percent upside days back-to-back.
- In half the cases, the upside reversal occurred within five trading days of the low. The longer it takes for the upside day reversal, the more skeptical the investor should be.
- Investors should be careful when only one of the two upside components reaches ninety percent. Such rallies are usually short.
- Back-to-back ninety percent upside days are relatively rare but usually are long-term bullish.

## NET NEW HIGHS AND NET NEW LOWS

When the stock market is rising, it is only reasonable to assume that individual stocks are making new highs. Conversely, stock market declines are associated with stocks making new lows.

Generally, a stock is considered to reach a new high if the day's price is higher than the price has been over the past year. Prior to 1978, new highs and new lows were measured from January of the current year only but in 1978, the New York Stock Exchange began determining new highs and new lows based on trailing 52-week prices. Other exchanges also adjusted their reporting at that time for consistency with the NYSE figures. Thus, a stock reaches a new high when the price is higher than it has been anytime during the previous 52 weeks, not necessarily when it has reached a new all-time high.

The financial press reports 52-week highs and lows, but the period of 52 weeks is not sacred. Analysts calculate many other periods based on their individual investment horizons. For short-term breakouts, for example, 10 or 21 days are used. In any case, the number of new highs and new lows is a useful measure of the number of stocks participating in an advance or decline. It is thus an indicator of continuing trend and usually subject to divergence analysis, similar to breadth statistics.

The raw data of new highs and new lows is subject to the same problems as breadth in that the number of issues listed on an exchange will often change over time and make indicators using differences between highs and lows unreliable and subject to constant change in indicator parameters. As in breadth indicators, the way around this difficulty is to divide the difference between the new highs and lows by the total issues traded on the exchange, thus eliminating any bias from the changing number of listings.

### New Highs Versus New Lows

The most straightforward, and probably useful, index is to buy when the number of new highs exceeds the number of new lows on a daily basis and to sell when the opposite occurs. Colby reports very favorable results on both sides of the market, long or short, but the holding period is relatively short. A variation using a five-day moving average of new highs to new lows by Ned Davis Research is shown in Figure 8.9. It shows a particularly strong positive result when the ratio declines to below -13.8%. Otherwise, the results are mixed.

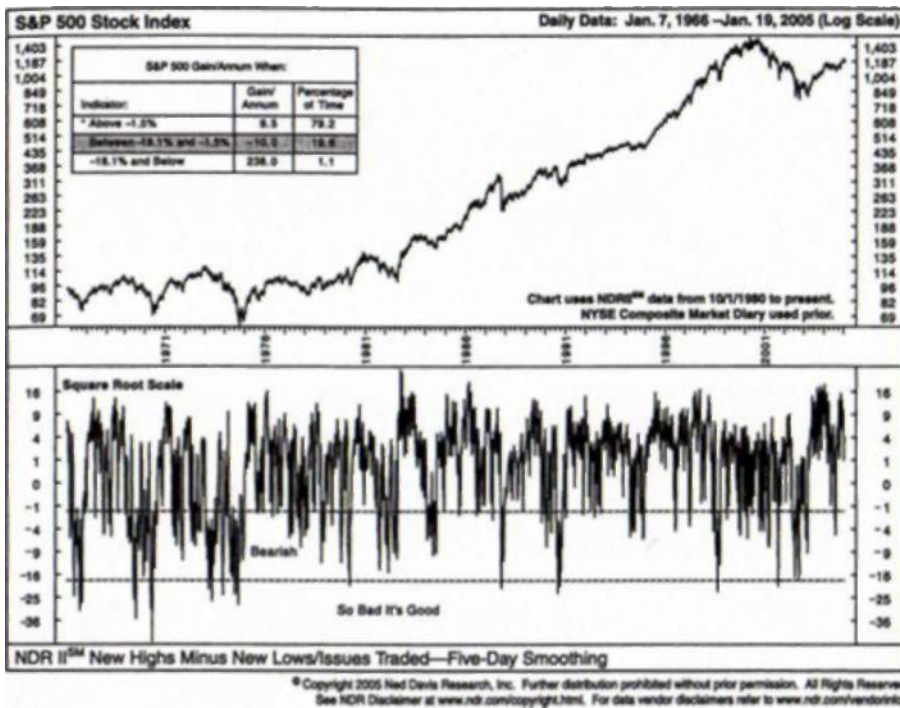


FIGURE 8.9 Five-day-smoothed new highs minus new lows divided by issues traded

## High Low Logic Index

Norman Fosback (1976) is the developer of the high low logic index. This index is defined as the lesser of two ratios: the number of weekly new highs to total issues or the number of weekly new lows to total issues. Low index levels tend to suggest a strongly trending market. A low number would indicate that either a low number of new highs and/or a low number of new lows are occurring. A high index level implies mixed market because the index can only be high when the number of both new highs and new lows is large.

Analysts traditionally smooth this index over ten weeks with a moving average (see Chapter 14). With either the raw or smoothed data, levels are then determined at which a signal is generated. Generally, high levels are bearish and low levels are bullish. In the first edition of *The Encyclopedia of Technical Market Indicators*, authors Robert Colby and Thomas Meyers reported that from 1937 to 1987, the results from such indicators were highly significant to the 99.9% confidence level. Their thresholds for raw data were above 0.020 for a down market one to three months later, and below 0.002 for an up market one to six months later. For the ten-week smoothed index, a downward market was signaled above 0.058 for three months, and an upward market was signaled below 0.005 for 3 and 12 months later.

## Hindenburg Omen

Many indicators use a combination of other indicators to derive a signal. The Hindenburg omen is such an indicator. Very similar to the high low logic index, this indicator was devised by Jim Mikkea and was named by Kennedy Gammage (Colby, 2003) after the Hindenburg Dirigible disaster of 1937. Obviously, it signals a market reversal downward and includes

- The lesser of weekly new highs or new lows more than 2.4% of total issues
- A rising ten-week moving average of the NYSE Composite Index
- A negative McClellan Oscillator

This indicator, abbreviated to only the relation between new weekly highs and lows and excluding the other two requirements, gave sell warnings in September 1987 (before the 1987 crash), in June and July 1990 before the large declines in July and October, before the March 1994 hit, and on July 9, 1998. More recently, a Hindenburg Omen sell signal occurred in April 2006.

## NUMBER OF STOCKS ABOVE THEIR 30-WEEK MOVING AVERAGE

The indication of a trending stock usually is gauged by whether the stock price is above or below a moving average. The longer the moving average, the longer the trend the relationship represents. One indicator of overbought and oversold markets is the number of stocks above or below

their 30-week moving averages. This indicator essentially measures the number of stocks in uptrends and downtrends. It is a contrary indicator, however, in that when the percentage of stocks above their 30-week moving averages reaches above 70 percent, the market is inevitably overbought and ready for a correction. Conversely, when the percentage of stocks below their 30-week moving average declines below 30 percent, the market is at or close to a bottom. Investors Intelligence Inc. popularized this indicator. They have developed other rules for action between the 30 and 70 percent levels that follow intermediate-trend turns. Figure 8.10 shows an example of this analysis.

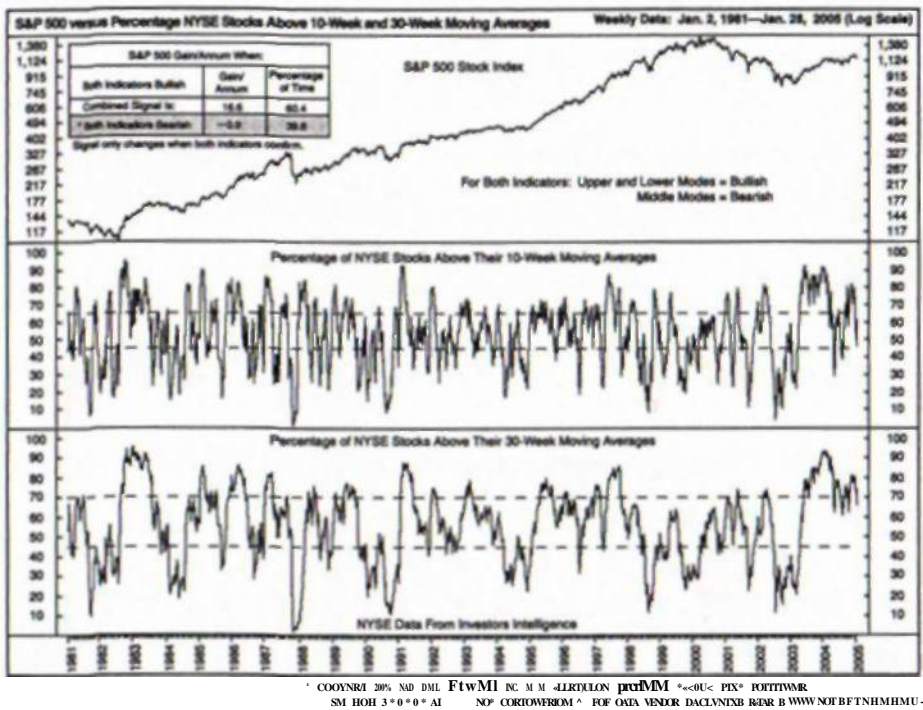
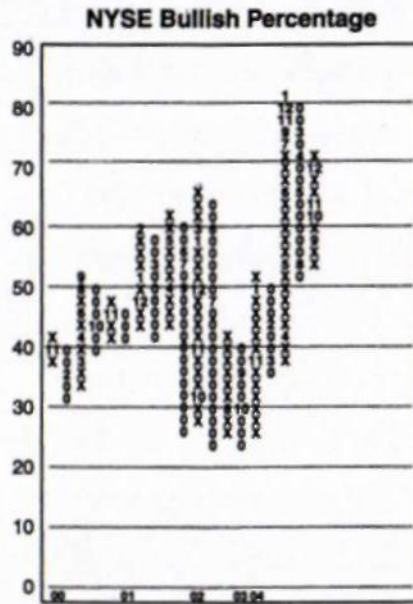


FIGURE 8.10 Percentage of NYSE stocks above their 10- and 30 week moving averages

A variation of this indicator is Investors Intelligence's percent bullish and bearish. As we will see in Chapter 16, "Point-and-Figure Chart Patterns," simple signals are generated when prices break above or below their previous highs or low. These simple signals can be accumulated

for all stocks and an index created of the percentage that is bullish or bearish—they can only be one or the other. Thus, another point-and-figure chart (see Figure 8.11) or a line drawing (see Figure 8.12) can display this percentage. Generally, as in the percentage above their 30-week moving average, 70 percent of stocks with bullish signals is a sign of an impending top, and below 30 percent is a sign of an impending market bottom.



Adapted from [www.investorsintelligence.com](http://www.investorsintelligence.com)

FIGURE 111 PointonFigure chart of the percentage of stocks that are bullish [January 1 1, 2005]

## VERY SHORT-TERM INDICATORS

### Breadth and New Highs to New Lows

Although breadth and new high-low data tend to be indicators of trend, and divergence analysis is useful in determining when a known trend may be reversing, short-term readings of breadth and new high-low data are often contrary indicators. For example, when the daily breadth ratio of advances to declines rises to 2/1 or 3/1, the subsequent market direction is more often down than up. The opposite is also true for days in which the advance-decline ratio is 2/1 or 3/1 on the downside. It often provides excellent buying opportunities for the very short term (that is, the next week).

### NYSE Bullish Percentage

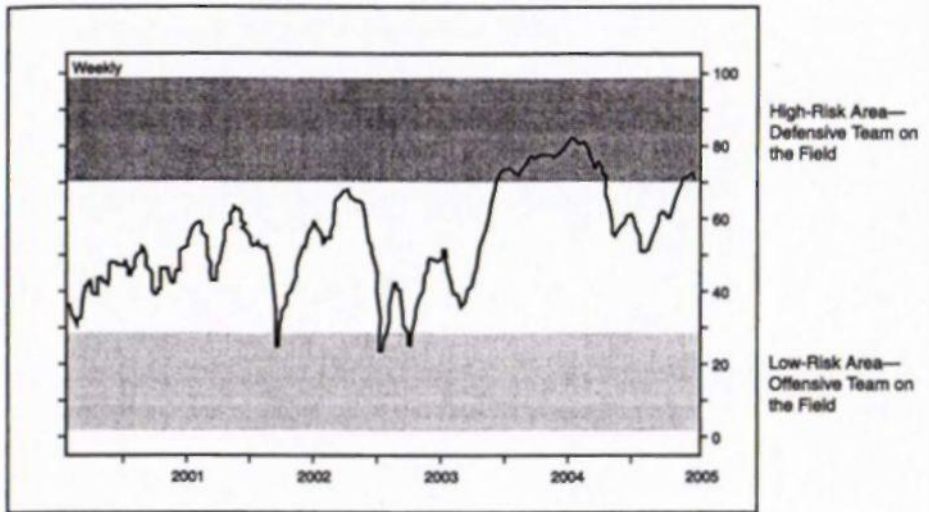


FIGURE 8.12 Line chart of percentage of stocks that are bullish (January 10, 2005)

New highs and new lows show the same results. Trading with the longer-term trend is the best method of maximizing profits. To enter the trend right after it has been recognized, however, is often not profitable, at least until prices have retraced from their initial reaction. Thus, for example, if the market is above its 200-day moving average and is presumably in a longer-term uptrend, whenever the averages break to new ten-day lows is an excellent time to go long. Oppositely, when the market is below its 200-day moving average and thus in a longer-term downtrend, whenever rallies take prices above their ten-day highs is when the best opportunity to sell short exists. In this manner, the use of new highs and new lows thus can be used as a contrary signal within the major trend and a way of profiting from price dispersions from the mean trend.

### Arms Index

Watching the Arms Index intraday can sometimes give a clue as to when a short-term market reversal is about to take place. Readings above 1.0 warn of a correction when prices are rising intraday, and readings below 0.5 warn of an advance when prices are declining intraday.

## Net Ticks

Ticks represent actual trades. When a stock changes price, even by the smallest amount, either an uptick or downtick is produced. If the stock trades at its previous price, a zero-tick is produced. By summing at any one instant the number of upticks versus downticks, the day trader has an indicator of market action across the board. It is similar to an advance-decline ratio or difference except that it is based on much more sensitive intraday data.

Generally, tick data is used as a contrary indicator because it measures very short-term bursts of enthusiasm or fear. Extreme readings may indicate a longer-term change in trend, but usually the tick ratio oscillates within bounds throughout the day. When it is oversold, traders will buy into the short-term fear, and when it is overbought, they will sell into the temporary enthusiasm. Ratios and moving averages are used with this data in a similar manner as with breadth statistics. Ticks can also be calculated for averages and indices such as the Dow Jones Industrial, where only the stocks included in the average are measured.

Closing ticks can also be used similar to daily breadth statistics. Closing ticks represent the trading action just at the close of trading and show whether traders are anxious or ambivalent. In Figure 8.13, a ten-day moving average of net ticks shows oscillations in line with the averages. Combining this indicator with one of the Arms Index (MKDS) and the NYSE Composite, Ned Davis Research found specific levels at which significant market moves could develop.

## CONCLUSION

In this chapter, we have focused on the measurement of market internal strength. One important factor in measuring market internals is the calculation of market breadth. Market breadth is a measure of how widely a market move is spread throughout the stock market. In other words, measuring breadth tells the analyst whether an increase in the market index is characterized by a large increase in the price of a few stocks or a smaller increase in the price of the majority of the market stocks. Is the typical stock moving the same way that the market index (which can be influenced by big moves in a few stocks) is moving? If so, the market direction is confirmed by the internals. If not, the internals and the index are diverging, indicating that internal strength is changing.

Another way of looking at internal market strength is to look at up and down volume. Instead of looking at the number of issues that advanced or declined on a particular day and the up and down volume measures, consider the Arms Index of the number of shares trading up and down. Using this type of measure, each stock issue is not given equal weight. Instead, stocks with heavy trading volume are given more weight and play a more important role in gauging internal market strength.

A third major way to gauge internal market strength is to compare the current price of each stock with its historical price. Looking at how many stocks are being traded at price extremes can do this—that is, looking at stocks trading at new highs and new lows. Alternatively, it can be

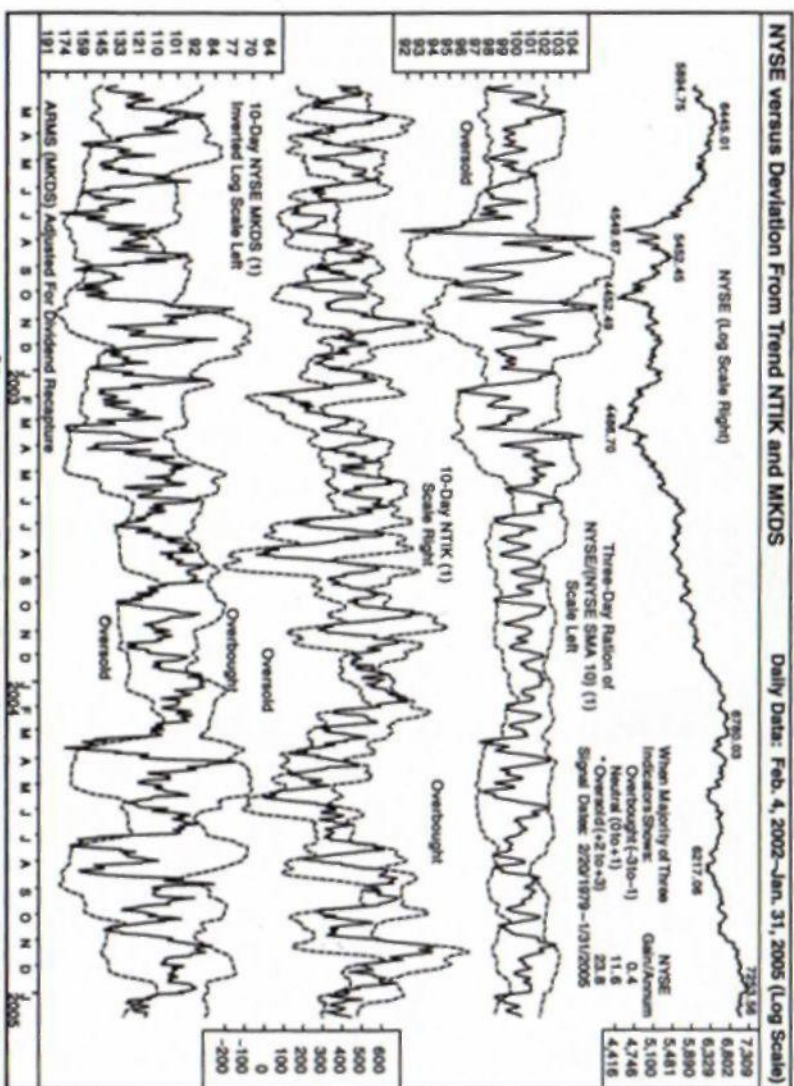


FIGURE 8.13 Tendency moving average of net ticks



done simply by comparing the current price with a historical average price of each issue to see how many stocks seem to be moving in the same direction as the market index.

Whatever method is being used, the indicators presented in this chapter are designed to measure whether there is enough strength internally to predict that the market trend will continue in the direction it has been. Understanding how internal strength relates to broader market movement is important. Unfortunately, we have seen many of the traditional indicators perform poorly during the past few years. Only time will tell if the traditional indicators with their traditional parameters will perform satisfactorily in the future. In the meantime, analysts continue to develop, test, and refine ways to measure market internal strength. It is the job of the technician to find what works best for the appropriate trading or investment time horizon.

## REVIEW QUESTIONS

1. Explain what the term "market breadth" means.
2. Explain what the terms "positive divergence" and "negative divergence" mean.
3. An analyst appearing on the financial news made the following statement:  
"Since the recent run-up in the S&P 500 has been accompanied by weak internals, I do not have much confidence that the uptrend in the S&P 500 will continue much longer."  
Explain what the analyst means by "weak internals." What types of statistics has the analyst been looking at to determine that the market internals were weak?
4. Explain how looking at "new highs" and "new lows" can help an analyst determine internal market strength.
5. Assume that market indices are all trending upward. What type of market internals would you like to see to confirm these trends?
6. The web site <http://finance.yahoo.com> reports useful information about market internals every day. This information can be found under the heading "Today's Markets" by clicking on the "Indices" option and then the "Advances and Declines" option. Look up the information for today's trading. What would you conclude about the internal market strength today? Explain what information leads you to your conclusion.
7. Use the information you gathered for Question 6 to calculate the Arms Index and the Modified Arms Index for the day. What information does each of these indicators give you?

# TEMPORAL PATTERNS AND CYCLES

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The long (50-60-year) Kondratieff wave cycle
- The 34-year cycle
- The decennial cycle
- Four-year cycles, including the election year pattern
- Seasonal tendencies in stock performance
- The relationship between January stock market performance and the rest of the year
- The relationship between events and stock market performance

In the previous two chapters, we looked at ways to measure the sentiment of market players and the internal strength of the stock market. In those chapters, we saw that the market alternates between periods of strength and weakness. A major market cycle appears when market players become more and more optimistic, sometimes to a point of euphoria, followed by a period of market weakness, which is associated with increasing investor fear and panic. Seeing how this is a repeated pattern, some analysts have focused their attention on attempting to predict these patterns using cycle theory that is often similar to the cycle theory of the natural scientists. We will cover in Chapter 19, "Cycles," how to analyze market data of unconventional cycles, but we will now look at cycles appearing to occur for understandable reasons.

Is there a time of the year that is the best to buy stocks? Do stocks perform better in one month or season of the year than another? Does it matter what day of the month I buy stocks? Should I buy stocks on a certain day of the week? How do stocks perform when there is an upcoming presidential election? Does the weather affect stock performance? These are all examples of the types of questions that must be asked.

Although a rigid cycle that would result in a specific, narrow rule (e.g., always buy stocks on the first day of the month or never buy stocks in December) does not appear, the effects of time do seem to display themselves in price patterns and cycles of varying shapes and lengths. In many cases, the origin or cause of these cycles is unknown. Some analysts attempt to correlate a variety of cycles to either economic events or stock prices, and these apparent relationships range from the plausible to the ludicrous. Researchers have considered sun spots, rainfall in New York City, phases of the moon, various planet positions, tilt of the earth, lynx populations in Canada, tree rings, and elections, to name only a few of the possible causes.

Like the periodicity of the sun and moon to Stone Age man, the observations are unquestioned but the reasons are unknown. So far, only coincidental cycles have been found. Edward R. Dewey (1947, 1971), founder of the Foundation for the Study of Cycles, tabulated these coincidental periodic peaks and troughs, beginning in the 1940s. The records and past journals of the Foundation, in which many of these cycles are tabulated, have now been integrated with the library of the Market Technicians Association. In this chapter, we discuss the most dominant of these temporal effects associated with the stock market.

## PERIODS LONGER THAN FOUR YEARS

### Kondratieff Waves, or K-Waves

Nicolas D. Kondratieff, an economist who lived in Communist Russia, studied historical commodity prices in the 1920s. He analyzed European agricultural commodity prices and copper prices from the late eighteenth century to his time and noticed a periodicity in these prices of approximately 50 years. He then hypothesized that there were long cycles in economic activity in capitalist nations that evolved and self-corrected and that the Marxist hopes for an approaching collapse of capitalism were misdirected. He was sent to a Siberian concentration camp, presumably for these views, where he died in 1938.

Few of Kondratieff's papers were originally published in the West, but more recently, a large number have been collected and translated into a book. *The Long Wave Cycle*. The long 50-60 year cycle that he measured, known as the Kondratieff wave (or "K-wave"), is an economic phenomenon that is not necessarily observable in commodity or stock prices.

It was Harvard economics professor Joseph A. Schumpeter, endorsing Kondratieff's ideas in the 1930s, that first used the name "Kondratieff wave" to refer to the cycle that Kondratieff uncovered. The K-wave theory remained in academic contention, largely because of the few-recorded instances, until the 1970s and 1980s, when the world economy slowed down and new research on the importance of innovation added substance to the theory of K-waves. Today there is a reasonable academic body of knowledge attached to K-wave theory. George Modelski and William Thompson have written extensively on the topic. In their book. *Leading Sectors and*

*World Powers: the Co-evolution of Global Economics and Politics*, Modelski and Thompson point to the following important aspects of the K-wave theory:

- Waves are attributes of the world economy led by a major national economy.
- Waves concern output rather than prices—sector output surges rather than general macroeconomic performance.
- Waves unfold as phased processes, implying an S-shaped growth curve sequence rather than mechanical and precise periodic cycles.
- Waves arise from bunching of innovations in product, services, technology, methods of production, new markets, new sources of raw materials, and new forms of business organization (from Schumpeter). This innovation spurt comes from earlier economic slowdown, and each wave can be identified by its predominant innovative character (see Table 9.1).
- Each K-wave has its characteristic location—cotton in Manchester, Great Britain or technology in Orange County, California—and a clear location in time that can be dated. World systems theorists can now date the theory back 19 separate waves to Sung China, more than a thousand years ago.
- Each K-wave affects the structure of the world economy into the future.
- The long start-up of a K-wave is often accompanied by a major war.
- A significant relationship exists between the K-wave and the rise and fall of world powers. A new K-wave in a new and different location suggests the next location for global leadership. The K-wave grows out of necessity and innovation and then influences global power and politics as they evolve to accept the new economics.

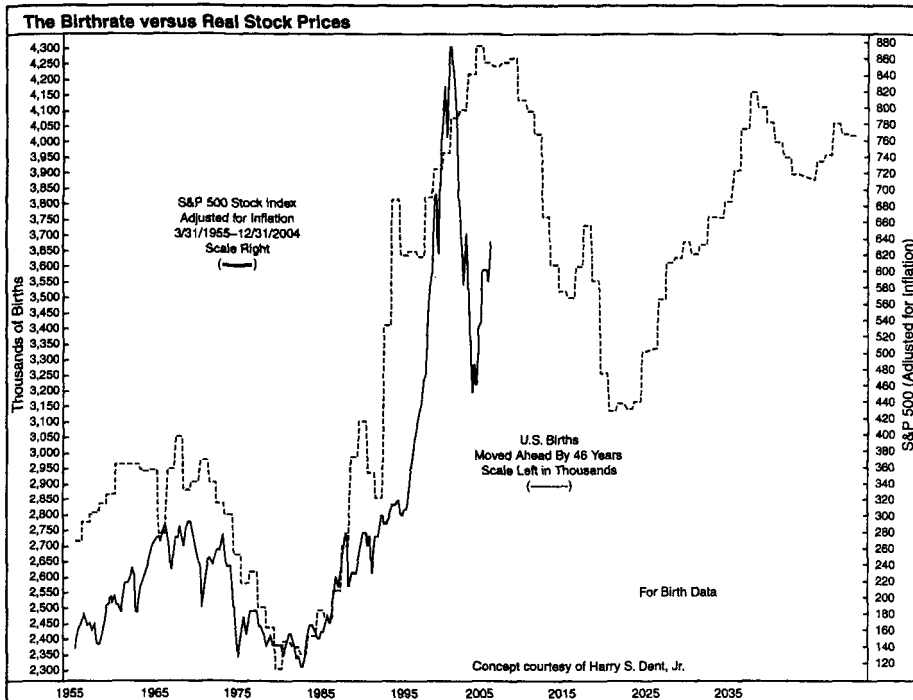
The Kondratieff wave, therefore, is an interesting long-term phenomenon in economics and world politics, but it has only marginal use in the stock, bond, and commodities markets. In the 1970s, K-wave cycle theory increased in popularity as many people began watching what would happen as the fiftieth anniversary of the 1929 stock market crash and Great Depression approached. However, the rise out of the 1981-1982 stock market bottom, with the DJIA quickly breaking the 1,000 level, which continued until the year 2000, eliminated interest in the K-wave theory as applied to the stock market.

Because double K-waves seem to develop into even longer cycles of economic power and global leadership and the United States is in the second cycle, the prospects for U.S. markets are seemingly favorable for a third period of about 17 years after 2026, when the next wave is scheduled to begin. Of course, this period may, and likely will be, punctuated by wars and at least one economic depression, but the U.S. prospects are still relatively favorable, even if replaced by another innovative period somewhere else, with the K-wave cycle theory predicting at least a trading market for the next 50 years in the United States.

**TABLE 9.1** K-Wave Cycles and the Associated Global Leading Sectors  
(Table adapted from Modelski & Thompson, 1996)

Date	Long Cycles	K-Waves	World Powers	Global Leading Sectors
930	LC1	K1	Northern Sung	Printing and paper
990		K2		National market
1060	LC2	K3	Southern Sung	Fiscal framework
1120		K4		Maritime trade expansion
1190	LC3	K5	Genoa	Champagne fairs
1250		K6		Black Sea trade
1300	LC4	K7	Venice	Galley fleets
1350		K8		Pepper
1420	LC5	K9	Portugal	Guinea gold
1492		K10		Spices
1540	LC6	K11	Dutch Republic	Baltic trade
1580		K12		Asian trade
1640	LC7	K13	Britain 1	American plantations
1680		K14		Amerasian trade
1740	LC8	K15	Britain 11	Cotton, iron
1792		K16		Railroads
1850	LC9	K17	USA	Electric power, steel
1914		K18		Electronics, motor vehicles
1973	LC10	K19	USA II	Information industries
2026		K20		

Confirming the prediction of the start of a new K-wave period beginning around the year 2026 is the relationship researchers have found between the U.S. birth rate and the stock market. A high correlation exists between the U.S. birth rate and U.S. stock market performance 46 years later. As seen in Figure 9.1, this correlation has been very close since the mid 1950s. Should this relationship continue, the birth rate data projects a major stock market bottom around 2020 followed by another major, but slightly weaker, rise than the 1980-2000 rise, into about the year 2040. The birth rate projection, of course, can change over the next 50 years, but for now, it appears to confirm the projections of the K-wave.



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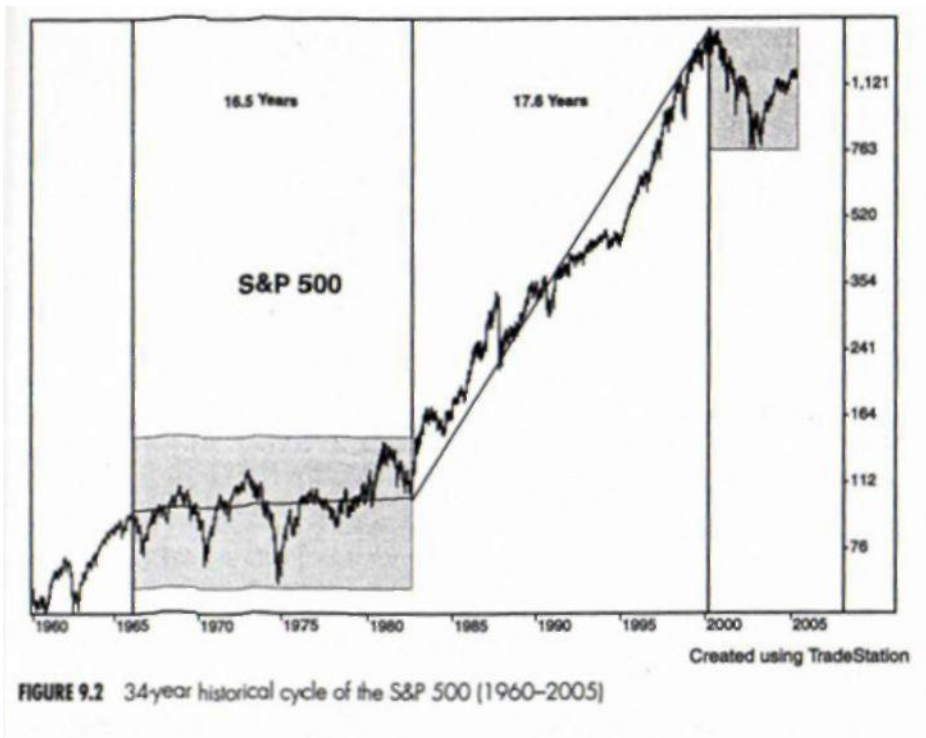
Source: National Center for Health Statistics

FIGURE 9.1 U.S. birth rate versus real stock prices

## 34-YEAR HISTORICAL CYCLES

Historical data suggests that 34-year cycles, composed of a 17-year period of dormancy followed by a 17-year period of intensity, also appear to exist. Figure 9.2, for example, shows a 16.5-year dormant period beginning in the mid 1960s in which movement in the S&P 500 was sideways. This trading range period was followed by a 17.5-year upward trend period in the S&P 500. The upward movement in the S&P 500 ended around the turn of the century. Historical cycles suggest that this present dormant period should last roughly until the years 2016-2017.

Notice that during the 1966 to 1982 dormant period, volatility was very high. Declines of 35% and 50% occurred within the period, as well as sharp advances, yet the overall, longer-term trend remained relatively flat. This is a period when technical analysts outshine fundamental analysts because the buy-and-hold philosophy breaks down. In the intensive period between 1982 and 2000, the buy-and-hold philosophy came back as prices generally rose, and profits were made regardless of the analytical method. Since the year 2000, another dormant but volatile



period began in which buy-and-hold strategies will likely fail and technical analysis returns as the most successful analytic method.

Warren Buffett, one of the wealthiest men in the world, is not widely known to use technical methods; however, it is interesting to note that he has long used the 17-year cycle in his investment planning. Buffet does not attribute the cycle to growth in the GNP, noting that in the dormant cycle from 1966 to 1982, the GNP grew at twice the rate as during the intensive 1982 to 2000 period. Instead, he attributes the different periods to changes in interest rates, corporate profits, and investor confidence in the economy, ideas he learned from reading a book, *Common Stocks as Long-Term Investments* by Edgar Lawrence Smith (1928), that he claims most influenced his investment philosophy (Loomis, 2001).

## DECENNIAL PATTERN

In his book *Tides and the Affairs of Men* (1939), Edgar Lawrence Smith presented the notion of a ten-year stock market cycle. Smith's theory resulted from combining two other theories, Wesley Mitchell's 40-month cycle theory and the theory of seasonality, both of which we cover in the

shorter-term cycles later in this chapter. Combining these two periods, Smith theorized that there must be a ten-year, or 120-month, cycle. This would result from ten 12-month, annual cycles and three 40-month cycles coinciding every 10 years.

When Smith investigated prices more closely, he found that indeed there appeared to be a price pattern in the stock market that had similar characteristics every ten years. This pattern has since been called the "decennial pattern."

The decennial pattern theory states that years ending in 3, 7, and 10 (and sometimes 6) are often down years. Years ending in 5, 8, and most of 9 are advancing years. Smith did not follow the normal calendar year beginning in January but found that counting the beginning of a year in October was more reliable. He also hypothesized that occasionally a nine-year or 11-year cycle overlaid the decennial cycle. He attempted to find the reason behind the decennial pattern and looked at sunspots and solar radiation, average rainfall, barometric pressure, and other weather-causing conditions, believing that weather patterns were the most likely cause of change in human psychology. It was then well accepted that weather had an effect on health and disease, and thus on optimism and pessimism, an observation first mentioned by Hippocrates.

The decennial pattern continues to have an excellent history. For example, the fifth-year advance has been observed well over 100 years never to have failed 12 out of 12 times.<sup>1</sup> One problem with the theory is that a large enough sample is not possible yet, and that such projections could be the result of chance. It is something to keep in the back of an investor's mind but not something to use alone to commit funds to the stock market.

## PERIODS OF FOUR YEARS OR LESS

"A day is a definite period of time. A year, within small limits, is also definite. A month, however, may be lunar or solar; it may also be a number of other things. Hence 40 months of our present calendar must remain an approximation and certainly not an exact measure of the duration of cycles, if, as we shall be led to believe, natural phenomena have some part in determining the pattern of their recurrence." —Smith (1939, p 20)

### Four-Year or Presidential Cycle

Wesley C. Mitchell (1874-1948), economics professor and one of the founders of the National Bureau of Economic Research (NBER), was the originator of the 40-month cycle theory. He empirically discovered that the U.S. economy from 1796 to 1923 suffered a recession, on average and excluding four wars, every 40 months, or approximately every four years.

**1. There is some question about whether 2005 advanced. Some market indexes were up slightly, and some were down. Most foreign stock markets advanced.**



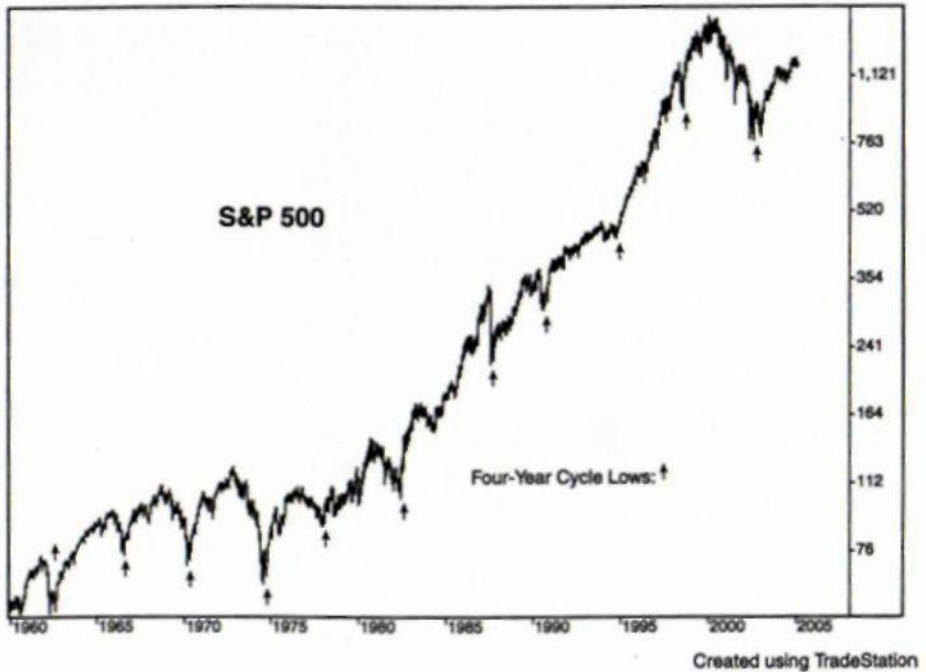


FIGURE 9.3 Four-year cycle lows in the S&P 500 (1960-2005)

Today, the four-year cycle, from price bottom to price bottom, is the most widely accepted and most easily recognized cycle in the stock market. Occasionally it strays from four years, but only by a portion of a year (see Figure 9.3). This is a remarkably consistent series.

Almost all cycles are measured from bottom to bottom. Tops fail to occur as regularly, but, of course, their average interval is also four years (see Table 9.2). Some analysts have argued that because the U.S. presidential elections are also four years apart, the cycle is due to the election cycle (see the next section, "Election Year Pattern"). It is thus often called the "presidential cycle." However, this cycle also occurs in countries that do not have four-year elections, such as Great Britain. It may be that U.S. economic strength is so huge and so globally powerful that other countries are forced to follow its stock market cycles, or it may be that the 40-month (almost four years) economic cycle Wesley Mitchell discovered 80 years ago is still dominant but has been slightly stretched by economic and the Federal Reserve policy action. Whatever the reason for its existence, the four-year cycle is obviously a very strong, important, and reliable cycle.

TABLE 91 Four-Year Cycle in the Dow Jones Industrial 11 896-20021  
(Adopted from Bressert. 19911

Data of Low	Low Close	% Decline from High	Date of High Close	High Close	% Advance to High	Month. Low to Low	Month. Low to High	Month. High to Low
Augu*8. 1896	28		Apr. 25. 1899	77	175 0*	49	32	17
Secaimber 24. 1900	53	-31 2%	Jena 17. 1901	73	47 2*	38	9	29
Noamner 9. 1903	42	-46 2*	Jonuory 19. 1906	103	145 2*	46	26	22
November 15. 1907	53	^18 5*	November 19, 1909	101	9 06*	46	24	22
September 25. 1911	73	-27.7%	September 30, 1912	94	28 8*	39	12	27
r>camC4>24. 1914	53	-43 6*	November 21. 1916	1 10	107 5*	30	23	13
December 19. 1917	H	-40 0*	November 3. 1919	12c	81 8*	44	23	21
Aogut# 24. 1921	64	-4 67 1	Febnrjory 11, 1926	162	153 1*	55	54	1
Vorch 30. 1926	135	-1 67*	Septembers, 1929	381	182 2*	44	42	2
November 13. 1929	199	-47 8*	April 17, 1930	294	47 7X	32	5	27
July 8. 1932	41	-8 6 1*	Worth 10, 1937	194	373 2*	68	56	12
Word. 31. 1938	99	-49 0*	September 12. 1939	156	57 6*	49	18	31
Apri 28. 1942	93	-40 4*	Woy 26. 1946	2:3	129 0*	54	49	5
October 9. 1946	163	-23 5*	June 15, 1948	193	18 4*	32	20	12
Jme 13. 1949	162	-16.1X	Jonuory 5. 1953	294	81 5*	51	43	8
September 14. 1933	259	-12.9*	Apnl 6. 1956	522	103 9*	49	31	18
October 22. 1957	420	-195*	December 13, 1961	735	75.0*	50	50	6
Jun* 26. 1962	535	-27.1*	February 9. 1966	995	85 6*	52	44	8
October 7. 1966	^44	-25 2*	December 3. 1968	985	32 4*	a	26	17
Woy 26. 1970	53:	-35 9*	Jonuory 11, 1973	1052	66 7*	55	32	23
December 6. 1974	578	-45 1*	September 12, 1976	1015	7 56*	38	21	17
february 28. 1978	742	-26 9*	Apnl 27. 1981	1024	38 0*	54	38	16
August 12. 1982	777	-24.1*	August 25. 1987	2722	250 3*	02	60	2
October 19. 1987	1739	-36 1*	July 17. 1990	3000	72 5*	36	33	3
October 11. 1990	2365	-21 2*	Jonuory 31, 1994	3978	68 2*	42	39	3
A o,14. 1994	3593	-9 7*	July 17. 1998	9338	159 9*	53	51	2
September 10. 1998	7615	-18 5*	January 14. 2000	11723	53 9*	49	16	33
Ooover?. 2002	7286	-37 8*	Moy 10. 2006-	11642	59 8*		43	
*)last high baton rhi book wen published								
A * o g <		-33.5*			102 2*	472	32.8	14.7

## Election Year Pattern

Yale Hirsch, editor of the *Stock Trader's Almanac* ([www.stocktradersalmanac.com](http://www.stocktradersalmanac.com)), has compiled statistics on the four-year election cycle and broken it down into the characteristics that have occurred each year for the period that a president is in office. Since 1832, the market has risen a total of 557% during the last two years of each administration and only 81% during the first two years. This amounts to an average of 13.6% per year for each of the last two years of an administration and only 2.0% for each of the first two years. Indeed, since 1965, none of the 13 major lows occurred in the fourth year of a presidency, and more than half (9) occurred in the second year. Hirsh's presumption is that the incumbent party wishes to appear in a favorable light during

the last two years, and especially in the last year of an administration, in order to be re-elected. To do this, aside from providing the normal "spin" about their accomplishments, they force interest rates lower and stimulate the economy. At least, history shows that interest rates are inversely correlated with the stock market during those latter two years. How the administration in power can force them lower is subject to conjecture.

In any case, this is a reasonable and relatively consistent partem. Some would argue that it is confusing "cause" with "correlation" and that there may not be a direct causal link between politics and the stock market. Such an argument can be made about many occurrences in nature and in man that appear to cause the stock market to react. The human mind often requires an explanation for stock market behavior. It will invent causal relationships where they do not exist. This mental tendency is something for the technical analyst to be careful of and is the primary reason that concentration always should be focused on price action rather than on speculating on what might or might not be the cause for its behavior.

## Seasonal Patterns

A seasonal pattern in agricultural prices has been known for centuries. More recently, interest rates have followed a seasonal pattern as money was borrowed for seed and returned when the crops were gathered. It turns out that seasonality exists in almost all economic statistics, and most producers of economic statistics, such as the Treasury, Federal Reserve, National Bureau of Economic Research, The Conference Board, and many others, adjust their numbers for seasonality. Technical analysts sometimes frown upon this practice because it distorts real figures with adjusted figures. However, it is an admission that seasonality is an important factor in economic statistics and that the earth's tilt and travel around its orbit have a substantial effect on prices, markets, and economic activity.

In the commodity markets, such products as com, hogs, and oil are those most affected by seasonality. However, changes are occurring in the seasonality in the agricultural sector because many food products are now produced in and shipped from the southern hemisphere in the "off-season." However, "seasonal" does not mean that from a trading or investment standpoint, a position should be held for many months. In oil, for example, since 1983, the best performance months are July through September, and the weakest is usually October ("Futures Insight: Crude Oil," *Active Trader Magazine*, July 2004, p 70). In orange juice contracts, for example, a seasonal trade for 35 years has been 74% profitable for short trades initiated on June 4 and closed on July 1 (Momsen. 2004). Almost all commodity and stocks have seasonal components that once recognized can be profitable. This is called "entry date/exit date" trading. Price action at or near each date should be analyzed closely because dates are only arbitrary, but once a seasonal pattern is recognized, with proper discipline and observation, it can be very profitable over time.

"Sell in May and go away," usually until October 1, refers to the tendency for the stock market to decline from May to September and rise from October to April. In the past ten years, August and September have been the worst months for performance, and October, November, and January have the best gains, with another small rise in April. May, under this model, is the month to sell, and August is the month to start looking for a bottom. This model has been very

consistent. Notice in Table 9.2 that 14 out of 28, or 50%, of the four-year cycle bottoms (14) occurred in August, September, or October. Not one peak has occurred in October since 1896. Only one peak has occurred in August and only four in September. In other words, in stock prices, there seems to be a downward bias in the late spring and summer and an upward bias in the late fall and winter. In a study by *Active Trader Magazine* ("May-October System, The Trading System Lab," *Active Trader Magazine*, July 2003, p 42), the results of buying on October 1 and selling short on May 15 for ten years, January 1993 through March 2003, showed excellent results. The only problem was the occurrence of large drawdowns on the short side during the speculative bubble in 1997 and 1998. The recovery from such drawdowns was quick, however, and the possibility of another speculative bubble in the immediate future is remote. Thus, this simple seasonal system seems to have merit, even if it is only used as a guide as to when to be aggressive and when to be cautious.

## **JANUARY SIGNALS**

### **January Barometer**

"As the Standard & Poor's goes in January, so goes the year" is a basic contention proposed by the Hirsch's of *Stock Trader's Almanac*. Statistical problems arise with this indicator, despite its popularity. First, if January is up, for example, the year starts with an advance and already has a leg up. Second, because the stock market has had a positive bias over the years, January usually is up as is the market for the year. When the periods and odds are broken down, the predictive value of the January barometer comes within normal statistical probabilities and is without predictive value.

### **January Effect**

The January effect was a condition that lasted for many years. During January, small-cap stocks had a tendency to have abnormal strength. Although some analysts attributed this effect to investors timing trades for tax reasons in December and January, no one could explain why the January effect occurred in the magnitude it did. As a result, it became the darling of anti-random-walk theorists as an example of how the market can establish patterns that are profitable. In recent years, however, the January effect has not worked very well. Some say it has been arbitrated out of business.

## **EVENTS**

Short-term traders sometimes practice what is called "event trading." This is when either a news announcement is due, a surprise news announcement occurs, or a holiday is soon to occur. Holidays are seasonal and thus included here.

The major holidays during the year have shown to have recurring patterns. For example, some analysts have observed an Independence Day pattern. Stock market performance tends to be the strongest five days prior to Independence Day. Diminishing average performance generally occurs the five days following Independence Day. The sixth day after Independence Day is associated with very strong stock market performance. Another example of a holiday pattern is that the two weeks before Thanksgiving seem always to be positive. However, as we have seen in the "Seasonal Patterns" section, November is generally one of the strongest months anyway. Thus, when we deduct for November's habitual strength, the pre-Thanksgiving strength becomes more random and less useful. Is this type of information useful to the individual trader? The answer is up to the individual trader. In most cases, the observed pattern is well within expected statistically random results and is, thus, not helpful.

Another often-heard rule of thumb is to "Buy stocks on Monday and sell stocks on Friday." However, monthly, weekly, and daily patterns have the same statistical problems as holidays. Any patterns observed once adjusted for underlying trend and for randomness show little in the way of consistent return. Even when there seems to be a relationship between an event and the stock market's performance, the additional gain is minimal, hardly enough to cover commissions and slippage costs. Most studies of this sort are usually just fillers in magazines and newspapers and can be relegated to what the Hirsch's call the "indicator graveyard."

## CONCLUSION

Although the statistical methods demonstrating some of the temporal patterns are flawed, several appear to have some merit. Though not something to depend strictly upon, they are consistent enough to be considered when timing long-term investments. These are the long-term Kondratieff cycle, the alternating 17-year cycle of dormancy and intensity, the four-year cycle, and the seasonal cycle. Each has been relatively reliable, statistically sound, with some generous and occasional adjustments, and if applied mechanically have produced substantial results. The other cycles and patterns may occasionally prove to have merit, but the technical analyst should approach their use with great caution.

## REVIEW QUESTIONS

1. Consider K-wave cycle theory, 34-year cycle theory, and the relationship between birth rates and the stock market. Plot on a time line what each of these theories suggests stock market performance will be over the next 50 years. Do the predictions tend to agree and reinforce each other, or do they tend to contradict each other?
2. Consider the four-year cycle. Plot out the pattern this theory would suggest for the stock market over the next 50 years. How well does your plot match what the decennial pattern theory would suggest would be positive years for stock returns?

3. Rosa said that over the past three years, she has invested all of her money in an S&P 500 index fund on October 1 and sold the fund 7 months later on May 15, remaining out of the market until the next October 1. Why do you think Rosa followed this strategy? How well has Rosa done following this strategy over the past three years?
4. Calculate the monthly rate of return in the S&P 500 for the past two years. What about your results is in line with what you would have predicted given the information about seasonality in this chapter? What about your results seems to be contrary to the seasonality theory in this chapter?

# FLOW OF FUNDS

## CHAPTER OBJECTIVES

By the end of this chapter, you should

- Understand why knowledge of the flow of funds is important to determining stock market valuation
- Understand why liquidity plays an important role in potential stock market valuation
- Be familiar with measurements of market liquidity
- Understand the relationship between Federal Reserve policy and the cost of funds

Thus far, we have covered four of the five necessary ingredients for making a reasonable assessment of the markets' future direction. We have looked at the primary trend, as defined in the Dow Theory; at sentiment, to see how different types of investors are thinking and acting; at market indicators, as confirmation of or divergence from the trend; at seasonality; and at other temporal tendencies. In this chapter, we will look at the fifth ingredient. Our focus is on what propels markets in one direction or the other—money, traditionally called the "flow of funds."

For supply and demand to work in any market, money must be available. Money is both the fuel and the lubricant that facilitates transactions. Bartering for stock shares would be ponderous and unwieldy. When money is unavailable or expensive, the supply of stock available for sale increases as investors sell their stocks to raise funds for other purposes. When money is available and relatively inexpensive, it is available for investment in the markets. Accessible money does not necessarily imply a strong market because the available money may be invested elsewhere or just put under a mattress. However, available money seeks the most attractive return, and if the markets are rising, as confidence in the markets builds, more money is funneled into the markets. Finally, if money is limited or becomes excessively expensive, the stock market has the conditions for a decline.

We will look at four major topics in our study of the flow of funds. First, we will look at the money that is available and can be measured internally within the financial marketplace, such as money market funds, margin debt, and public offerings. Second, we will look at the availability of funds not currently invested within the financial markets, such as household liquid assets, liquidity, money supply, and loan demand including consumer credit. Third, we will focus on the cost of funds, looking at short-term interest rates like the fed funds rate and the prime rate and long-term interest rates in the bond market. Fourth, we will consider the important influence that Federal Reserve policy has on all of these variables.

As we look at the indicators in this chapter, we will see that many conventional signals turned out to be incorrect or were outweighed by other indicators during the speculative bubble from 1998 to 2000 and the subsequent collapse between 2000 and 2002. Interestingly, it appears that flow of funds signals work poorly during such emotional times, presumably because stock prices appear to divorce themselves from economics. However, now that the speculative period is over, the flow of funds signals may return to favor and should not be ignored just because of their shortcomings during that earlier period. After all, the flow of funds indicators have a history and a logical reason for existence that goes back 60 years. Their recent failures are more likely due to an anomaly than to a permanent change in the relationship of money and the stock market.

## FUNDS IN THE MARKETPLACE

### Money Market Funds

When aggressive investors or traders become nervous about the stock market, they usually sell stocks and place the funds into money market mutual funds. The amount of money market fund assets is therefore a potential source of funds for reinvestment into the stock market. Because investors and traders also tend to be wrong at market extremes, the level of money fund assets can be a contrary opinion sentiment indicator.

One method of looking at the relationship between assets in money market funds and the stock market is shown in Figure 10.1. It shows that when money market mutual fund assets exceed 12.8% of Wilshire 5000 Stock Index, on average the market advances approximately 14.1% per annum. This is reliable when the figure is first recorded at 12.8%. Conversely, when the percentage declines to below 11.4%, the stock market has a tendency to decline as less money is available and investors are excessively optimistic. This indicator does not give actual buy and sell signals because it shows only the liquidity or illiquidity available to the stock market. It shows the conditions existing that may have an effect on the stock market but is not a mechanical signal generator. Just because there is money in money market mutual funds does not necessarily imply that the money will eventually flow into the stock market. The indicator states only that such money is available for commitment somewhere, perhaps in the stock market.



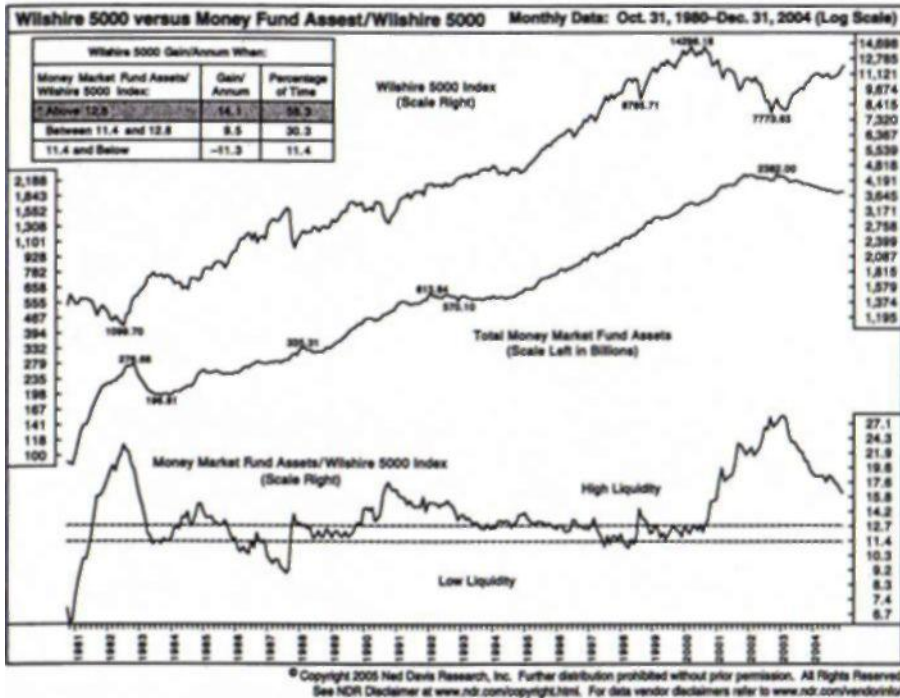


FIGURE 10.1 Money market fund assets and the Wilshire 5000 Index

### Margin Debt

Margin debt, the amount of funds that customers at brokerage houses borrow for commitments in stocks, has historically been considered a sentiment indicator. The theory was that when markets became speculative and attracted the less sophisticated and less knowledgeable investors and traders, who began to trade on margin, the market was near a top. Although this relationship may still be partially true, margin debt as an all-encompassing figure of investor debt may have become obsolete. Today's speculator, instead of borrowing from his brokerage firm, can purchase and sell various highly leveraged derivatives such as options and futures that avoid being reported to the exchanges as margin debt. Thus, the market debt figures may be changing, and certainly an indicator based on them should continually be adjusted.

One way of looking at margin debt is shown in Figure 10.2. It uses a 15-month rate of change as the indicator of margin debt excess. When, over this period, the indicator crosses above -21%, a buy signal is generated, and when it crosses below 61%, a sell signal is generated. This has worked well in the period from 1970 through 2004, but potential change in the parameters must be considered for the future.

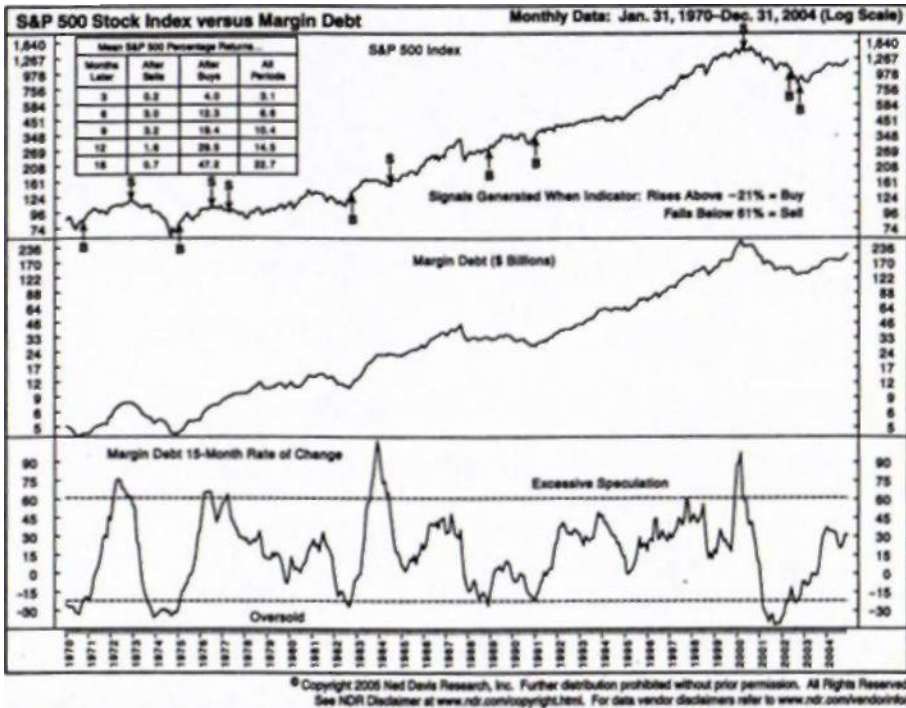


FIGURE 10.2 /Margin debt and the S&amp;P 500 stock index

## Public Offerings

The number of public offerings is a sign of increasing supply of stock being sold on the market. This is usually a bearish sign for two reasons. First, it is a sign that more supply is coming into the marketplace, soaking up available funds. Following the basic principles of economics, as the supply of stock increases, the price of stock will fall. Second, the sellers, usually insiders, are liquidating. These insiders will try to sell stock at times when they think the price is relatively high. Thus, an increase in public offerings is directly related to supply and demand for stock and is also a sentiment indicator.

Ned Davis Research uses the number of offerings rather than the dollar amount so that the figures are not dominated by only a few huge offerings. The number relates more to the broadness of the tendency to sell out than to the actual money being soaked up, making it a more reliable figure of broad insider sentiment. They have found that when the number exceeds 14 per month, the market is heating up and willingly taking out the offerings. There must be demand for any offering to be successful. On the other hand, when more than 29 offerings occur in a month, the number is excessive, and the market is likely at or near a top. The performance record for such parameters has been very good from 1976 through 2004 (see Figure 10.3).

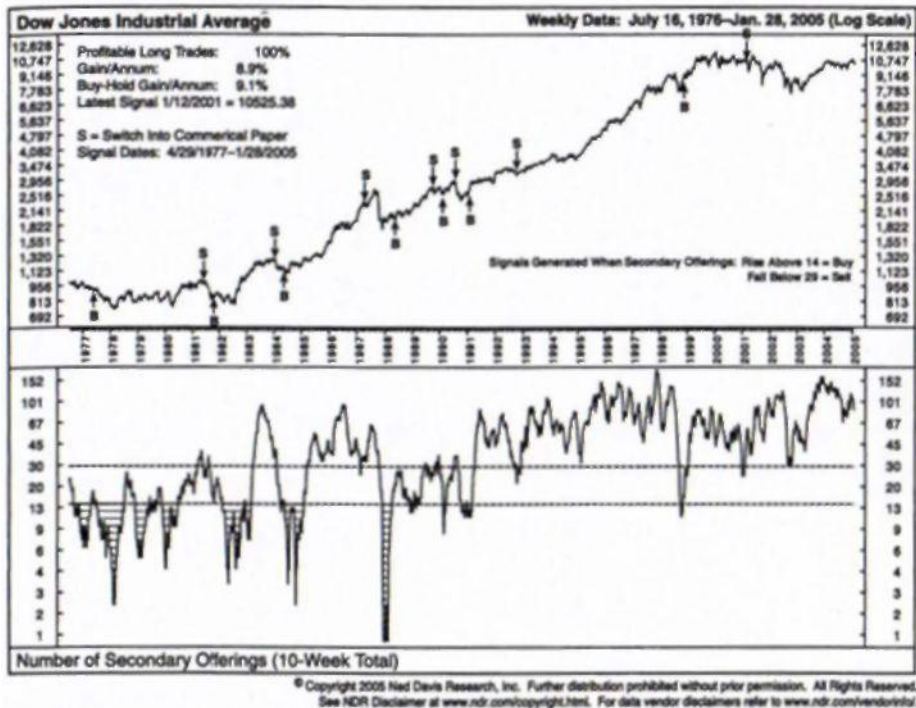


FIGURE 10J Public offerings

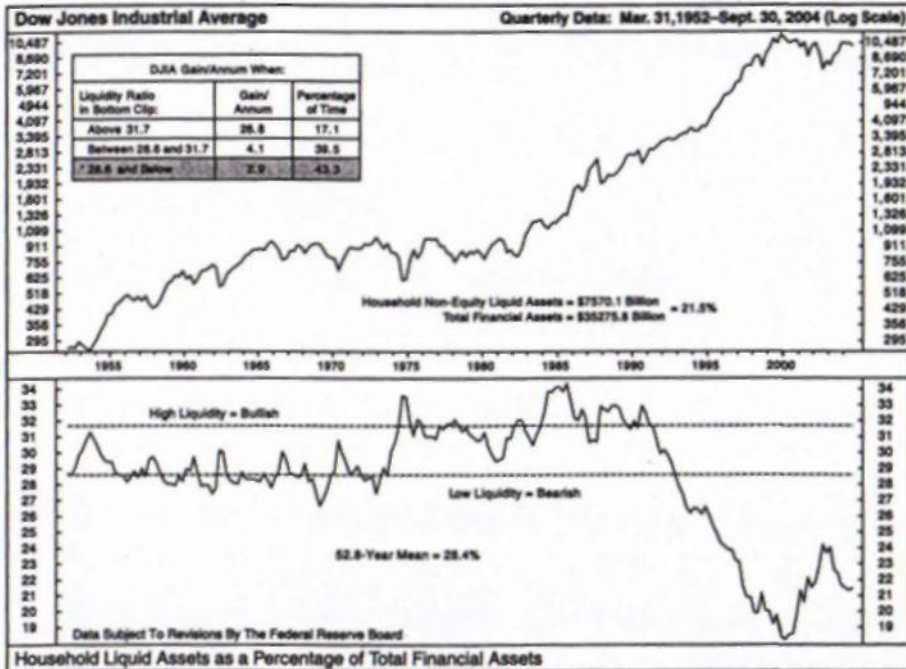
## FUNDS OUTSIDE THE SECURITY MARKET

### Household Financial Assets

Households, like corporations and governments, have different kinds of assets. They have both physical assets, such as cars and houses, as well as financial assets, such as stocks, bonds, mutual funds, and banking accounts. Some of their financial assets are liquid and some are not. Liquid assets can be converted to cash quickly; cash, bank deposits, money market mutual funds, U.S Treasury bonds, notes, and bills are liquid financial assets. Other financial assets cannot always be converted to cash quickly; stocks generally are considered to be more liquid than other financial assets, such as pension funds, retirement accounts, profit-sharing accounts, unincorporated business ownership, trusts, mortgages, and life insurance.

A ratio of liquid financial assets to total assets shows how "liquid" households are—in other words, how easily they can raise cash if they need it. Generally, the more liquid households are, the more able they are to invest in stocks. When household liquidity is high, it is, therefore, favorable for the stock market, while low liquidity is negative for the stock market.

The data presented in Figure 10.4 shows a decline in household liquidity since the early 1990s. This is one reason why consumer debt has risen so strongly since then. It also suggests that households would not likely be able to withstand a severe economic contraction. If a severe economic contraction were to occur, one major source of funds for cash-strapped households would likely be the stock market. Thus, this indicator, although it does not give mechanical signals, does measure the potential funds for stock demand or supply.



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FIGURE 10.4 Household liquidity

### Money Supply

Expansion in the money supply is a measure of potential demand for stock, as well as other assets, and is thus a rough measure of the potential for business and stock market expansion. Increases in the money supply have been historically associated with increases in economic growth and productivity. Although this economic theory is straightforward, quantifying actual money supply growth is not as easy as it seems. Measuring the amount of money in the economy depends upon knowing what money is. If I ask you how much money you have, you would certainly count the currency and coins in your wallet. However, you would also probably think

about the money you have in your checking account. Then, there is also the money you have in a savings account or money market mutual fund. Thus, the definition of money, and what to include in a measurement of money, is not as straightforward as it would initially seem.

The Federal Reserve measures money supply in a number of ways. Table 10.1 shows the various measurements of money that the Federal Reserve uses. The categories are based on liquidity, or the ease in which the financial assets can be converted into cash.

**TABLE 10.1** Measurements of the Money Supply (June 6, 2005)

**Billions of Dollars**

M1	• Currency in circulation	708.8
	+ Travelers' checks	7.4
	+ Demand deposits	301.9
	+ Other checkable deposits	320.8
	Total M1	1338.9
M2	- M1	
	+ Small-denomination time deposits	893.1
	+ Savings deposits including money market deposit accounts	3591.9
	+ Retail money market mutual fund shares	696.3
	Total M2	6520.2
M3*	- M2	
	+ Large-denomination time deposits	1229.5
	+ Institutional money-market mutual fund shares	1044.3
	+ Repurchase agreements	521.4
	+ Eurodollars	427.8
	Total M3	9743.2

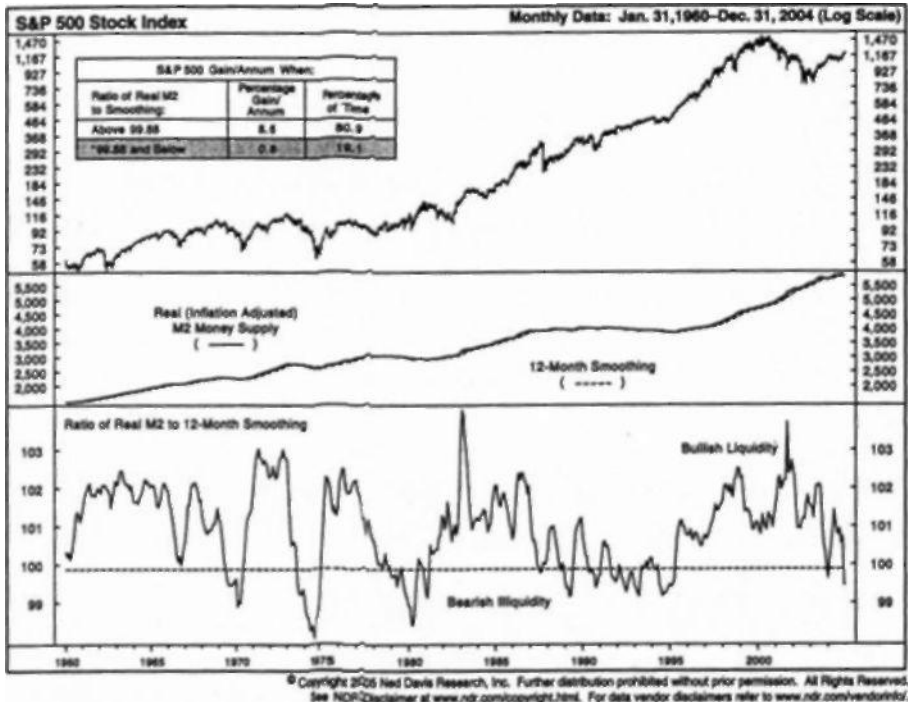
Source: [www.federalreserve.gov/releases/h0/](http://www.federalreserve.gov/releases/h0/)

\* The Board of Governors of the Federal Reserve discontinued publication of M3 as of March 23, 2006.

M1, the narrowest definition of money, is a measure of the most liquid assets in the financial system. It includes currency and the various deposit accounts on which individuals can write checks. M2 is a slightly broader measure of money, which includes various forms of savings accounts. The additional components of M2 are slightly less liquid than the financial assets of M1. Today, the most commonly quoted monetary aggregate is M2, because its movements appear to be most closely related to interest rates and economic growth.

### Signals Using M2 Relative to Its 12-Month Moving Average

Ned Davis Research calculates a ratio of the current M2 to its 12-month moving average. When the current M2 rises above its moving average, M2 is expanding, which is generally a favorable sign for the stock market. Conversely, when the current M2 declines below the recent M2 moving average, the signs are generally negative for the stock market. This relationship is demonstrated in Figure 10.5.



**FIGURE 10.5** Money supply as measured by M2 and the S&P 500

### Bank Loans

Generally, an increase in loan activity, the amount of loans being created and existing, is a sign of increased business activity. It can also be a sign of increased speculation and/or a particular period when banks, because the yield curve is so much in their favor, become less prudent in their lending policies. When loan demand increases, it puts upward pressure on interest rates. Conversely, a decrease in loan demand puts downward pressure on interest rates.

The growth and contraction of bank loans has a bearing on interest rates and on the stock market. As shown in Figure 10.6, Ned Davis Research found that since 1948, a year-to-year rise in bank loans (and leases) greater than 13% indicated an overheated economy and a high likelihood of a stock market decline of 2% per year. When bank loans only expanded at 5.5% or lower, the economy was healthier and the stock market rose on average 11.9% per year.

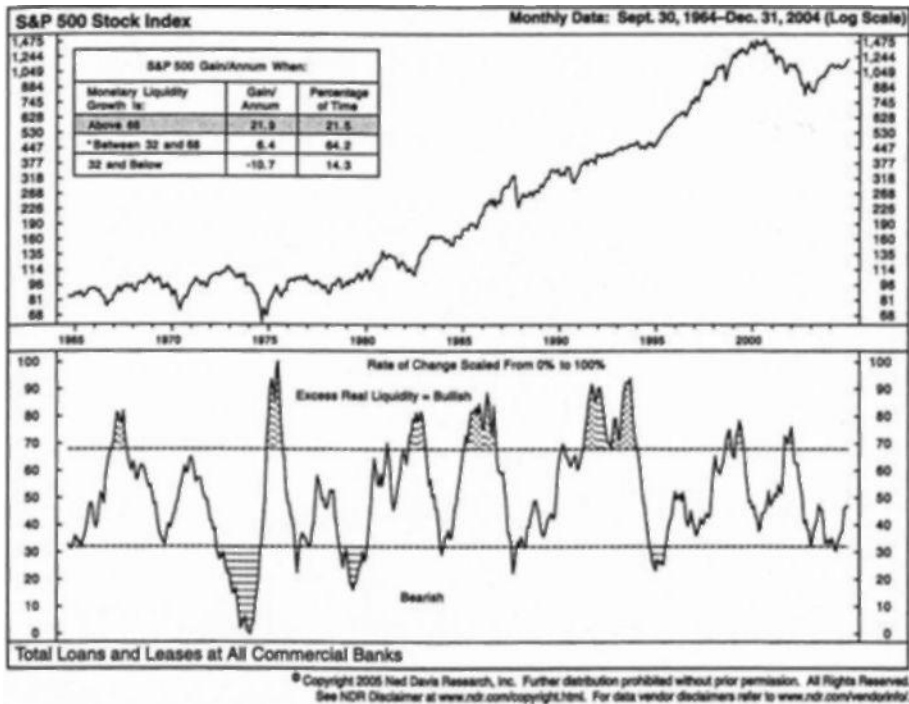


FIGURE 10.6 Bank loans and the S&P 500

## THE COST OF FUNDS

### Short-Term Interest Rates

The theory behind using short-term interest rates as stock market signals is based on two assumptions. First, interest-bearing investments are alternatives to stock investments. In other words, savers make choices about placing their investment funds in interest-bearing securities or

the stock market. When interest rates are relatively high, the interest-bearing securities look relatively more enticing. Second, interest rates directly affect costs for corporations and, thus, corporate earnings. However, the interest rate itself is important because the expected rate of return in the stock market must be greater than the short-term interest rate for investors to invest. When interest rates begin to rise, while the stock market languishes, investment outlooks begin to change. On the corporate and personal level, rising rates translate into rising costs. Whether it is working capital borrowing or adjustable rate mortgage payments, increases in short-term rates have a negative effect on net income and, by extension, on confidence. Alternatively, when rates decline, costs also decline and confidence builds. Furthermore, and regardless of potential reasons, short-term interest rates correlate very closely but inversely with stock market behavior. To know when a major switch in direction in short-term interest rates has occurred is important knowledge as to a probable switch in stock market direction.

As is demonstrated next, the Fed Policy indicators and short-term interest rates are generally very accurate, though often early, as a predictor of stock market direction. During the speculative bubble in 1998 to 2000 and its collapse into 2002, however, interest rates had little effect upon the market's direction. Emotion had overcome logic, and the relationship between short-term interest rates and the market was abandoned for greed to make easy money and fear of missing the next upward wave in stock prices. These indicators, however, should not be discarded blithely because they did not work during that extraordinary period. The last time they did not work was in the 1920s speculative bubble and early 1930s collapse. They were reliable for more than 50 years thereafter. Although they should continually be tested as time goes on, it is only logical that their relationship will begin again now that the bubble has burst. The transition back to the earlier relation, however, may take some time to develop.

## Misery Index

Economist Robert Barro designed the Misery Index in the 1970s when inflation was a special concern. Inflation, coupled with high unemployment, resulted in what economists call stagflation. Barro created the index in an attempt to measure the social and economic cost of high inflation and high unemployment. A high Misery Index indicates that the combination of inflation and unemployment is high and that investors are experiencing a more stressful economic environment.

The Misery Index is a universal index that can be calculated for any country by simply summing the country's inflation and unemployment rates together. The original Misery Index has been modified to create the American Misery Index. The American Misery Index is calculated by adding the inflation, unemployment, and interest rates. Figure 10.7 shows how the level of the American Misery Index has related to the performance of the DJIA since 1966. This figure shows the results of buying the DJIA whenever the American Misery Index falls by 0.3 points and selling the DJIA whenever the index rises by 3.2 points. The trading accuracy of this system is 88% favorable, and its gain per annum is greater than the buy and hold gain per annum. Because the calculation of the Misery Index is easy and low-cost, the profitable results of this trading system appear valuable.



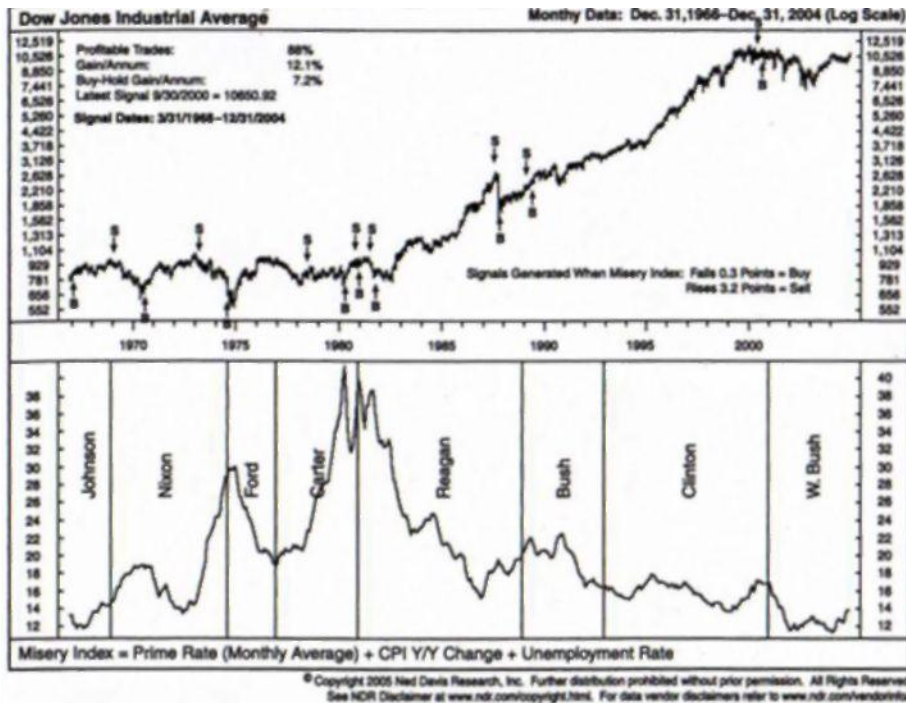


FIGURE 10.7 The Misery Index and the DJIA

### Boucher's T-Bill Rate of Change Rule

Mark Boucher (1999) reports a very simple rule with excellent results. It is simply to buy the stock market when the three-month Treasury bill annual rate of change, not rate, is less than or equal to 6%. The performance of this indicator since 1995, when Boucher ended the calculations for his book, *The Hedge Fund Edge*, has continued to be strong. It is a buy-only strategy and gave a buy signal in October 1995 that remained in effect until September 1998 (a 74.7% gain in the Standard & Poor's 500). It signaled again to buy in August 1999 and quickly sold out in October for a miniscule gain; then it signaled a buy in January 2001, long before the market bottomed in the summer of 2002, but it sold out again only a month later for a small loss, avoiding the worst portion of the 2001-2002 decline. This method is one of the few interest rate-related methods to withstand the major stock market collapse in 2000-2002.

## Zweig's Prime Rate Indicator

Because there is not a single "interest rate" in the marketplace, analysts must decide which interest rate to use for their investing strategies. In his book *Winning on Wall Street*, Martin Zweig (1986) promotes using the prime rate as the easiest measure of short-term interest rates. The prime rate is the base rate at which banks make short-term loans to businesses. Though based on market conditions, it fluctuates much less than some other short-term interest rates because most banks are reluctant to incur the cost of adjusting loan payments every time the short-term interest rate ticks up or down. The prime rate lags behind changes in the short-term interest rate because banks only change it when an obvious change in short-term rates has occurred. In relation to the stock market, short-term interest rates tend to lead the stock markets inversely, and thus the lag in the prime rate's change in direction occurs close to the turning point in the stock market.

Zweig's indicator uses a prime rate of 8% as a benchmark. This may change over time, but for the past 50 years, it has been sufficient. His signals are to buy on any initial cut in the rate when the prime rate is below 8%, and to sell on any full 100 basis point hike or two sequential hikes in the prime rate. When the prime rate is 8% or higher, buy on a full 100 basis point cut or two sequential cuts in the rate, and sell on any initial hike. An initial hike occurs when the previous direction has been downward and suddenly the prime rate is raised.

Since Zweig's last paperback edition of his book in 1997, this model has only given five signals—three sells and two buys—and the performance has deteriorated. The first two sell signals, in March 1997 and August 1999, were premature, and performance was eclipsed by the later stages of the great bull market in the late 1990s. The third sell signal occurred in July 2004 and has yet to prove out. The buy signal in October 1998 was profitable, but the buy signal in February 2001 was premature by almost a year and a half. Thus, this method has failed when the market was in a speculative phase as it was during the 1990s or in a crash stage as it was in the early 2000s.

## FED POLICY

The Federal Reserve System ([www.federalreserve.gov](http://www.federalreserve.gov)), often referred to as "the Fed," is the independent federal organization that determines and implements monetary policy for the United States. The Federal Reserve's policy regarding the money supply is the principal determinant of short-term interest rates. The Federal Reserve has three main tools for adjusting the money supply: changing the amount of reserves that banks are required to hold, changing the discount rate, and buying and selling U.S. Treasury and federal agency securities through its open market operations. The third tool (open market operations) is the one that the Fed most often uses.

When the Federal Reserve purchases securities, it adds money to the banking system. Because banks then have more cash in reserve, they are more likely to make loans, and interest rates tend to fall. Another way to look at this relationship is that the Fed's purchase of bills represents increased demand for bills. As the demand for bills rises, bill prices rise and short-term interest rates decline.

Fed selling of government securities has exactly the opposite impact. As money is used to pay for these securities, reserves are drained from the banking system. When there is less money in the banking system, banks can make fewer loans, and interest rates tend to rise. Fed selling of government securities represents an increased supply of securities in the marketplace, and, thus, the price of these securities falls. As bill prices fall, interest rates rise.

The Fed uses open market operations to reach a federal funds rate target. The fed funds rate is the interest rate at which banks borrow from each other. Although the fed funds rate is not set by the Federal Reserve, Fed action greatly impacts this rate. If the Federal Reserve makes open market purchases, banks will have more money in reserve. Fewer banks will need to borrow reserves from other banks, and more banks will have excess reserves that they want to lend. This, in turn, places downward pressure on the federal funds rate. When the Fed sells securities, bank reserves decrease, and as bank reserves decline, more banks want to borrow and fewer banks want to lend in the fed funds market. Thus, the fed funds rate will rise.

The Federal Open Market Committee (FOMC) meets about every six weeks. At these meetings, the FOMC establishes a fed funds target rate. Although the minutes of each FOMC meeting are not made available to the general public until three weeks after the meeting, the FOMC announces its fed funds target rate at the conclusion of the meeting. By implication, this fed funds rate target tells the public whether the Federal Reserve is pursuing a restrictive or expansionist policy. Because short-term interest rates are so important to business and the stock market, and because the Federal Reserve has such a large impact on short-term interest rates, it is important for the analyst to be aware of Fed policy and the subtle changes in that policy.

## Predicting Federal Reserve Policy Changes

### Fed Policy Futures

The FOMC meets in private and only provides a brief announcement about its strategy immediately following its meeting. Because a change in Fed policy can have a significant impact on the financial markets, people try to anticipate and predict Fed policy changes. The faculty at The University of Iowa Tippie College of Business operate a small-scale (maximum investment of \$500) futures market known as the Iowa Electronics Market (TEM) ([www.biz.uiowa.edu/iem/markets/fedpolicyb.html](http://www.biz.uiowa.edu/iem/markets/fedpolicyb.html)). One of the IEM markets is on the prospects for the Federal Reserve to change the fed funds target rate at their next several scheduled meetings. This futures market has been very reliable in predicting, up to a month or more before, the direction of Federal Reserve Policy with respect to the direction of its target rates.

### The Greenspan Model

Although the Federal Reserve is in charge of monetary policy and is concerned with the overall health of the economy and the financial markets, the Federal Reserve seldom makes direct comments about the health of the stock market. However, economist Ed Yardeni ([www.yardeni.com](http://www.yardeni.com)), in the back pages of a Fed report, discovered the Greenspan Model, also

known as the Fed's Stock Valuation Model. This model gives a general indication of whether the Federal Reserve sees the stock market as overvalued or undervalued. It is a valuation model that determines if the stock market is too high or low based on the stock market earnings yield relative to yield on the 10-year U.S. note. It is calculated as follows:

$$\frac{\text{Expected 12-Monthly Earnings}}{\text{Price of the S\&P 500}} \div \text{Yield on the 10-Year U.S. Treasury Note}$$

Although this is an extremely easy-to-calculate indicator of general market value, there are several criticisms of this model. The principal criticisms of the model are that 1) it is too simplistic, 2) a better correlation exists between actual reported earnings than estimated earnings, and 3) it doesn't include inflation, an important factor in determining long-term interest rates.

### Zweig's Fed Indicator

As part of his monetary model, Martin Zweig (1997) developed a simple indicator to follow Federal Reserve monetary policy that has had an excellent history of anticipating major stock market changes in direction. The indicator uses the fed funds target rate, bank reserve requirements (not changed since 1981 and effectively abolished in the 1990s except for checking accounts, which are minor in importance), and margin requirements (for stock market borrowing, the last change of which was in 1981). The original indicator was composed of two components—the fed funds target rate and both margin and bank reserve requirements. Now that the reserve requirements have been effectively abolished, the most important ingredient is the fed funds target rate.

The indicator is the sum of points given for various changes and times of changes in the fed funds target rate. A minus point is given to the indicator for each hike in the fed funds target rate. This wipes out any previous plus points. The minus point remains for six months and then is discarded. After six months beyond the last rate hike, the indicator goes to zero.

Plus points have a greater effect on the stock market than minus points. When the Federal Reserve initially cuts its fed funds target rate or cuts its rate after two years of inactivity, two plus points are added to the indicator and all minus points are eliminated. One point gained from the initial two is eliminated after six months, and the remaining plus point is eliminated after a year. Each subsequent cut adds one more point and likewise is eliminated after six months.

Signals are generated by the following sum of points at any one time:

- Extremely Bullish +2 or more
- Neutral 0 to +1
- Moderately Bearish -1 to -2
- Extremely Bearish -3 or less

Between 1958 and 1996, Zweig (1997) reports that, using the Standard & Poor's 500, the Extremely Bullish signal was correct 88% of the time and was associated with a gain of 21.6%

per year better than a buy-and-hold. The Extremely Bearish signal was correct 70% of the time and turned in a minus 14.5% per year versus a buy-and-hold.

Zweig's data ends when his book ends in 1996. Since then, his Fed indicator has generated several signals. As with other interest rate-related signals, Zweig's Fed indicator signal performed poorly during the speculative bubble. A sell signal in November 1999 closed the buy signal that occurred in 1995 with a gain of 104.2%, but the signal was far too early and missed the last 32% gain into the top in 2000. Again, a buy signal in January 2001 was far too early, and an investor following the signal would have been in the market for the entire decline into October 2002. A sell signal in June 2004 has yet to be played out, but as of this writing it appears to be either wrong or far too early.

### Three Steps and a Stumble

Similar to Zweig's Fed policy indicator and in line with the desire to measure when the Federal Reserve is tightening credit, Edson Gould, a legendary technical analyst from the 1930s through the 1970s, developed a simple rule about Federal Reserve policy that has an excellent record of foretelling a stock market decline. The rule states that "whenever the Federal Reserve raises either the federal funds target rate, margin requirements, or reserve requirements three consecutive times without a decline, the stock market is likely to suffer a substantial, perhaps serious, setback" (Schade, 2004). This simple rule is still relevant. Although it tends to lead a market top, it is something that should not be disregarded. As shown in Figure 10.8, the rule has been followed by a median decline of 17%. Only two possible incorrect signals were given since 1915: the 1928 signal, prior to the 1929 crash, was possibly too early, and the 1978 signal was probably too late. Thus, this signal has an accuracy record of at least 87.5%.

### Two Tumbles and a Jump

The Two Tumbles and a Jump indicator was first mentioned in Fosback's 1973 edition of *Market Logic*. It is essentially the opposite of Gould's Three-Steps rule. Although it uses changes in the Federal Reserve funds target rate, margin requirements, and reserve requirements, it looks for two consecutive declines, or tumbles, in either of these policy variables. It has an excellent history of predicting the stock market rises. As Figure 10.8 demonstrates, the percentage of accuracy since 1915 is 84%, with some of the errors considered questionable.

One way to use these two interest rate indicators, which the evidence shows to be superior, is to take them as warnings of important changes in market direction. They are not necessarily strict signals by themselves. However, if direction action is taken based on one of them, a reversal in direction from the signal direction would be signaled if the market exceeded its earlier high or low. Thus, if the Three-Steps rule gives a sell signal and the market begins to decline, a buy signal would be generated if either the market broke above its earlier highs or a Two-Tumble signal occurred. The same protection could be used for the Two-Tumble rule in the opposite direction. Essentially, these are "stops" that would prevent any major loss from future incorrect signals, rare as they may be.

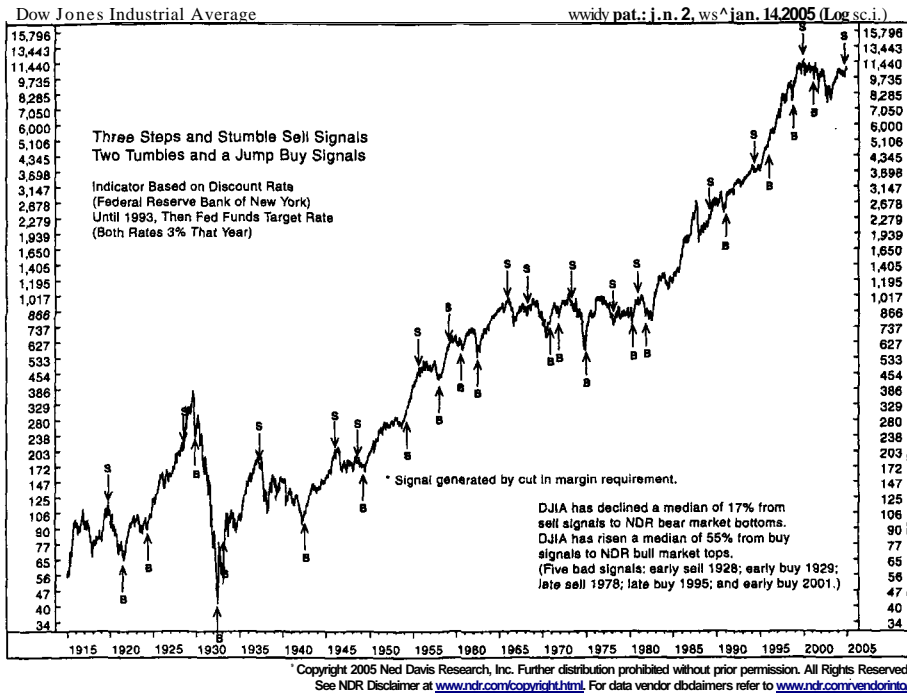


FIGURE 10.8 Three Steps and a Stumble and Two Tumbles and a Jump

## Long-Term Interest Rates (or Inversely, the Bond Market)

Long-term interest rates are related to but not perfectly correlated to short-term interest rates. The Federal Reserve effectively controls short-term interest rates through its various policy measures, but it does not have as tight control of the long-term market. When we speak of long-term interest rates, we speak of the bond market. Long-term interest rates and bond prices are inversely related. When long-term interest rates rise, bond prices fall, and when long-term interest rates fall, bond prices rise.

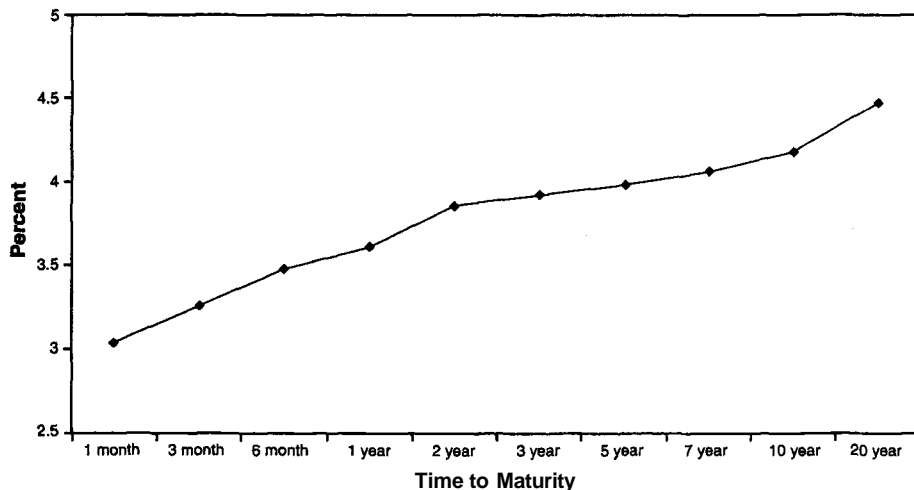
Relationships between the bond market (or long-term interest rates) and the stock market also exist. The relationships between bonds and stocks have much to do with the payout for security holders, coupon payments for bondholders, and dividends for stockholders. Generally, investors view bonds as long-term investments with a steady, fixed coupon return, whereas stocks are long-term investments with a variable, less-predictable return. Both markets, however, can fluctuate widely.

For long-term outlooks (as opposed to long-term interest rates), therefore, it is important to know the historic relationship between these investments. As a rule, long-term bonds have tended

to move in the same direction as the stock market. In other words, long-term interest rates have tended to move in the opposite direction from the stock market. As the bond market makes a major bottom, the stock market often makes a major bottom also. At tops, the bond market tends to lead the stock market and is thus, very often, an early indicator of trouble ahead for the stock market. As in short-term interest rates, this relationship broke down during the period of the speculative bubble and collapse between 1998 and 2002. Prior to that period, the relationship had been steady over 50 years and will likely return.

## Yield Curve

The yield curve ([www.ustreas.gov/offices/domestic-finance/debt-management/interest-rate/yield.shtml](http://www.ustreas.gov/offices/domestic-finance/debt-management/interest-rate/yield.shtml) or [stockcharts.com/charts/yieldcurve.html](http://stockcharts.com/charts/yieldcurve.html)) is a graphical relationship of the yield on bonds with various lengths of time to maturity. A yield curve for July 15, 2005, is shown in Figure 10.9. In this graph, we can see the relationship between short-term interest rates and long-term interest rates. Usually, the yield curve will be upward sloping, indicating that long-term interest rates are higher than short-term interest rates. A steeper yield curve represents a larger spread between long-term and short-term interest rates, while a flatter yield curve means a smaller spread between long-term and short-term interest rates. Because long-term interest rates usually exceed short-term interest rates, the upward sloping yield curve is the *normal yield curve*; however, in certain market conditions, an *inverted yield curve* can occur in which longer-term interest rates fall below shorter-term interest rates.



Source: [www.ustras.gov](http://www.ustras.gov)

FIGURE 10.9 The yield curve For July 15, 2005

Banks traditionally practice maturity intermediation, borrowing short-term funds and lending to corporations or individuals over longer periods. They are thus said to "borrow short, and lend long." Their profit depends on the spread between the cost of funds, the short-term interest rate, and the return from loaned funds, the long-term interest rate. As short-term interest rates rise, presumably from Federal Reserve policy action, and long-term interest rates remain steady or decline, the yield curve becomes flatter and the banks are unable to profit as much from the spread. The yield curve, therefore, is a crude measurement of bank potential profitability. Bank profitability affects interest rates, and interest rates affect the stock market. Thus, the yield curve is a forecaster of stock market direction, and historically it has had an acceptable record of anticipating major rums in the stock market.

In Figure 10.10, it is plain that a steep yield curve is favorable for the stock market and a flatter curve is unfavorable.

## CONCLUSION

Flow of funds indicators, with the exception of the time during the speculative bubble from 1998 through its collapse in 2002, are a good means of assessing the available funds for investment. We have looked at some indicators of funds within the marketplace, from outside the market, place, and their interest rates. The most reliable signals seem to come from interest rates. Some technical analysts believe that the study of the flow of funds is best left to quantitative analysts or "quants," who closely follow the historic relationships between equities and fixed income securities. It may be many years for even those who subscribe to the flow of funds concept to believe in their monetary indicators after the experience of the late 1990s and early 2000s period.

## REVIEW QUESTIONS

1. Explain how the amount of money in money market mutual funds can be a predictor of stock market performance. Calculate the ratio of money market mutual fund assets to the Wiltshire 5000 index using the most recent statistics available. (Money market mutual fund asset statistics are included in the Federal Reserve Flow of Funds Report Z. 1 in Chart L. 122, available electronically at [www.federalreserve.gov/releases/](http://www.federalreserve.gov/releases/).) What does this ratio suggest about future stock market performance?
2. Why would many public offerings occur at market tops (and few at market bottoms)?
3. Why might household liquidity be related to stock market performance?
4. What has happened to the federal funds target rate over the past year? What does this suggest about stock market performance?
5. Gather data for the yield curve this week and for the yield curve one year ago. What changes do you notice? What impact do you think this will have on the stock market?



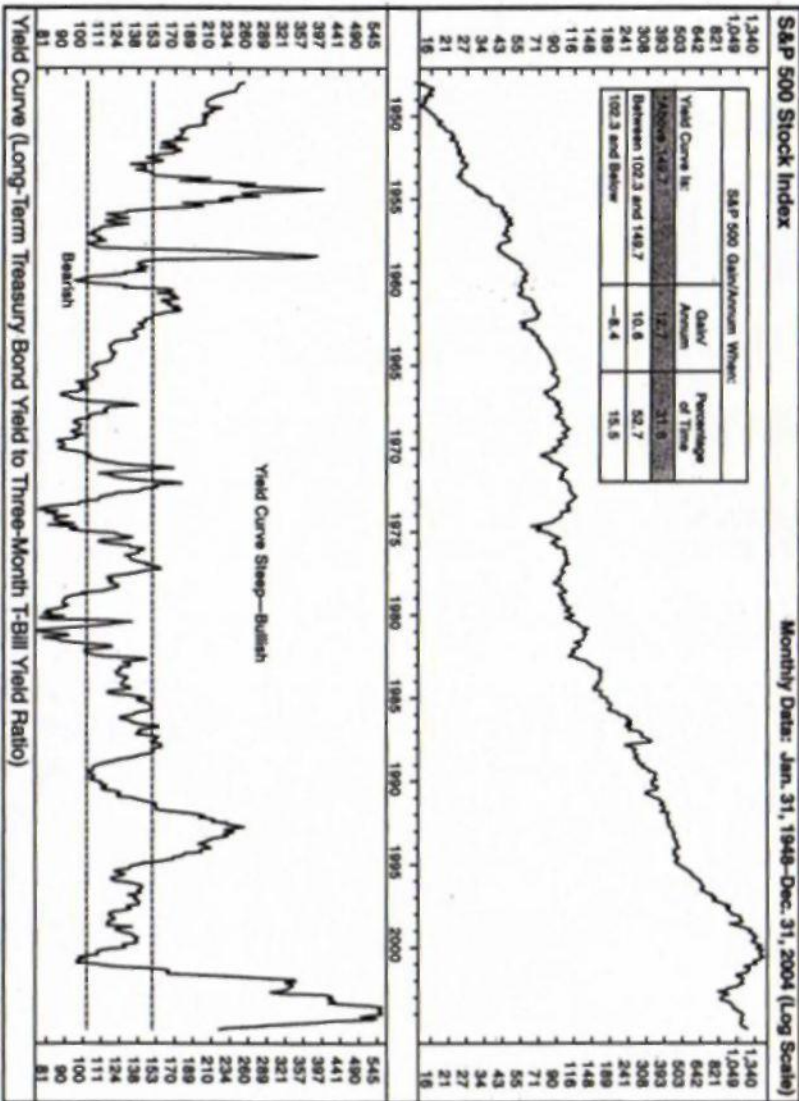


FIGURE 10.10 Yield curve steepness and the S&amp;P 500

# **TREND ANALYSIS**

**CHAPTER 11 HISTORY AND CONSTRUCTION OF CHARTS**

**CHAPTER 12 TRENDS—THE BASICS**

**CHAPTER 13 BREAKOUTS, STOPS, AND RETRACEMENTS**

**CHAPTER 14 MOVING AVERAGES**

# HISTORY AND CONSTRUCTION OF CHARTS

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The advantages of presenting price information in a picture, or chart, format
- The construction of line charts
- The construction of bar charts
- The construction of candlestick charts
- The construction of point-and-figure charts
- The differences between arithmetic and logarithmic scales

"A chart is like a cat's whiskers. A cat's whiskers tell the cat which way the mouse will turn and thus which way to pounce. The mouse doesn't think about which way it will run, but the cat must anticipate that direction. Likewise, the market doesn't know which way it will turn, but the speculator must anticipate that turn regardless. He uses a chart as his whiskers." —Sieki Shimizu (1986)

A chart is the traditional tool of the technical analyst. Charts are merely graphical displays of data. Many chart varieties have evolved over the centuries, but the basic principle of graphing price and other important information is the cornerstone of technical analysis. Indeed, in many countries, technical analysts are still called "chartists," even though hand-drawn charts have become somewhat antiquated because computers display and, in some programs, analyze the price data. Nevertheless, some specialists, floor traders, market makers, and technical analysis departments for brokerage and management firms still maintain hand-drawn charts. These analysts believe that by drawing a chart, rather than allowing a computer to draw a chart or a publishing service to deliver a chart, the fine points of price changes, trends, and patterns become

more visible. By taking the time and effort to draw each day's activity, a personal "feeling" for the price action develops that is more intimate than that gained from a mechanical drawing.

From these charts, technical analysts recognize patterns and trends that can hopefully be useful in trading and investing. Of course, the chart method is also subject to considerable criticism largely because the recognition of patterns and trends is subjective, based on the analyst's skill and experience. These human attributes are difficult to quantify and, thus, difficult to test. Some analysts are now using pattern-recognition systems and other sophisticated computerized methods, and early results have demonstrated that, indeed, many of the traditional chart patterns have some predictive value. Charts have other uses, however, if only to observe quickly the history of prices. The benefits of chart use outweigh the problems associated with their interpretation.

#### **10X11.1** Benefits of Using Charts

In his book, *Technical Analysis*, Jack Schwager (1996) outlines numerous benefits to the investor of using charts. These benefits include the following:

- Charts provide a concise price history—an essential item of information for any trader [or investor].
- Charts can provide the trader or investor with a good sense of the market's volatility—an important consideration in assessing risk.
- Charts can be a very useful tool to the fundamental analyst. Long-term price charts enable the fundamentalist to isolate quickly the periods of major price moves. By determining the fundamental conditions or events that were peculiar to those periods, the fundamentalist can identify the key price-influencing factors. This information can then be used to construct a price behavior model.
- Charts can serve as a timing tool, even by traders who base their decisions on other information (e.g., fundamentals).
- Charts can be used as a money management tool by helping to define meaningful and realistic stop points.
- Charts reflect market behavior that is subject to certain repetitive patterns. Given sufficient experience, some traders will uncover an innate ability to use charts successfully as a method of anticipating price moves.
- An understanding of chart concepts is probably an essential prerequisite for developing profitable technical trading systems.
- Cynics take notice: Under specific circumstances, a contrarian approach to classical chart signals can lead to very profitable trading opportunities [when those signals fail].

## HISTORY OF CHARTING

The Japanese have the best records of chart use going back to around 1870, when some believe that an "Englishman" brought chart analysis to Japan. On the other hand, the "opening of commodity exchanges in Western Europe (1561) and Japan (1654) provided the necessary environment for the development of the chart" (Shimizu, 1986, p 14).

The information charted and the method of charting often flows from how the market being analyzed operates. For example, the current use of high and low in a bar chart is not feasible in those trading markets that settle a price only once a day.

Plausibly, the first type of chart was just a simple plot on paper of a number, either amount or price, and a date. In early Japan, for example, rice was traded by amount. Instead of a price per bag, it was the number of bags per price that was recorded by the famous rice trader Sokyū Honma in the 1750s. As markets began to trade more frequently during the day, the chart became more complex. A high and low price could be recorded, and eventually as multiple trades occurred, an open and close price could be added. Volume was recorded much later when more complete and public records were available. At first, the prices were just recorded by witnesses located in the marketplace. Eventually, markets became better organized, and prices and amounts were made publicly available.

Thomas Alva Edison's invention of the ticker tape, which was patented in 1869, allowed for point-and-figure charting, because such charts required knowledge of every price at which an item had traded during the day. Without the ticker tape, the gathering of this information would have been difficult in markets with multiple trades during a day.

### 10X11.2 What Is a Ticker Tape?

A "tick" is any movement, up or down, in the price of a stock. Information regarding stock transactions is recorded on a ticker tape. By watching the ticker tape, an investor is able to keep abreast of changes in stock prices. The first ticker tape was developed in 1867, following the invention of the telegraph machine. This technology allowed information to be printed in a shorthand format on a narrow strip of paper, or tape. Messengers would run a circuit between the New York Stock Exchange (NYSE) trading floor to brokers' offices, delivering tapes of the most recent transactions. Brokers would place an office near the NYSE because the closer they were to the trading floor, the more quickly they could get ticker tapes and the more up-to-date their information about recent stock transactions would be. Technology improved over the years, providing faster access to stock transaction data. In the hectic trading days of the late 1960s and early 1970s, the ticker could not keep up with trading, and there was a period that the markets were closed on Wednesdays to facilitate the clearing of trades. It was not until 1996 that the real-time electronic ticker provided up-to-the-minute transaction data. Today, you will see immediate stock market transaction figures on

*Continued*

TV news shows and web sites. Although these figures are reported electronically, and the actual tape is no longer used, the name "ticker tape" is still used when a running list of trades is shown on TV or a quote machine.

When you are watching a ticker tape, you will see information recorded in a format such as

**HPQj..@23.16»1.09**

*or*

**Ticker Symbol share.TtKjeoOPrice Traded, Change Direction, Change Amount**

The first information given is the ticker symbol, the unique characters that are used to identify a particular company. In the preceding example, HPQ indicates that this information is for the stock of Hewlett-Packard Co. Next, the volume of shares traded is reported. 2K indicates that 2,000 shares were traded. The price per share for the particular trade is then quoted. Next, an up or down triangle will appear, indicating whether this trading price is higher or lower than the previous day's closing price. Finally, the difference between the current trading price and the previous closing price is reported. Reading this ticker tape, we can tell that 2,000 shares of Hewlett-Packard stock just traded at \$23.16 a share. We can also tell that this is \$1.09 higher than the previous day's closing price of \$22.07.

Modem technology has greatly simplified the task of chart construction. Computer power has replaced much of the tedious human work. Now, even basic home computers have spreadsheet programs, such as Excel, that can store daily stock price data and create a variety of charts used by technical analysts. In addition, other sophisticated software programs that are specifically designed for technical analysis are readily available. These programs not only plot charts and indicators or oscillators but also can test trading rules. Examples are Tradestation ([www.tradestation.com](http://www.tradestation.com)), Metastock ([www.equis.com](http://www.equis.com)), and Amibroker ([www.amibroker.com](http://www.amibroker.com)). Today, the technical analyst can focus much more time and attention on analysis and much less on chart construction.

Over the years, technicians developed several different approaches to chart construction. The four main categories of charting that we discuss in this chapter are line charts, bar charts, candlestick charts, and point-and-figure charts. Each approach has its own features, benefits, and drawbacks. Whichever method a technical analyst chooses to use, charts serve as the technical analyst's roadmap. Chans give a quick and concise picture of past price action.

For example, look at Table 11.1. This table contains the closing price for Krispy Kreme Donuts (KKD) for each trading day from December 1 through December 31, 2004.

TABLE 11.1 Stock Price Data for KKD in Tabular Form

Date)	Open	High	Low	Close	Volume)
1-Oec0l	10.05	10.59	10.05	10.59	1695800
2-Dec04	10.51	10.6	10.3	10.42	1391000
3-0ec04	10.41	10.44	10.14	10.24	1201500
6Oec04	10.05	10.14	9.89	10.03	1925300
7Oec04	10.05	10.1	9.95	9.99	1323100
8-0ec04	10.06	10.06	9.9	9.95	1311500
9Oec04	9.98	10	9.8	9.97	1244000
10Oec-04	9.94	9.97	9.8	9.85	754800
13-Dec04	9.84	9.97	9.61	9.68	2380100
14-Dec04	9.54	10.18	9.5	10.03	3725800
15-Dec04	10.07	10.67	10.07	10.63	2595000
16-Dec-04	11	12.6	10.76	11.55	8855900
17-Dec-04	11.71	11.75	11.07	11.5	2940100
20Oec04	12	12	11.1	11.15	2445100
21-Dec04	11.15	11.44	11.15	11.29	1285800
22-Dec04	11.26	11.66	11.25	11.52	1760300
23-Dec04	11.62	11.66	11.39	11.53	1270900
27-0ec04	11.54	11.89	11.54	11.84	1749000
28-Oec04	11.83	12.18	11.81	12.15	2171900
29Oec04	12.12	12.83	12.01	12.8	3779500
30Oec04	12.89	12.9	12.3	12.4	2468000
31-Oec04	12.48	12.62	12.19	12.6	1630600

Source: [WWW.LLNONCEYONIQ.COM](http://WWW.LLNONCEYONIQ.COM)

It is difficult to look at the 22 closing prices in this table and get an idea of whether the stock price trend is up, down, or sideways. Now look at Figure 11.1.

This chart contains the same information as Table 11.1. Notice how much easier it is to process the information when it is provided in the picture form of Figure 11.1 rather than in tabular form. As the old saying goes, "A picture is worth a thousand words." With just a glance at the chart, you have a roadmap of where prices have been; in a fraction of a second, you can easily spot the highest prices and lowest prices that occurred during the period. A chart quickly transforms a table of data into a clear visual representation of the information.

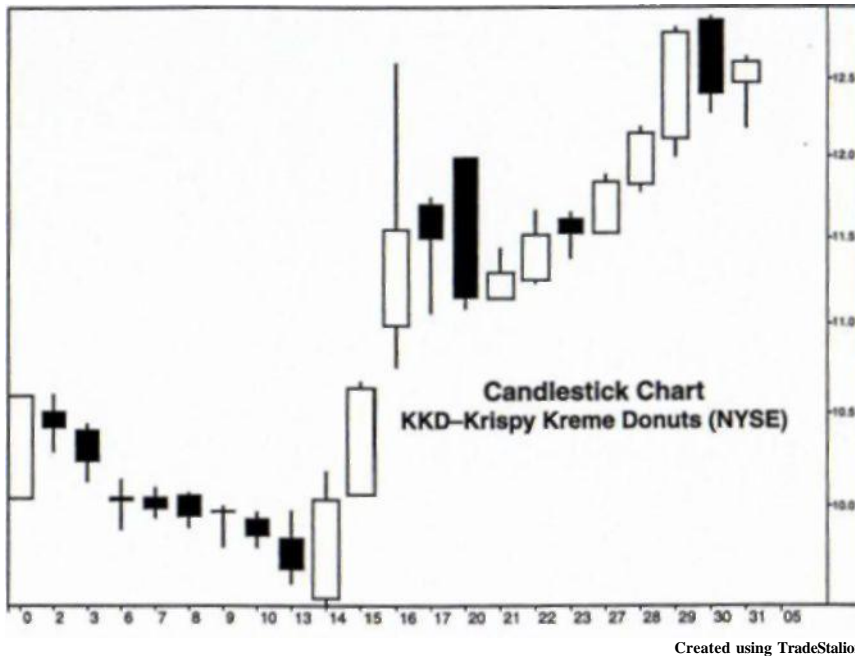


FIGURE 11.1 Stock price information for KKD in chart form (dairy: December 1-31, 2004)

## WHAT DATA IS NEEDED TO CONSTRUCT A CHART?

To construct reliable charts, the technical analyst must be sure of the trustworthiness of the data. During a normal trading day, many errors appear on the tape, from which most data is originated, that must be screened out and adjusted. Some trades report the wrong price or volume; some trades are in error and must be broken; and some trades occur out of order. When a price error occurs at a high or low for the trading day, the error is especially troublesome because it affects daily calculations of averages and oscillators using highs and lows. It is therefore very important that any data used for charting is extremely "clean" and reliable.

In addition to trading errors, other data errors can occur through stock splits, dividends, offerings, and distributions. In the commodities markets, because contracts have a settlement date at which trading halts, incorrect calculation of the time and price linkage between contracts may affect longer-term technical patterns and trends. Calculation of these linkages into time series data for a longer-term perspective is never precise. The results are called either "nearest future," "perpetual series," or "continuous series" and are provided by many data vendors and exchanges (see Box 11.3). There are other methods of joining the different contracts into a continuous series, but all have serious problems for the analyst wishing to test longer periods of data. Schwager (1996) recommends the continuous contract as the best method for such tests.



**BOX 11J Linked Contracts**

For very short-term testing and analysis of futures contracts, the actual contract can be used. The test period must be extremely short, however, because the liquid portion of any contract, the period when active trading occurs, is only a portion of the contract time span. Thus, the data available for realistic study is short, and to test a number of signals, they must occur at very short intervals.

Once the trading signal horizon exceeds an hour, however, a linked contract must be calculated to provide sufficient data for testing. There are three basic types of linked contracts: the nearest future, the perpetual, and the continuous. Each has its advantages and disadvantages.

The nearest future is just a plot of each futures contract as it expires and is replaced by a new contract. Its problem is that the transition between contracts is usually accompanied by a gap at the rollover into the new contract. Thus, this method is useless for testing trading systems, even though the contracts plotted are historically correct. It is the least preferable method of analyzing longer-term futures price moves.

The perpetual contract (also known as the "constant-forward"), to avoid the nearest future rollover problem, uses a constant forward price, namely the anticipated price some specific period ahead. It comes from the interest and foreign exchange markets where constant forward contracts are traded. The adjustment to the futures markets assumes a price that is adjusted for the time between a contract series that is current and one that is beyond the specific constant forward period. The perpetual price then is the price of the current contract and the forward contract each weighted by the amount of time remaining in the hypothetical forward period. Thus, the perpetual price avoids the problem of the rollover by smoothing the two contract prices, one near and one far out, in a gradual manner as time progresses. The problem with this method is that it is not real. The actual prices recorded in the perpetual contract never occurred. It is thus not a suitable method for testing a technical trading system.

The third method, the continuous contract, is more realistic but cannot be used for calculating percentage changes over time. It is constructed by adjusting for the premium between the current contract price—the price of the contract into which the trader rolls his position at a specific rollover date, say 15 days before expiration—to avoid the trading bias that occurs as the contract nears its end. This continuous contract then carries the adjustment into the future. It reflects exactly what would have occurred to a portfolio that invested in the first contract and rolled over each contract at its rollover date. It is thus a realistic expression of the history of the futures contract and can be used for testing past data. It has two problems, however. One is that because the adjustments are additive, it cannot be used for percentage returns; and two, the ending price of the continuous contract is not the same as the current price of the current contract. The continuous contract is used primarily for testing trading systems.

## WHAT TYPES OF CHARTS DO ANALYSTS USE?

### Early Charts

In early markets, when the price for a security or good might be established only once or twice a day, the chart was extremely simple. It was merely a graph of closing prices connected by a line, sometimes directly connected, and sometimes connected by perpendicular lines. In Japan, this type of chart was called a "tome" chart from the word "tomene," which means "close." In the Western world, this type of chart is still used and is called a "line" chart

When trades became more frequent, chart forms took two paths. The first and still most common style was borrowed from the bar graph or stick graph and portrayed the high and low with a "floating" vertical line not connected to the base line. These were called "bar charts" or "vertical line charts." Interestingly, in Japan, where many chart types were developed, the original plotting of price data was from right to left rather than the now-universal method of plotting from left to right. This bar style then evolved into the "candlestick" chart, which uses the same information as the bar chart but has a more appealing appearance to the eye. The other path was called the "price movement line," where prices were recorded as they occurred, and only the ones that deviated from earlier prices by a specified amount were graphed in a line. This method of price plotting is the forerunner to the modern "point-and-figure" chart

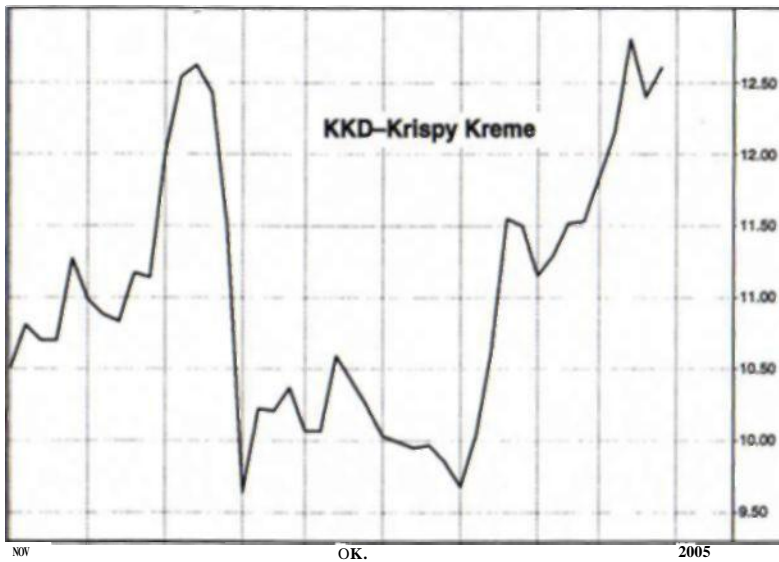
Today, the three most common types of charts that record prices at given time intervals (such as hourly, daily, weekly, or monthly) are line charts, bar charts, and candlestick charts. Let us look at each of these charts and how they differ.

### Line Charts

Figure 11.2 is an example of a line chart. These simple charts provide information about two variables, price and time. In Figure 11.2, the price variable is the daily closing price for KKD. A line chart has price data on the vertical, or y, axis. A time measure is placed on the horizontal, or x, axis.

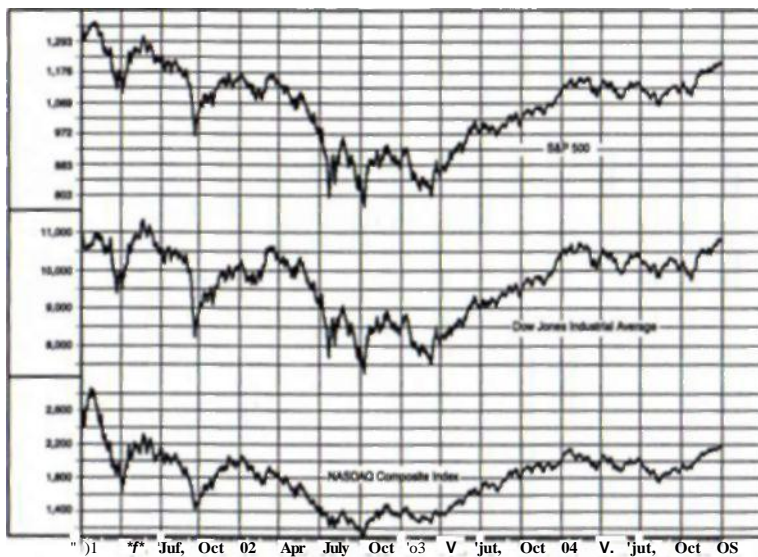
Simple line charts are especially useful when studying long-term trends. Because line charts display summary statistics, they are often used when information about several different variables is being plotted in the same graph. For example, in Figure 11.3, three line charts are used to plot the daily close of the Dow Jones Industrial Average, the S&P 500, and NASDAQ for the past four years. Journalists often use line charts to give the reader a quick, concise picture of the variables being discussed.

Figure 11.3 represents daily data. Line charts, however, can be used to present data collected at any time interval. More frequent data collection will lead to a more detailed, but more cluttered, graphical presentation. Especially when studying long-term trends, these extra details muddy the waters and obscure a basic trend. For example, compare Figures 11.4, 11.5, and 11.6. Each of these charts represents trading data for Disney, DIS, over the four-year time period from 2001-2004. The first chart uses daily data, the second chart displays weekly data, and the third chart presents monthly data. See how broader, longer-term movements in the stock price are more easily discernible in the third graph, which relies on less-frequent data observations.



CnMted using TrKtoSUUn

FIGURE 11I Line chart of KKD daily closing prices (dairy: November 1-December 31, 2004)



Ctmld using TmdeSUDon

FIGURE 11J Line charts of the daily closing prices of S&P 500, DJIA, and NASDAQ Composite (dairy: December 31, 2000-December 31, 2004)

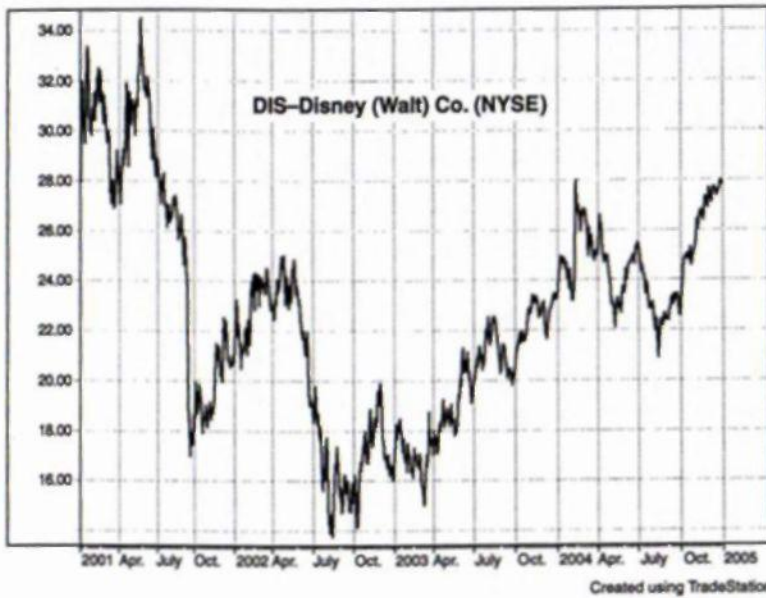


FIGURE 11.4 Line chart of daily close for DIS (2001-2004)

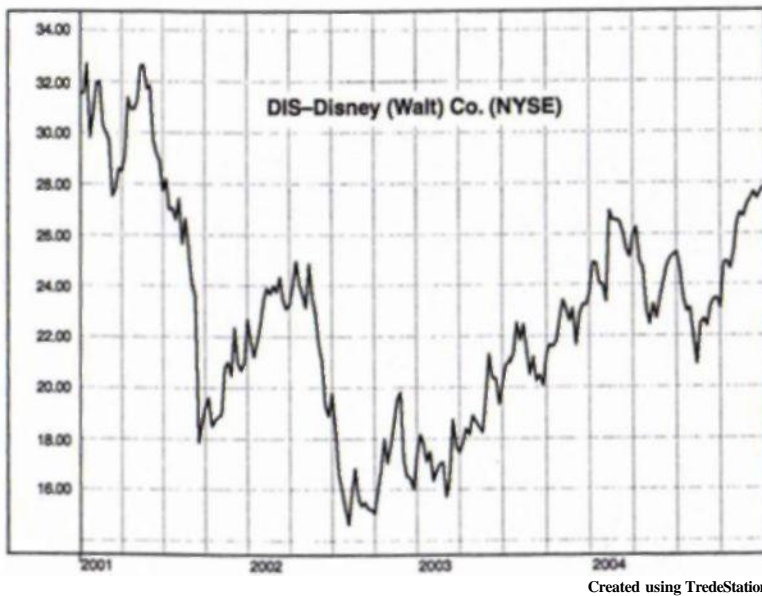


FIGURE 11.5 Line chart of weekly closes for DIS (2001-2004)

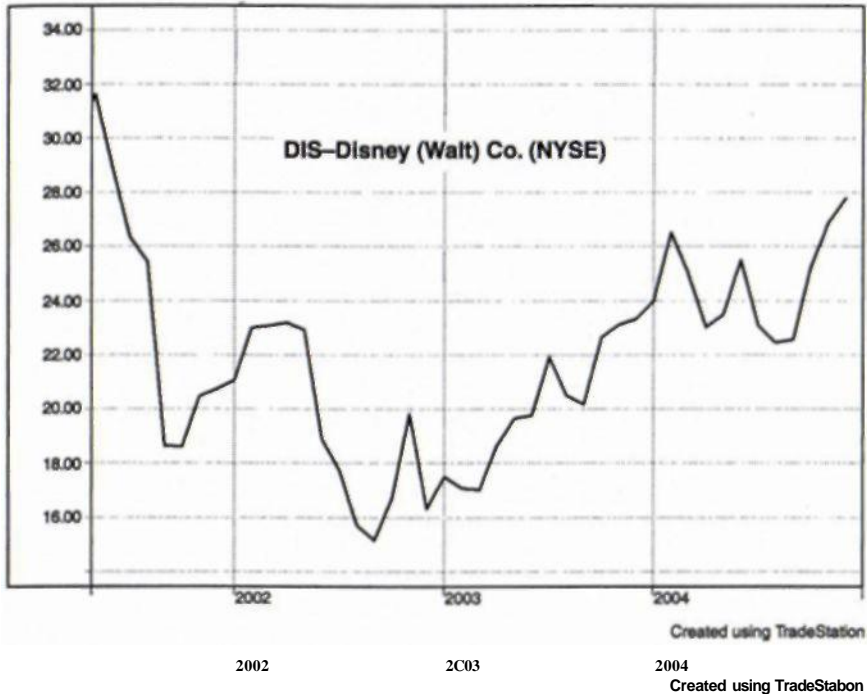


FIGURE 11.6 Line chart of monthly closes for DIS (2001-2004)

## Bar Charts

Although the line chart visually displays one piece of information for each time interval, a bar chart shows at least three pieces of information: the high, the low, and the closing price for each time interval. Some bar charts also contain a fourth piece of price information, the opening price. Each time interval (that is, day, week, or five-minutes) is represented by one bar.

Figure 11.7 is an example of a daily bar chart. Each bar represents one day's price action. Just as with the line chart, price data is placed on the vertical axis, and time is measured on the horizontal axis. A vertical line shows the trading range for that day. The top of this vertical line represents the highest price at which the security traded on that day; the bottom of the bar represents the lowest trading price of the day. A longer line denotes a wider trading range during the day. Likewise, a short bar means that the spread between the highest price during the day and the lowest price during the day was small. A small tick mark on the right side of the bar indicates the closing price for the day. If the opening price for the day is recorded on the bar chart, it is represented by a small tick mark to the left side of the bar.

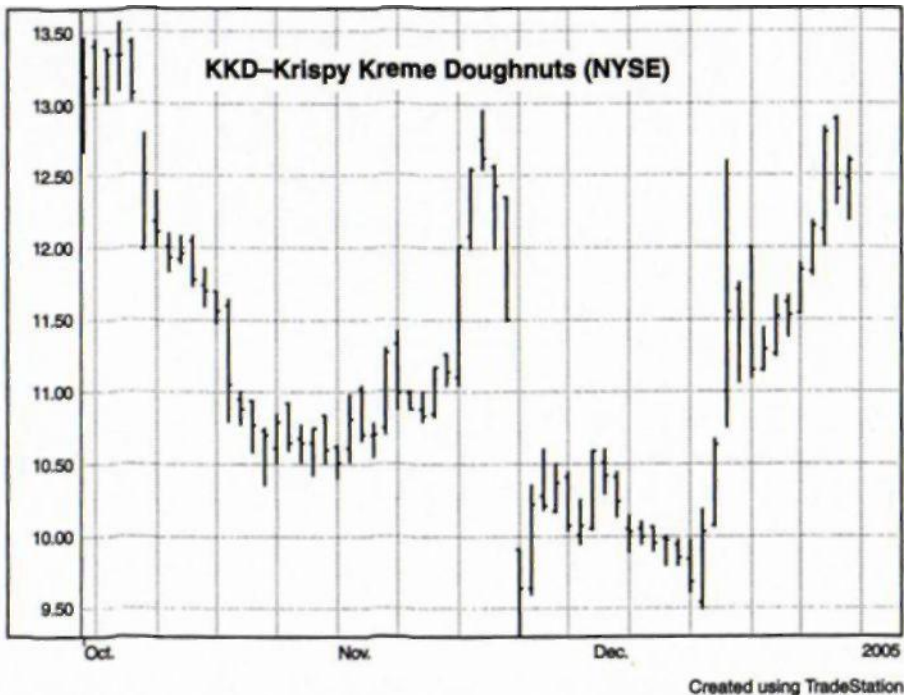


FIGURE 11.7 Daily bar chart (arithmetic scale) for KKD (October 1 -December 31 . 2004)

We see that the first bar in Figure 11.7 represents trading information for KKD on October 1, 2004. The lowest point of the bar is 12.67, which is the lowest price that a share of KKD traded for on that day. The highest price anyone paid for a share of KKD was \$13.46, which is represented by the top of the bar. The difference between the high and low price in any bar is called the "range." The opening price for KKD was \$12.76, represented by the left hash mark. The right hash mark at \$13.19 represents the closing price.

We can glean a lot of information from a quick visual observation of the bar chart. For example, the fact that the bar for trading day 2 is much shorter than the bar for trading day 1 in Figure 11.7 indicates that the range on October 2 was much smaller than the range on October 1. Another quick observation is that the bar for trading day 6, October 8, lies completely below that of the previous trading day. Thus, the bar chart makes it easy to spot days when the trading range lies completely outside of the previous day's trading range.

Just as with the line chart, bar charts can be constructed for various intervals of data collection. For example, Figure 11.8 presents a weekly bar chart for KKD for the last quarter of 2004. As we use longer and longer intervals to gather information for our bar charts, we will lose some

of the details but will have a less-cluttered chart that offers more of a broad stroke picture of past price movement.

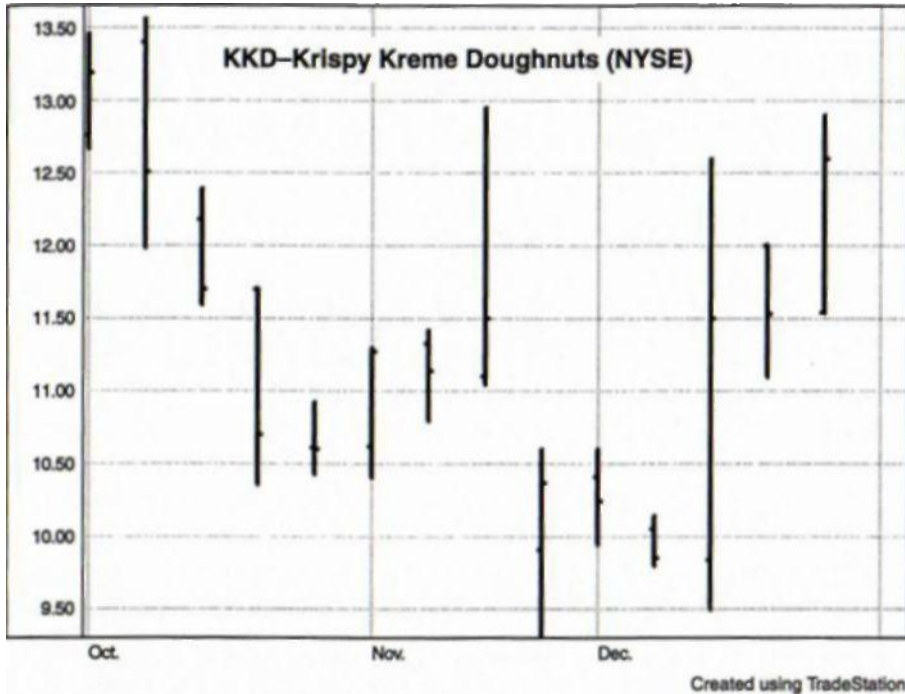


FIGURE 11.8 Weekly bar chart for KKD (October 1-December 31, 2004)

## Candlestick Charts

As mentioned in Chapter 3, "History of Technical Analysis," candlestick charts originated in Japan. This charting method was used as early as the mid-1600s to trade rice futures in the Japanese markets and continues to be the most popular form of technical analysis in Japan.

These techniques have been widely used in the Far East for many generations, but not until the publication of the book *Japanese Candlestick Charting Techniques* by Steve Nison in 1991 were Western traders introduced to candlestick charts. Before the publication of Nison's book, very few U.S. and European services offered candlestick charts. Today, almost every technical analysis software package and technical service offers candlestick charts. You can even create candlestick charts through the charting options in Excel.

Candlestick charts are similar to bar charts in their construction. Both charts use the high price, low price, and closing price; candlestick charts also always include the opening price. To construct a candlestick chart, the low and high prices are plotted on a thin bar, just as they would be for the bar chart we just discussed. A box is used to represent the opening and closing prices. To create this box, a horizontal mark is made at both the opening and closing prices; a rectangle is formed using these two horizontal marks. This rectangular box is called the *real body* of the candlestick. If the security closed at a higher price than it opened, the real body is white or open. These white, or "open," real body candlesticks indicate price advances from the opening. Conversely, if the closing price falls below the opening price, the real body of the candlestick is shaded. These candlesticks with a "closed," or black, real body designate price declines from the opening.

Figure 11.9 is a candlestick chart of daily prices for the last quarter of 2004 for KKD. Much more colorful than the bar chart, the candlestick chart makes it easy to spot immediately days in which KKD closed at a higher price than it opened. For example, the candle for the first trading day of the quarter, October 1, has a gray body, indicating that the stock closed at a higher price than it opened. The following day, however, we see a black-bodied candlestick, indicating that the stock closed lower than it opened that day.



MM 11.9 Doily condlesnck chart (arithmetic scale) for KKD (October 1 -December 31. 2004)



As you can see in Figure 11.9, candlesticks come in a variety of shapes and sizes. If the real body of the candlestick is tall, the opening price and closing price were relatively far apart. Shorter real bodies indicate opening and closing prices that were very similar. In the extreme, the real body can be so short that it is just a horizontal line, indicating that the opening and closing prices were identical. The candlestick for October 6, trading day 4, is an example of this.

The thin vertical bars, representing the price extremes of the trading session, are called the "shadows." The shadow above the real body is called the "upper" shadow; the shadow below the real body is called the "lower shadow." You can easily see how the candlestick chart got its name; many times, the real body will look like a candle and the upper shadow will look like the wick.

Looking at the second candlestick in Figure 11.9, which represents price information for October 4, we see that this candlestick has relatively short upper and lower shadows. This, along with the black body, indicates that KKD opened near the high and closed near the low of the day. We see this same type of trading pattern three days later on October 7. We can also see candlesticks with very long shadows. For example, in the candlestick for December 16, we see that its long shadow represents a relatively wide trading range for the day. The highest price that KKD traded for on that day was \$12.60 and the lowest price was \$10.76; the difference between these two extreme prices gives us a thin vertical bar of \$1.84. Because the stock opened at \$11.00 per share and closed at \$11.55, the body of the candle is only \$0.55 tall, leaving a particularly long upper shadow.

In fact, individual candlesticks can take on a variety of interesting sizes. If the opening price of the stock equals the low price for the trading session, as happened on October 8, a lower shadow will not exist on that day. Likewise, if the security closes at its high price for the day, there will be no upper shadow. Examples of this type of candlestick can be seen on October 15, 26, and 29. On some days, the opening and closing prices represent the entire trading range for the day. An example of this trading pattern occurs on November 19, when KKD opened at the high for the day, traded lower during the day, and closed at the low price of the day. Therefore, a black real body candlestick with no upper or lower shadow characterizes the trading for the day.

Because candlestick charts contain all the information that a bar chart contains, all of the technical tools that are used with bar charts can also be used with candlestick charts. In addition, some technical tools rely on the color and size of individual candlesticks to signal trades. We will study the trading techniques that are peculiar to candlestick charts in Chapter 17, "Short-Term Patterns."

## WHAT TYPE OF SCALE SHOULD BE USED?

### Arithmetic Scale

For all the charts we have examined so far, we—along with most technical analysts—have used arithmetic (or linear) scales. A plot with an arithmetic scale shows the price units along the vertical scale at the same price intervals. For example, the vertical plot distance of a change of \$1 to \$2 would be the same as the plot distance from 10 to 11 or 100 to 101. In other words, using regular evenly divided grid paper, we plot each box vertically as the same dollar amount.

## Semi-Logarithmic Scale

Although the arithmetic scale is the scale most often used, sometimes adjustments need to be made, especially when observing long-term price movements. For example, compare Figure 11.10 to Figure 11.11.

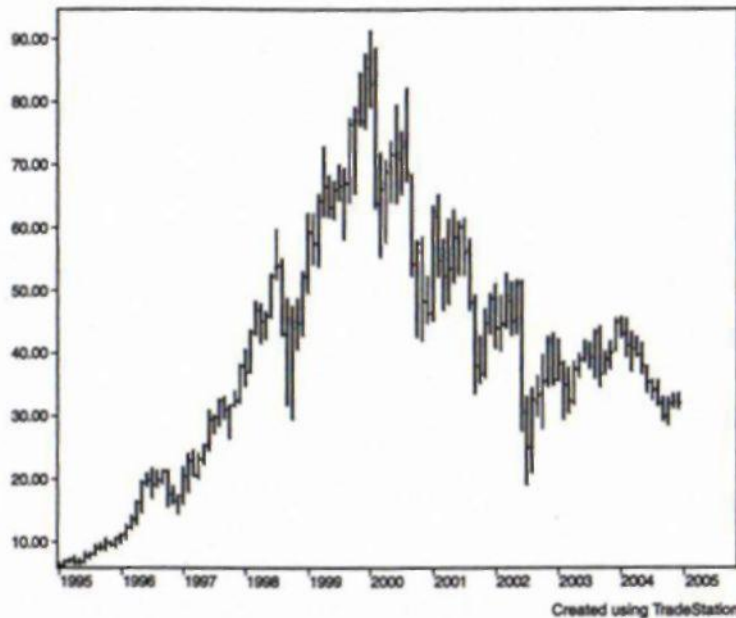


FIGURE 11.10 Daily bar chart for CCU using arithmetic scale

Both these charts plot the weekly price for Clear Channel Communication (CCU) for 1995-2004. In January 1995, CCU was trading for under \$10 a share; at that time, a \$1 increase in price would represent approximately a 10% gain for the investor. By January 2000, CCU's price had advanced to almost \$100 a share. At that point, a \$1 price increase represented only about a 1% gain for an investor owning CCU. On the arithmetic scale, in Figure 11.10, a \$1 price movement is visually the same whether it is a move from \$10 to \$11 or a move from \$99 to \$100. This type of scale can be somewhat deceptive; a \$1 move is much more significant to an investor if the price of a security is \$10 than if the price of the security is \$100. The logarithmic scale addresses this issue. On the logarithmic scale, the vertical distance represents the same *percentage* change in price. Look at Figure 11.11. In this logarithmically scaled graph, the vertical distance between \$5 and \$10 is the same as that between \$10 and \$20 or \$50 and \$100. This vertical distance always represents a 100% increase in price rather than a particular dollar amount increase in price. The rule of thumb for when to use an arithmetic or logarithmic scale is that when the security's price range over the period being investigated is greater than 20%, a logarithmic scale is more accurate and useful. As a rule, the truly long-term charts (more than a few years) should always be plotted on logarithmic scales.

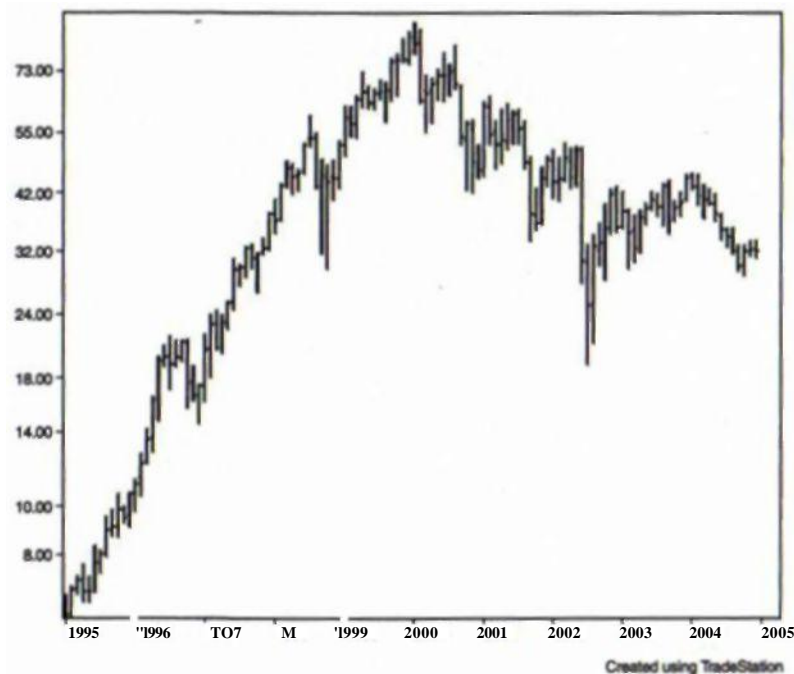


FIGURE 11.11 Monthly bar chart for CCU using logarithmic scale

## POINT-AND-FIGURE CHARTS

The point-and-figure chart records price data using a very different technique than line, bar, and candlestick charts. At first, it may appear that the construction of these charts is somewhat tedious. In addition, these kinds of charts are rarely published or discussed in the popular financial news. Because many of the point-and-figure charts are constructed using intraday trading data, use of these charts was historically limited to professional analysts who had access to intraday data. However, with some practice, you will see that point-and-figure chart construction is not that difficult and provides an interesting and accurate method of price analysis.

Point-and-figure charts account for price change only. Volume is excluded; and although time can be annotated on the chart, it is not integral to the chart. The original point-and-figure charts took prices directly from the tape as they were reported in the "Fitch Sheets" and by services prepared especially for point-and-figure plotting, such as Morgan, Rogers, and Roberts. Most of these services were put out of business by the computer and the use of the three-box reversal charts. The reading of each stock or commodity trade by trade was a laborious process. Today, very few services provide the data to plot one-point reversal charts.

The origin of point-and-figure charts is unknown, but we know they were used at the time of Charles Dow around the late nineteenth century. Some have thought that "point" came from

the direction of the entries on the chart, pointing either up or down, but more likely "point" refers to the location of the price plot, which at first was just a pencil-point mark. "Figure" comes from the ability to figure from the points the target price.

Construction of a point-and-figure chart is very simple because only prices are used. Even then, only the prices that meet the "box" size and "reversal" size are included. Finally, the chart reflects the high and low of the period, whenever it is important. Many technicians believe that the high and low of the day are important numbers determined by supply and demand and are more important than the opening or closing prices, which occur at single, arbitrary moments in time.

As with all of the charting methods, different analysts use variations of point-and-figure charting to best meet their particular needs. We will begin our discussion of point-and-figure chart construction by looking at the oldest method, referred to as the one-point reversal point-and-figure method. Further information about these one-point reversal charts can be found in reprints of Alexander Whelan's *Study Helps in Point and Figure Technique*.

### **One-Box (Point) Reversal**

All point-and-figure charts are plotted on graph paper with squares that form a grid. There should be enough squares to include a significant period of trading activity. Early charts had a special outline around the rows ending in 0 and 5, just for clarity. As with the other types of charts, we will plot price on the vertical axis, but the bottom axis is not time scaled with the point and figure graph.

The best way to learn to read a point and figure graph is to walk through an example of how this type of graph is constructed. Let us begin by taking a series of price changes in a stock of 43.95, 44.10, 44.3, 44.15, 44.5, 44.7, 44.9, 44.85, 44.95, 45.00, 45.05, 44.4, and 43.9. Each square (now called "boxes") on the graph paper will represent one point in the price. In point-and-figure charting, the plot is made only when the actual price of the box is touched or traded through. In this example, 43 would not be plotted because the price never reached 43 exactly or traded through to below 43. Forty-four would be plotted because the price ran from 43.95 to 44.10, trading through 44.00. Thus, our first plot for the point-and-figure chart would be placing an "X" in the 44 box when the price of 44.10 is observed, resulting in a chart that looks like Figure 11.12, Plot 1. For the next seven reported prices, no mark is made on the chart because all of these trades are between 44 and 45. When the tenth price, 45.00 is observed, a second X is plotted because the price actually touched 45. This X is plotted in the 45 box in the same column, resulting in a chart that looks like Figure 11.12, Plot 2. We now know that this first column is recording an uptrend in the stock price.

As long as the observed prices range above 44 and below 46, no more marks are made on the graph. For example, the next prices recorded in our sample data are 45.05 and 44.4. Because neither the next higher number (46) nor the next lower number (44) have been reached, no mark is made to represent this price observation. These trades are considered "noise" and the point-and-figure chart eliminates the plotting of this noise data.

	Plot 1	Plot 2	Plot 3	Plot 4
47				
46				
45		X	X	X
44	X	X	X X	X X
43				X X
42				X X
41				X X
40				X
39				

FIGURE 11.12 One-box reversal point figure chart

It is not until the next price of 43.9 is observed that another mark is plotted. The price has now reversed downward through 44. Obviously, there is already an "X" at 44 in Column 1. Column 1 represented an uptrend in the price, and only price increases can be recorded in it. Therefore, we move to Column 2 and place an "X" at 44, as is shown in Figure 11.12, Plot 3. At this point, we don't know whether the trend in column 2 is upward or downward. The second posting in this column will tell us. If the price should now rise to 45 again, we would place an "X" at 45, and Column 2 would record rising prices. If the price should decline to "43," we would place an "X" at 43, and Column 2 would record falling prices.

Let us say that the price declines in a steady stream with no one-box reversals to 39.65, and then it rallies back in a steady stream to 43.15. This would be represented as in Figure 11.12, Plot 4. A plot is made only in a new box when the price is trending in one direction and is then moved over and plotted in the next column when that price reverses by a box size and cannot be plotted in the same column. Remember that a particular column can record only price increases or price declines; in our example, Columns 1 and 3 represent price increases and Column 2 plots price declines.

### Box Size

From this basic method of plotting prices come many variations. Box size can be expanded, as in our example in Figure 11.13, where the box size is expanded to two points and labeled 48,50,52, and so on. Then a two-point change in direction would be required before prices moved to the next column. As shown in Figure 11.13, by increasing the size of the box, we reduce the amount of noise even further. Gradually, as the box size increases, the amount of price history becomes smaller and the chart becomes squeezed to the left, as fewer columns are necessary. The elimination of the noise makes the chart more useful to traders or investors interested in longer periods of time and activity. On the other hand, if a pattern appears to be developing in the longer-term chart, the box size can be reduced to give more detail near the potential longer-term change in direction. This more detailed view can give early signals based on what the longer-term pattern is forming.

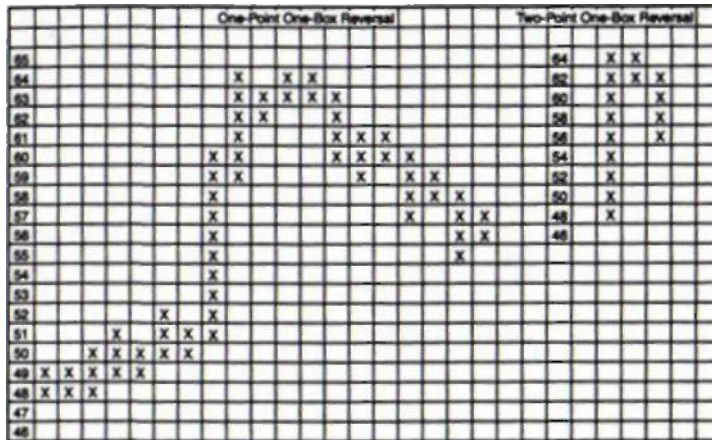


FIGURE 11.13 Box size and the point-and-figure chart

## Multi-Box Reversal

The other variable in a point-and-figure chart is the reversal amount. In our previous example, we used one point for both the box plot and the reversal amount. We could have expanded that reversal amount to three or five boxes, however. In other words, we could keep the one-point box scale but only record a reversal to the next column when the price reversed by three boxes. This also cuts down on the noise in price action and lengthens the time over which price action is recorded.

As an example, Figure 11.14 shows a one-point, three-box reversal chart of Exxon-Mobil from September 24, 2004 to April 22, 2005, the same data as in Figure 11.13. The plot itself is a little different from the pure one-point one-box reversal chart. "X's" are used for the column in which prices are rising, and "O's" are used for the column in which prices are declining. This gives an easier-to-read picture of the price history.

The three-box reversal method gained popularity when it was publicized by Abe Cohen and Earl Blumenthal of *Chancraft* in the 1950s. More recently, Tom Dorsey has popularized this method in his book *Point and Figure Charting*, and the majority of point-and-figure analysts now use the three-box reversal method. Because the three-box reversal method is less concerned about small, intraday changes in prices, it is especially useful when daily summary (H, L, C) price data is being used.

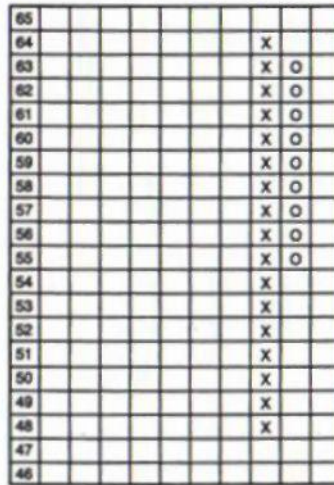


FIGURE 11.14 One-point three-box reversal point-and-figure chart for Exxon-Mobil (Sept. 24, 2004-April 22, 2005), same raw data as in Figure 11.13

### Time

In some point-and-figure charts, when a new price is first recorded for a new month, the first letter or the number of the month is plotted in place of the "X" or "O." In other instances, the month is recorded at the bottom of the column in which a price is first recorded for that month. We can plot years, weeks, and days similarly, depending on how sensitive the chart may be to price changes. Both methods can be used concurrently. Often, when years and months are the principal periods recorded, the year will be plotted on the bottom of the column and the month number (1 for January, 2 for February, etc.) will be plotted instead of the "X" or "O." Figure 11.15 shows the same three-box, one-point reversal chart as Figure 11.14, with the dates included. Time is of Utile importance in point-and-figure chart analysis. In many cases, it is plotted only to see how long it takes for a formation or pattern to form.



FIGURE 11.15 One-point threebox reversal point-and-figure chart with date notations included

## Arithmetic Scale

Scale becomes a problem in plotting point-and-figure charts, especially when the price rises or falls a significant distance. Obviously, when a stock is trading at \$70, a one-point move is less significant than if it was trading at \$7. Blumenthal first introduced the solution to this problem in three-box reversal charts. He suggested that the chart scale be one point per box for prices between \$20 and \$100, one-half point per box for prices between \$5 and \$19.50, one-quarter point per box for stocks trading below \$5, and two points per box for stocks trading above \$100. This scale has since become standard in most three-box reversal charts. However, depending on the behavior of the stock price, the scale can be adjusted, and of course, it is useless in the futures markets where prices are considerably different.

## Logarithmic Scale

As in bar charts, when long periods of trading activity are plotted, distortion arises from the fact that most charts are plotted on an arithmetic scale. Low-price action does not look as active as high-price action. Logarithmic scale changes the plot to include percentage change rather than absolute price change. Thus, the low-price action in percentage terms may appear more variable than the high-price action, and often is. To account for percentage change in point-and-figure charts, prices are converted into their logarithmic equivalent and plotted as a logarithmic number. This makes immediate interpretation difficult unless a table of logarithmic equivalents is immediately handy, because most analysts cannot convert the logarithmic number into the actual price in their heads.

This scale, however, should be used only for long periods of price data in which considerable volatility has made an arithmetic scale meaningless. For most investment and trading, the arithmetic scale is not only just as useful, but it is also easier to read and to convert to actual prices.

## CONCLUSION

In this chapter, we have studied several different methods that technical analysts use to create charts. Line charts, which plot a single statistic, may be considered the simplest of these methods. Bar charts and the more colorful Japanese candlestick charts provide more summary information, such as the opening price, the closing price, and the price range for a particular trading period. Point-and-figure charts provide a much different approach to graphing price data; with this method, sequential trading data is plotted with price trends and reversals emphasized.

All types of charts can be plotted with data of varying frequency. Monthly, weekly, daily, and even intraday data can be used. The frequency that an analyst will choose will depend upon the type of analysis being done and the period being explored. Analysts may choose to use an arithmetic scale, where the vertical distance on the graph always represents the same dollar amount. Or, an analyst may prefer a logarithmic scale so that the vertical distance in the chart always represents the same percentage change. We will address these issues throughout the book as we look at various techniques of technical analysis. Remember that the chart is a tool of



technical analysts, not an end in and of itself. Therefore, there is not one correct charting technique but to several to meet a variety of analysts' needs.

## REVIEW QUESTIONS

1. Melinda is analyzing Wal-Mart's stock over the past three months and notices that the price has ranged from \$31 to \$53 per share. Joshua is analyzing Merck's stock over the past five years and notices that the price has ranged from \$25 to \$90 a share over that period. Which analyst would be more likely to use an arithmetic scale, and which analyst would be more likely to use a logarithmic scale to analyze price information? Explain your reasoning.
2. Gather open, high, low, and closing prices for Valero Energy Corp (VLO) for the period from June 2002-June 2005. Gather this data for daily, weekly, and monthly quotes. Yahoo! Finance provides this information online at <http://finance.yahoo.com>; just put in the ticker symbol VLO and click the "historical prices" option. This data can be downloaded into a spreadsheet for easy manipulation.
  - a. Graph a line chart using an arithmetic scale for VLO using the daily closing prices.
  - b. Graph a line chart using an arithmetic scale for VLO using the weekly closing prices.
  - c. Graph a line chart using an arithmetic scale for VLO using the monthly closing prices.
  - d. What type of information can you gather about VLO stock by looking at these three graphs?
  - e. What differences do you notice in the three charts that you created?
3. Repeat parts a, b, and c in Question 2 using a logarithmic scale. What differences do you notice between the graphs you have created in this question and the graphs you created in Question 2?
4. Using the same data that you gathered for Question 2, create two candlestick charts for Valero using weekly data and monthly data. What type of information can you gather about VLO stock by looking at these two graphs?
5. Not having intraday, sequential trade data, instead, using the daily closing prices that you gathered for Question 2, create a one-point one-box reversal point-and-figure chart for VLO for June 2002-June 2005.
6. As in Question 5, using the daily closing prices that you gathered for Question 2, create a two-point one-box reversal point-and-figure chart for VLO for June 2002-June 2005.
7. As in Question 5, using the daily closing prices that you gathered for Question 2, create a one-point three-box reversal point-and-figure chart for VLO for June 2002-June 2005.

# TRENDS—THE BASICS

## CHAPTER OBJECTIVES

By the end of this chapter, you should

- Know why identifying trends is paramount to profits in securities
- Be able to recognize an uptrend, downtrend, and a trading range
- Understand the concept of support and resistance
- Be familiar with the major methods of determining trends
- Be familiar with the major signals that a trend is reversing

We are now entering into the more controversial aspects of technical analysis, the analysis of trends, and in Part IV, "Chart Pattern Analysis," the analysis of patterns. This is the "fuzzy" aspect of technical analysis that discourages most students very quickly because none of the observations or rules is specific. Rules in technical analysis come from many, many observations by many traders and investors. In general, the rules have remained unchanged since Dow's time, and in reading some of the old masters back in the 1930s, one sees the same observations that are witnessed today. The advent of the computer has speeded the process and has often eliminated rules that could be quantified but turn out to be unprofitable. However, the basics remain essentially the same. The markets have near, intermediate, and long-term trends. Patterns still form in much the same manner as 50 or 100 years ago, but they are no longer similarly interpreted by all analysts. The details may be different, and perhaps the methods of profiting are dependent on various tradeoffs between risk and reward, but still the analyst must use the rules and decide on the entry and exit points. The difficulty of profiting from technical analysis is not with the rules themselves but with their application.

In all the following chapters in this book, it is important to remember that the observations and statements we make are derived from the observations by us and other practitioners of technical analysis. Most trends and patterns are not mechanical methods that can be programmed and tested on a computer. Generally, they take long periods—sometimes years of practice—to be

fully recognized. One of the major criticisms of technical analysis is that it has yet to be thoroughly computerized and tested. As we saw in Part U, "Markets and Market Indicators," many relationships have been tested in the past but then break down as the future unfolds. The only constants, it seems, are that trends occur and that they are the source of profit when recognized and properly utilized.

All analysts occasionally make statements that appear to be fact, but in many cases, they are statements based on subjective observations and should never be blindly relied upon without a thorough investigation. The discussion of trend, support and resistance, and pattern nuances will show where they can be in error or where interpretation can be particularly difficult. There are rules that have been developed over the years that will help with interpretation. Nevertheless, the student should be sure to test and experiment. Nothing in technical analysis, or any other investment analysis approach, is foolproof. Most professionals, who have spent their lifetime in study and practice of technical analysis, will assert, "There is no easy, magic formula for wealth!" Do not, therefore, expect the following observations and rules to be an easy means to profit. Study, have patience, and study some more. We suggest that the student trade on paper, and finally with small amounts of money. There is no need to rush. The markets are always there.

## **TREND—THE KEY TO PROFITS**

Remember that profit in the securities markets is the sole objective, and technical analysis is an effective way to profit as well as to control risk. In earlier chapters, we emphasized the importance of determining and riding the directional uend in the security markets. The key to profiting in the securities market is to follow these three steps:

1. Determine, with minimum risk of error, when a trend has begun, at its earliest time and price.
2. Select and enter a position in the uend that is appropriate to the existing trend, regardless of direction (i.e., trade with the trend—long in upward trends and short or in cash in downward trends).
3. Close those positions when the trend is ending.

Trending is very simple in concept, but it is difficult in practice. Almost all successful mechanical trading systems that have made millions and millions for their investors have been based on the simple concept of jumping on a trend and riding it to its inevitable end. We will discuss the principles behind some of these methods later in this chapter and in following chapters.

The principal caveat, however, in technical analysis, as mentioned previously, is that although the trend concept is easy to understand, its application is difficult largely because the determination of trend and trend reversal is, in many instances, a subjective decision that depends on one's skill and experience in the securities markets and one's ability to control one's own emotions. Practice and mental anguish are the background of any successful technical analyst. The most expensive education in the world is likely the money lost in incorrect, sloppy, and

undisciplined decisions. All market participants make mistakes, but the regimented professionals correct theirs quickly.

When we arrive at Chapter 15, "Bar Chart Patterns," and discuss the various price patterns that have been observed, we will note that all patterns are a combination of trend lines—up, down, or sideways. It is therefore imperative first to understand trends and trend lines. In addition, all patterns are used to either confirm that a longer trend is still in control or warn that such a trend is changing. Patterns are therefore not trade signals explicitly in themselves, but they are the means of taking advantage of the underlying and, perhaps, changing trends.

## TREND TERMINOLOGY

Trends define a direction in prices. When we refer to a trend we will describe a directional trend, one of rising or falling prices from which a profit can be generated with a trend-following method. We will refer to a sideways trend as a "trading range" or "neutral" area. These are the recognized terms for describing different types of trends. Trend-following techniques work poorly in nontrending markets. Most technicians prefer to use price oscillators when dealing with such patterns.

In the next several chapters, we will look at prices from the positive, advancing perspective. By that, we mean that when we discuss trends per se, we will assume an upward trend (an "uptrend"). In most cases, the description and rules of a downtrend are exactly opposite from those of an uptrend. It does not make sense to duplicate every statement for both trend directions. Likewise, when we discuss support and resistance, we will discuss support and make the assumption, unless otherwise noted, that resistance is the exact opposite but in an opposing direction. We do this for readability and because most investors prefer to look at rising prices anyway, even though there is no rational reason for doing so.

## BASIS OF TREND ANALYSIS—Dow THEORY

As we learned in Chapter 6, "Dow Theory." Charles Dow was one of the first to write about the fact that stock market prices trade in trends. Virtually all items that trade in free, liquid markets, which include currencies and futures, trade in trends. As noted by Dow, investors or traders must concentrate on the time horizon most favorable to their circumstances.

*Trends are fractal*, in that their behavior is the same regardless of the period. Minute-to-minute trends behave exactly like day-to-day trends with only minor differences because of the understandable variation in liquidity over the shorter periods. Dow suggested there were three principal time horizons—the primary, the intermediate, and the minor—that he likened to tides, waves, and ripples. In fact, there are considerably more trend periods. He focused on the first two because he apparently believed the ripples could not be analyzed. Today, some technicians

recognize considerably more than Dow observed, but then he did not have the advantage of a computer that could track prices trade by trade.

Dow's final, and perhaps most important, observation was that by their very nature, *trends tend to continue rather than reverse*. If it were otherwise, first, there would not be a trend, and second, the trend could not be used for profit. This seems like a silly and perhaps too obvious statement, but it underlies almost everything the technician assumes when looking for the beginning or end of trends.

*Any particular trend is influenced by its next larger and next smaller trend.* For example, in Figure 12.1, we can see a well-defined uptrend in the stock of Disney (DIS). It is not a straight line upward, however. Within the rising trend are many smaller trends, both down and up, and if we look more closely, there are even smaller down- and uptrends within these. This is the fractal nature of trends. Notice also that the next set of trends below the long uptrend have larger rises and smaller declines. This is the effect the larger trend is having on the smaller trends. It is why the analyst when studying any particular length trend must be aware of the next longer and shorter trend directions. The longer trends will influence the strength of the trend being watched, and the shorter trends will often give early signs of turning in the longer. By definition, short-term trends reverse before medium-term, and medium-term trends reverse before long-term.

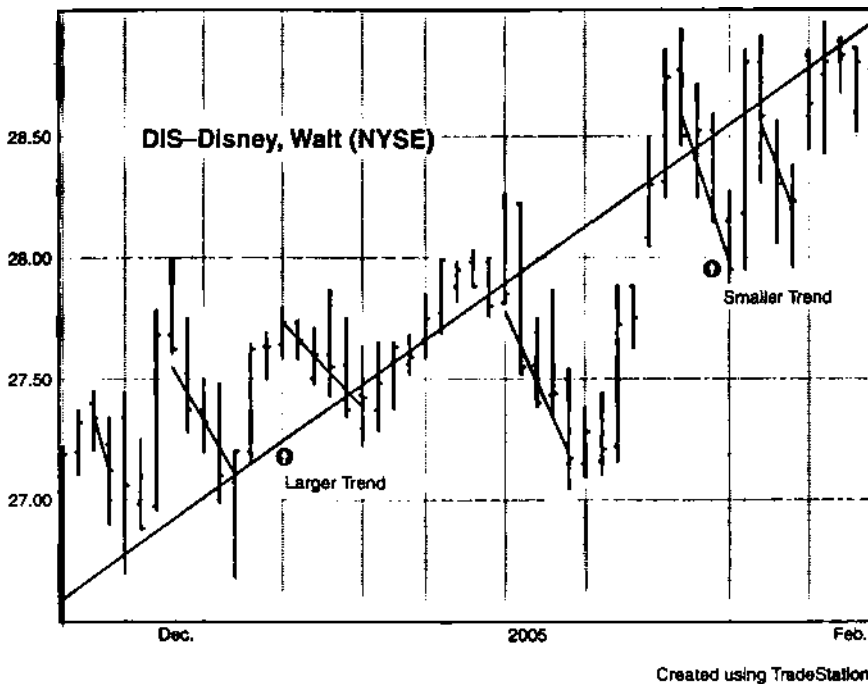


FIGURE 12.1 Uptrend (daily: November 22, 2004–February 4, 2005)

## How DOES INVESTOR PSYCHOLOGY IMPACT TRENDS?

As we know from basic economics, supply and demand establishes the price of any good. It is no different in the securities markets. All prices are established by supply and demand when sellers and buyers agree on a price and amount. What does price, and especially price change, tell us? Presumably, if a substantial number of transactions occurs at one price, price is telling us that supply and demand are in equilibrium and that both buyers and sellers are satisfied. Of course, in the financial markets, equilibrium is rarely reached. Prices constantly change, if only by minuscule amounts, as they move *toward* equilibrium. They can oscillate in small increments or large; they can go up and/or down; or they can do both. Whatever the price movement, it is ultimately determined by the expectations and power of the buyers and sellers. If broad expectations are for a higher price in the future but with little or no capital to act, prices will remain as they are or even decline. Of course, expectations change and come and go, as does the power to act. Nothing is perfectly stable or constant.

When prices travel in a trend, called "trending," they remain headed in one direction, and they tell us that there is an imbalance of demand and supply. Some will incorrectly say that there are more buyers than sellers or vice versa. In every transaction, there is an equal number of shares transacted, and thus there is always equilibrium between buyers and sellers at that instant in time. What makes a trend is the power of the buyers or sellers—do they have enough stock or money?—and the aggressiveness or anxiousness of buyers and sellers—do they have specific information or deductions, rational or irrational, or are emotions of fear or greed propelling their action?

We know from behavioral studies that, psychologically, a positive feedback mechanism in our minds tends collectively to maintain that trend. In an uptrend, for example, buyers who have profited tend to continue being buyers, and new buyers, seeing what they have missed, also buy. The price trend continues upward. Eventually, over a longer period, prices revert to some kind of mean or value, but meanwhile, they trend, up, down, or sideways. If, for example, prices are gradually rising, then buyers must have stronger positive expectations and be willing and able to place more money in the security. Contrarily, if prices are declining, sellers must have stronger negative expectations and larger positions to sell. The price trend thus tells us the amount of power, aggressiveness, and anxiousness there is in the marketplace to buy or sell each security. To the technical analyst, the basis for the expectations—and there are many—as well as the source of power, money, or stock, is largely irrelevant. The trend in prices, as long as it continues, is how the technician profits.

## How Is THE TREND DETERMINED?

Of course, the trend is never a straight line. Then it would be too easy to tell that it had reversed. Instead, the *trend is a direction rather than a line*. Many doubting participants often accompany this direction. Sometimes, it can be arbitrageurs, who bet against the trend or who are merely trading the spread. More likely, it is investors or traders running out of money or stock or just holding back for a little while, hoping that the price will retrace back toward their orders. In other words, the security price oscillates back and forth in smaller trends along its travel in the larger trend. This makes determining when that larger trend is reversing a difficult decision because any signs

of reversal may only be for smaller trends within the larger trend. Additionally, securities occasionally "rest" during a trend and move sideways as the earlier rise or fall is "digested" by all the different players. The psychology of what causes these spurts, stops, and retracements is an interesting study by itself, but again it is irrelevant for our present discussion. What we want to know above all is, what is the larger trend, and are there signs of it ending or changing direction?

## Peaks and Troughs

What is the simplest way to look at prices and determine the trend? The easiest is to look for peaks and troughs within a series of price oscillations. If the peaks tend to be higher than the earlier peaks, and the troughs tend to be higher than the previous troughs, the trend must be upward. As you see in Figure 12.2, it is that simple. If peaks and troughs are lower than previously, the trend must be downward. If the peaks and troughs are scattered, the trend is random, and if the peaks and troughs occur at the same relative levels, the trend must be a trading range.

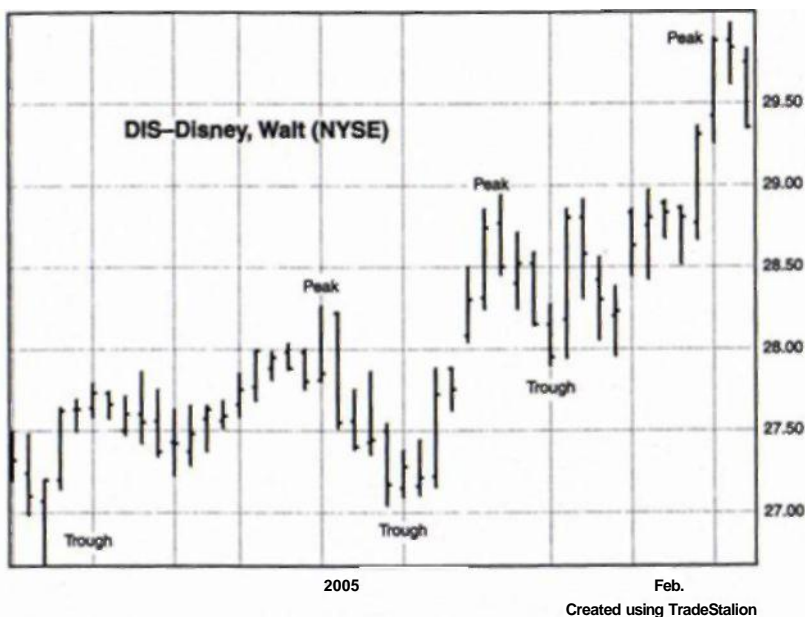


FIGURE 12.2 Peaks and troughs used to determine trend (daily: December 6, 2004-february 18, 2005)

Quite obviously, it is much easier to look at price trends on a chart. As the previous chapter demonstrated, a table of data makes recognition of price order of any sort very difficult. Most technicians use either bar or candlestick charts to draw lines representing trends (see Figures 12.3 and 12.4). There are many ways to do this that will be discussed later in the chapter. For now, let us begin with discussing sideways trends because they display very clearly an important technical concept called "support" and "resistance."

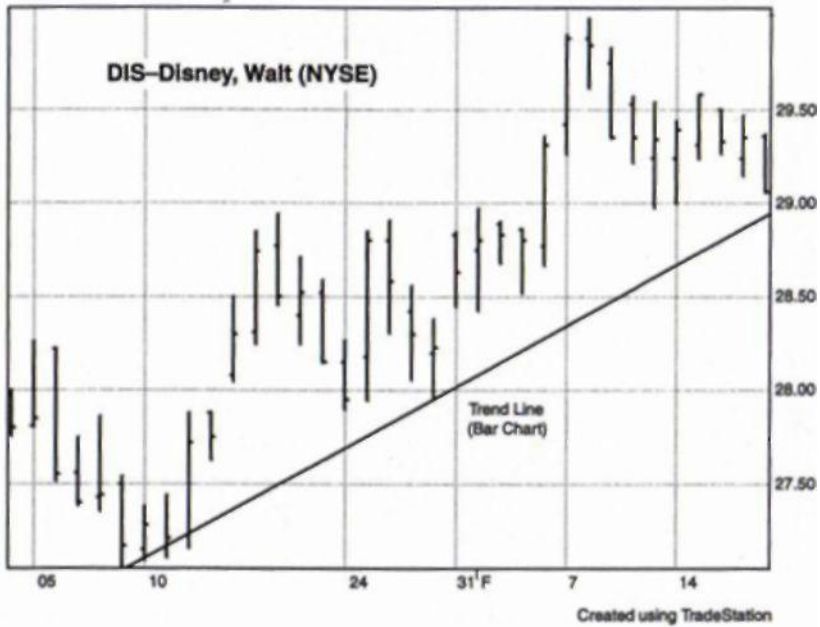


FIGURE 12.3 Trend line drawn through troughs (daily: December 31, 2004–February 18, 2005)



FIGURE 12.4 Trend lines in candlestick chart (daily: December 31, 2004–February 18, 2005)



## DETERMINING A TRADING RANGE

### What Is a Trading Range?

Trading ranges (or sideways trends) occur when peaks and troughs appear roughly at similar levels. The peaks cluster at a certain price level, and the troughs cluster at a certain price level below the peaks. The configuration usually occurs after a larger trend has come to a temporary halt. A trading range also is called a *consolidation* or *congestion* area or a *rectangle formation*. Charles Dow called very small lateral patterns a *line formation* and using it in the Dow Jones Averages, had very specific rules by which the averages had to abide for that designation. William Hamilton, Dow's successor editor at the *Wall Street Journal*, thought the line formation was the only price formation with any predictive power.

### What Is Support and Resistance?

When prices have been rising and then reverse downward, the highest point in the rise, the peak, is referred to as a "resistance level." It is the level at which sellers may be as powerful and aggressive as buyers and stop the advance. When the sellers (supply) become more powerful and aggressive than the buyers (demand), the result is a subsequent price decline from the peak. A resistance level becomes a resistance zone when more than one resistance level occurs at roughly the same price. Prices rarely rise and stop at exactly the same level. A single, high-volume price peak often defines a resistance level, but even then, because the high volume, especially if preceded by a sharp price rise, is a sign of speculation and emotion, the price where large sellers actually began to enter the market is not clear.

A "support level" is the opposite of a resistance level in that it is a single trough. At the support level, buyers become as powerful or aggressive as sellers and stop a price decline.

The concept of support and resistance presumes that in the future, prices will also stop at these recorded levels or zones, and that they represent a remembered psychological barrier for prices. The zones will carry through time and become barriers to future price action. Not only will the zones carry through time, but also once they are broken through, they will switch functions: Previous support will become resistance, and previous resistance will become support.

### Why Do Support and Resistance Occur?

"Have you ever bought a stock, watched it decline in price, and yearned to sell out for what you paid for it? Have you ever sold a stock, watched it go up after you had sold it, and wished you had the opportunity to buy it again? Well, you are not alone. These are common human reactions, and they show up on the stock charts by creating support and resistance." —Jiler (1962)

Let us look at the presumed psychology behind a support level and see why it might carry into the future.

There is little question that a price trough is a point where buyers overwhelmed sellers. In Figure 12.5, DIS peaked at \$30 on February 8 (A), a potential resistance level, and then declined touching \$27, on February 25 (B), at which point it traded on high volume and reversed upward. This price becomes a support level. Subsequently, the stock price rallied back to \$29 on March 7 (C), now a resistance level. At that point, regardless of future action, many participants or potential participants in the stock have been left out. In any future decline, the price will have a tendency to at least stop its decline at \$27, again, as it did on March 11 (D), and perhaps reverse back upward to \$29 again, as it did on March 15 (E). On March 21 (F), we can assume there are the potential buyers at \$27, because:

1. Those who sold short at \$30 will be covering because they have seen that the price halted its earlier decline at \$27 and do not want to take the risk that it will rally again to \$29 or \$30 and wipe out their profits.
2. Those who had been watching the stock but did not buy it at \$27, earlier and will be satisfied that the decline to \$27, is back to where they earlier had wanted to purchase it but "missed it."
3. Those who sold the stock during the high volume at \$27, when it declined from \$30, saw the price immediately rise thereafter, and wish to reenter a position at the price they sold it earlier.

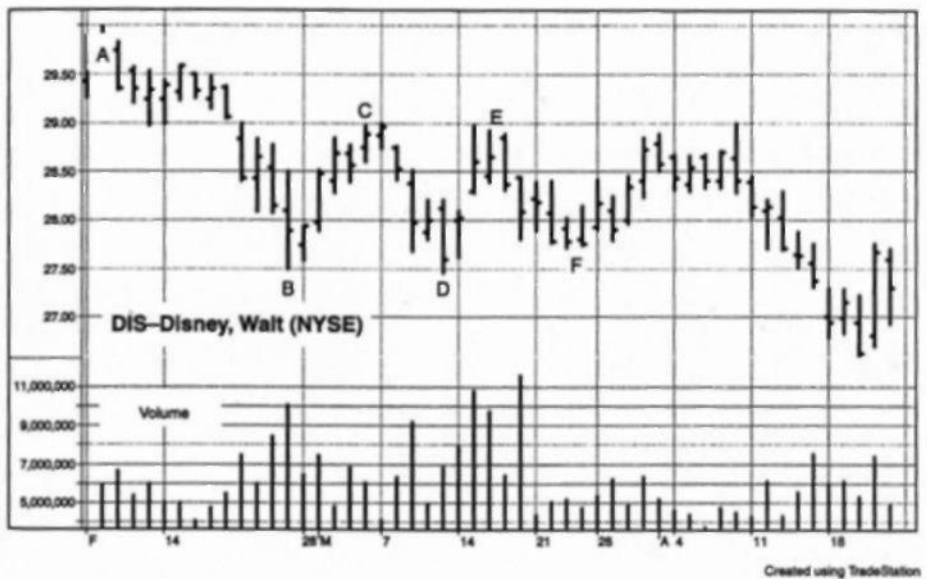


FIGURE 12.5 Support and resistance zones (daily: February 7, 2005-April 22, 2005)

Notice that none of these players is using a fundamental or other informational reason for buying the stock at \$27". The reasons are purely psychological, but they are strong reasons by themselves. The presumption for technical analysts is that \$27", has now become a support zone and that prices will stop declining at that level in the future. The more frequently prices halt at a zone, the stronger and more important that zone will likely be in the future.

A resistance zone will likely now also exist at \$29 for similar reasons because sellers at that price wish to sell: sellers who missed \$29 before, sellers who bought at \$29 and want their money back, and sellers who want to short the stock at \$29 where it halted earlier. Support and resistance zones, therefore, are price levels where supply and demand reach equilibrium for unusual but persistent psychological reasons.

### **What About Round Numbers?**

Ironically, when prices reach round numbers, the tendency to buy and sell increases. As an example, Figure 12.5 of DIS shows a strong support and resistance level at \$29. People think in terms of round numbers. Otherwise, why would Wal-Mart sell a shirt for \$29.95 rather than \$30? They know people subconsciously will associate with the "29" and will believe they are getting a \$29 shirt rather than a \$30 one. People think in terms of round numbers and act accordingly in the securities markets as well. The current problem with the concept of round numbers is that knowledge of that tendency is widespread. From the standpoint of entering orders then, it is best to determine entry and exit points based on the technical situation rather than worry about round numbers.

### **How Are Important Reversal Points Determined?**

The more important the reversal point, the more important the support or resistance level. There are a number of ways to identify a significant reversal point. Let us look at some of them.<sup>1</sup>

#### **DeMark or Williams Method**

Tom DeMark and Larry Williams each has a method of determining a reversal point by using the number of bars (in a bar chart) on either side of a suspected reversal point. In a low bar, for example, the analyst may look for two bars with higher lows directly on either side of the suspected trough bar. The number of bars on either side can be increased to increase the importance of the trough, but the number of troughs will be sacrificed. The higher the number of confirming lows necessary, the more important will be the trough.

As an example, look at Figure 12.6. Each of the two-bar lows and highs are marked with an arrow. Point A is not a trough because it does not have at least two bars on either side of it with higher lows. Likewise, Point B is not a peak. It does not have two bars on either side of it with lower highs. Is Point C a peak? We do not know yet because there are not two bars to the right of the high to use to judge Point C.

**1. In this section, we focus primarily on how to determine significant troughs and support levels. Of course, significant peaks and resistance levels would be determined in the same fashion, only in the opposite direction.**

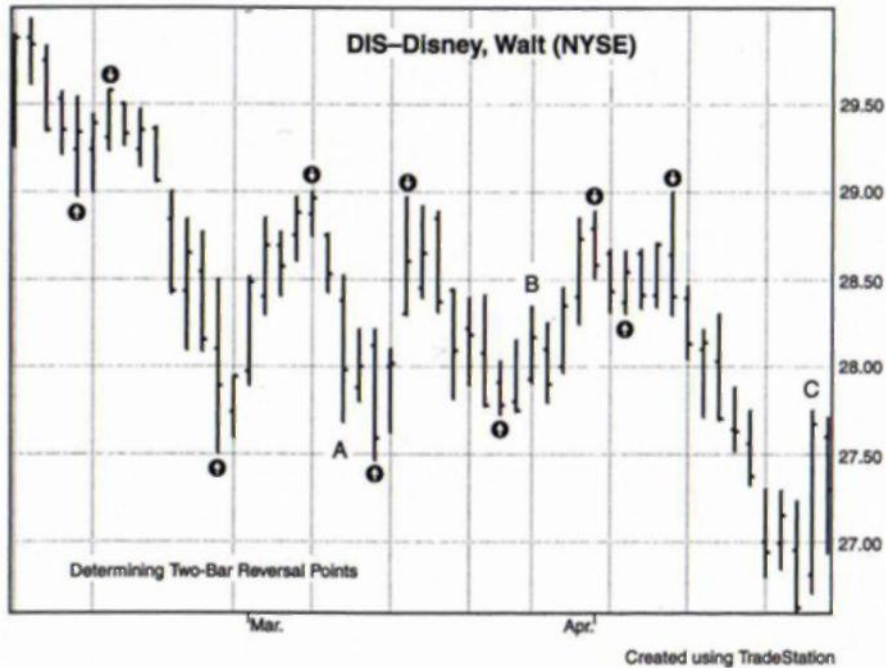


FIGURE 116 Reversal points (daily: February 7, 2005-April 22, 2005)

#### Percentage Method

Another method of identifying significant troughs is by deciding beforehand how much the price should decline and rally into the trough. A percentage is usually used. Using 1%, for example, any time the price declines more than 1%, makes a low, and then rallies more than 1% will define a significant trough. The larger the percentage used, the more important but less frequent the reversal point.

#### Gann Two-Day Swing Method

W. D. Gann's swing method is very similar to the DeMark or Williams method. To find a support point, or trough, a low bar is identified. Once the low bar is identified, the two following trading days are observed. If these two days have higher highs than the low bar, then the low bar is a support point. Originally, Gann used the three following trading days to determine a support point, but more recently, it has been switched to two days (Krausz, 1998). Likewise, a resistance point is defined as any high bar during an uptrend that is followed by two successive bars with lower lows. Figure 12.7 is identical to Figure 12.6, except that the reversal points are determined using the Gann rule. The only difference between the two charts is that at point D, the peak reversal point as defined by the Gann rule occurs a day later. The reason is that the day of the actual high was not followed by two successive days with lower lows. The next day, at point D, however, the

subsequent two days had lower lows. Thus, by Gann's rule, the reversal may not occur on the actual high or low bar.

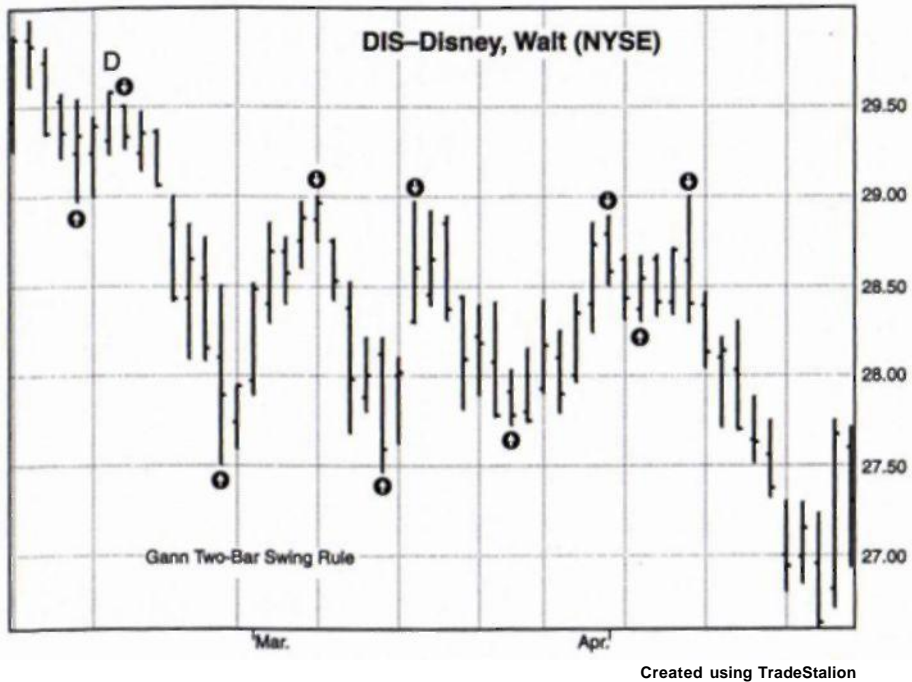


FIGURE 12.7 Gann two-bar swing points (daily: February 7, 2005-April 22, 2005)

#### High Volume Method

Very large volume can also identify a significant reversal point. High volume indicates that larger than usual activity occurred on that trading day. Figure 12.8 shows a one-day reversal on high volume at a high, creating a significant reversal point and resistance level that stopped the subsequent rally.

Figure 12.9 illustrates a one-day and a two-day reversal. A two-day reversal looks the same as a one-day reversal except that it takes place over two days. These one- or two-day patterns can occur at peaks or troughs. When these occur on high volume, they usually signify important reversal points. Because these formations usually occur at a stage of high emotion, they signify either a panic or a speculative bubble. As such, the actual price level at which the reversal took place is not identifiable on a large bar chart. Sometimes intraday action must be inspected to see at just what price level the majority of buying and selling occurred.

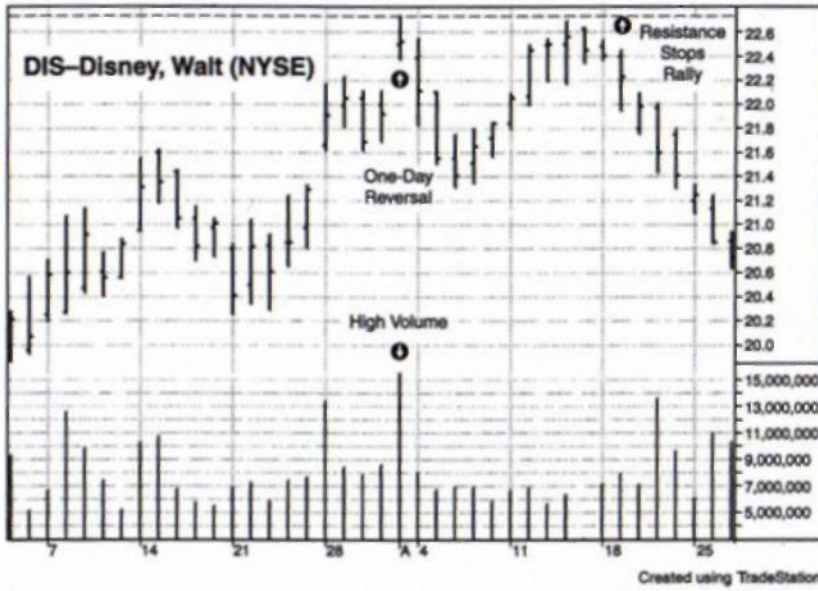


FIGURE 12.8 High-volume reversal (daily: July 2, 2003–August 27, 2003)

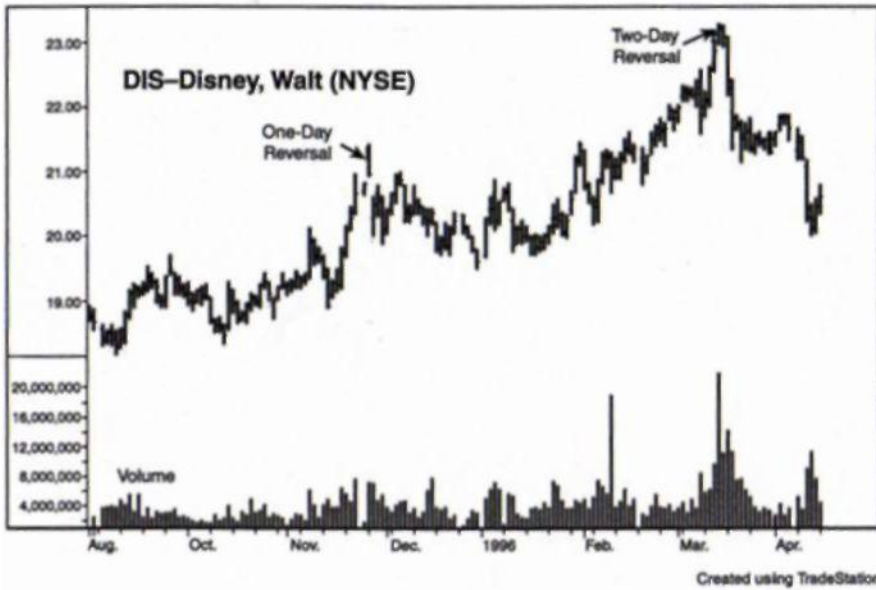


FIGURE 119 Twobor reversal (daily: August 31, 1995–April 15, 1996)

### How Are Support and Resistance Zones Drawn?

To construct a support (or resistance) zone, simply draw a horizontal line through each significant trough (or peak) into the future. These lines can be drawn through the respective bar lows or, as Jiler (1962) suggests, using the bar's close because this is what most investors read in the paper. These lines should also be extended into the past to see if earlier price declines stopped at the same price level. Where these horizontal lines bunch together, sometimes overlapping at the same price level is a support or resistance zone. This zone is usually stronger the more horizontal lines there are within it. In other words, the more times the price level has halted previous declines, the stronger the support will be in the future. Because all previous significant troughs have not likely occurred at exactly the same price level, a shaded area can be constructed between the highest and lowest horizontal line in the zone to outline the zone more clearly.

Figure 12.10 shows how support and resistance lines can be drawn. Notice that the line at \$29 was first a support line, holding the decline from \$30 for almost a week, and then became a resistance line when the price later rallied from below several times and halted at that level. Notice also the support zone between \$27.50 and \$27.75, where a series of horizontal lines from previous significant troughs were drawn and extended. The final small rally in April, after the break below the lower portion of the support zone, managed to break back above the lower portion of the support zone, which had then become a resistance zone, but it did not penetrate through the top of the support zone.

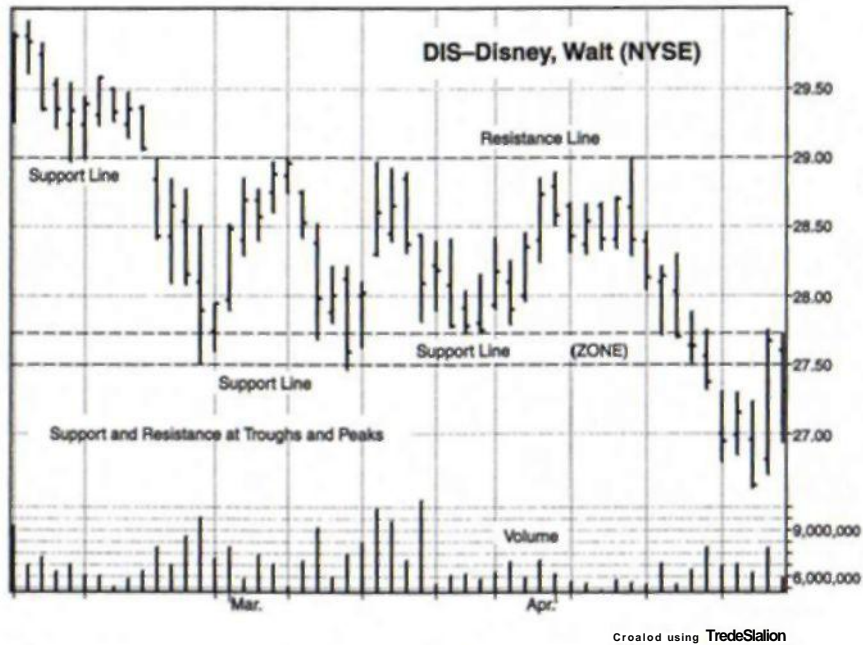


FIGURE 12.10 Support and resistance lines (daily: February 7, 2005-April 22, 2005)

If a horizontal line is by itself with no other horizontal lines close to it, it is likely an independent support or resistance level. Such levels, unless accompanied by extraordinary volume, usually do not have the same strength in the future that a combination of horizontal lines might have within a zone.

In the future, prices will tend to halt their decline at these support zones, and occasionally at a single support level. Prices will often enter the zone but will not break below the lower horizontal line of the zone. If they do break that level, we have what is called a "breakout" that has important consequences. A price break below the support zone implies that buyers are satiated at that level. See the downward breakout in Figure 12.10 in April at \$27.50. That leaves a vacuum of buyers, and the sellers, at least at that price, now control the stock. If there is another support zone at some distance below the current broken zone, prices will generally trade down to that next lower zone. Thus, a support zone in a declining market can become a price objective once a higher support zone is broken. Support zones exist at all horizons—day, week, or even minute-to-minute. Some traders only trade stocks or futures, especially e-mini futures, between these zones often on an intraday basis between very, very short-term support and resistance zones.

What we have said about support zones is equally applicable to resistance zones. Horizontal lines at significant peaks will demonstrate the existence of these zones, and extended into the future, they will become zones of resistance to price rises. Naturally, in a market in which prices are reaching all-time highs, there will be no identifiable resistance zones from the past. There are ways to project potential resistance zone above new highs, and we will cover these when we discuss target projections later.

In addition, as time goes on, the importance of past horizontal lines diminishes for both support and resistance zones. More recent price reversals are more important. Human memory fades quickly.

## **How Do Analysts Use Trading Ranges?**

Getting back to our earlier introduction of sideways trends, a trading range, as shown in Figure 12.10, is a price level where both support and resistance zones are relatively close together, and prices "bounce" between them until finally breaking out in one or the other direction. Some traders will trade the "bounces" between support and resistance, but this is usually very dangerous and requires very low costs and constant attention (Schwager, 1996). The most profitable and reliable way to use the trading range is to practice "breakout" trading. Let us look at each of these strategies a little more closely.

### **Range Trading**

Trading within a range is difficult. Although many books suggest it as a strategy, it is almost impossible for the nonprofessional to profit through range trading. First, it is difficult to recognize that prices are trading in a range until after a considerable amount of trading and time has passed. It is therefore largely in retrospect that the opportunities are recognized. In addition, operating costs, such as commissions and slippage, must be small and execution extremely efficient, or any potential profit will be overwhelmed by transactions costs. Because the bounds of the trading range are zones rather than specific price levels, the point at which an execution



order, either buy or sell, should be placed is indefinite. Finally, the location for a protective stop-loss order to prevent a breakout from ruining trading profits is difficult to determine. By the time all these costs and execution levels are recognized, the potential for profit has diminished considerably making any profit unlikely. Thus, most traders stay away from trading within a trading range and instead wait for the inevitable breakout.

#### Breakout Trading

Breakout trading is as old as technical analysis and likely the most successful. Remember that a trading range is somewhat like a battleground, where the buyers and sellers are warring for dominance. Before the war is over, it is almost impossible to determine who will win. It is usually wiser, and more profitable, to wait rather than to guess. Once, however, prices break out of the trading range, the investor has information about who has won the war. If the breakout is to the upside, buyers are driving price up; if the breakout occurs to the downside, sellers are overwhelming buyers. Trading on this breakout is probably the most profitable and reliable strategy for the investor faced with a trading range.

Breakout trading can be used in many different ways other than for just trading ranges. One of the most famous is the Donchian breakout method, also called the "four-week breakout system," originated by Richard Donchian and later improved upon by Richard Dennis. It still appears to work. A recent study by *Active Trader Magazine* (Kurczek and Knapp) indicates that even though the method is popular and has been widely known for many years, it still produces profits, especially in the commodities futures markets. Its calculation is absurdly simple. Buy when the highest high over the past four weeks is broken, and sell when the lowest low over the past four weeks is broken. A "stop-and-reverse" strategy requires a position, long or short, at all times.

A breakout is a powerful signal. It indicates that the balance between demand and supply has been settled, usually violently, and thus is an indication of the initiation or continuation of a directional trend. The subject of "breakouts" and "stops" will be covered in the next chapter.

## **DIRECTIONAL TRENDS (UP AND DOWN)**

### **What Is a Directional Trend?**

To determine resistance and support levels, we determined reversal points. These points can also be called "peaks" at resistance levels and "troughs" at support levels. When these peaks and troughs occur at roughly the same price level, we have identified a trading range and a flat or sideways trend in prices.

However, when a peak and trough occur at higher price levels than the immediately previous peak and trough, the trend has turned upward. Conversely, for a peak and trough lower than their previous peak and trough, the trend has turned down. The angle of the trend, therefore, is u<sup>n</sup>dermined by the amount by which the peaks and troughs are higher or lower than their previous

levels. To see this more clearly, a chart is almost a necessity. Figure 12.11 shows an upward trend in DIS during 2003. The principles of trends are applicable regardless of direction.

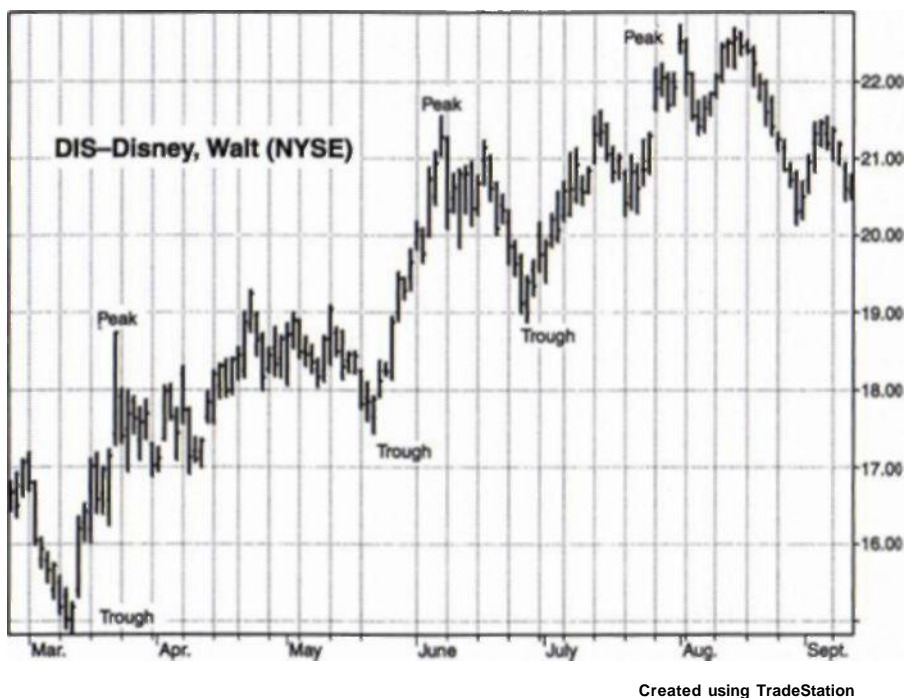


FIGURE 111 1 Uptrend (daily: February 26, 2005-September 11, 2005)

Quite obviously, the steeper the angle of the trend, the more powerful is the buyer or seller group. It means that the one group is overwhelming the other group at a faster pace. In a decline, sellers are willing to receive lower and lower prices before becoming temporarily exhausted at a trough. In an advance, buyers are more and more anxious and willing to pay higher prices. This is the time when an investor who is long the security is happiest. It is a trend and is what the technician is looking for in indicators and charts. The corollary, however, is that the steeper the angle of ascent or descent, the less sustainable it becomes.

An uptrend, therefore, is a display of the anxiousness of the buyers versus the anxiousness of the sellers. It is similar to the concept of support and resistance except that the support and resistance are changing in a specific direction. Because all the stock desired by the buyers and

sold by the sellers is not transacted at one time and at one price level but over a period of time as news leaks out and positive feedback affects other players, the price trend continues until it has reached a point of exhaustion. At that level, the price trend either flattens out in a congestion or consolidation area or reverses direction into a declining trend. Some analysts argue that an actual trend only lasts a short time, roughly 20% of the trading period, and the remaining time is spent in a consolidation or pattern formation with an indefinite trend. This percentage, however, has not been demonstrated statistically. It is estimated only by counting the time that an ADX indicator (a measure of trending tendency—see Chapter 14, "Moving Averages") shows that a trend exists in varying markets, periods, and circumstances.

It is undeniable, however, that the majority of profits come from correctly anticipating and acting upon a trend, and for this reason, almost all technical study is devoted toward early anticipation of a trend.

### How Is an Uptrend Spotted?

In retrospect, a trend is easy to spot, especially on a price chart. Without being specific, it is usually easy to see where previous highs and lows occurred and the general direction of historical prices. The difficulty, from an analysis standpoint, comes in being specific enough to determine when the signs of a trend change are occurring. To do this, the technical analyst uses several tools: 1) the regression line, 2) the trend line, and 3) moving averages. In this chapter, we discuss the regression line but focus the majority of our attention on the trend line. We will focus on the use of moving averages in Chapter 14, "Moving Averages."

#### Using a Regression Line

Any series of data can be mathematically fitted to a linear line on a chart. This line has two variables—its starting point and its slope. Where the data begins and ends determines both variables. The technical analyst is interested in the regression line's location on the chart and to some degree its slope. In the example in Figure 12.12, the regression line from the bottom price to the top price travels through a majority of the data. Indeed, the mathematical equation used to determine the line is based on minimizing the distance between all the data points and the theoretical line. The line is said to be the "best fit" to the data.

We can also calculate standard deviations about this best fit line that will encompass most of the data. Outliers, those prices that occur outside of the standard deviation lines, are considered either anomalies or to the technical analyst, if they occur in the most recent data, signs that the trend may be changing. In Figure 12.12, the right-hand, most recent, price plots are outside the standard deviation of the line. These, having occurred recently, are a clue that the regression line slope may be flattening.

#### Using Trend Lines

The oldest and easiest method of determining the trend of prices is with a "trend line." Trend lines can be drawn with just a ruler and the use of one's eyes rather than a fancy mathematical formula. All that is needed is two support reversal points to draw an uptrend or two resistance reversal points to draw a downtrend. A line is drawn between the reversal points, as shown in Figure 12.13.



FIGURE 12.12 Regression line and one standard deviation (daily: February 26, 2003–September 11, 2003)



FIGURE 12.13 Trend line (daily: February 26, 2003–September 11, 2003)

The important lesson to learn is that the lines are generally drawn between lows (support) when the price is rising and between tops (resistance) when the price is declining. The lines that connect the lows or highs are extended into the future so that the analyst can tell when the trend line is broken. Remember, the purpose of the trend line is to provide a signal of a change in trend. For example, in Figure 12.13, price movement appeared to be in the upward direction. Therefore, a trend line was drawn that connected the major troughs in March, May, and June and continued to the right. In August, when prices broke below the trend line, analysts had a clue that the trend was changing.

#### Scale and Trend Lines

The problem of scale sometimes arises in the plotting of trend lines as it does with prices. Generally, on an arithmetic chart in which the prices are displayed within a 20-40% range, a trend line can be drawn with accuracy. When price changes have occurred over a wider range, the logarithmic chart is necessary. In this case, the trend line represents a percentage change in prices rather than a point change. Over long periods, this is the preferred method because it represents better how investors look at a stock price. Generally, over long periods, investors think in terms of percentages, whereas over shorter periods, they may think more in terms of points.

#### Accelerating Trend Lines

Another problem with trend lines is that they may not be straight lines. Often prices, especially in a speculative bubble or in a panic, will accelerate upward or downward and run away from a standard, straight trend line. In this case, the trend line must be adjusted continually to account for the price action's acceleration. This phenomenon is shown graphically in Figure 12.14.

An accelerating trend line, of course, is unsustainable because eventually it would reach an infinite slope. If the acceleration can be calculated through mathematical means, the expected time for the infinite slope will be the time by which the price must reach its zenith. It is a means of determining when the latest time for the eventual reversal will occur. As we will see in the chapters on patterns, an accelerating price trend has very profitable, as well as dangerous, implications.

#### Decelerating Trend Lines

The opposite of an accelerating trend line is the decelerating trend line. This is called a "fan line." In the chart, the fan lines are shown as regular trend lines that are being broken without an obvious reversal in direction and then being redrawn to account for each new support level. Figure 12.15 shows the fanning effect that decelerating trend lines give.

These lines can go on forever in theory, but practitioners have generally stated that the maximum to be expected is three fan lines before a reversal in direction is to be expected. These three fan lines often are accompanied by some kind of standard pattern. Of course, if an earlier support zone is broken as well as a trend, it is a stronger implication that the trend has reversed direction.



Created using TradeStation

FIGURE 11.14 Accelerating trend line (daily: August 31, 1995-April 15, 1996)



Created using TradeStation

FIGURE 12.15 Decelerating trend or fan line (daily: February 1, 2000-July 25, 2000)

### General Rules for Trend Lines

Several standard rules have been developed about trend lines. One is that the longer and the more times that the drawn line is touched by prices, the more significant it is when the line is finally broken. Another is that the steeper the trend line, the sooner it will be broken. This is obvious in an accelerating uend line but is equally true in a steep, straight trend line.

Sometimes a trend line is broken slighdy by intraday price action, as shown in Figure 12.16. This action provides a problem for the analyst who must determine whether the break is permanent and indicative of a trend change, or whether it is an anomaly. Should it be ignored, or should the trend line be adjusted slightly to accommodate the new level? The question here is whether the break of the trend line is significant or just minor. Trend lines should never be considered exact, largely because price action within a bar may be influenced for a very short lime by exogenous factors that have nothing to do with the Uend. Some analysts, for example, draw uend lines between peak and trough closing prices rather than intraday highs and lows. They argue that because intraday traders usually must close their positions by day's end and are out of the market by then, the closing price represents longer-term players' determination of supply and demand and is, thus, a truer figure for drawing longer trend lines. By using the closing prices, the number of false breakouts is usually reduced. We will discuss these issues regarding the rules for breakouts more thoroughly in the next chapter.



FIGURE 12.16 Slight break in trend line (daily: February 26, 2003-September 11, 2003)

## Channels

Remember that uptrend lines should be plotted between support troughs, and downtrend lines should be plotted between resistance peaks. In other words, when prices are trending upward, the trend line will lie below the price action, and when prices are trending downward, the trend line will appear above the price action.

Sometimes, as in Figure 12.17, prices appear to travel in a "channel." Line A is plotted in an uptrend between the resistance peaks and is parallel to the underlying uptrend line. These channels often contain price motion just as the congestion area or rectangle formation contains prices when the trend is sideways. Remember that a trend is a direction of supply and demand. In an uptrend, the lower line represents the increasing demand for the security, and often the supply of the security is traveling parallel but above the demand. Thus, prices tend to "bounce" off this rising upper channel line as if supply were present at these moving intervals and rising at the same rate as demand. Indeed, when we see that the upper channel line is no longer parallel (see Figure 12.17, Line B), but beginning to close on the underlying trend line, we know that supply is getting just a little more anxious and that the price is likely approaching a reversal point. The same channel rules apply in downtrends.



Created using TradeStatxxi

FIGURE 12.17 Trend line with channel line (daily: February 26, 2003-September 11, 2003)



A channel line can be drawn almost immediately after two troughs and their intervening peaks are recognized. A line is drawn parallel to the trend line through the intervening peak and projected into the future. This line now becomes a target line for subsequent rallies within the channel. In Figure 12.17, for example, the channel line (A) could have been drawn as soon as the second trough in May had been recognized, by drawing a parallel line through the April peak. Projected into the future, that channel line was a level at which subsequent rallies would be expected to reach, just as the next one did at the intersection of lines A and B.

Another potential signal with channel lines is when, in an uptrend, for example, the price breaks above the channel line rather than being contained by it. This is a sign that the underlying trend is accelerating and that its end is coming closer. Such occurrences also occur during a downtrend and signal that a major price bottom is not far ahead. Any kind of acceleration is a sign of pure emotionalism and thus a potential sign of an impending reversal. Practically speaking, however, the investor or trader should never attempt to anticipate the reversal. A change in direction may occur soon, but because the price is changing so rapidly, an attempt to anticipate the actual price reversal can be disastrous. It is much wiser to watch for the actual reversal and then act with the comfort of trading with the new trend, rather than against the old one.

### **Internal Trend Lines**

There is also what is called an "internal trend line." This line is more difficult to recognize and has only limited value. Generally, it is a line drawn through trending price action such that a large number of minor reversals touch the line both from above and below. An example of an internal trend line is shown in Figure 12.18. In some ways, it appears similar to a regression line that travels through the majority of prices, and in some ways, it appears like a mid-point line between the two boundaries of a channel. In any case, though it is interesting and occurs often, its use for trading or investing is limited. The observation that prices often bounce off an internal trend line may be somewhat useful for very short-term trading, but moving averages provide a better means of measuring the midpoint in prices as they travel through time.

### **Retracements**

The final subject relating to trends is "retracements." As mentioned and observed previously, a trend rarely follows a line without including a number of smaller trends. The smaller countertrends are called "retracements," and several rules have been developed concerning them.

Retracements are always corrections to the principal trend. As prices rise, for example, in a strong uptrend, the rise is interrupted periodically by downward corrections. In an uptrend, the beginning of these corrections is always a resistance point, and the bottom of the retracement is always a support point. The lower support point is where a new trend line can be plotted from a previous support point. Thus, a retracement is a smaller trend itself and runs counter to the principal trend.

For example, consider the price movement pictured in Figure 12.19. Obviously, the principal trend for DIS is upward. From late May to early June, the prices follow this trend, moving upward. However, for most of June, the prices are trending downward in a countertrend, retracing a portion of the price gain.



Created using TradeStation

FIGURE 12.18 Internal trend line (daily: February 26, 2003-September 11, 2003)



Created using TradeStation

FIGURE 12.19 Retracement (daily: February 26, 2003-September 11, 2003)

A retracement can be analyzed in the same way as the longer trend. It is, in fact, a trend in itself but with a direction opposite from the principal trend and with a shorter period and length. Within a trend, many retracements of different amounts and periods can occur. Because the end of a retracement usually is the support or resistance point for the longer trend, the length and time of a retracement can tell us something about the longer trend. For example, in a sharply rising uptrend, you would expect the retracements to be short and not "retrace" a large percentage of the earlier rise. Indeed, the general rule is that a strong uptrend requires retracements of only one-third of the previous uptrend. The same is true for downtrends. Should the retracement in an uptrend decline 50% for example, after having only had one-third retracements in prior retracements, the trend line in the longer uptrend would likely be broken and a warning of a trend change in direction generated. Usually, a 50% retracement only suggests that the uptrend is slowing and is not necessarily an imminent danger signal, but if the retracement is more than 50% (as in Figure 12.19, where it is 66%), and especially if it is more than two-thirds of the prior advance, a severe warning is generated. Thus, the amount of retracement is an indication of the larger trend's strength.

A retracement, in a healthy trend, can also present an opportunity to the trend-follower who missed the earlier stages of the trend and would like to jump on. A retracement, as long as it holds above the longer trend line and does not retrace more than 50%, is an opportunity for the trend follower to act in the direction of the larger trend. A very large percentage retracement may be an indication that the trend is weakening. Retracements provide an entry point at a low enough level, not only for potential future profit, but also close enough to identify a point at which a protective stop can be established to minimum risk. Stops are necessary to prevent large losses, and we will cover them in the next chapter.

Unfortunately, retracements rarely reach an exact percentage. Some analysts believe that percentage retracements provide a good starting point. Many articles and books have hypothesized that in an uptrend or downtrend, prices will tend to retrace a certain percentage. The most common mentioned are 33 1/3%, 50%, 66 2/3% and the Fibonacci percentages of 38.2% and 61.8%. The late Art Merrill, a well-respected technical analyst, in a paper published in the *Journal of Technical Analysis* (August 1989), found that the amount by which prices retrace in the DJIA during an advance or decline did not concentrate about any of these percentages.

Anticipating retracement levels, therefore, can be somewhat hazardous, and the tradeoff between the amount of retracement desired and what may actually occur is usually unanticipated. Thus, a rough estimate from previous retracements, support and resistance zones, and the location of the longer trend line are probably the best information for an estimate rather than the mechanical percentage numbers derived from various formulas.

### **Fullbacks and Throwbacks**

Variations of retracements that occur after a breakout, usually from a horizontal support or resistance zone but sometimes from a trend line, are called "pullbacks" or "throwbacks" depending on whether the breakout was downward or upward. When the price retraces quickly back to the breakout zone from an upward breakout, it is called a "throwback," and conversely, the quick retracement from a break downward is called a "pullback" (Edwards and Magee, 2003). These will become more important when we discuss chart patterns, but they often are found in any

breakout, especially in one from a rectangle formation or congestion area. These retracements may not abide by normal retracement percentages if they are blocked by the support or resistance level from which they broke. They tend to be very short in time and distance but often provide a second, lesser-risk opportunity for a breakout trader to enter a position.

## OTHER TYPES OF TREND LINES

### Trend Lines on Point-and-Figure Charts

A trend line may be drawn between successive lows or highs in the standard, old-style, point-and-figure charts, just as they are drawn in a bar or candlestick chart. There is one variation, however, that occurs in the three-box reversal method. For this type of chart, trend lines are drawn at 45-degree angles (see Figure 12.20). Upward trend lines, called *bullish support lines*, are drawn at a 45-degree angle from the lowest low, and downward trend lines, called *bearish resistance lines*, are drawn from the last peak. These lines are not really trend lines in the sense that we have covered earlier, but price penetration through them has very specific meaning. We will cover these in more detail in Chapter 16, "Point-and-Figure Chart Patterns."

#### DJ Industrials (INDU)

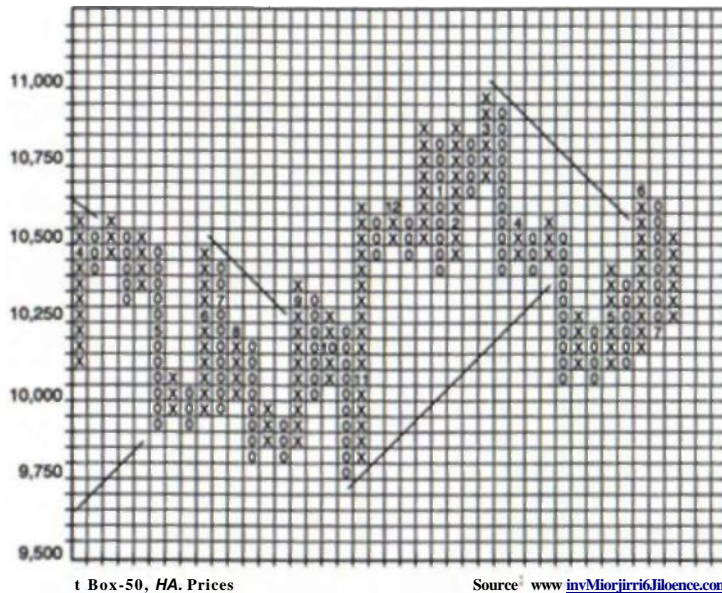


FIGURE 12.20 Bullish support and bearish resistance lines on a point-and-figure chart (through July 12, 2005)

## Speed Lines

The late Edson Gould, an early proponent of technical analysis who did extensive market research, developed a means of estimating future support and resistance by what he called *speed lines*. Speed lines are calculated in the instance of an uptrend by taking the low point of the advance and the high point and creating a box whereby the low point is the lower-left corner and the high point is the upper-right corner. Alternatively, as shown in Figure 12.21, during a downturn, the beginning of the decline (the high point) is the upper-left corner of the box and the low point is the lower-right corner of the box. The vertical line from the high to the low straight down from the high is then marked at each third and at the halfway level, and a "speed" line drawn from the actual low in the lower-left corner through each of the two marks on the right side and projected into the future. His hypothesis was that these speed lines were natural levels of support, and the prices would retrace to them. Modern methods have included marking the Fibonacci ratio numbers of 38.2% and 61.8% and drawing the speed lines through them. As retracements do not seem to follow a consistent percentage, it seems doubtful that much merit should be applied to speed lines, but they are often seen in the literature on technical analysis.

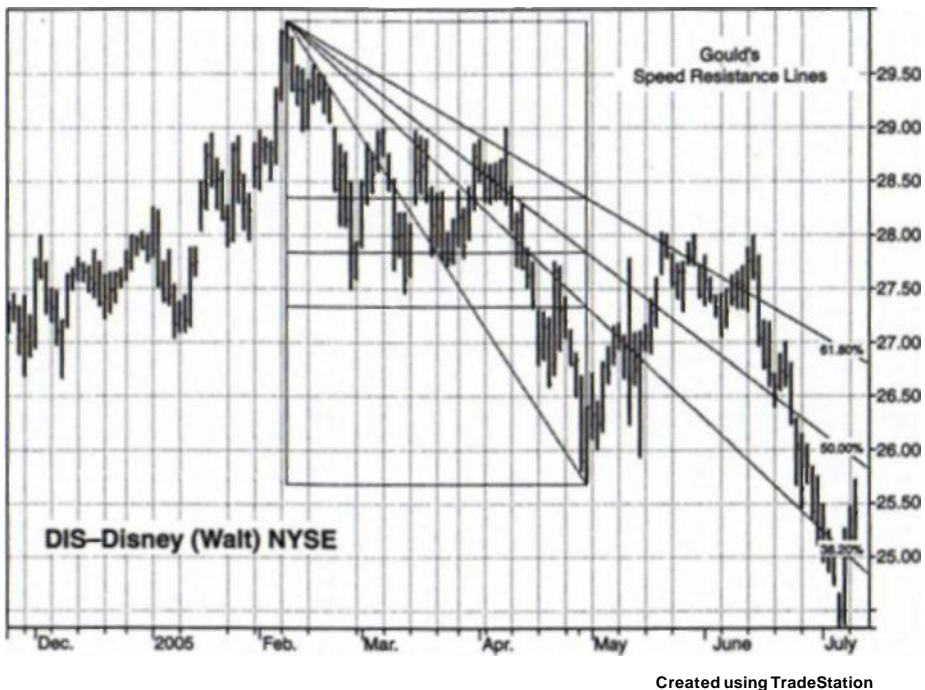


FIGURE 12.21 Gould's speed resistance lines (December 20&Huly 2005)

### Andrews Pitchfork

Developed by Dr. Alan Andrews, the pitchfork, in a downtrend (see Figure 12.22), takes the earliest high (1), the next minor low (2), and the first major retracement high (3), and then draws a line between the low and the retracement high (2-3). It then marks the halfway point on that line, draws a trend line through the earlier high and that mark, extending it into the future, and also draws parallel lines to that new line from the minor low and from the retracement high. It sounds complicated, and like the speed line, apparently has limited value in projecting future support and resistance levels. Users claim that 80% of the time after the pitchfork is formed, prices will retrace to the middle line HA). This has not been tested, however. The method is often seen in press articles, likely because of the name (similar to candlestick patterns that also have catchy names), but its usefulness is suspect.



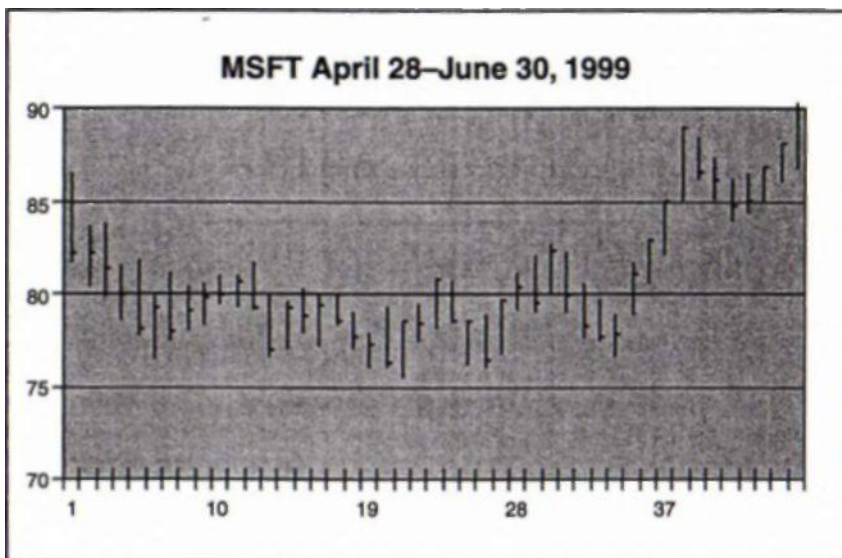
FIGURE 12.22 Andrews pitchfork (December 2004-July 2005)

## CONCLUSION

The trend of prices is the most important variable in profiting from technical analysis. The trend can sometimes be obvious and sometimes be elusive. The most useful trends are those identified the earliest, ridden as long as they last, and the inevitable end recognized. The first step in this process is observing what trends currently exist. Support and resistance zones determine when trends have reversed in the past and are a clue as to when they will reverse in the future. Support and resistance produces troughs and peaks. By connecting with a line from trough to trough and peak to peak, we can easily plot trend lines that represent past trends and extend them into the future. From retracements and the breaking of these extended trend lines, we can also spot when a trend may be changing direction. In the next two chapters, we continue with the discussion of trends, introducing other methods of measuring them and other signals that can warn of impending change in price direction.

## REVIEW QUESTIONS

1. Explain what the term "trading range" means. Why is it hard for a trader to make money when the market is in a trading range?
2. What does the term "support" mean? How is support generally drawn on a chart?
3. What does the term "resistance" mean? How is resistance generally drawn on a chart?
4. Explain the psychology behind support and resistance levels.
5. Jonathon is watching the stock of his favorite company trade in a congestion area. He is watching closely for a breakout to jump into the market. He says he does not want to miss the breakout, but he is cautious not to assume a breakout prematurely.
  - a. Why do you think Jonathon is sitting on the sidelines while the stock is trading in the congestion area?
  - b. How might Jonathon recognize a breakout?
  - c. Explain the tradeoff Jonathon is facing about being cautious regarding prematurely assuming a breakout, but at the same time being careful not to miss the breakout.
6. On the next page is a daily bar chart for MSFT for April 28-June 30, 1999. Much of this chart represents a "trading range" area.
  - a. Make a photocopy of this chart and mark the peaks and troughs on the chart.
  - b. Which of the peaks and troughs that you marked fulfill the two-bar reversal point criterion?
  - c. Which of the peaks and troughs that you marked fulfill the Gann two-day swing criterion?
  - d. Draw support and resistance lines (or zones) on the graph.
  - e. When does a breakout from the trading range occur?



7. Using the data that you gathered and the graphs that you created in Chapter 11, "History and Construction of Charts," for VLO (June 2002-June 2005), find the following items:
  - a. Find a period of congestion on the graph. What were the levels of support and resistance during this trading range? In what direction did a breakout occur? What story does this breakout tell about the war between buyers and sellers?
  - b. Locate a period when an accelerating uptrend occurs on the graph. When does a reversal occur?
  - c. Locate a period when a decelerating uptrend occurs on the graph. When does a reversal occur?
  - d. Find a period on the graph when the major trend is upward, but a retracement occurs.



# BREAKOUTS, STOPS, AND RETRACEMENTS

## CHAPTER OBJECTIVES

By the end of this chapter, you should

- Understand what a breakout is
- Be familiar with the major methods of identifying a breakout
- Be familiar with the purpose of entry and exit stops
- Be familiar with the major methods of setting entry and exit stops

In Chapter 12, "Trends—The Basics," we discussed the importance of trends for profiting from price action, and we observed several ways in which trends can be recognized. We also learned that to maximize profit, we must join a trend at its earliest, safest point, and ride it until it shows signs of changing direction against us. To do this, we mentioned that a trend will begin often from a breakout of a support or resistance level and sometimes from a trend line. In this chapter, we discuss breakouts and stops. They are never exact levels and require certain rules for us to have confidence in their validity. Stops are useful for both entry and exit strategies, and protective stops are prices at which investors must admit, as difficult as that might be, that their analysis is wrong and that the best solution is to exit from the position. Breakouts and stops are somewhat similar, although stops need not be as stringent.

## BREAKOUTS

### What Is a Breakout?

A breakout occurs most often when a price "breaks out" through a prior support or resistance level or zone. A breakout often signals that a significant change in supply and demand has occurred and that a new price trend is beginning. For this reason alone, a breakout is an extremely important signal to the investor or trader. A breakout can also occur at a trend line, which as the previous chapter noted, is just a moving support or resistance level. A breakout in the direction of the previous trend is a confirmation that the trend still exists, and a breakout in the opposite direction of a previous trend suggests that the trend is reversing and that a position should be closed and possibly reversed. Breakouts occur when prices pass through specific levels. Because these levels are often somewhat unclear zones and because false breakouts are common, the point at which a breakout occurs is extremely important. Often there must be a tradeoff between speed and conviction. Speed of action is necessary just as a price is breaking a level, and conviction is necessary to be sure that the breakout is real. There are a number of ways to accomplish both, but there is always the tradeoff between risk and reward. More conviction that the breakout is real reduces the potential reward, and less conviction increases the risk that the breakout is false.

### How Is Breakout Confirmed?

The first requirement for a breakout is a penetration of a previous trend line, or support or resistance zone. The next requirement is confirmation that the penetration is a real breakout, not a false one.

When the exact breakout level is not clear, as in a support or resistance zone, the extreme level of the zone is considered the breakout level. For example, in a trading range with a wide support zone of horizontal lines from previous support points, the lowest support line would be the breakout level. The other horizontal lines are also parts of the zone, but prices will often recede into the support zone without breaking through it entirely. Thus, a break of the lowest support point is evidence that the entire support zone has been penetrated. A trend line is a more definite breakout level because it is a line, but even with a trend line, a false breakout often occurs and requires redrawing of the trend line. In both these instances, a penetration of the breakout level or trend line requires confirmation.

### Techniques

Penetrations often occur on an intra-bar basis, and then the price closes back on the nonbreakout side of the breakout level or trend line. For an example of an intra-bar penetration, see Figure 13.1. Notice that in late June, the price fell below the support zone in intraday trading but closed above the support level. Penetrations of this type are usually false.

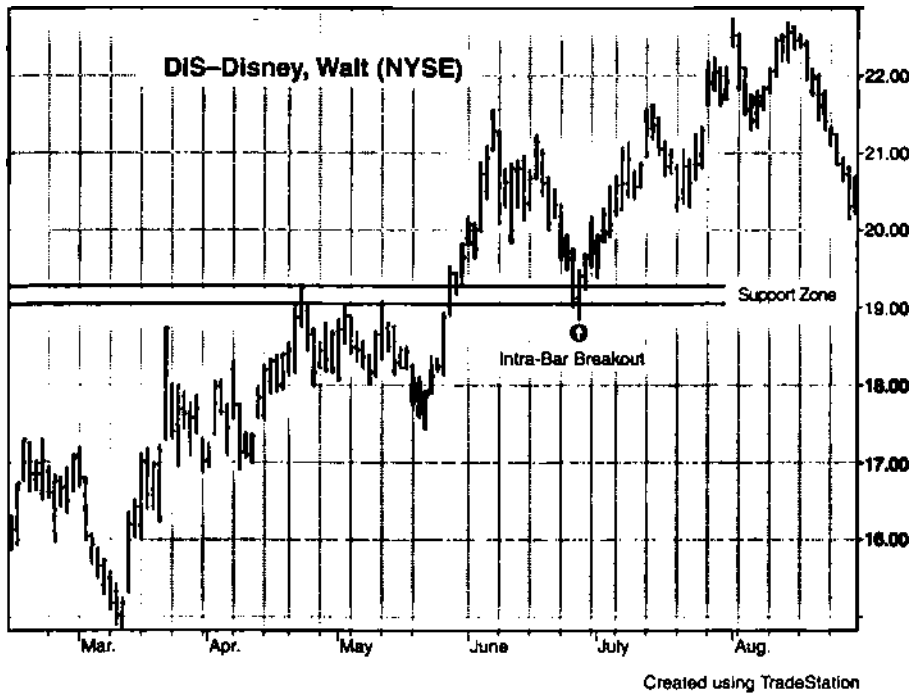


FIGURE 111 Intra-bar breakout (dairy: February 26, 2003-September 11, 2003)

#### Close Filter

The major problem from the analyst's standpoint is that when the penetration is occurring, there is usually no other confirming evidence until after the close. Some analysts will act immediately on the penetration and wait for the confirmation later. This is dangerous because the odds of a false breakout are greater with just an intra-bar penetration, but the entry can be protected with a close stop. The least risky confirmation is to wait for the close to see if, perhaps, the penetration was just due to an intra-bar exogenous occurrence that had little longer-term meaning. If the price ends up on the nonbreakout side of the breakout level at the close, it is plain that the intra-day penetration was likely false and new lines might have to be drawn to account for it. On the other hand, if the close is through the breakout level, the odds are higher that the breakout is real (see Figure 13.2).

Some traders even wait for two bar closes beyond the breakout level for confirmation. This increases the risk that some part of the move subsequent to the breakout will be missed, but on the other hand, it increases the possibility that the breakout is real.



Created using TradeStation

FIGURE 112 Close breakout (daily: February 26, 2003-September 11, 2003)

#### Point or Percent Filter

Another confirmation method is to establish a breakout zone either a certain number or fraction of points or percentage beyond the breakout level, as pictured in Figure 13.3. The theory is that if the price can penetrate the breakout level and a prescribed zone beyond it, the penetration must be real. The number points or percentage is determined before the penetration and is helpful in computerized models where a definite breakout price needs to be established. Waiting for the close after an intra-bar breakout is more difficult to program. The number of points or percentage can be arbitrarily or empirically derived. Although the signal can use any percent or number of points, the most commonly used is a 3% rule, a level 3% from the ideal breakout point.

#### Time

Rather than looking simply at price, this method looks at time since the penetration. The basis is that if the penetration remains for a certain time, it must be real. The usual time period is two bars, but it can be any length of time. The price must remain beyond, or at least close beyond, the

breakout level for the required number of bars. A combination of the time rule and the close rule uses both rules. This method requires a penetration and close beyond the breakout level, and then a second bar in which the price penetrates even further beyond the breakout level. For example, in a breakout down, the close must be below the breakout level, and the next bar must have a trade below the previous bar's low for confirmation of the breakout down. Figure 13.3 demonstrates this type of breakout to the upside.



Created using TradeStation

FIGURE 113 Breakout filter (daily: February 26, 2003-September 1, 2003)

### Volume

Increased volume of trading often occurs with a breakout. Heavier trading demonstrates that other market players are acting in the direction of the new trend and that there is sufficient power behind the penetration. Jiler (1962), however, observes, and cannot explain why, that volume can dramatically decline on a breakout, and the breakout is still valid. Usually, volume then increases as the trend develops. In Chapter 15, "Bar Chart Patterns," we will look at volume behavior on the breakouts from different chart patterns.

### Volatility

All of the preceding price rules have obvious drawbacks. The principal drawback to most of these methods is that they don't account for the price volatility of the security. By nature, some stocks tend to be characterized by more volatile trading; for these stocks, a more significant price move can be expected without it signaling a breakout. Remember that a filter using just the close doesn't require that the close be any distance from the breakout level. In highly volatile stocks, for example, the close can vary from a trend line or breakout level by a considerable amount and still not be a valid breakout.

A filter rule that uses some arbitrary point or percentage rule is likely to be broken by a highly volatile security before a true breakout occurs. In this case, analysts may consider the price volatility of the security when determining what the filter for a legitimate breakout should be. Three means of calculating volatility are most often used; these are beta, standard deviation of price, and Average True Range (ATR).

Beta is a calculation of the standard deviation of price relative to a market proxy, usually the S&P 500. It is not useful in commodities because commodities have little useful correlation to the stock market or a commodity average. Indeed, beta's use has diminished over the years, as the underlying assumption that it is a valid measure of risk has been questioned. It does have one advantage in that it eliminates the trend of the market from the volatility calculation.

Standard deviation of price is the basis for most option and other derivative models and uses the complete set of prices over some past period in time. Its usefulness as a breakout filter is diminished by the fact that it includes the trend of the security in its calculation. The breakout filter must use the volatility about the trend and not include the trend itself. Otherwise, a strongly trending stock with little volatility about its trend would have a higher filter than a flat-trending stock with wide fluctuations about its mean.

ATR is a derivation of the Average Range, which is just the average of the difference between each bar high and low over some past period. The average is calculated using a special formula devised by Wilder himself to reduce the effects of older data (see Chapter 14, "Moving Averages"). The ATR is an average of the True Range, which includes the previous bar's close (Wilder, 1978). In doing so, it includes whatever effect a price gap between bars might have on the security's volatility. The True Range is the greatest of

- The difference between the current bar high and low
  - The absolute value of the difference between the prior bar close and the current bar high
- or
- The absolute value of the difference between the prior bar close and the current bar low

The ATR is the average of the True Range over some time period. Being dependent solely on the price of the security, the ATR is not influenced by any other average or security and is thus pure to the security's own action. It includes the recent trend only so far as the trend has had an effect on the range of prices. ATR is an excellent measure of volatility and is used in many indicators as well as breakout and stop-loss formulas.

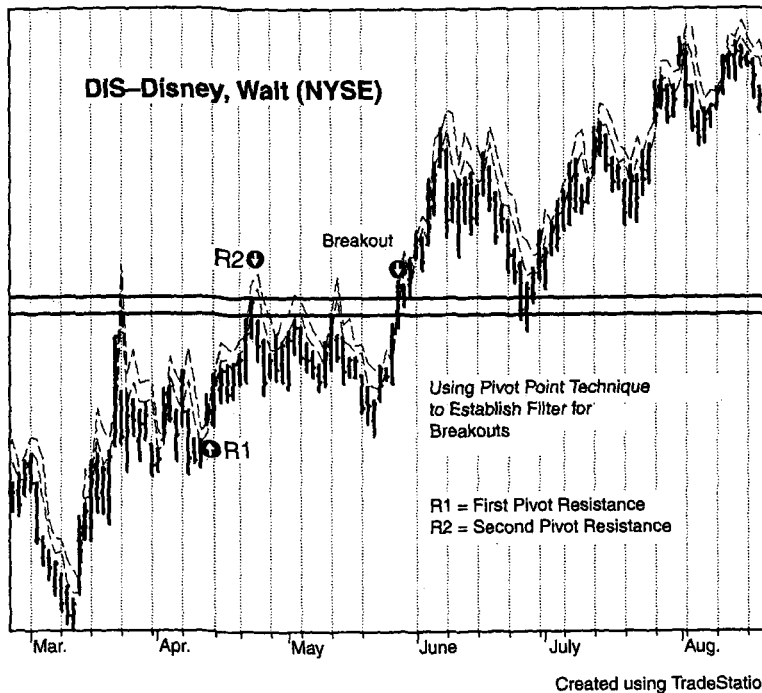
As a price filter for confirmation of a breakout, the breakout level is adjusted for the volatility of the security. As you can see in Figure 13.4, an ATR filter expands and contracts over time as price volatility changes. For example, if price volatility increases, daily True Ranges will expand, and the ATR will be larger, making it less likely to have a false breakout due to the increased price volatility. This means that a highly volatile security will have a wider filter to account for its likelihood of making false breakouts just because of its higher volatility. On the other hand, a dull security that has few wild moves will have a narrow filter that will trigger the breakout with only a minimum deviation from its usual range.



**FIGURE 13.4** ATR breakout filter (daily: February 26, 2003–September 11, 2003)

#### Pivot Point Technique

The Pivot Point Technique is a method of determining likely support and resistance levels. It is widely used by day traders to establish potential price ranges for the day, and it is used as confirmation for breakouts (see Figure 13.5).



**FIGURE 13.5** Pivot Point technique filter (daily: February 26, 2003–September 11, 2003)

This technique uses the previous bar's high, low, and close to establish support and resistance levels for the current bar. Price points derived from the previous bar are used to calculate a series of points called "pivot points" for the current bar. The theory behind using this technique is that as time goes on, the effect of past prices on current prices diminishes. Thus, the most recent, previous bar's action is the best predictor of the current bar's action.

This technique uses the following formula (Kaufman, 1998):

$$P \text{ (pivot point)} = (\text{High previous bar} + \text{Low previous bar} + \text{Close previous bar}) / 3$$

$$R1 \text{ (first resistance)} = 2 \times P - \text{Low previous bar}$$

$$S1 \text{ (first support)} = 2 \times P - \text{High previous bar}$$

$$R2 \text{ (second resistance)} = (P - S1) + R1$$

$$S2 \text{ (second support)} = P - (R1 - S1)$$

these calculations are then used to establish upper and lower levels at which prices would be expected to meet resistance or support based on the previous period's action. Floor traders will



calculate the pivot point from the previous day's action to determine resistance and support levels to be expected for the current day. They will then enter or exit trades around these calculated pivot levels. The use of this formula is, of course, questionable because the logic behind it is questionable. The reason that so many intraday price reversals occur at pivot points is likely because so many traders use them, and thus they become self-fulfilling.

Traders looking for the validity of daily breakouts, on the other hand, will use the previous week or month action to establish current expected resistance and support levels; a price break through a current actual resistance or support level would be confirmed if it also broke a pivot resistance or support level. As a method of confirming breakouts, the logic behind their use is a little more solid. The formula is essentially a measure of the previous day's volatility projected into the following day. Volatility, as we have seen previously, is a useful method for determining accurate breakout confirmations.

### Can a Breakout Be Anticipated?

So far, we have looked at ways of confirming a breakout *after* it has occurred. Is it possible to determine that a breakout is about to occur *before* it actually does? Sometimes it is possible to anticipate a breakout. Often, volume is a clue that a breakout is about to occur. As we will learn later, volume often accompanies the trend. In other words, an increase in volume with a trend is supportive of that trend. Thus, when prices are oscillating, for example, beneath a resistance zone and volume increases on every small up leg and decreases with every small down leg, the odds favor that the price will eventually break up through the resistance zone.

Prices can also give a hint as to their next directional move. For example, in a trading range, if prices begin to reverse upward at a level slightly above the lower boundary of the range and then reverse downward right at the resistance zone, it indicates that buyers are becoming a little more aggressive with every minor correction and are willing to pay just a little more for the security. If this tendency to have slightly rising lows is accompanied by increasing volume on the rallies, the probability of an upward breakout through resistance increases.

Figure 13.6 gives a hypothetical example of price activity hinting that a breakout may soon occur. Resistance has existed in the past and has stopped the first price rally. A downward reversal takes place to the point marked C. If volume increased on the initial rise to resistance but declined on the correction to C, C becomes a possible entry point in anticipation of a breakout above resistance. This is a low-odds, riskier entry point because the chances of it failing to follow with an actual breakout are considerably greater than after an actual breakout has occurred, but the price at which entry is made is lower, and thus the trade, if it works out, is potentially more profitable. A tradeoff exists between the higher risk of entry prior to the breakout and the higher reward of a cheaper entry price. At B, assuming again that volume has increased with the small rally, the odds of a breakout have increased over C, but the price is not quite as advantageous. At A, we know that a breakout has occurred, and thus our risk of a failure has diminished (but not been eliminated because false breakouts can still occur), but the price of entry is considerably higher than the other possible entry points. This tradeoff between risk and reward is a constant problem for the analyst, and the decision as to which breakout method to use is entirely at the analyst's discretion, based on individual reward/risk tolerance. Deciding on the most comfortable relation between risk and

reward is a problem that will arise in almost every technical situation, from breakouts to money management, and it is one of the reasons that evaluating technical systems is so difficult.

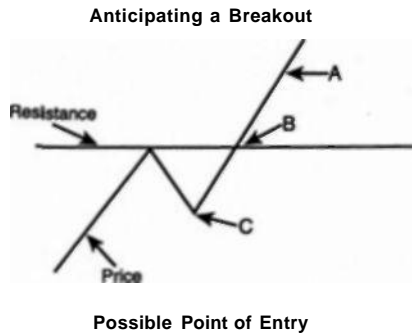


FIGURE 13.6 Anticipating a breakout

## STOPS

A stop order is an order to buy or sell once a specific price has been reached.

### What Are Entry and Exit Stops?

Stop orders, called "stops," can be used to enter a position or to exit a position. In an advance, a stop order would be placed to purchase the security once the price has risen to the particular level. These entry stops are used to initiate a position once a certain price, such as an upward breakout price above resistance, is reached. During a decline, the entry stop order would be placed to sell short once the specified price has been reached. Exit stops are used either to protect capital from further loss, what Edwards and Magee (2003) call "protective stops," or to protect profits from deteriorating back into a loss, usually called "trailing stops." These stops are defensive in nature and are an absolute necessity once a trade entry has occurred.

Breakout levels and stop-loss levels or zones are very similar. Exit stop levels are levels that signal the analysis may be incorrect or at least that the analysis is uncertain and that a position should be exited to protect capital but not necessarily reentered in the opposite direction. Entry stop levels are positioned using the preceding rules for establishing a breakout level or zone or anticipation of a breakout through those levels or zones. The methods described previously for confirming breakouts are equally useful in confirming stop levels.

In an entry stop at a breakout level, an investor is committing new money and taking the risk that the breakout is valid. In an exit stop, one is closing a position and thus not increasing risk. This is not to say that stops should be used carelessly. Indeed, by placing stops too close to current price action, an investor can be easily "whipsawed." A whipsaw occurs when an investor buys a security, the security price falls, the investor sells the security, and then the security price

goes up above the original purchase price. The investor's original opinion was correct, but he or she still lost money. The word "whipsaw" comes from the timber industry where a long, thin, two-man wood saw would often get caught in a log, if not properly handled, and whip the sawyers back and forth without cutting the wood and subjecting them to "two damaging and usually opposing forces at the same time" ([www.Randomhouse.com](http://www.Randomhouse.com)). The whipsaw resulted from lack of analysis and lack of patience, just as in investing.

## Changing Stop Orders

The most important underlying principle for stops, because they protect one's capital but at the same time may imply the original analysis was wrong, is that they should never be moved away from the trend of the security. In other words, if one is long a security and has placed a stop at a reasonable level below the current price, that stop should never be cancelled or reduced. Its purpose is to keep the investor honest. By changing or canceling the stop, especially when the security is trading at a loss, the investor is losing discipline and reacting to emotional pressures having to do with not desiring to admit an error, a natural and strong human emotion, but unrelated to the rational assessment of the price action. If a decision about the security originally is made with the best logic and information available and a stop is placed at that time at the point at which the analysis will obviously be incorrect, changing it or canceling it negates all the original thought and analysis. The stop may be adjusted along with price as a trailing stop or one that follows each successive change in support or resistance in the direction of the trend, but it should never be cancelled or changed against the trend.

Many investors and traders place stops too close to the current price of the security in which they have a position. This often causes whipsaws, even when the stop is adjusted for volatility. A stop is basically a protection device. It is not necessary for short-term trading. Often, because they don't wish to lose any amount of profit, investors will place a stop too close to the current price and get closed out too early in a longer move. A better method is to allow the security "breathing" room and place the protective stop below where the breathing room correction would be serious. We know that security prices retrace their advances in a progression of steps along the trend, and we know that we will never buy and sell at the absolute peak or trough. We also know that we have to decide upon what time horizon we wish to play. Once that is decided, to place a stop based on a shorter time period only invites whipsaws. It is better to wait for the retracement and let the security "breathe."

On the other hand, if the situation is such that the overall market appears ready to reverse, and one's security has run along with the market but is also showing signs of fatigue, a trailing stop very close to the current price is sometimes warranted. When the situation is such that a position will likely be closed soon anyway, for whatever reason, tightening the stop just allows the marketplace to make the decision rather than the investor or trader.

## What Are Protective Stops?

Whenever a position is initiated, usually even before initiation, a protective exit stop level must be determined. The reasons are twofold. First, the protective stop protects capital. Not every entry is correct and ends up with a profit. Indeed, many traders have more losing trades than winning trades, but they are able to profit because of the judicious use of their stops. They place

protective stops at a level at which they know the trade will have been unsuccessful, and when a trade works out, they run with the profits until the trend appears to be reversing. The protective stop, therefore, is necessary in any investment endeavor. Even standard fundamental analysis should use some kind of stop. It is ridiculous to think that when entering a trade or investment that it will always be successful and that risk of loss should be disregarded.

The other reason a protective stop is necessary is to determine what risk the trader or investor is accepting in the trade. By establishing a stop level (and placing an order to that effect), the investors now know exactly what capital risk is being taken. Assume that a stock breaks upward out of a resistance zone at \$20, and the entry stop is triggered so that the investor is now invested in the stock at \$20. By analyzing previous support, trend lines, and other technical data, the investor determines that if the stock should sink to \$17 (perhaps that is a support level or a trend line level adjusted for corfirmation), there is something wrong with the analysis that suggested that the price would be rising. The need to know what is wrong is unnecessary because the stock price action itself is suggesting that something is wrong. Rational investment management would then be to get out of the stock until what is wrong is understood and evaluated. Technical analysis tells the investor at what price this exit should be made. Once the \$17 price is determined as the exit point, the risk of the trade has been determined to be \$3, the difference between the entry and potential exit prices. Knowing that the risk is \$3 makes the money management problem considerably easier. Say the investor has \$100,000 and never wishes to risk more than 10% of capital in any one investment. A 3,300 share position with the risk of losing \$3 is a \$10,000 risk in a \$100,000 portfolio, or 10%. No other investment method is as useful for measuring risk of loss. If the best exit point was \$16 rather than \$17, the risk would be \$4 per share and the ideal position to limit loss to 10% of the portfolio would then have been 2,500 shares. By knowing the risk level, the investor can adjust the amount of shares to be purchased. This method provides a tremendous advantage in reducing risk.

All stops should be placed based on the price action of the security and the level at which a reversal in trend is likely. Generally, these are trend lines or support or resistance levels. The methods using percentages or points from entry do not address the action of the price and are not adjusted to it. Instead, these levels are purely arbitrary. These rules will often stop out a position before a crucial level is reached or long after it has been penetrated. Exits always should be placed at logical levels of price based on the analysis of trend, support and resistance, volatility, and pattern, not on the peculiarities of a particular portfolio or on an arbitrary rule.

## **What Are Trailing Stops?**

When a security is in a recognizable trend, a trailing stop can be used to avoid the potential loss of profits. Edwards and Magee called these stops "progressive" stops. These trailing stops are necessary because, for instance, in a significant uptrend, the prior support or resistance level may become a substantial price distance from the current price. For example, consider Figure 13.7. Assume that the initial resistance level that was broken through (and the place your initial long position was entered) is represented by the low March price. As the stock continues trading in an uptrend over time, the price gets further and further from this initial stop point. By August, you have made a substantial profit. Setting a trailing stop will help you lock in that profit if the

uptrend reverses. If you kept the stop at the original March level, you could watch the price fall by a large amount, and your profits would disappear before the protective stop was activated.



FIGURE 13.7 Trend line trailing stop (daily: February 26, 2003-September 11, 2003)

#### Trailing Stops Using a Trend Line

The easiest method of establishing a trailing stop is to follow the trend line with a confirmation filter similar to those used in standard breakouts, as shown in Figure 13.7. For example, an uptrending stock has a definite, well-defined, standard trend line drawn beneath the recent price history. By setting a stop level below the trend line, to prevent false signals, using the amount determined from any of the preceding breakout confirmation methods—say a 3% filter—you establish a trailing stop. It must be adjusted with every new bar to travel along with the trend line. If it is triggered and the position closed, profits already accrued would not be appreciably affected, at least not as much as waiting for a previous support or resistance level to be broken

would adversely affect them, yet the stop level is far enough away from the trend line so as not to be triggered with a false breakout.

Another method of trailing stop designed to account for the intrinsic volatility of the security is to measure some fraction of the security's ATR from its latest reversal point. This method is called a "Chandelier Exit." For example, assume you are long a security rising on an accelerated trend that reaches \$50. The 14-day ATR for this stock is \$2.50. Based on an evaluation of the market strength, you decide to place a stop three times the ATR below the recent highest high. (Usually a multiple of 2.5 to 4.0 times the ATR is used.) Therefore, you place a sell stop at \$42.50. You don't consider the trend line or the previous support level, which may be considerably below the current price. This method provides a stop based purely on the price and volatility of the security. When price rises above \$50, the stop moves up with the price rise to three times its new ATR below the new high. Figure 13.8 shows what using the Chandelier Exit looks like. Using this method reduces the likelihood that a false breakdown will occur because you are adjusting the stop for the security's volatility. This method is especially useful when other levels such as a trend line or support level are considerably distant from the current price, and the security is following an accelerated upward trend whose end is difficult to predict.



Created using TradeStation

FIGURE 13.8 Chandelier Exit (daily: February 26, 2003-September 11, 2003)

### Trailing Stops Using Parabolic SAR

Another trend-following method for setting stops is the Parabolic SAR. (SAR stands for "Stop and Reversal.") Developed by Welles Wilder (1978), it was initially intended as a trading system because it required a long or short position. However, it has become not only a breakout confirmation rule, but also an excellent, but sometimes very sensitive, stop rule.

The Parabolic is calculated by using an "acceleration factor" that increases as the price moves along its trend. Thus, the name "parabolic" is used because the stop level follows a parabolic curve, as shown in Figure 13.9. The weakness of the formula is that it doesn't include the security's volatility and is thus subject to many whipsaws. The acceleration factor is arbitrary and requires some testing for each security to find the best level with the least whipsaws. The concept of a parabolic curve for a stop level is an interesting one, however, and once adjusted for a security's volatility may have more value.



Created using TradeStation

FIGURE 13.9 Parabolic SAR (daily: February 26, 2003-September 11, 2003)

### Trailing Stops Using Percentage of Gain

One final method of determining trailing stops is to place stops at a percentage of each leg in the direction of the trend. This requires that a profit is accruing. On the initial favorable leg, for example, a stop can be placed at 50% of the gain and moved with the gain until after the first retracement. The stop can then be raised as a higher fraction of each successive favorable leg.

## What Are Time Stops?

Time stops are exit stops used to close a position after a predetermined period of time has passed. Time is an investor's enemy. Uncertainty increases in future time. The longer we look into the future, the less accurate our projections are. This uncertainty is one reason why long-term interest rates are usually higher than short-term interest rates—to account for the risk of something adverse happening over time. When a trading model or investment method determines that a position should be entered, for whatever reason, the longer that time goes on without a profitable reaction to the position entry, the higher are the chances that the entered position will be unprofitable. Technical analysis is a method of timing investments or trades. To maximize return on capital, capital should not be idle. For this reason, technical analysts often use a time stop to exit a position after a predetermined time, especially if the position is not profitable. Time stops are also useful in testing mechanical trading methods. All positions must have an entry and exit. Often one is unrelated to the other, but without the ability to analyze both the entry and exit, their respective strengths and weaknesses are unknown. To analyze the signal entry, a time stop gives equal weight to all the entry signals being tested.

## What Are Money Stops?

Instead of using price points at which risk of significant loss is possible, some traders and investors use a money stop. This stop is based on the risk one is willing to take in terms of money. For example, in the previous description of the protective stop, the investor was willing to risk \$10,000. Instead of determining from the analysis at what point the security is at risk of major loss, the investor determines how far down the security may decline before the \$10,000 is lost. With this method, investors enter into an arbitrary number of shares at their choosing without any analysis of the price point at which the position should be closed and then allow the balance in their investment account to tell them when to sell. From the strategic and money management viewpoint, this method is a poor way to establish a protective stop. The better method is to determine the risk points in the security and work from there. A money stop is based not only on the price change but also on the amount of securities or contracts entered. It is thus not a good method of determining when the chance of further loss has increased and will often cause expensive whipsaws, especially if the position has a large number of shares or contracts and is exited after only a small change in price.

As one can see, there are numerous variations of stops. The technical analyst usually tests a variety on the securities being traded and sticks with the most successful method.



## How Can Stops Be Used with Breakouts?

A breakout above resistance or below support signals a change, usually in direction. A trend breakout is a warning of change but not necessarily of a reversal in direction. The most used breakout is the breakout from support or resistance. In Chapter 15, we will cover chart patterns. Almost all patterns are made of trend lines and support or resistance lines. The most reliable chart patterns are completed on a breakout usually through support or resistance. Most strategies utilizing chart patterns, therefore, must have a way of recognizing a breakout, measuring its importance, and confirming it.

## Using Stops When Gaps Occur

Some traders act directly on the breakout and are willing to pay the extra price generated by the enthusiasm associated with the breakout. This is usually a wise decision when the breakout creates a gap (see Gap A in Figure 13.10). A *gap* occurs when a security opens and trades at a range totally outside the previous day's range. In other words, there is no overlap between one day's trading prices and the previous day's trading prices, and a gap appears between the bars for the

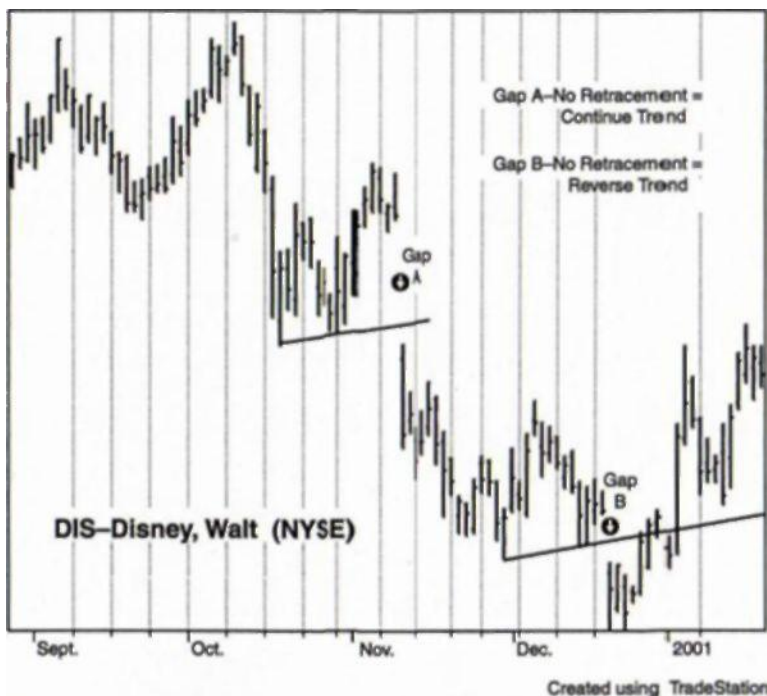


FIGURE 13.10 Gaps with and without retracement (daily August 21, 2000-January 1, 2001)

two days on a chart. A gap is usually a sign that important information was released during the period between the bars that had an extraordinary affect on the buyers and sellers. Usually, if the reason for the gap is legitimate, the price continues in the direction in which it broke out. When the gap is closed ("covered" or "filled"), however, there is the danger that the gap was false and prices will reverse their trend (see Gap B in Figure 13.10). Thus, a protection stop should be placed around the gap opening. We will discuss the different kinds of gaps in Chapter 17, "Short-Term Patterns."

### Waiting for Retracement

When a breakout occurs, but a gap is not present, some traders will wait for the pullback or throwback before entering a position. To do this, they wait for the initial run from the breakout to exhaust itself, calculate a percentage—usually 50%—retracement from the breakout to the high or low, and place a limit order at that level. A breakout followed by a pullback is pictured in Figure 13.11. Studies have shown (Thorn Hartle, *Active Trader Magazine*, March 2004) that the per-



FIGURE 13.11 Breakout and pullback (doily: November 17, 2001 - May 13, 2005)

centage retracement is not predictable and varies widely. Thus, these traders run the risk that the security will not retrace the percentage or will retrace the percentage and continue correcting back to the original stop level. To prevent this, once the percentage retracement level is determined and the limit order is placed, the stop is adjusted to just behind the limit order to prevent the retracement from becoming a large loss if it continues. Often the trader will also enter a partial position on the breakout and a partial position at the expected retracement level with a stop for the entire position just behind it. This way, the risk of missing the security continuing beyond its breakout without a retracement is reduced, and should the retracement occur, a full position will be entered at a lower average price.

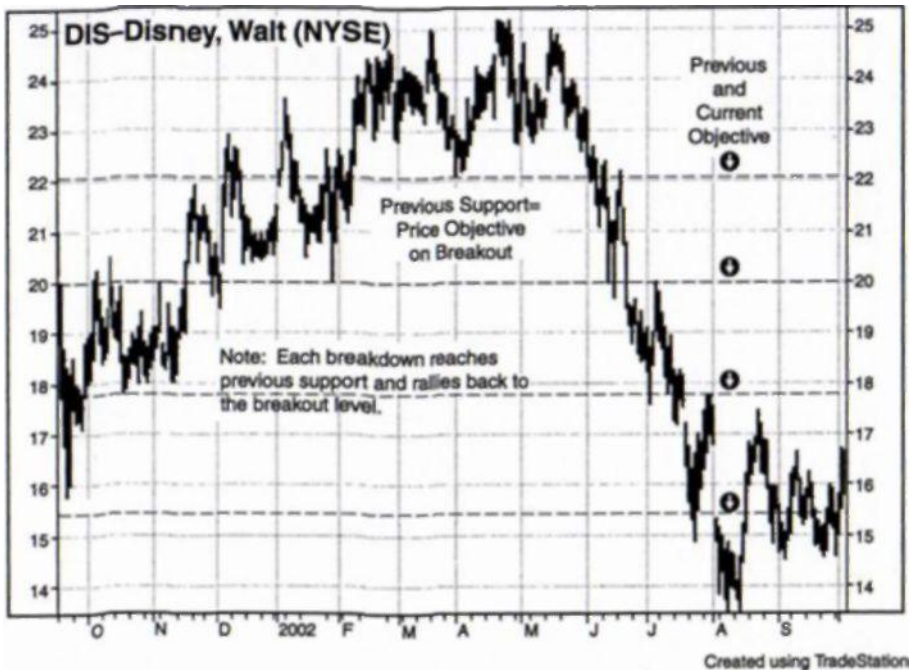
### **Calculating a Risk/Return Ratio for Breakout Trading**

Usually breakouts from support or resistance run to the next zone of support or resistance. This gives the investor or trader a price objective for the breakout. From that price objective, a risk/return ratio can be calculated. The return is the difference between the entry price and the price objective. The risk is the amount the price must go against the entry price before exited on a stop, usually some price on the other side of the breakout. Traditionally, the reward/risk ratio should be a minimum of three to one. This gives the investor the odds of making money even when two out of three trades fail, assuming the third action provides a three-to-one gain. In Chapter 15, "Bar Chart Patterns," and Chapter 16, "Point-and-Figure Chart Patterns," we will learn other methods of determining a price objective. This three-to-one guideline, however, should always be the minimum reward/risk ratio. Anything less than three to one increases the odds of losing money beyond acceptable amounts.

In Figure 13.12, we show the support levels and how the price subsequent to a downward breakout tends to run to the next support level. In the chart, these support levels occur approximately every three points. Once a downward breakout occurs, the objective is the next support level from the previous advance. Depending on where the trade is entered and what level is necessary for a stop, a calculation can easily be made as to the reward/risk of the trade. Notice in this chart that the trader had a second chance on every downward breakout. The price rallied back to the breakout almost immediately in a pullback, and then it declined again to the next support level. Such pullbacks do not occur frequently, but the odds of returning to an earlier support level are generally good.

### **Placing Stops for a False (or "Specialist") Breakout**

Figure 13.13 shows an example of a downward "specialist breakout." This false breakout triggers all the sell stops placed to protect against a loss from a reversal in upward trend or to enter a new short position. Prices, with no follow-through, then reverse again, and they break back up through the earlier breakout level, leaving many investors with a loss. Those who sold their longs on a protective stop no longer have a position, and those who entered a short position now have a loss. The false breakout down caught them. It is often called a "specialist" breakout from the days when specialists and market makers would create false breakouts at prices known to be strong support or resistance levels and establish a position with the longer trend—in the example, the uptrend.



**FIGURE 13.17** Breakouts to support levels (daily: September 17, 2001–October 3, 2002)

Thus, the breakout downward in Figure 13.13, against the longer upward trend, triggered sellers who sold their stock to the specialists or market makers, who then held for the continuation of the earlier trend. Whether these false breakouts are manipulations today is somewhat irrelevant, but they do occur quite frequently and, if not protected against, can be very painful.

To protect against these losses, the astute investor or trader will place another, close buy stop (in the example) slightly above the high of the breakout bar, as drawn on the chart. If prices quickly reverse upward, the trader will cover losses and make a profit from the second stop being triggered, and the earlier long investor will be long again.

The reaction to a specialist breakout is often so strong and dramatic because it has trapped investors in the wrong direction. In itself, it is a tradable formation. In the chart example, should the trader have no position but see the downward breakout, rather than trade the breakout, he or she could place a stop above the breakout bar in case the breakout is false. If the breakout is false and triggers the trader's entry stop, he or she makes a quick profit, and if it does not trigger, he or she doesn't lose anything. A trader who was fooled by the false breakout could also use this procedure for a stop and reverse. If the short is entered on the downward breakout, the buy stop would be placed at the upper level of the breakout bar to close the short position and to enter a long position. In the example, you can see that the triggered stop would have produced a sizeable profit.



Created using TradeStation

FIGURE 13.13 Stop for specialist breakout (daily: September 3, 2003-february 3, 2003)

The most important point about trailing stops, or any kind of stop, is to test the method first. It is remarkable how much a stop, if properly placed, can improve performance over that from just an arbitrary stop placement.

## CONCLUSION

Breakouts from support, resistance, or trend lines are the primary signal that the price has changed direction or is reaccelerating in its original direction. As such, breakouts are usually the first signal to act. Because breakouts can be false, and often are, some means of confirming a breakout is necessary. We have covered a few methods but none of them is foolproof. The technical analyst must experiment with different methods and find those most satisfactory to his method of trading or investing. The same can be said for stops. Although stops need not be as precise, they are always necessary when a position has been entered, and they must never be cancelled or changed until they are triggered or the position is closed. Their purpose is to keep the investor honest and solvent. The rules for breakouts apply equally to stops. They should account

for either previous support or resistance or trend, should adjust for the security's volatility, and should not be placed too close to the current price as to invite a false signal or whipsaw.

## REVIEW QUESTIONS

1. Explain what is meant by the term "whipsaw." What could cause an investor to experience a lot of whipsaws?
2. The daily open, high, low, and close for two stocks, Biosite Inc. (BSTE) and Coca-Cola (KO), for April 15-May 13, 2005 are given in the following table.
  - a. Calculate the five-day ATR for the two stocks for this time period.
  - b. Compare the volatility of the two stocks given the ATR.
  - c. How would these ATRs impact the filter you would want to use for a breakout for each of these stocks?

Date	KO				BSTE			
	Open	High	Low	Close	Open	High	Low	Close
15*pr05	42.08	42.13	41.15	41.29	58.65	60.26	58.18	58.35
16-Apr05	41.12	41.33	40.74	40.97	58.33	58.81	57.52	58.42
19Apr05	42.7	42.92	42.06	42.4	58.33	59.92	58.14	59.82
20Apr05	42.52	42.55	41.63	41.88	60	60.85	58.97	59.3
21-Apr05	42.3	42.3	41.74	41.98	59.4	60.89	59.29	60.8
22-Apr05	41.95	42.56	41.09	42.13	58.03	62.5	58	58.89
25Apr05	42.43	42.73	42.11	42.68	59.51	60.2	59.09	59.77
26-Apr05	42.68	43.31	42.6	42.96	59.35	59.69	58.15	58.4
27Apr05	42.89	42.95	42.48	42.82	58.55	58.55	57.15	57.75
28-Apr05	42.63	42.92	42.62	42.69	58.04	58.04	55.99	55.99
29-Apr05	42.71	43.5	42.6	43.44	56.46	57	55.45	57
2Atof05	43.49	43.62	43.24	43.57	56.61	56.85	55.76	56.64
3-UofOS	43.57	44.02	43.52	43.76	56.78	57.06	56.01	56.26
4-Moy05	43.98	44.24	43.69	43.93	56.56	57.82	56.55	57.61
*Moy05	43.78	44.24	43.76	44.15	57.59	57.96	56.81	57.42
6Moy05	44.22	44.53	44.1	44.19	57.87	57.99	56.11	56.76
WafOS	44.2	44.6	44.1	44.57	56.65	57.7	56.27	57.47
10Moy05	44.12	44.41	44.02	44.23	57.18	57.65	57	57.21
11-Moy05	44.13	44.32	43.79	44.27	57.01	57.37	55.9	56.73
12*May05	44.17	44.75	43.75	44.17	56.7	57.87	56.51	57.65
13-May05	44.47	44.47	43.87	44.11	57.52	58.26	56.91	57.58

3. Using the same data that you used in Question 2, calculate the daily pivot points for the two stocks. Explain how these results can be used to determine points of resistance and support or breakouts.
4. Explain why, during an uptrend, an investor would want to use trailing stops rather than setting one constant stop level.
5. Explain the advantages and disadvantages of using time stops and money stops.

# MOVING AVERAGES

## CHAPTER OBJECTIVES

By the end of this chapter, you should

- Be aware of how moving averages are used to identify trends
- Be able to calculate a simple moving average
- Be able to calculate an exponential moving average
- Be familiar with the concept of directional movement
- Be familiar with the construction of envelopes, bands, and price channels

One of the most successful methods of identifying and profiting from trends is the use of moving averages. A moving average is a constant period average, usually of prices, that is calculated for each successive chart period interval. The result, when plotted on a price chart, shows a smooth line representing the successive, average prices. Moving averages dampen the effects of short-term oscillations. Many of the most successful technical investment managers use moving averages to determine when trends are changing direction. Moving averages are especially useful in markets that have a tendency to trend.

Moving averages have been tested by academics and shown to have statistical significance. Brock, Lakonishok, and LeBaron (1992) were the first to demonstrate, using modern statistical methods that reduce bias, that moving average crossover signals have intrinsic value. As with most academic studies, the results of Brock, Lakonishok, and LeBaron's have been somewhat controversial. Even though some have since criticized their study, other researchers have validated their results. (Incidentally, the Brock, Lakonishok, and LeBaron study provides one of the more useful arguments against the Random Walk and Efficient Markets hypotheses.) Although the Brock, Lakonishok, and LeBaron study focused on the Dow Jones Industrials,



later studies have used moving average crossover systems for market data in other countries with generally the same positive results. Detry and Greg ire (2001) provide a summary of these studies.

There obviously is something to moving averages. Traders and trend investors, of course, have known all this for many years, but technical analysts now feel more comfort in what they have been doing. In this chapter, we discuss some of the moving average methods and strategies that technical analysts use, as well as introduce some variations on moving averages, such as Bollinger Bands, envelopes, and directional movement indicators.

## **WHAT IS A MOVING AVERAGE?**

The moving average is one of the oldest tools used by technical analysts. Daily fluctuations in stock prices, commodity prices, and foreign exchange rates can be large. Moving averages tone down these fluctuations—deemphasizing, and sometimes distorting, fluctuations. Technical analysts use moving averages to smooth erratic data, making it easier to view the true underlying trend.

The principal reason that moving averages are used is to smooth out shorter fluctuations and focus on the trend that fits with the investor's time horizon. A moving average by its nature is just one number that represents a net of certain past numbers. For example, a 20-day moving average is one number that represents all the prices for the past 20 days. As such, it filters out each one of the prices during the past 20 days and tells us how the group of 20 days is behaving, rather than its separate parts.

## **How Is A SIMPLE MOVING AVERAGE CALCULATED?**

Table 14.1 contains the daily closing prices for DIS (Walt Disney Company) from July 1 through September 30, 2003. Most moving averages of prices are based on closing prices, but they can be calculated on highs, lows, daily means, or any other value as long as the price type is consistent throughout the calculations. We will use closing prices.

Notice that on July 15, 2003, DIS closed at \$21.35. By August 22, had DIS closed at \$21.41, six cents a share higher than mid-July. However, during the intervening five weeks, DIS closed as high as 22.56 a share and as low as 20.41 a share. From these numbers alone, it is hard to tell if the price of DIS is trending upward or if the value of DIS is remaining at about 21.40 with some fluctuation around that level. The moving average helps smooth out daily fluctuations, allowing us to determine the true underlying trend.

TABLE 14.1 Price Data and Moving Average Calculations for DIS Price Close Between July 1 and September 30, 2003

Trading Day	Date	Open	High	Low	Close	10-Day SMA	60-Day SMA	10-Day linearly Weighted MA	10-Day EMA
1	1*103	19.76	19.94	19.40	19.89	19.80	19.07	19.66	
2	2JuK>3	20.00	20.28	19.86	20.21	19.76	19.11	19.73	
3	3*103	19.96	20.57	19.93	20.07	19.76	19.16	19.79	
4	7>K)3	20.25	20.70	20.20	20.58	19.78	19.21	19.94	
5	8juK)3	20.27	21.07	20.27	20.60	19.86	19.27	20.09	
6	9JuK)3	20.47	21.13	20.44	20.92	19.99	19.32	20.28	
7	10M03	20.61	20.77	20.41	20.56	20.13	19.36	20.38	
8	11juK)3	20.56	20.88	20.56	20.84	20.28	19.40	20.51	
9	14*103	20.95	21.55	20.95	21.31	20.47	19.46	20.70	
10	15*K)3	21.60	21.62	21.18	21.35	20.63	19.51	20.86	
11	16*103	21.44	21.45	20.98	21.05	20.75	19.55	20.94	20.86
12	17*103	21.05	21.15	20.71	20.82	20.81	19.58	20.95	20.85
13	18*103	20.97	21.05	20.74	21.01	20.90	19.61	20.98	20.88
14	21*103	20.80	20.84	20.26	20.41	20.89	19.64	20.90	20.79
15	22*103	20.50	21.04	20.35	20.82	20.91	19.69	20.88	20.80
16	23*103	20.83	20.92	20.30	20.61	20.88	19.72	20.83	20.76
17	24*103	20.85	21.24	20.66	20.85	20.91	19.76	20.82	20.78
18	25*103	20.97	21.33	20.81	21.29	20.95	19.81	20.89	20.87
19	28*103	21.70	22.17	21.63	21.91	21.01	19.86	21.07	21.06
20	29Jul03	21.99	22.23	21.82	22.05	21.08	19.91	21.26	21.24
21	30-JulK)3	22.05	22.11	21.63	21.69	21.15	19.97	21.37	21.32
22	31*103	22.00	22.11	21.70	21.92	21.26	20.02	21.51	21.43
23	1-Aug03	22.38	23.80	22.38	22.52	21.41	20.09	21.74	21.63
24	4-Aug03	22.39	22.55	21.83	22.11	21.58	20.16	21.86	21.72
25	5-Aug03	22.10	22.10	21.51	21.55	21.65	20.21	21.86	21.69
26	6-Aug03	21.55	21.75	21.32	21.41	21.73	20.25	21.82	21.64
27	7-Aug03	21.51	21.80	21.35	21.65	21.81	20.30	21.80	21.64
28	8-Aug03	21.72	21.85	21.57	21.84	21.87	20.36	21.81	21.68
29	11 Aug03	21.84	22.09	21.80	22.05	21.88	20.42	21.84	21.74
30	12-Aug03	22.07	22.49	22.00	22.45	21.92	20.48	21.94	21.87
31	13-Aug03	22.49	22.54	22.20	22.50	22.00	20.56	22.05	21.99
32	14Aug03	22.50	22.69	22.18	22.56	22.06	20.64	22.15	22.09
33	15-Aug03	22.63	22.63	22.35	22.45	22.06	20.72	22.22	22.16
34	18Aug03	22.48	22.53	22.37	22.40	22.09	20.79	22.28	22.20

[continued!]

TABLE 14.1 Continued

Trading D°y	Date	Open	High	Low	Close	10- Day SMA	60- Day SMA	10-Day Linearly Weighted MA	10- Day EMA
35	19-Aug03	22.40	22.45	21.95	22.23	22.15	20.86	22.31	22.21
36	20-Aug03	21.80	22.09	21.76	21.98	22.21	20.91	22.28	22.16
37	21-Aug03	21.97	22.01	21.44	21.60	22.21	20.94	22.17	22.06
38	22-Aug03	21.75	21.80	21.31	21.41	22.16	20.98	22.02	21.94
39	25-Aug03	21.20	21.33	21.10	21.25	22.08	21.01	21.86	21.82
40	26-Aug03	21.13	21.24	20.85	20.85	21.92	21.02	21.63	21.64
41	27-Aug03	20.86	20.94	20.64	20.72	21.75	21.03	21.41	21.47
42	28-Aug03	20.80	20.83	20.15	20.30	21.52	21.03	21.15	21.26
43	2^Aog03	20.32	20.70	20.22	20.50	21.32	21.02	20.97	21.12
44	2-Sep03	20.73	21.04	20.56	20.95	21.18	21.01	20.90	21.09
45	3-Sep03	21.20	21.47	20.83	21.32	21.09	21.03	20.92	21.13
46	4-Sep03	21.18	21.49	21.17	21.46	21.04	21.05	20.99	21.19
47	5-Sep03	21.43	21.54	21.13	21.19	21.00	21.05	21.02	21.19
48	8-Sep03	21.12	21.40	20.98	21.36	20.99	21.06	21.09	21.22
49	9-Sep03	20.95	21.21	20.93	21.18	20.98	21.07	21.12	21.21
50	10-Sep03	20.87	20.94	20.46	20.60	20.96	21.07	21.05	21.10
51	11-Sep03	20.56	20.79	20.48	20.68	20.95	21.07	21.00	21.03
52	12-Sep03	20.43	20.44	20.07	20.24	20.95	21.06	20.87	20.88
53	15-Sep03	20.00	20.45	20.00	20.10	20.91	21.06	20.72	20.74
54	16-Sep03	20.20	20.50	20.05	20.44	20.86	21.06	20.63	20.69
55	17-Sep03	20.36	20.55	20.20	20.27	20.75	21.07	20.52	20.61
56	18-Sep03	20.30	20.45	20.09	20.45	20.65	21.08	20.47	20.58
57	19-Sep03	20.35	20.50	20.21	20.48	20.58	21.11	20.44	20.56
58	22-Sep03	20.15	20.23	19.87	20.01	20.45	21.12	20.34	20.46
59	23-Sep03	20.12	20.30	20.02	20.20	20.35	21.13	20.29	20.41
60	24-Sep03	20.13	20.16	19.78	19.81	20.27	21.13	20.19	20.30
61	25-Sep03	20.32	20.65	20.15	20.31	20.23	21.14	20.20	20.31
62	26-Sep03	20.33	20.40	19.97	20.08	20.22	21.14	20.17	20.26
63	29-Sep03	20.02	20.30	19.84	20.28	20.23	21.14	20.18	20.27
64	30-Sep03	20.15	20.48	19.86	20.17	20.21	21.13	20.17	20.25

Source: <http://finance.yahoo.com>

The most commonly used type of moving average is the simple moving average (SMA), sometimes referred to as the arithmetic moving average. An SMA is constructed by adding a set of data and then dividing by the number of observations in the period being examined. For example, look at the 10-day SMA in Table 14.1. We begin by summing the closing prices for the first ten days. We then divide this sum by 10 to give us the mean price for that ten-day period. Thus, on the tenth trading day, the ten-day simple moving average would be the mean closing price for DIS for Days 1 through 10, or 20.63.<sup>1</sup>

On Day 11, the moving average changes. To calculate the moving average for Day 11, we calculate the mean price for Days 2 through 11. In other words, the price for Day 1 is dropped from the data set, while the price for Day 11 is added. The formula for calculating a ten-day simple moving average is as follows:

$$\text{SMA}_{i0} = \frac{\sum_{t=1}^{10} \text{data}_{it}}{10}$$

Of course, moving averages of different lengths can be constructed. In Table 14.1, you can also see a 60-day moving average. This SMA is simply calculated by adding the 60 most recent closing prices and dividing by 60.

Although a moving average can smooth prices over any desired period, some of the more popular daily moving averages are for the periods 200, 60, 50, 30, 20, and 10 days. These periods are somewhat arbitrary and were chosen in the days before computers when the calculations had to be done by hand or on a crank adding machine. Gartley (1935), for example, used the 200-day moving average in his work. Simple, round numbers were easier to calculate. Also, the 10-day, 20-day, and 60-day moving averages summarize approximately two weeks, one month, and three months of trading data, respectively.

Once calculated, moving averages are plotted on a price chart. Figure 14.1 shows a plot of the 60-day moving average for DIS. From mid-May through August, the moving average is an upward sloping curve, indicating an upward trend in Disney's price. The daily fluctuations are smoothed out by the moving average so that the analyst can see the underlying trend without being distracted by the small, daily movements.

A rising moving average indicates an upward trend, while a falling moving average indicates a downward trend. Although the moving average helps us discern a trend, it does so after the trend has begun. Thus, the moving average is a lagging indicator. By definition, the moving average is an indicator that is based on past prices. For example, Figure 14.1 shows an upward trend in DIS beginning in mid-March. However, an upward movement in the SMA does not occur until approximately a month later. Likewise, the trend reversal that seems to occur in mid-August is associated with a flat SMA at the beginning of September. Remember that according to technical analysis principles, we want to be trading with the trend. Using a moving average will always give us some delay in signaling a change in trend.

**1. Of course, being able to calculate a ten-day moving average requires ten days of data. Data occurring before the period shown in the chart was used to calculate the ten-day moving average for days July 1-14. Our discussion centers on the calculation of the moving average for Day 10 so that the reader can follow the steps necessary to do such a calculation.**

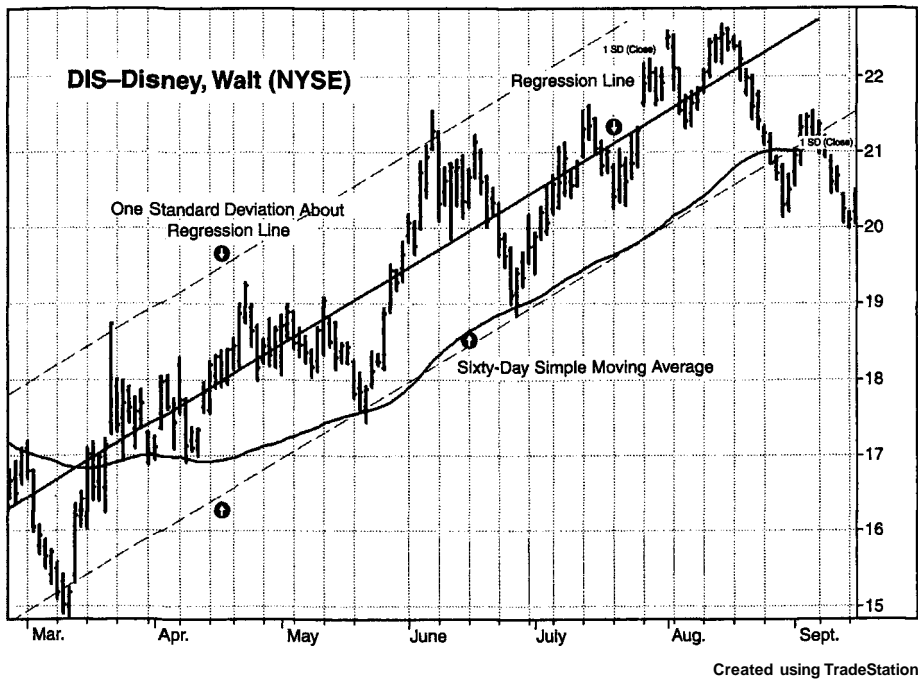


FIGURE 14.1 Simple moving average (daily: February 26, 2003-September 15, 2003)

### Length of Moving Average

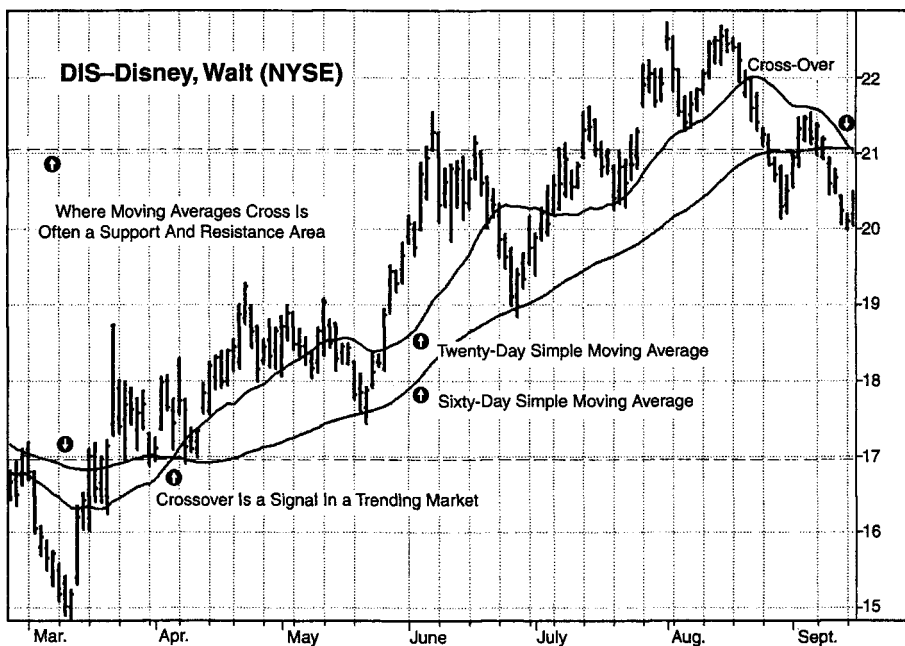
Because moving averages can be calculated for various lengths of time, which length is best to use? Of course, a longer time period includes more data observations, and, thus, more information. By including more data in the calculation of the moving average, each day's data becomes relatively less important in the calculation. Therefore, a large change in the value on one day does not have a large impact on the longer moving average. This can be an advantage if this large change is a one-day, irregular outlier in the data.

However, if this large move represents the beginning of a significant change in the trend, it will be longer before the underlying trend change is discernable. Thus, the longer moving average is slower to pick up trend changes but less likely to falsely indicate a trend change due to a short-term blip in the data.

Figure 14.2, for example, shows both a 20-day and a 60-day SMA plotted for DIS. Notice how the shorter, 20-day moving average shows more variability than the longer, 60-day moving average. The 60-day moving average is said to be the "slower" moving average.

Although it provides more smoothing, the 60-day smoothing average is also slower at signaling underlying trend changes. Notice how the 20-day SMA peaks in mid-August, signaling a change in trend; a month later, the slower, 60-day SMA is flat but still has not turned down to indicate a change in trend direction. Thus, the 60-day SMA is slower to indicate a trend change.

Because spotting a trend reversal as soon as possible maximizes trading profits, the 20-day SMA may first appear to give superior information; however, remember that the faster SMA has a disadvantage of potentially giving a false signal of a changing trend direction. For example, look at mid-May in Figure 14.2. The 20-day SMA takes a downturn, which, at the time it occurred, would suggest a trend reversal. After the fact, however, we can see that a trend reversal did not occur in mid-May. The 20-day SMA was overly sensitive to a temporary decrease in price. During this period, the slower 60-day SMA continued to signal correctly an upward trend.



Created using TradeStation

FIGURE 14.2 Two moving averages—crossover as support and resistance zone (daily: February 26, 2003-September 15, 2003)

## Using Multiple Moving Averages

Analysts do not have to limit their analysis to the information provided by a single moving average. Considering various moving averages of various lengths simultaneously can increase the analysts' information set. For example, as shown in Figure 14.2, a support or resistance level often occurs where two moving averages cross. Where the shorter moving average crosses above the longer is often taken as a mechanical buy signal, or at least a sign that the price trend is upward. Likewise, it is considered a sell signal when the shorter declines below the longer. Many successful moving average strategies use moving averages as the principal determinant of trend and then use shorter-term moving averages either as trailing stops or as signals. In some instances, moving averages are used to determine trend, and then chart patterns are used as entry and exit signals.



Created using TradeStation

FIGURE 14.3 Moving average crossovers causing whipsaws in a flat trend (daily: February 26, 2003 - September 15, 2003)

Using these types of dual moving average signals during a sideways trend in prices, however, can result in a number of whipsaws. This problem can be seen in Figure 14.3. This is essentially the same problem that occurs during the standard sideways trend in a congestion area. It is very difficult to determine from such action in which way prices are going to break out, and meanwhile they oscillate back and forth within the support and resistance levels. A moving average provides no additional information on which way the trend will eventually break. Indeed, a moving average requires a trend for a crossover to be profitable. This means that the analyst must be sure that a trend exists before using moving average crossovers for signals. Otherwise, and some traders are willing to take the risk of short-term whipsaws in order not to miss the major trend, a plurality of signals will be incorrect and produce small losses while waiting for the one signal that will produce the large profit. This can be a highly profitable method provided the analyst has the stomach and discipline to continue with the small losses, and it often is the basis for many long-term trend systems. It also demonstrates how, with proper discipline, one can profit while still losing on a majority of small trades.

## WHAT OTHER TYPES OF MOVING AVERAGES ARE USED?

Although we have discussed various lengths of moving averages, up to this point our discussion has centered on the most basic type of moving average calculation—the SMA. Remember that each day's calculation of the SMA represents adding the most recent day's price figure and dropping the earliest day's price figure. When calculating the simple moving average, equal weight is given to each daily observation. For a ten-day SMA, the information contained in the stock price for each of the ten days is given equal importance. However, in certain situations, the most recent stock price may have more bearing on the future direction of the stock than the ten-day old stock price does. If observations that are more recent contain more relevant information than earlier observations, we will want to weight data in favor of the most recent observation. By calculating a weighted moving average, the most recent day's information is weighted more heavily. This weighting scheme gives the most recent observation more importance in the moving average calculation.

### The Linearly Weighted Moving Average (LWMA)

Let us refer back to the example in Table 14.1 to calculate a linearly weighted moving average. A ten-day linearly weighted moving average multiplies the tenth day observation by 10, the ninth day by 9, the eighth day by 8, and so forth. The total of these numbers are added up and divided by the sum of all the multipliers. In this case, the total will be divided by the sum  $10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1$ , or 55. In Table 14.1, we find that the linearly weighted moving average for the first ten trading days is 20.86.

When using this ten-day moving average weighting scheme, the most recent trading data (Day 10) is given twice the importance of the price five days earlier (Day 5) and ten times the importance of the price ten days earlier (Day 1). As we go on to calculate the ten-day linearly weighted moving average for Day 11, the prices for trading days 2-10 again will be weighted. Therefore, just as with the simple moving average, as the moving average is calculated for each successive day, the earliest trading day information is dropped from the data set being used in the calculation.



## The Exponentially Smoothed Moving Average (EMA)

For some analysts, dropping off the earliest trading day's data that occurs with an SMA or linearly weighted moving average is problematic. If the most recent price reflects little change, but the earliest price, now being omitted, shows considerable change, the moving average can be unduly influenced by the discarding of the older data. A large change in the moving average that results from the deletion of early data potentially generates a false signal. This is called the "drop-off effect" (Kaufman, 1998) and is probably the most criticized aspect of a simple moving average.

Although it is easy to see how this very early data is not necessarily as important in determining future price movement as the most recent prices, it is still information that may have value. With both the simple moving average and the linearly weighted moving average, this older information, which lies outside of the length of the moving average, is being totally ignored. To address this issue and maintain this older information in the moving average calculation, analysts have developed the exponential moving average.

To see how the exponential moving average is calculated, let us again refer to the example in Table 14.1. The simple ten-day moving average on Day 10 was 20.63. The closing price on Day 11 was 21.05, a higher value than the mean value for the previous ten days. To calculate the exponential moving average, we will use both the ten-day moving average (which represents the mean exchange rate for Days 1-10) and the closing price for Day 11. Thus, we are now using 11 days of price information. If we were going to calculate an SMA using these 11 days of information, each day's exchange rate would have a weight of 1/11, or 9.09% in the calculation. Remember, however, that we want to place a larger weight on information that is more recent. If we want the exchange rate information from Day 11 to have a weight twice as great as it would have in a simple moving average, it would have a weight of 2/11, or 18.18%. Of course, the total of all the weights in the calculation of the exponential moving average must sum to 100%. This leaves 100% - 18.18%, or 81.82% weight to be placed on the ten-day moving average.

The general formula for determining the weight of the current day's data in the exponential moving average calculation is as follows:

$$\text{WEIGHT}_t^{\text{EMA}} = 2 / (\text{number of days in moving average} + 1)$$

In our example, the calculation gives us  $\text{WEIGHT}_{11}^{\text{EMA}} = 2 / (10 + 1) = 18.18$  percent. If we were using a longer moving average, this weight would decrease in value. For a 19-day EMA, the calculation would be  $2 / (19 + 1)$ , or 10%; a 39-day EMA would have a weight of  $2 / (39 + 1)$ , or 5%.

The general formula for determining the weight given to the moving average in the calculation of the exponential moving average is the following:

$$\text{WEIGHT}_t^{\text{EMA}} = 100\% - \text{WEIGHT}_t^{\text{EMA}}$$

In our example, we have  $\text{WEIGHT}_{10}^{\text{EMA}} = 100\% - 18.18\% = 81.82\%$ .

Once we have the weights, the formula for calculating the exponential moving average is as follows:

$$\text{EMA}_t = \text{WEIGHT}_t^{\text{EMA}} \times \text{DATA}_t + \text{WEIGHT}_t^{\text{EMA}} \times \text{Moving Average}_{t-1}$$

The exponential moving average for Day 11 in our example in Table 14.1 is calculated as the following:

$$\text{EMAn} = .1818 \times 21.05 + .8182 \times 20.63 = 20.86$$

To calculate the exponential moving average for Day 12, we need only two pieces of information—the exponential moving average for Day 11 and the closing price for Day 12. The EMA<sub>12</sub> would be calculated as follows:

$$\text{EMAn} = .1818 \times 20.82 + .8181 \times 20.86 = 20.85$$

Figure 14.4 shows both a 60-day SMA and a 60-day EMA for DIS. Generally, the EMA will change direction more quickly because of the additional weighting that is placed on the most recent data. However, these two curves will usually track each other closely.



FIGURE 14.4 Exponential versus simple moving average (daily: February 26, 2003-September 15, 2003)

The EMA is used in a number of indicators and oscillators. In Chapter 8, "Measuring Market Strength," for example, we looked at the McClellan Index. The McClellan Index uses a 19-day and a 39-day EMA. Because the 19-bar EMA has a smoothing factor of 0.10 and the 39-bar EMA has a smoothing factor of 0.05, these calculations are relatively easy. We will see later that a number of oscillators use an EMA, most prominently the MACD. The reason for the use of an EMA is that it is easily calculated and that it weighs more strongly the prices that are more recent. It is thus called a "weighted moving average."

### Wilder Method

Welles Wilder (1978) used another very simple method to calculate a moving average that weights the most recent number more heavily. The formula for calculating Wilder's moving average is as follows:

$$MA_{n,t} = ((n - 1) \times MA_{n,t-1} + Price_t) / n$$

For example, a 14-day Wilder moving average would be equal to the previous day's moving average figure times 13 (i.e.,  $14 - 1$ , where  $n$  is the number of items to be averaged) plus the current closing price, all divided by 14 (i.e.,  $n$ ).

Wilder's method of calculating a moving average should be used in the Average True Range (ATR), relative strength index (RSI), and the Directional Movement Indicator (DMI) calculations that he invented rather than the SMA or EMA. When using Wilder's indicators that are prepackaged in available trading and charting software, one must be sure that the calculations for moving averages are Wilder's. Some software programs use just an SMA or EMA and give results inconsistent with Wilder's methods.

### Geometric Moving Average (GMA)

The geometric moving average is used mostly in indexes. It is a simple moving average of the percent changes between the previous bar and the current bar over some past predetermined period. Using percentages rather than points does not change its range or dimensions like a price-based moving average. However, it still has all the other problems of equal weight and lag.

### Triangular Moving Average

Taking a moving average of a moving average gives a doubly smoothed moving average. The triangular moving average begins with a simple moving average of a predetermined number of bars and then, using those results, takes a moving average of a length of half the original number of bars. An example would be a 20-day SMA of daily closes smoothed in a ten-day SMA. The result is a smoothed line that emphasizes the weight of the middle of the price series. The benefit of this

method is that it doubly smoothes the data and thus better represents the trend. However, the double smoothing also detracts from its sensitivity to trend changes.

### **Variable EMAs**

The use of a variable moving average is suggested by Chande and Kroll (1994). This moving average is the same as an exponential average (EMA), but the weighting scheme is adjusted based on the volatility of the price data. This is done to make the EMA shorter during trading ranges when volatility is narrow and expand the EMA when price begins to trend. The desire was to reduce the number of adverse signals during a trading range.

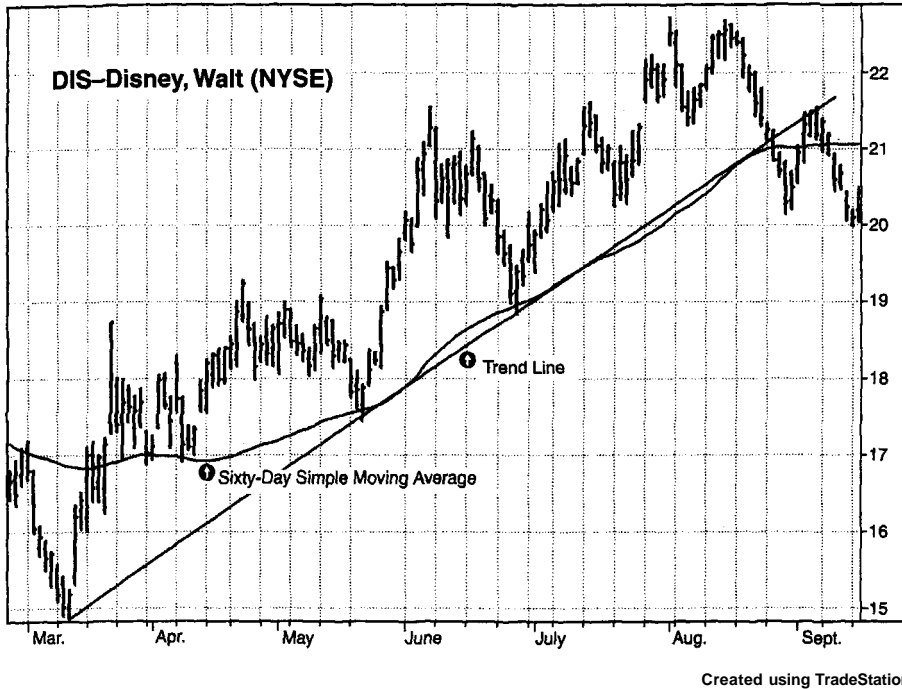
There are a number of variations of this theme. For example, the Kaufman Adaptive Moving Average (KAMA) involves an extremely complicated formula that adjusts an EMA for volatility and trend (Kaufman, 1998). The Volume-Adjusted Moving Average (Arms, 1989) is a somewhat complicated moving average, but its essence is that it emphasizes those bars with higher volume. In the September 2001 issue of *Stocks and Commodities Magazine*, John Enters presents MAMA and FAMA. MAMA, the MESA Adaptive Moving Average, and FAMA, the Following Adaptive Moving Average, are EMAs that adapt to volatility using Hilbert's Transform based on the phase change of a cycle in the data. Needless to say, the calculation of these moving averages is complicated. A buy or sell signal is generated when the MAMA crosses the FAMA. In April 2004, *Active Trader Magazine* compared the effectiveness of using the MAMA-FAMA strategy to using an SMA for 18 stocks and found that the MAMA-FAMA strategy performed slightly better than the simple method.

## **STRATEGIES FOR USING MOVING AVERAGES**

### **Determining Trend**

Technical analysts use moving averages in four basic ways. First, moving averages are used as a measure of trend. The most common usage is comparing the current price to the moving average that represents the investor's time horizon. For example, many investors use a 200-day moving average. If the stock or market average is above its 200-day moving average, the trend is considered upward. Conversely, if the stock or market average is below the 200-day moving average, the trend is considered downward.

Figure 14.S includes the same data with the moving average and the trend lines we used in Chapter 12, "Trends—The Basics." You can see how the moving average tends to follow the trend line fairly well. The moving average then becomes a proxy for the trend line and can be used to determine when a trend is potentially changing direction, just as a trend line can. In the chart, for example, the later prices have broken both the trend line and the moving average. In addition, the moving average is beginning to change direction itself, another clue that the trend in prices is changing.



**FIGURE 14.5** Trend line versus simple moving average (daily: February 26, 2003-September 15, 2003)

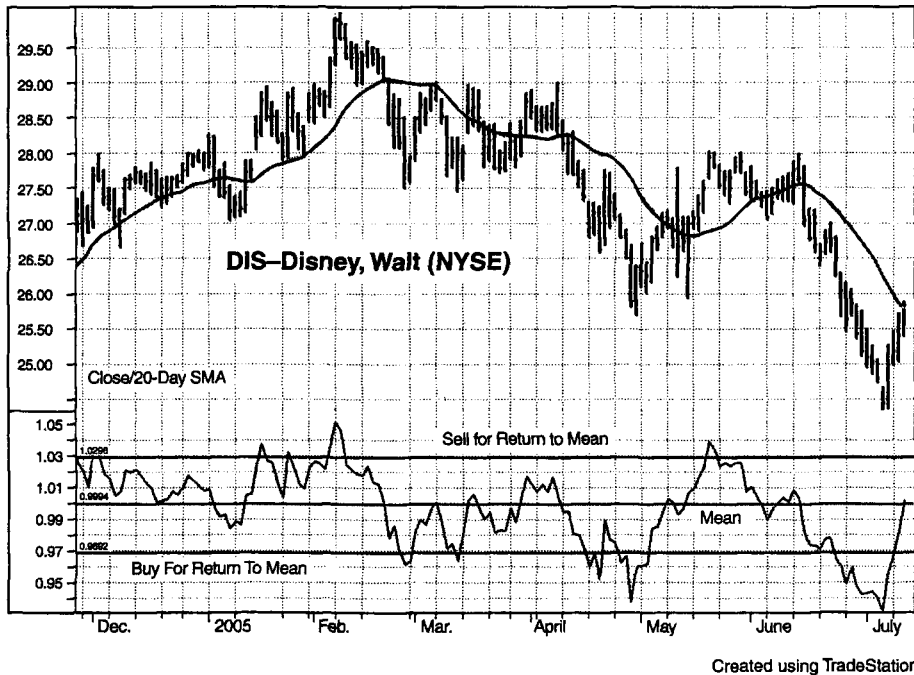
### Determining Support and Resistance

Second, the moving average will often act as support or resistance. As we have seen from Figure 14.5, a moving average often duplicates the trend line; therefore, it can be an easy trailing stop mechanism for determining when a position should be liquidated or reduced.

### Determining Price Extremes

Third, the moving average is an indicator of price extreme. Because the moving average is a mean, any reversion to the mean will tend to approach the moving average. For trading purposes, this reversion is sometimes profitable when the current price has deviated substantially from that mean or moving average. Price has a tendency to return to the mean. Thus, a deviation from the moving average is a measure of how much prices have risen or fallen ahead of their usual central tendency, and being likely to return to that mean, this deviation then becomes an opportunity to

trade against the trend. As always, trading against the trend is dangerous and requires close stops, but the reversion also provides an opportunity to position with the trend when it occurs. In addition, when prices continue substantially away from the trend, they are often signaling that the trend is changing direction. An example is shown in Figure 14.6. When the price deviates from the 20-day SMA, it always eventually returns to that moving average. Thus, by measuring when the price is sufficiently distant from the moving average, a trade can be initiated knowing that the price will return to that mean. As can be seen, the price does not always reach an extreme, especially when the longer trend is directional. For instance, in the example, the trend turned downward in March. Several opportunities occurred to trade against the trend during the decline, all of them dangerous and requiring close stops. However, in May, an excellent opportunity to sell short in line with the longer trend occurred when the price deviated by an upward extreme. These opportunities in sync with the longer trend provide minimum risk and excellent profit potential.



**FIGURE 14.6** Ratio of current price to moving average (daily: December 2004–July 2005)

## Giving Specific Signals

Fourth, some technical analysts use moving averages to give specific signals. These can occur when prices cross a moving average, when a shorter moving average crosses a longer moving average, and in some cases, when a third, even shorter, moving average crosses two longer ones. Generally, using two moving averages and their crossover as a signal has been successful but with substantial drawdowns in capital in sideways markets because of the many unprofitable small trades that occur from the many false signals. Methods, such as using the ADX, described in the next section, have been developed to determine if prices are trending at a rate at which a moving-average crossover system will work. The **MAMA-FAMA** system described previously and other methods of adapting moving averages to changes in volatility are aimed at solving this drawdown problem. However, it will not go away, and thus, though the crossover methods are profitable over time, the investor must have patience and enough capital to withstand a series of small losses until a trend develops.

Of the four strategies, the most sensible use of moving averages is trend determination. The trend is where the technical analyst profits. If the moving average can help in determining the trend, it is a useful tool. Indeed, it is only during a trending market that moving average signals are profitable. A sideways market is costly in almost all cases, but especially so if the investor depends on moving average crossovers for signals. Once a trend has been established and identified, the next best method is to use price patterns and breakouts in the direction of the trend for timing of position entries. This method will lag behind the major bottom and top of a price trend but will accrue profits and minimize losses. It is also the most popular method in professional trading systems, along with channel breakout systems such as Donchian's four-week rule that we discuss in the "Channel" section of this chapter.

## WHAT IS DIRECTIONAL MOVEMENT?

One of the great contributions to the concept of trend and direction is the concept of directional movement that Welles Wilder develops in his book, *New Concepts in Technical Trading Systems*. Wilder compares a stock's trading range for one day to the trading range on the previous day to measure trend. Positive directional movement occurs when the high for a day exceeds the high of the previous day. As shown in Figure 14.7, the amount of positive directional movement (+DM) is the day's high minus the previous day's high, or the vertical distance between the top of the two bars. If the low for the day is less than the previous day's low, negative directional movement occurs. The value of the negative directional movement (-DM) is the difference between the two lows.

Days on which the range is completely within the previous day's range are ignored, and a zero is given to the range excess. In addition, one day's trading range is sometimes much larger than the previous day's trading range. This can result in both a higher high and a lower low.

When this happens, the greater difference wins. In other words, only +DM or -DM may be recorded for a particular day.

### Wilder's Directional Movement -DM and +DM

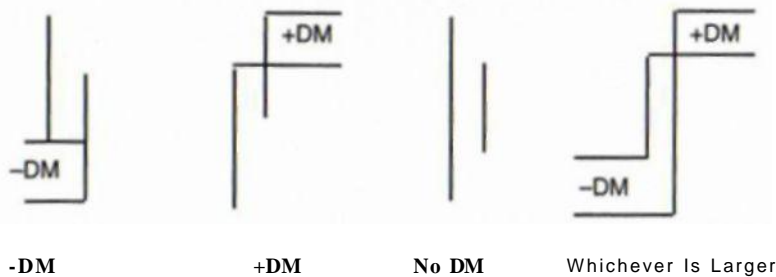


FIGURE 14.7 Calculating directional movement

### Constructing Directional Movement Indicators

A moving average is calculated for both +DM and -DM, usually over 14 days, using the Wilder method of averaging. In addition, a 14-day ATR is calculated. Two indicators are calculated using this data. The Positive Directional Movement Indicator (DMI+) is the ratio between the smoothed +DM and the TR; this calculation gives the percentage of the true range that was above equilibrium for those 14 days. The second indicator is the negative Directional Movement Indicator (DMI-), which is calculated as the ratio between the smoothed -DM and the TR.

### Using Directional Movement Indicators

Figure 14.8 shows 14-day DMIs for Disney. Looking at this chart, an analyst sees a number of hints about trend. First, when one DMI is higher than the other, the trend is in the direction of that DMI. For example, from December through February, with one minor exception, the DMI+ was above the DMI-. This suggests that a majority of the 14-day ATR excess for Disney was on the upside during that period. When the first major crossover occurred in late February and the DMI- crossed above the DMI+, the trend had reversed downward. At that point, a longer-term trend line would not have yet caught the switch in direction. At the point marked 2 on the chart, a downward crossover signal occurred that warned of the upcoming severe price decline. Thus, the DMI crossover is an important signal in analyzing trends.



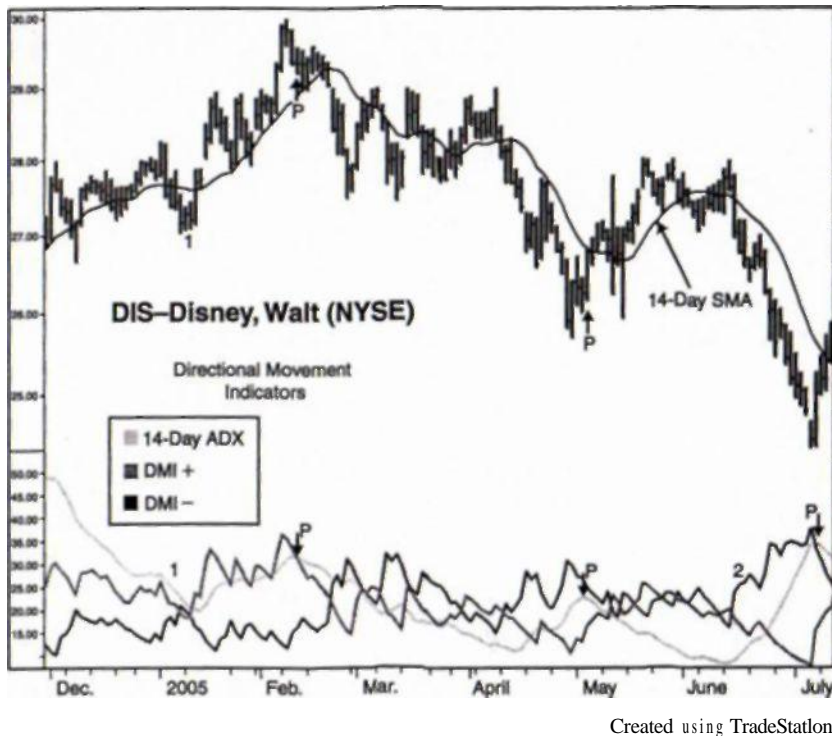


FIGURE 14.8 Directional Movement Indicators (daily: December 2004-July 2005)

Second, the minor crossover that occurred in January (marked with a 1) that lasted only a few days is also an important sign. It suggests that the direction of the trend is now sideways and, like a congestion area, it may break in either direction. Often, the two DMIs come to equilibrium and then part in their original direction, as happened here, in which case the earlier trend resumes. At other times, the DMIs cross more dramatically and incisively, as they did in late February, and signal a trend reversal. When the two meet, therefore, is an important period. Wilder suggested placing a buy or sell stop at the price when the two first cross. In Figure 14.8, as the two DMIs cross in January, we do not know if this is a trend reversal or not. Thus, we place a short-sell stop at a price just below the price that occurred when the two initially crossed. If the trend is reversing, the price will hit our stop, and our position will be in line with the new downward trend. If the stop is not hit, the two lines will likely diverge again, and the old trend will continue without us.

Third, a DMI reaching an extreme level is often associated with a trend being at its maximum slope. When this occurs, the trend will invariably slow down and perhaps reverse. This is

the best time to exit a position. In Figure 14.8, for example, peaks in the two DMIs seem to occur around 35. These levels are different for every stock or commodity and should be analyzed first. When the DMI+ rose above 35 in early February, it signaled an extreme and the best time to sell a long position. When the DMI- rose above 35 in July, it was an extreme and the best time to cover a short.

Fourth, the DMIs can be used to create a Directional Index (DX). This DX then is used to create the ADX line shown in Figure 14.8. The DX is calculated by taking the absolute difference between the values of the two DMIs and dividing it by the sum of the two DMIs. The DX is always positive and represents the tendency of the market to trend because it measures the DMIs against each other. When one DMI is very large compared to the other DMI, the market is moving strongly in one direction and the value of the DX will be large.

The ADX is the smoothed value of the DX and is plotted on Figure 14.8. When the ADX is rising, the market is increasingly trending in either direction. If the DMI+ is higher than the DMI-, the increasing trending is on the upside. In the chart, for example, this trending began in early January and ended at the top in early February. Because the DMI+ was higher than the DMI-, the trend was upward. Note that a high value for the ADX represents a strong trend, but the analyst must look back to the DMIs to see the direction of the trend. For example, the high value of the ADX in July is associated with a downtrend in DIS.

The ADX indicator is valuable in determining when to apply a moving average trend-following system, for example. We know that the moving average systems have multiple whipsaws when the market is not in a directional trend but have very profitable outcomes when the market is trending in either an upward or downward direction. Many trend-following models use both of these indicators to determine when money should or should not be committed to the markets.

Fifth, when the ADX peaks above both the DMIs, it often signals a peak in the trend. In Figure 14.8, even though the ADX never rises and peaks above both the DMIs, peaks (marked with a P) do show periods when the trend has ended, such as in February, late April, and early July.

Low levels in the ADX are also useful because they signify periods when the market has become dormant and trendless. As we know from looking at congestion areas, a dormant period is usually followed by a dynamic period. This phenomenon can be seen in Figure 14.8 with the low ADX value associated with the sideways price movement at the beginning of June, followed by a strong downward price trend. Thus, a low ADX period is when the trader or investor should be watching price closely for a breakout in either direction. ADXs and DMIs can be used on weekly, monthly, and even shorter-term, intraday charts for clues as to trend strength and direction.

## **WHAT ARE ENVELOPES, CHANNELS, AND BANDS?**

The simple moving average represents the center of a stock's price trend. Actual prices tend to oscillate around that moving average. The price movement is centered on the moving average but falls within a band or envelope around the moving average. By determining the band within which prices tend to oscillate, the analyst is better able to determine the range in which price may be expected to fluctuate.

## Percentage Envelopes

One way of creating this type of band is to use percentage envelopes. This method, also known as a percentage filter, was developed in an attempt to reduce the numerous unprofitable signals from crossing a moving average when the trend is sideways. This is a popular method used in most of the academic studies on moving average crossover systems. It is calculated by taking a percentage of the moving average and plotting it above and below the moving average (see Figure 14.9)—thus the term "envelope." This plot creates two symmetrical lines, one above and one below the moving average.



**FIGURE 14.9** Envelope about a moving average (daily: December 4, 2000–June 26, 2001)

This envelope then becomes the trigger for signals when it is crossed by the price rather than when the moving average is crossed. The percentage used in the calculation should be large enough that it encompasses most of the oscillations around the moving average during a sideways period and thus reduces the number of incorrect signals, yet small enough to give signals

early enough to be profitable once a trend has been established. This percentage must be determined through experiment, because a slight difference in percentage can cause a considerable difference in performance.

One of the major problems with fixed-percentage envelopes is that they do not account for the changing volatility of the underlying price. During a sideways trend, when volatility usually declines, price action can be contained within a relatively narrow band. When the trend begins, however, volatility often expands and will then create false signals using a fixed-percentage envelope. To combat this problem, the concept of bands that are adjusted for volatility developed.

## **Bands**

Bands are also envelopes around a moving average but, rather than being fixed in size, are calculated to adjust for the price volatility around the moving average. Thus, they shrink when prices become calm and expand when prices become volatile. The most widely used band is the Bollinger Band, named after John Bollinger (2002).

### **Bollinger Band**

As we mentioned earlier, there are two principal ways to measure price volatility. One is the standard deviation about a mean or moving average, and the other is the ATR. Bollinger Bands use the standard deviation calculation.

To construct Bollinger Bands, first calculate a simple moving average of prices. Bollinger uses the SMA because most calculations using standard deviation use an SMA. Next, draw bands a certain number of standard deviations above and below the moving average. For example, Bollinger's standard calculation, and the one most often seen in the public chart services, begins with a 20-period simple moving average. Two standard deviations are added to the SMA to plot an upper band. The lower band is constructed by subtracting two standard deviations from the SMA. The bands are self-adjusting, automatically becoming wider during periods of extreme price changes.

Figure 14.10 shows the standard Bollinger Band around the 20-period moving average. Of course, both the length of the moving average and the number of standard deviations can be adjusted. Theoretically, the plus or minus two standard deviations should account for approximately 95% of all the price action about the moving average. In fact, this is not quite true because price action is nonstationary and nonrandom and, thus, does not follow the statistical properties of the standard deviation calculation precisely. However, it is a good estimate of the majority of price action. Indeed, as the chart shows, the price action seems to oscillate between the bands quite regularly. This action is similar to the action in a congestion area or rectangle pattern (see Chapter 15, "Bar Chart Patterns"), except that prices also tend to oscillate within the band as the price trends upward and downward. This is because the moving average is replicating the trend of the prices and adjusting for them while the band is describing their normal upper and lower limits around the trend as price volatility changes.



FIGURE 14.10 Bollinger Bands (daily: December 4, 2000-June 26, 2001)

#### Keltner Band

Chester Keltner introduced Keltner Bands in his book, *How to Make Money in Commodities*. To construct these bands, first calculate the "Typical Price"  $(\text{Close} + \text{High} + \text{Low}) / 3$ , and calculate a ten-day SMA of the typical price. Next, calculate the band size by creating a ten-day SMA of High minus Low or bar range. The upper band is then plotted as the ten-day SMA of the typical price plus the ten-day SMA of bar range. The lower band is plotted as the ten-day SMA of the typical price minus the ten-day SMA of bar range. (When the calculation is rearranged, it is very similar to the use of an ATR, and these bands are sometimes referred to as ATR bands.)

As with most methods, different analysts prefer to modify the basic model to meet their specific needs and investment strategies. Although Keltner's original calculation used ten-day moving averages, many analysts using this method have extended the moving averages to 20 periods. The 20-period calculation is more in line with the calculation for a Bollinger Band.

#### STARC Band

STARC is an acronym for Stoller Average Range Channel, invented by Manning Stoller. This system uses the ATR over five periods added to and subtracted from a five-period SMA of prices. This produces a band about prices that widens and shrinks with changes in the ATR or the volatility of the price. Just as with the Keltner Bands, the length of the SMA used with STARC can be adjusted to different trading or investing time horizons.

## Trading Strategies Using Bands and Envelopes

In line with the basic concept of following the trend, bands and envelopes are used to signal when a trend change has occurred and to reduce the number of whipsaws that occur within a tight trading range. While looking at the envelopes or bands on a chart, one would think that the best use of them might be to trade within them from high extreme to low extreme and back. Similar to strategies for rectangle patterns, however, the trading between bands is difficult. First, by definition, except for fixed envelopes, the bands contract during a sideways, dull trend and leave little room for maneuvering at a cost-effective manner and with profitable results. Second, when prices suddenly move on a new trend, they will tend to remain close to the band in the direction of the trend and give many false exit signals. Third, when the bands expand, they show that volatility has increased, usually due to the beginning of a new trend, and any position entered in further anticipation of low volatility is quickly stopped out.

Bands, therefore, have become methods of determining the beginnings of trends and are not generally used for range trading between them. When the outer edge of a band is broken, empirical evidence suggests that the entry should be in the direction of the breakout, not unlike the breakout of a trend line or support or resistance level. A breakout from a band that contains roughly 90% of previous price action suggests that the general trend of the previous price action has changed in the direction of the breakout.

In Figure 14.11, a breakout buy signal occurs in October, when the price breaks above the upper Bollinger Band, hinting that a strong upward trend is starting. You will notice that the bands had become narrower during September. This band tightening, caused by shrinking volatility, is often followed by a sharp price move. The chart also shows a sell signal in early January, as price falls below the lower band.

The only difference between a band breakout and a more conventional kind is that a band is generally more fluid. Because moving averages will often become support or resistance levels, the moving average in the Bollinger Band calculation should then become the trailing stop level for any entry that previously occurred from a breakout above or below the band. The ability of moving averages to be used as trailing stops is easily spliced into a system utilizing any kind of bands that adjust for volatility. The other use for the moving average within a band is that because the moving average often becomes either support or resistance, it can become a retracement level for additional entry in the trend established by the direction of the moving average and the bands. With a stop only slightly below the moving average using the rules we learned in the last chapter for establishing stop levels, when the price retraces back into the area of the moving average while in a strong upward trend, an additional entry can be made where the retracement within the band is expected to halt.

Figures 14.11 and 14.12 give examples of how the moving average can be used in trading a band. Figure 14.11 give two market signals about a 20-day moving average. In Figure 14.12, A is a buy signal because prices broke above the upper Bollinger Band. B is a retracement to the support often seen at a moving average and is a secondary buy point as well as a stop point in case prices break below it. C is where prices broke below the moving average and triggered a sell stop to liquidate the position.

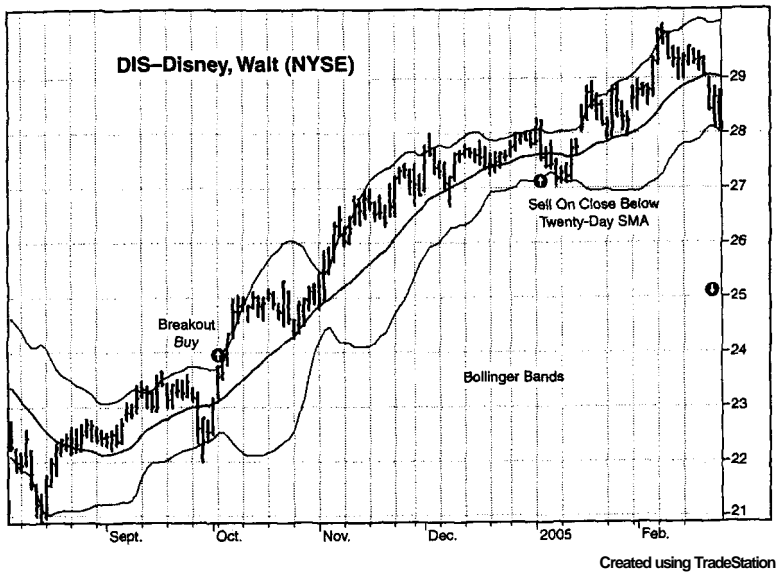


FIGURE 14.11 Bollinger Bond breakouts (daily: August 5, 2004-February 24, 2005)

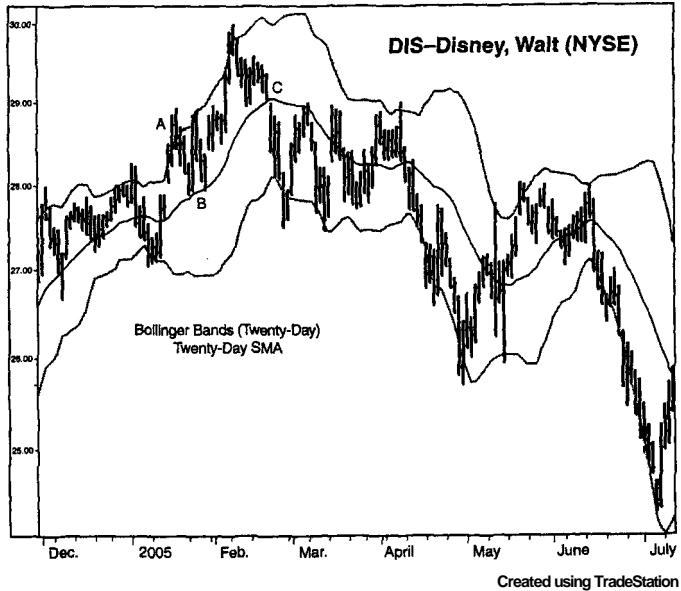


FIGURE 14.12 Stops at moving averages (daily: December 2004-July 2005)

In testing band breakouts, the longer the bar, it seems, the more profitable the system. Very short-term volatility, because it is proportionally more active, causes many false breakouts. Longer-term periods with less volatility per period appear to remain in trends for longer periods and are not whipsawed as much as short-term trends. The most profitable trend-following systems are long-term, and as short-term traders have learned, the ability of price to oscillate sharply is greater than when it is smoothed over longer periods. Thus, the inherent whipsaws in short-term data become reduced over longer periods, and trend-following systems tracking longer trends have fewer unprofitable signals. Bands are more successful in trending markets and are therefore more suitable for commodities markets than the stock market.

Another use for bands is to watch price volatility. Low volatility is generally associated with sideways to slightly slanted trends, ones where whipsaws are common and patterns fail. High volatility is generally associated with a strong trend, up or down. By watching volatility, especially for an increase in volatility, the analyst has a clue that a change in trend is forthcoming. To watch volatility, one should take a difference between the high band and low band and plot it as a line below the price action. Bollinger calls this line a "Bandwidth Indicator." A rise in the bandwidth line, which results from increasing volatility, can be associated directly with price action. Any breakout from a pattern, support or resistance level, trend line, or moving average can be confirmed by the change in volatility. If volatility does not increase with a price breakout, the odds favor that the breakout is false. Volatility therefore can be used as confirmation for trend changes, or it can be used as a warning that things are about to change. This use of bands is more successful when combined with other methods of determining an actual trend change.

## Channel

In discussing trend lines, we noted that a line can often be drawn parallel to a trend line that encompasses the price action in what was called a "channel." For present purposes, that definition changes slightly by relaxing the requirement for a parallel line.

Channels have become described as something simpler than two parallel lines. For example, in Chapter 12, we mentioned the Donchian channel method that has been so successful even though it's been widely known for many years. Signals occur with the Donchian channel when the breaking above or below a high or low over some past period occurs. This method does not require the construction of a trend line; the only requirement is a record of the highs and lows over some past period. In the case of the Donchian channel method, the period was four weeks, and the rule was to buy when the price exceeded the highest level over the past four weeks and sell when the price declined below the lowest low over the past four weeks. Such systems are usually "stop and reverse" systems that are always in the market, either long or short. As is likely imagined, the channel systems are more commonly used in the commodities markets where long and short positions are effortless and prices tend to trend much longer.

An adaptation of the standard channel breakout system is to use different periods for buy and sell signals. For example, a 200-day period of highs might be used for a buy signal, and a 20-day period might be used for a sell signal. Generally, this method works well in commodity markets where trending is stronger and longer lasting. It does not work as well in the stock market.



## CONCLUSION

The basic way the technical analyst makes profits is by identifying a trend in prices and riding that trend. At times, daily fluctuations in prices make it difficult for the analyst to view the basic underlying trend in prices. Moving averages are tools used to smooth this erratic data, making it easier to discern the genuine underlying trend.

Although there are various methods of calculating a moving average, the basic idea is to give a summary of the average or normal price history of a particular period. Because the moving averages are based on historical prices, by nature, they will be a lagging indicator of trends. The shorter the period covered by the moving average, the less of a lag there will be. However, using a shorter period also leads to more false signals. As usual, when choosing a moving average system, there is a tradeoff between early trend reversal recognition and certainty of trend reversal. The use of envelopes, bands, and channels around the moving average can minimize the number of false signals by providing a larger range of price movement before a signal is triggered.

Box 14.1 gives a list of basic principles that the technical analyst should keep in mind. This list provides a summary of some of the key points we have addressed in the past three chapters.

### BOX 14.1 Trading Rules

In the past few chapters, we have covered a good deal of material regarding trends. Here are some of the key points to remember when investing:

- Riding the trend is the most profitable use of technical analysis.
- Trends can be identified with trend lines, moving averages, and relative highs and lows.
- Always pick a security that trends up and down. Flat or random trends are usually unprofitable.
- Be aware of the next higher and lower trend from the one being traded.
- Always trade with the trend:
  - "Trend is your friend."
  - "Don't buck the trend."
- Breakouts from support or resistance levels, patterns, or bands usually signal a change in trend.
- A trend line breakout is at least a warning.
- The longer the trend, the more important the breakout.
- Confirm any breakout with other evidence, especially when entering a position. In exiting, confirmation is not as important.
- Always use stops, protective and trailing.
- Do not sell profitable positions too soon; just keep trailing with stops.

**REVIEW QUESTIONS**

1. Explain why a rising moving average indicates an upward trend and a falling moving average indicates a downward trend in stock prices.
2. Explain why there is a lag between the time a trend reverses and when the moving average signals this reversal. Why is this lag longer for a 200-day moving average than a 10-day moving average?
3. What problems are associated with an SMA that an EMA calculation is designed to overcome?
4. Explain why a shorter-term moving average is considered to be a "faster" moving average and a longer-term moving average is considered to be a "slower" moving average.
5. Sophia says that she is watching a 10-day SMA and a 60-day SMA of her favorite stock, and she is planning to purchase the stock when the 10-day SMA crosses above the 60-day SMA. Explain the rationale for Sophia's strategy.
6. Thomas warns Sophia that her strategy can easily lead to whipsaws. Explain what Thomas means by "whipsaws," and describe the type of market in which whipsaws are most likely to occur.
7. If Sophia is concerned about whipsaws, how might she use envelopes or bands to minimize the likelihood of whipsaws?
8. Why is choosing a stock that is trending upward or downward, rather than one that is moving sideways, an important key to trading profitability?
9. Explain what Welles Wilder means by the term "directional movement" and how this concept is important to determining price trends.
10. Why does a low value for ADX suggest a period of congestion?
11. Gather the daily high, low, and closing prices for McDonald's stock (ticker symbol MCD) for January 2004 through July 2005 from Yahoo! Finance or another electronic source.
  - a. Using a spreadsheet, calculate 10-day and 60-day SMAs. Plot these two curves with a bar chart of the stock prices.
  - b. Compare and contrast the 10-day and the 60-day SMA.
  - c. Explain the relationship between the market trend and the 60-day SMA during the following periods:
    - i. May 2004-October 2004
    - ii. October 2004-May 2005
    - iii. May 2005-July 2005
  - d. Find a point in your graph where the faster moving average crosses the slower moving average. What type of signal would occur at this point? In hindsight, would trading on that signal have been profitable? Why or why not?

*Part III Trend Analysis*

Construct DMI+ and DMI- for McDonald's for the period August 2004-March 2005.

- i. Interpret DMI+ during this time.
- ii. Interpret DMI- during this time.
- iii. Compare DMI+ and DMI- with the price movement over this time. What type of relationships do you see?

# **PART IV**

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## **CHART PATTERN ANALYSIS**

**CHAPTER 15 BAR CHART PATTERNS**

**CHAPTER 16 POINT-AND-FIGURE CHART PATTERNS**

**CHAPTER 17 SHORT-TERM PATTERNS**

# BAR CHART PATTERNS

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- Controversy over whether patterns exist
- The influence that computer technology has had on the study of patterns
- The formation of classic bar chart patterns such as triangles, flags, pennants, double tops, and head and shoulders
- Historical performance measures of major bar chart patterns

In the next three chapters, we discuss chart and price patterns. Traditionally, technical analysis has been closely associated with price patterns, perhaps even more than it should be. Prior to the advent of the computer, hand-drawn charts of prices were the only technical resources available. Trend lines and patterns were the principal means of analyzing price behavior. The computer has diversified technical analysis because it has made other mathematical relationships easier to calculate.

After discussing some of the basic characteristics of patterns, we will look at classic bar chart patterns, those used by the majority of technical analysts and having the longest history of use, in this chapter. In Chapter 16, "Point-and-Figure Chart Patterns," we will focus on point-and-figure charts. In Chapter 17, "Short-Term Patterns," we will consider short-term patterns, candlesticks, one- and two-day patterns, and other patterns that are not so widely used. There are as many different patterns as the combinations of price open, high, low, and close can accommodate. Generally, shorter patterns are more common and less reliable, and longer patterns are more complex and less frequent. In addition, as a rule, the more complicated the pattern, the less likely it will be profitable, and the more frequent a pattern, the less likely it will be profitable. The best patterns seem to be in the middle of frequency and complexity. We will address these. There are

many reference books on other patterns that you can investigate, but most fail to give any special advantage over the classic patterns.

## WHAT IS A PATTERN?

In the literature and usage of technical analysis, the terms "pattern" and "formation" are used interchangeably. We will do the same. A *pattern* is simply a configuration of price action that is bounded, above and below, by some form of either a line or a curve.

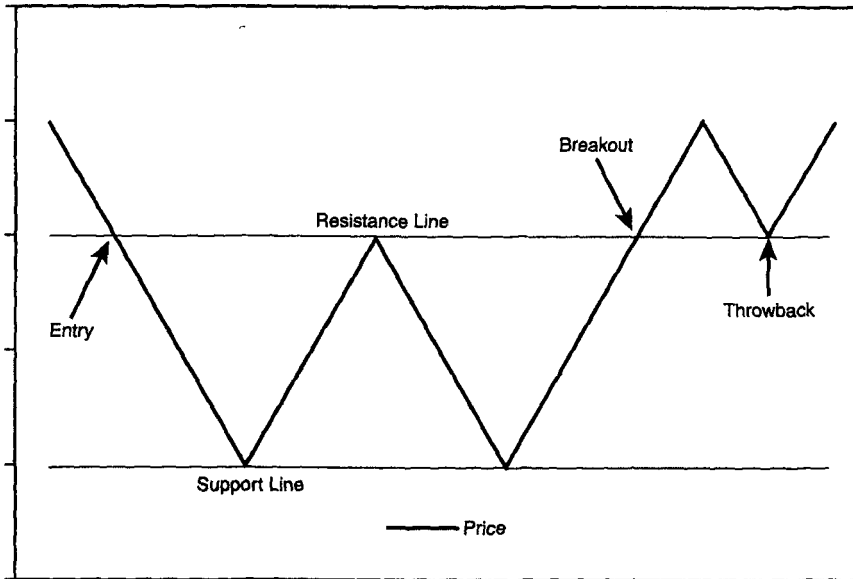
The lines that bind price movement in a pattern can be trend lines or support/resistance lines. In this chapter, we will be applying the concepts and terminology that we studied in Chapter 12, "Trends—The Basics," regarding these lines. When studying patterns, we add a new concept—prices being bound by a curve instead of a straight line. A *curve* is a less-definite arc drawn with either a "smiley face" for a bottom curve or a "frown" at a top curve. The lowest level in a bottom curve is a support level, and the highest level in a top curve is a resistance level. Curves simply define a support or resistance level with curved rather than straight lines. A pattern can be bounded by any combination of curves or lines as long as the upper and lower bounds are defined well enough for a breakout level to be established.

## Common Pattern Characteristics

The focus of this chapter is bar chart price configurations. Thomas N. Bulkowski has accomplished the most comprehensive modern study of bar chart patterns in his twin books, *Encyclopedia of Chart Patterns* (2000) and *Trading Classic Chart Patterns* (2002). Bulkowski observed over 700 stocks over ten years on a daily basis and catalogued their results under varying conditions. Although his analysis of patterns was, of course, subject to his potential bias, it was consistent and included a significantly large number of examples. Much of the material—specifically the statistics—in this chapter rely on Bulkowski's work. Before we begin discussing some of the particular patterns, however, we need to begin with some vocabulary related to the general characteristics of bar chart patterns.

### Entry and Exit

All patterns have a combination of an entry and exit. The entry describes the trend preceding the formation, and the exit is usually the signal for action. A pattern can occur after a decline, in which case, the entry is from above, or after an advance, in which case, the entry is from below. The exit, of course, can also be downward or upward. Figure 15.1, a double bottom, shows an entry from above and an upward breakout. On the other hand, a top formation has an entry from below and an exit downward. A consolidation in a larger uptrend has an entry from below and an exit upward. Thus, all patterns are described with these four variables: entry from above, entry from below, downward exit, and upward exit. These variables are important because statistically, in each pattern type, some of these characteristics are more reliable, occur more frequently, or are more profitable than others.



**FIGURE 15.1** Double bottom with breakout up

In his earlier book, Bulkowski (2000) uses the original and conventional categorization of patterns into continuation or reversal patterns. In his later book (2002), he defines patterns strictly on their shape, regardless of whether their entry was from below or above. For example, a triangle, which can be either a reversal or a continuation pattern, is described only by its exit direction, up or down. We follow the latter convention because it concentrates strictly on the pattern structure.

#### *Fractal*

The bars in a bar chart can be any period: weekly, daily, minute, and so on. Bar chart patterns are fractal. This means they can occur in any bar chart, regardless of the bar period. A triangle formation, for example, can occur in hourly bars or weekly bars. The pattern is always the same type and will always have the same general characteristics. This is odd but true. Indeed, looking at a bar chart pattern without a specified time horizon, a technical analyst who is experienced in pattern recognition cannot tell the periods of the bars.

#### *Pullbacks and Throwbacks*

Pullbacks occur when prices break out downward and then "pull back" to their breakout level. Throwbacks occur when prices break out upward and then "throw back" to their breakout level

(Edwards and Magee, revised 2003). Figure 15.1 shows an example of a throwback. Neither a pullback nor a throwback is easily or precisely defined, but you know one when you see it. The interesting aspect of this price behavior is that invariably a pullback or throwback will decrease the extent of the eventual move in the direction of the breakout. Thus, although each may provide a second opportunity for action at the breakout level, the subsequent rise or fall generally will be less than if there were no pullback or throwback. Tactically, this implies that a breakout should be acted upon immediately; waiting for the retracement will diminish profitability, and you may very likely miss the entire price move.

Pullbacks seem to occur more frequently on downward breakouts with less-than-average volume, and throwbacks occur more frequently with upward breakouts on above-average volume. Because pullbacks and throwbacks seem to undermine performance, the ideal situation, as a rule, is that on an upward breakout, less volume is preferred, and on a downward breakout, more volume is preferred.

#### *Failures*

All breakouts can fail in any of the formations, some more than others. Remember that a breakout is a signal that prices are beginning to trend, either upward or downward. This is particularly frustrating to the beginner who desires perfection. As we have seen, however, perfection is not in the lexicon of technical analysis. It is favorable odds, or an "edge," for which we are looking. Bulkowski's definition of a failure is when a breakout occurs and the price fails to move at least a certain percentage in the direction of the breakout before reversing by 20%. We will use a 10% gain as the criterion to determine whether a failure has occurred. In other words, we will relate the percentage of breakouts from each formation that fails to reach a 10% gain before reversing 20%. If the failure rate is 33%, it means that the odds of gain are 50/50 (one 20% loss for every two 10% gains), or a breakeven. Of course, the odds can be improved by containing the loss with a protective stop and allowing the profit to continue beyond the 10% gain. Any failure rate less than 33% also increases the odds of a profit, but any formation that has a 33% or higher failure rate should be disregarded. Indeed, any formation with a failure rate greater than 20% should be discarded because the success ratio using the preceding definition of failure will be only marginal.

#### *Traps*

When a price breaks out of a pattern, climbs less than 10%, reverses back into the pattern, and breaks out in the opposite direction, it is called a trap. Because it catches all the bulls that thought the price would continue to rise from the initial breakout, a bull trap is one in which prices first break out upward, reverse, and then break out downward (see Figure 15.2). A bear trap is the opposite, where the initial breakout is downward, and then prices reverse and break out upward. The trap percentage is the percentage of times that a pattern has developed a trap. This is a little different from a failure because the reversal need not extend the 20% from the peak. It depends on the height of the formation and the relative position of the two breakout zones. It is important, however, because it helps establish in conjunction with the 20% correction location where the initial protective stop should be placed and how often that stop will likely be triggered for a loss. You will find that in most patterns, the percentage of traps and failures is about the same.



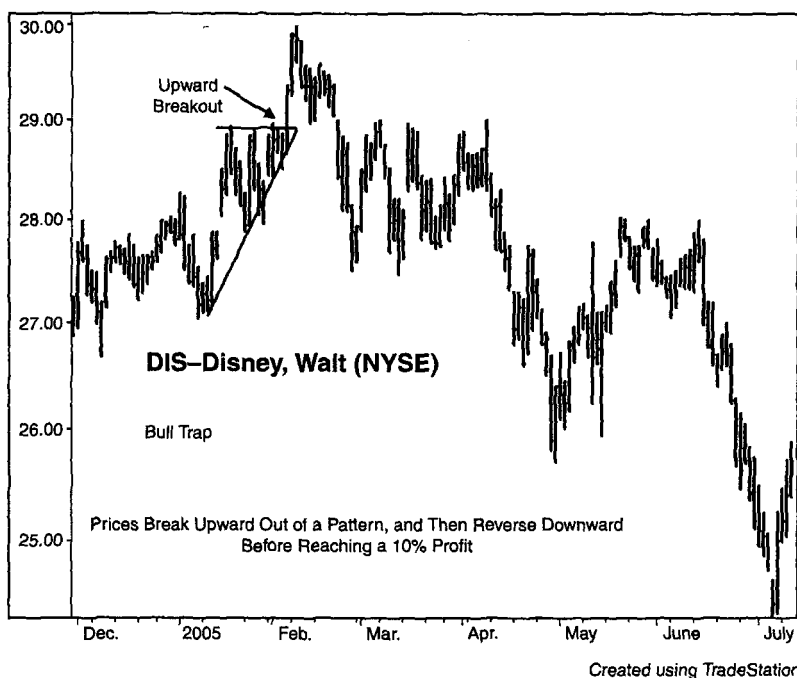


FIGURE 15.2 Bull trap (December 2004-July 2005)

## Do PATTERNS EXIST?

Some academics and investors believe that patterns do not exist. They believe either that price action is completely random or, at least, is indecipherable. We saw in Chapter 4, "The Technical Analysis Controversy," that the concept of randomness is now being questioned, leaving open the possibility that order does exist in prices. However, even if order does exist in market prices, it is possible that it cannot be recognized with present mathematical models because it is so complex. The methods used in chaos theory, neural networks, and other esoteric mathematical models may prove useful sometime in the future, but not now. Thus, there is still the realistic question of whether patterns do exist in prices. Technical analysts swear they do but in many cases analysts are not mathematically sophisticated enough to demonstrate their validity.

If prices do have patterns, what causes them? This has been a debate for at least a century and has coalesced into a belief that patterns are the result of human behavior, which, conveniently, is indecipherable. It is, however, why technical analysts are very much interested in the

new behavioral finance studies. They hope that the biases and tendencies in human behavior now being measured and gradually understood by behavioral finance students will eventually explain why price patterns seem to exist.

### **Behavioral Finance and Pattern Recognition**

The first fact to acknowledge about chart patterns is that they have not been proven to exist or to be profitable. Although many investors and traders swear by certain formations, their evidence is largely anecdotal. Added to this is the tendency to see patterns in random data.

Humans have a tendency to want patterns in data and other information and to see them when they do not exist. Superstitions are derived from the erroneous and coincidental observations of patterns that do not exist but are created because of the desire to have a pattern. B. F. Skinner, a famous Harvard psychology professor, studied pigeon behavior in a number of stimulus-response situations to see if the pigeons would react to various stimuli and thus "learn" responses. The reward for the correct response was usually food. In one experiment, he decided to give pigeons just food without a stimulus to see what they would do. Invariably, in trying to make sense out of stimulus-response, the pigeons responded in different manners by creating their own stimulus, some bobbing, some developing strange head motions, thus creating their own superstition, when a real stimulus did not exist (Skinner, 1947).

Humans are very similar in their desire to have some kind of stimulus, even if it is a black cat crossing the road, and develop supposedly predictive relationships when none actually exists. This is a special danger in price analysis because the desire to see a pattern can occur when no pattern actually exists.

Humans are also very poor statisticians and tend to put more weight on recent history than what is statistically warranted. An experiment by Kahneman and Tversky (1982) showed that in flipping coins, which have a statistical probability of landing on their heads 50% of the time regardless of what side they landed on earlier, observers began to expect more heads in the future when the sequence of heads turned up more frequently, and they were surprised when that did not occur. Their subconscious brains expected more heads because that was the most recent history of flips, even though the odds had not changed. In the technical analysis of patterns, the analyst must guard against superstition or what is often called market lore. Frequently these statements contradict other statements or are just plain wrong. An example is that "a descending triangle always breaks downward." We will see how this is not born out by fact when we discuss triangles. Pattern and trend analysis must be based on evidence alone.

Humans also tend to see the future as the past and look backward rather than forward. This bias is very likely the reason that trends in prices exist in the first place and why prices rise or fall until they reach some exhaustion limit rather than adjusting immediately as the EMH would suggest. For this reason, humans have difficulty in recognizing when past signs or patterns are no longer valid. Studies have shown that the human brain releases dopamine (a pleasure sensation chemical and thus a reward) when a human takes action that has worked before. Thus, the pleasurable action is desirable and overcomes any cognitive reasoning that might suspect the action is wrong. This problem is especially prevalent and potentially very dangerous in the financial markets where change is constant.

*"In a world without change, the best way to find cheese is to return to the location where it was found previously. In a world with change, however, the best way to find cheese is to look somewhere new"* Burnham (2005), paraphrasing from Johnson (1998). In other words, the chart pattern and trend reader should look for failure rather than believe in the constancy of previous patterns. Schwager (1996) suggests that profitability from failed patterns is often greater than from correct patterns.

## COMPUTERS AND PATTERN RECOGNITION

Analysts began recognizing chart patterns in the days when prices were plotted daily by hand. Aside from trend lines, they were the beginning of technical analysis, and for this reason, many nontechnicians mistakenly believe that patterns are all that technicians study. Floor traders and market makers still plot intraday charts of prices for their use in trading short periods, but the computer has changed technical analysis considerably. On a computer screen, charts of minute-to-minute, even tick-to-tick prices can now be displayed, and from them, various patterns can be recognized. This has led to impersonal contact with prices, different from the days when each bar was plotted individually and the "feel" for price action was more easily learned. In addition, the time horizon for traders off the floor has become shorter. The ability to see almost instantly a change in price behavior combined with lower commission costs and less slippage, all due to the introduction of computers, has led traders to speculate on shorter-term trends and patterns.

The computer did not make the study of patterns any easier, however. Patterns change and adjust to new markets. Some of the old patterns do not seem to work very well anymore, and others have taken their place. Patterns are also subjectively determined, and in many cases they are perhaps invalid. Tests are being made currently on their validity, a difficult enterprise because patterns are more visually based than mathematically based. They are peculiar to humans in that like recognizing a friend's face out of a collage of faces, a particular chart pattern must be recognized out of a series of patterns in prices. Like quantifying your friend's face, quantifying a chart pattern is not easily accomplished. Only through practice, many mistakes, and many correct interpretations that go wrong is the technical analyst consistently able to recognize patterns. This is how the art of technical analysis developed before the computer, and although the computer is now taking over both in plotting and in analyzing, the chart patterns still exist and are used by many practitioners. Recent authors of books on technical chart methods will attest to the longevity of certain patterns and their fractal nature. The analysis of price patterns remains, though less emphasis is placed on it.

The analyst using a computer is able to compute more quickly various ratios, averages, spreads, and so on. Computer usage also has the advantage of giving the technician the ability to test these new calculations as well as the old ones for accuracy and statistical significance. The old-time technical analyst had to rely on many years of experience to determine the reliability of formations and indicators and often, for example, stayed up late at night with a hand-crank adding machine calculating indicators and oscillators. As we know from studies of behavior, anecdotal experience can be deceiving, but with the advent of the computer, we can now objectively study many oscillators, averages, and other methods that before were impractical to study.

The computer has "cleaned" up a lot of the folklore about patterns and trends and eliminated those that have little or no validity. It has made technical analysis more of a science than an art. Remarkably, though understandable from the previous discussion of human behavior, many of these old inaccurate methods are still used.

## MARKET STRUCTURE AND PATTERN RECOGNITION

The markets, of course, have also changed since the beginning of technical analysis and the first recognition of patterns, and with this change, patterns have changed and become less accurate. First, the proliferation of technical knowledge has led to the recognition of specific patterns when they occur. Of course, once a pattern is widely recognized and acted upon, its effectiveness diminishes. Thus, patterns in widely traded securities tend to be less accurate than those quiet trading securities that very few traders watch.

In the stock market, ownership has become concentrated in relatively few hands that tend to act in concert. These "hands" are the institutional holders of securities. They tend to act together when news is announced, and thus by their large positions and anxiousness to get in or get out cause patterns to self-destruct. Although it is difficult to prove, when a large institution is the dominant owner of a stock and has knowledge of technical principles, there is a temptation to "manipulate" a chart formation and cause false breakouts. This can cause havoc with the short-term trader who is watching the same patterns develop.

Finally, the advent of derivatives in large quantities has influenced the price and volume action in individual securities for reasons other than the prospects for the underlying company. Addition or deletion from a market index or basket can suddenly introduce buying or selling unrelated to the pattern developing.

### BOX 15.1 For Further Reading

There are many good reference books devoted to the study of patterns in market prices. Some of these are listed here.

Bar Chart Patterns:

*Encyclopedia of Chart Patterns* by Thomas N. Bulkowski

*How Charts Can Help You in the Stock Market* by William Jiler

*How Technical Analysis Works* by Bruce Kamich

*Profits in the Stock Market* by H. M. Gartley

*Technical Analysis* by Jack Schwager

*Technical Analysis Explained* by Martin Pring

*Technical Analysis of Stock Trends* by Robert Edwards and John Magee

*Technical Analysis of the Financial Markets* by John Murphy

**Point-and-Figure Patterns:**

*Point and Figure Charting* by Thomas J. Dorsey

*Study Helps in Point & Figure Technique* by Alexander Wheelan

*The Chartcraft Method of Point and Figure Trading* by Abe Cohen, Earl B. Lumenthal, and Michael Burke

**Trading—Short-Term Patterns:**

*Connors on Advanced Trading Strategies* by Laurence Connors

*Dave Landry's 10 Best Swing Trading Patterns and Strategies* by David Landry

*Japanese Candlestick Charting Techniques* by Steve Nison

*Long-Term Secrets to Short-Term Trading* by Larry Williams

*Market Wizards* by Jack Schwager

*Street Smarts* by Laurence Connors and Linda Bradford Rashke

*The Hedge Fund Edge* by Mark Boucher

## BAR CHARTS AND PATTERNS

From Chapter 11, "History and Construction of Charts," you know how to plot a bar chart. It is the most common chart of price behavior and has been used ever since continuous trading data became available. In Chapter 12, you learned how to determine support and resistance zones and trend lines using bar charts. Bar chart patterns form by combining support and resistance zones and trend lines. In all cases, a pattern finalizes when a breakout occurs from the pattern. In some instances, a pattern will just dribble into inactivity, in which case it should be ignored, but most patterns result in a legitimate breakout in one direction or the other. The breakout may be false, of course, and we will look at how to handle their occurrence. We have observed the peculiarities of drawing trend lines and establishing support and resistance zones in previous chapters, and from the previous discussion, the difficulties in recognizing patterns from imperfect data. Patterns are thus never exactly the same from example to example and are fit into generic categories with common characteristics based principally on the direction of internal trends and their intersections.

Traditionally, we divide patterns into two categories: continuation and reversal. This is a holdover from Schabacker (1930), and used by Edwards and Magee (revised, 2003), who needed to break patterns into easily understood and recognizable divisions. Unfortunately, as Edwards and Magee recognized, patterns cannot always easily be relegated to a specific reversal or continuation category, and such a description can often be misleading. Instead, patterns can occur in both modes. For this reason, we prefer to abandon the standard method of differentiating patterns into "continuation" and "reversal," and although we will still use the terms when appropriate, we will instead describe the simplest patterns first and progress to the more complex.

## **How PROFITABLE ARE PATTERNS?**

Studies of chart performance and reliability are scarce. The problem, of course, is the difficulty in defining a chart pattern on a computer. In 1970, one of the authors of this book and Robert Levy (1971) devised a method to identify patterns by recording the sequence of reversal points relative to their immediate past reversal points. This sounds complex, perhaps, but using only five reversal points, almost all simple chart patterns can be identified and their results recorded. Arthur Merrill (1997) took this study method and with some variation tested it on the Dow Jones Industrial Average. In both studies, the results showed that chart patterns as defined had little predictive ability. Several patterns showed some statistical reliability, but not enough to prove the case for technical price patterns in general.

In a 1988 study by Lo and MacKinlay, more sophisticated statistical methods were used to see if patterns existed in individual prices. The study had mixed results. Although it did not negate the possibility of patterns, neither did it prove that patterns existed.

The most comprehensive study to date is that of Bulkowski (2000). Many of the statistics mentioned in each pattern section later in the chapter are taken from his more recent work on trading classic patterns (2002). The intriguing nature of Bulkowski's studies is that many of the old observations seen in the classic literature are turning out to be questionable, especially for maximum performance. As examples, volume trend within a pattern, slope of trends, and break-out volume may not be as relevant as others had originally thought.

Remember also that Bulkowski's observations are in retrospect. We can easily identify many chart patterns after they have occurred, and when we have observed the results. The real talent comes in identifying a chart pattern while it is evolving in real time and profiting from its completion. For this ability, only study, practice, and experience will suffice.

Finally, the results from Bulkowski's observations are relative only. They cannot be assumed to be profitable in the future, as they appeared to be during the trial period. The value of his study is not in determining the value of chart pattern analysis itself but in determining which of the classic patterns are more profitable with less risk. From Bulkowski's studies, it appears that pattern analysis outperforms the market (S&P 500) on average in every instance. This may or may not be true, but for our purposes, we are more interested in which patterns to study as being the most likely to profit over others.

We will begin by looking at classic chart patterns. These patterns generally have been recognized and used for over a hundred years. Only recently have there been tests of their reliability and profitability. Later, we look at those patterns that show the best odds of success and elaborate on how to use them in trading and investing.

**BOX 15.2 Using Breakout Price to Set Price Targets**

Bar charts can project price targets once a formation completes with the breakout. Most targets are measured from the breakout price. Targets are infrequently used because most technicians are satisfied with just being on the right side of the trend, wish only to ride that trend, and believe that targets are generally inaccurate. In many patterns, however, this is not so. Generally, the target is calculated by taking the height of the pattern and adding it to the breakout price. In each of the following trading boxes, we will describe the target peculiarities for each pattern and the success percentages.

**CLASSIC BAR CHART PATTERNS****Double Top and Double Bottom****Description**

A double formation is about the simplest of the classic formations. It is also one of the least reliable and least profitable patterns. A double top consists of only three reversal points: two peaks separated by a trough (see Figure 15.3). For it to be a true double top, the initial price must enter the pattern from below the trough price, and the exit signal must occur on the breakout below the trough low price. The two peaks must be at or close to the same price level, and thus the double top resembles the rectangle formation (described next) with less detail. A double bottom pattern has the same characteristics as the top but is upside down (see Figure 15.1). Both patterns form over a number of months—even years—and are thus longer-term. They are more observable in charts using weekly and monthly data and mostly in retrospect.

Newspaper and media commentators who want to sound like technical analysts frequently use the term "double" formation often when it is not a true double pattern. A true formation is only valid when the two tops or bottoms are at the same price level and once the intervening reaction reversal point has been penetrated. The danger of acting prematurely is great; roughly 64% of patterns fail before penetrating the breakout level (Bulkowski, 2000). Unfortunately, this pattern's performance is consistently below average and its failure rate is high. Even Charles Dow believed it was a useless pattern. Edwards and Magee considered it a "minor" formation because it is so rare and difficult to profit from.

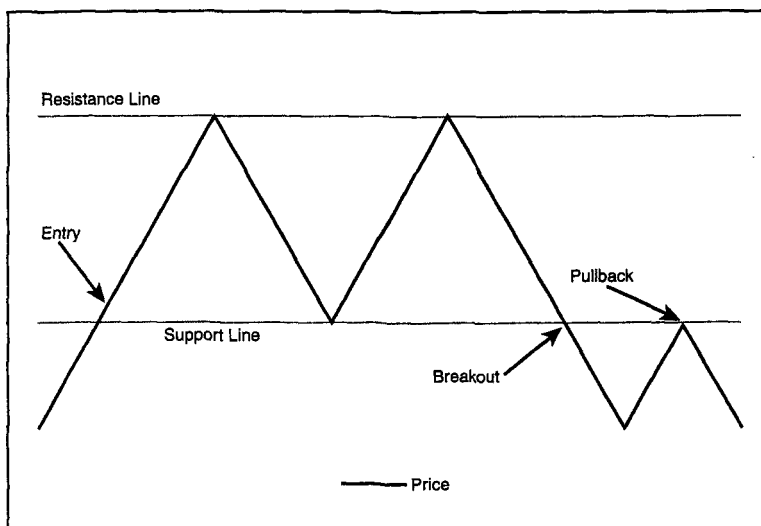


FIGURE 15.3 Double top with breakout down

Much analysis has gone into improving the recognition of characteristics within the pattern to see if post-performance can be improved by observing other traits that might suggest better performance, such as measuring whether the first and second reversal point is sharp or curved, whether volume on one reversal point should be larger or smaller, whether the first reversal point should be higher or lower than the second, and so on. No definitively successful rules have been developed, however. Even Bulkowski, who tries very hard to justify the formation, could not find a way that it can be screened for better-than-average, low-risk post-performance. Although much has been written about the double formation over the years, we suggest looking at the more successful patterns described next to find value.

#### Performance

Bulkowski divides double patterns into four different varieties based on the shape of each reversal point and whether it is rounded or spiked. In not one instance is the performance versus the S&P 500 better than the average of all the classic patterns mentioned next.

#### Failure

The failure rates, with one minor exception, are above the average for the classic patterns. In the case of double tops, the failure rate in all varieties is larger than the 33% breakeven threshold. This means that the odds of making a profit from a double top downward breakout are below even. For the double bottom, the percentage of failures doubles with each 5% increase in expected gain. In other words, the percentage of failures at the 10% expected gain level are



around 15-18%—not bad, but still below average—but the percentage rate of failures at a 15% gain is 29-30% and for a 20% gain is 35-47%. This means that almost a third to a half of the signals will fail before a 20% gain is reached. It also means that most profits are made with small percentage gains. These tend to eat up profits by increasing commission costs, slippage, and the fact that the trader will never close a position at the maximum gain. In other words, the double bottom pattern may work occasionally (5-12% derive over a 100% gain), but the technical analyst's position will be chewed up by smaller losses along the way.

### **BOX 15.3 Trading Double Formations**

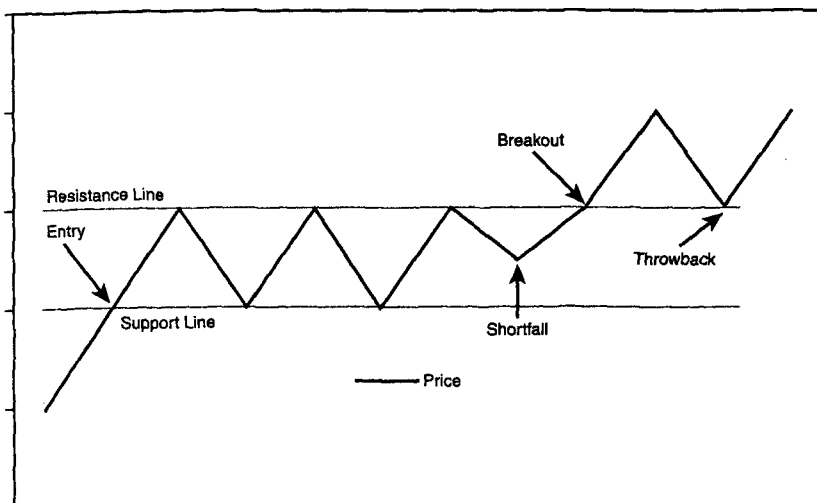
If one insists on buying a double bottom, several important observations must be made before acting to improve the chances of profit. First, never buy until the breakout has occurred. Second, look for flat bases either at the same level as the twin bottoms or slightly higher and earlier. Third, look for an absence of a consolidation area above the formation. Fourth, look for what is called an "Eve & Eve" variety, where each bottom is rounded rather than sharp, as in a spike, or for an "Adam & Eve" variety, where the first bottom is spike-like and the second is rounded. The latter variety often occurs after a sharp decline, the second bottom being the "test" of the first. Above-average volume on the breakout helps performance in both varieties, and declining volume during the formation of the Adam & Eve variety seems to help.

Finally, if you insist on selling a double top, look for signs similar to those at a bottom, except for the flat base. The Eve & Eve variety is better for performance gain, but not by much. Volume during each partem and on the breakout seems to have no significance for later performance.

## **Rectangle (Also "Trading Range" or "Box")**

### **Description**

In the earlier discussion on trading ranges and sideways trends, we effectively described a rectangle pattern. It is one of the simplest of patterns, consisting of a resistance line above and a support line below (see Figure 15.4). Each resistance or support line must also be a trend line, which means that it must touch roughly the same price reversal at least twice. This added requirement is what separates it from a double top or bottom formation, which only requires that three price reversals occur. Prices are bounded by and oscillate between the two lines, and eventually exit, or break out, in one direction or the other. The pattern can have a slight tilt upward or downward, but the trend lines defining the support and resistance zones are always parallel. It appears similar to a horizontal channel. It often has false or premature breakouts, neither of which is predictive of the eventual breakout direction.



**FIGURE 15.4** Rectangle with entry up and breakout up

#### **BOX 15.4 False and Premature Breakouts**

These breakouts are not exits from a formation but instead are minor breakouts above or below breakout levels that quickly return into the formation. They can occur at support and resistance levels as well as at trend lines. A "false" breakout is one that breaks out in the direction opposite from the direction of the final breakout, and a "premature" breakout is one that breaks in the same direction as the eventual exit breakout. In retrospect, these breakouts can have preactive value; but at the time either occurs, it is almost impossible to tell what type it is. When they occur frequently, they warn that a very strict breakout discipline must be used to avoid triggering action before the actual exit breakout.

Within the formation, prices do not necessarily always reach the two zones but may fall short (a "shortfall" or "partial decline"). Sometimes this is a warning as to the direction of the eventual breakout. As an example, when well along the way of the formation of a rectangle, prices begin to reverse before declining all the way to the underlying support zone, buyers are getting a little more anxious and the odds increase for a breakout upward. Bulkowski reports that such a shortfall within the latter stages of the pattern is accurate 71% of the time in predicting the direction of eventual breakout. About half the time prices throw back or pull back to the breakout

zone, providing another action point. Edwards and Magee estimated that about 40% of the time, a pullback or throwback would occur. When the breakout occurs on a gap, the odds decrease that a retracement will occur.

Volume is often an important factor in any formation. In the rectangle pattern, however, a rising or declining volume trend within the pattern has little or no effect on the results after the breakout, though declining volume is more common. Results increase, however, when volume increases on the breakout itself.

#### Performance

In rectangle patterns, Bulkowski made no distinction between the entry directions and only looks at the exit results. He had difficulty in finding a significant number of downward exits, likely due to the underlying upward trend of the general market during the test period. Upward exits from a rectangle, however, in his opinion, turned out to be the second-best pattern of all the classic patterns. It generated a median return of 29% above the S&P return for the period in which each formation existed.

#### Failures

For the upward-breakout-rectangle pattern, the reported 10% gain failure rate was 19%. This means that 19% of the upward breaking rectangle formations failed to reach a 10% gain. It sounds terrible, but in fact, it is very good. It is far better than the 33% maximum failure rate associated with breakeven. It means that 81% of the formations were successful at the 10% gain level.

The trap percentage of the upward breaking rectangle formation was 20%. In other words, 20% of the time, the upward breakout was followed by a downward breakdown before a 10% gain in the upward direction was reached. By looking at the formation and determining the relative position of a 20% loss from the breakout and the pattern trap reversal breakout, a protective stop price can be determined and the odds of success calculated more closely.

### **BOX 15.5 Trading Rectangles**

Edwards and Magee claimed that rectangles are more often continuation patterns, but as a reversal pattern, they occur more frequently at bottoms. This is likely why Bulkowski mostly found upward breakout rectangle patterns. An upward breakout, however, should never be assumed. Indeed, two out of three rectangles are continuation patterns, and the initial expected direction of the breakout should be in line with the previous trend. >

Rectangles have the bad habit of producing false breakouts. Indeed, over 75% of early breakouts are false; This is a large enough figure to hint as to the eventual final breakout direction, but it requires very close breakout and stop discipline. Once the final breakout has occurred, the failure rate is very low. Thus, it pays to be sure that the breakout is real. Another hint is the existence of shortfalls. Shortfalls occur

*(continued)*

later in the formation and can anticipate the breakout. Use a method similar to that shown in Chapter 13, "Breakouts, Stops, and Retracements," on anticipating breakouts, and keep a close protective stop. The volume trend during the formation of the pattern gives no hint as to the breakout direction and has only a minor affect on performance.

Some traders will trade within a rectangle, buying at the support level and selling at the resistance level. This is not recommended, however, unless the rectangle is particularly wide from top to bottom. Trading has many costs inherent in acting on the buys and sells. The obvious costs are commissions, slippage, and width of the spread. Additionally, when trading within two bounds, the bounds are not exact nor will a trade be executed exactly at the bound. Thus, sell orders must be placed a certain distance, a specified filter, below a resistance zone, and buy orders a certain distance above a support zone. To be able to absorb these costs and price filters, the trader is limited to rectangles that are sufficiently high, from support to resistance. One who attempts this kind of trading must be watching the price action incessantly and be ready to scalp the few points in between the bounds and filters in an instant. Most traders and investors are unable to do this.

A target can be calculated by adding the height of the rectangle formation to the breakout price. According to Bulkowski, in rectangles, the upward target is reached or exceeded 91-93% of the time, and in downward breakouts, the target is reached or exceeded 65-77% of the time. The difference in percentages is based on the entry, whether upward or downward, but in all cases, the target is a relatively accurate figure and can be used for risk/reward calculations.

## Triple Top and Triple Bottom

### Description

The triple top and bottom formation is just a rectangle with the number of touches to the support or resistance line being three. It is thus more specific than the rectangle and is less common, but as it turns out, its performance and risk statistics are roughly the same. Figure 15.5 shows a triple top with a breakout down, and Figure 15.6 shows a triple bottom with a breakout up.

The only time the performance for a triple top or bottom is substantially better than for the rectangle is when the third bottom in a triple bottom is higher than the other two previous bottoms. This pattern is similar to the one described in the rectangle pattern as having the final internal correction be a shortfall.

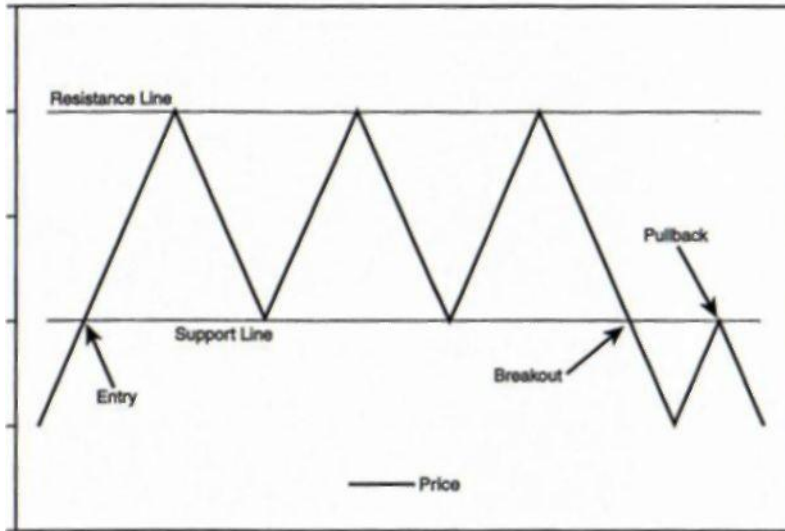


FIGURE 15.5 Triple top with breakout down

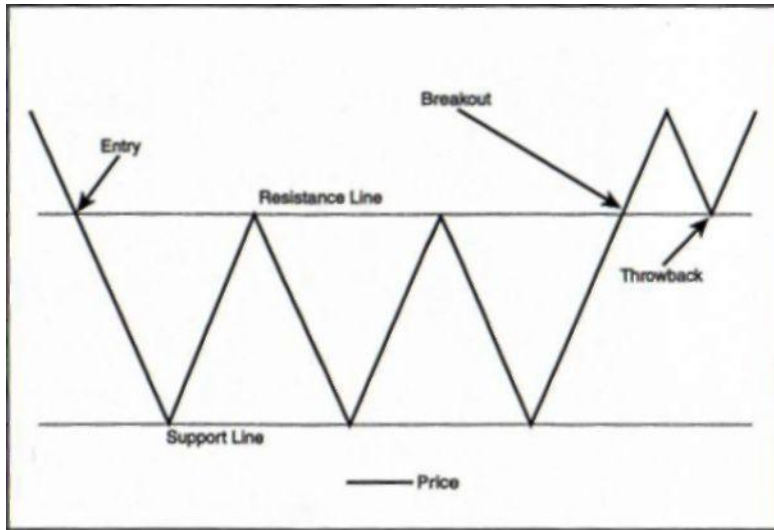


FIGURE 15.6 Triple bottom with breakout up

## Standard Triangles—Descending, Ascending, and Symmetrical

The rectangle pattern is bounded by parallel lines. If the same general pattern has nonparallel boundary lines such that when extended into the future they cross each other, the formation is a *triangle* pattern. Triangles can be the result of an upward-sloping lower bound or a downward-sloping upward bound. Thus, there are a number of possible combinations of the two lines.

In this section, we will look only at the standard triangle patterns. In these triangles, the point at which the two lines extend and cross over each other is called the apex or the cradle, and the distance between the first high reversal point and the first low reversal point within the triangle is called the base.

When the lower bound is a horizontal support zone and the upper is a downward slanting trend line, it is called a descending triangle. When the lower trend line is rising and the upper bound is a horizontal resistance zone, it is called an ascending triangle. When the upper bound is declining and the lower bound is rising, it is called a symmetrical triangle. When both the upper bound and lower bound are slanting in the same direction and converging, it is called a wedge, and when the two lines are diverging regardless of slope, a reverse triangle, it is called a broadening pattern. When we combine a broadening pattern with a triangle, usually a symmetrical triangle, we get what is called a diamond pattern.

**TABU 15.1** Statistics on Triangles

Triangles	Performance vs. SAP 500	Failure to Reach 10% Gain After Breakout	Percentage Gaining over 50%	Percentage Reaching Price Target	Percentage Throwbacks	Most Favorable Volume During Formation	Increasing Volume on Breakout
Descending Triangle, breaking up	29%	9%	34%	67%	29%	Rising	Irrelevant
Descending Triangle, breaking down	16%	27%	2%	67	55%	Declining	Desirable
Ascending Triangle, breaking up	21%	17%	25%	89	52%	Rising	Desirable
Ascending Triangle, breaking down	19%	24%	3%	89	43%	Declining	Irrelevant
Symmetrical Triangle, breaking up	25%	15%	28%	79-81%	51%	Irrelevant	Desirable
Symmetrical Triangle, breaking down	16%	24%	4%	57-62%	51%	Rising	Desirable

Source: Bulkowski | 2000, 20021

## Descending Triangle

### Description

Figure 15.7 shows a descending triangle with a breakout down. This formation can be stretched high and wide and is sometimes difficult to recognize, but it is a common pattern. The trend lines defining its boundaries are almost never exact and are loaded with false intrabar breakouts. A strict breakout strategy is required, therefore, as we discussed in Chapter 13. However, prices often explode out of it and produce sizeable gains. It can also be wild and guarantee an exiting ride. It will break out and run, break out and pull back to its trend line, break out and pull back to its cradle, or break back through the cradle, create a sizeable trap, and then reverse back in its original breakout direction and run. In other words, when you enter on a breakout from a descending triangle, the subsequent action must be watched carefully.

Upward breakouts on gaps add considerably to performance and are definitely something to look for. On downward breaks, gaps seem to have little effect.

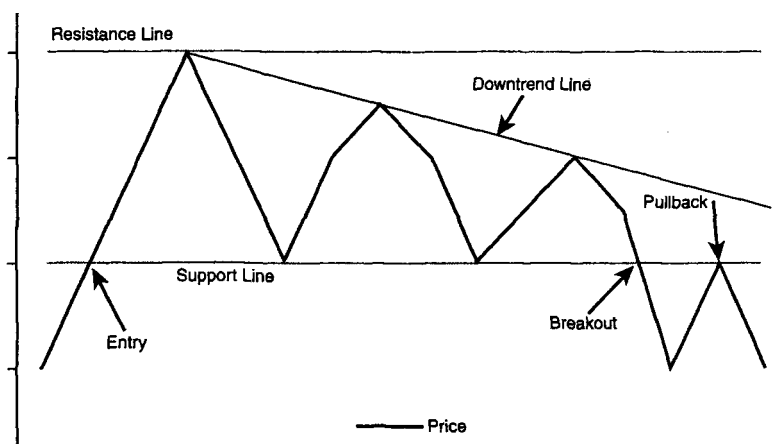


FIGURE 15.7 Descending triangle with breakout down

Figure 15.8 pictures a descending triangle with a breakout up. The typical pattern shows declining volume throughout its formation. However, increasing volume during the formation of an upward breaking descending triangle, though less frequent, is more favorable than declining volume. This contradicts the conventional opinion that advancing volume negates the pattern and represents a reason for screening it out for consideration. In the downward breakouts, declining volume during the pattern formation helps post-breakout performance only slightly. The amount

of volume traded on the actual upward breakouts has little effect on the post-performance, but in downward breakouts, an increase on the breakout helps performance slightly.

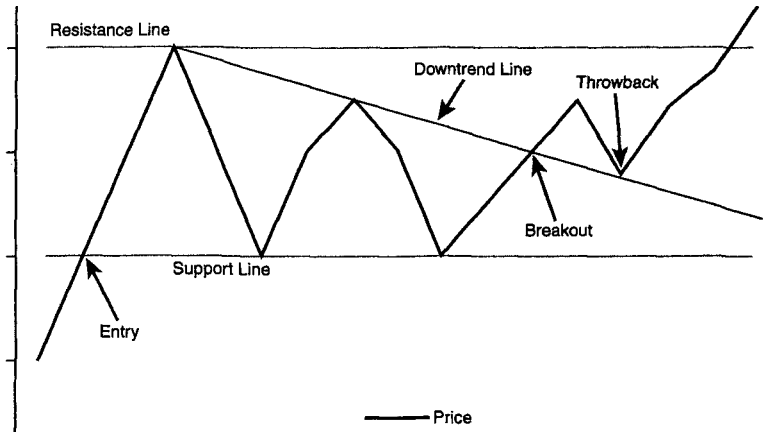


FIGURE 15.8 Descending triangle with breakout up

#### Performance

Bulkowski considers a breakout upward out of this formation to be the best pattern of all the classical patterns. It has a 34% median gain versus a 5% S&P 500 gain, which is a net of 29%. This compares precisely with the median gain from an upward breakout of a rectangle formation. What is more encouraging, however, is that the percentage of gains over 50% for upward breakouts is 34% versus only 29% in rectangle upward breaks. Downward breaks provide a median gain of 18%, while the S&P 500 declined 1%. In Bulkowski's study, the statistics for downward breakouts was somewhat surprising and contradict the conventional wisdom surrounding descending triangles. The declining upper bound has been thought to be an indication of increasing selling pressure and an indication that the breakout would more likely be downward and continue lower. In fact, the breakouts up or down were about evenly divided.

#### Failure

Upward breakouts appear to be extremely reliable. The 10% gain failure rate was only 9%. In other words, on an upward breakout, 91% of the time the price gained at least 10%. In downward breakouts, the failure rate was considerably higher at 27%, almost at the breakeven level. Traps also occurred frequently on breakdowns. 26% of these breakouts were traps, while only 9% of upward breakouts developed into a trap.



## Ascending Triangle

### Description

An ascending triangle (shown in Figure 15.9 with a breakout down) results from a horizontal upper bound of resistance with an upward angled lower bound of support. The characteristics of this pattern are just as erratic as in descending triangles—lots of action up and down. Breakout points must be chosen carefully because of the pattern's nature to have many small false breakouts, and declining volume is common but not necessary. Rising volume during the formation of upward breaking patterns actually helps post-performance slightly, and breakout volume on upward breaking stocks helps considerably, while having little influence on post-performance of patterns breaking down. These patterns are common, and breakouts upward are more common than breakouts down.

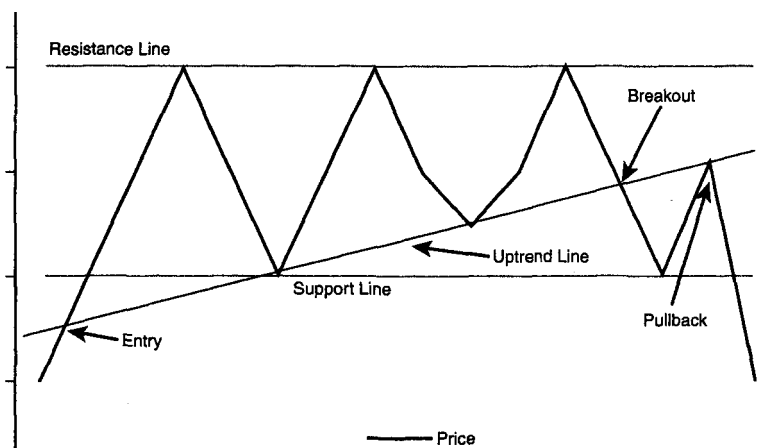


FIGURE 15.9 Ascending triangle with breakout down

### Performance

Ascending triangle performance was about average for all patterns. It was considerably better than the S&P 500 but less than some of the others, such as the upward breakouts in rectangles and descending triangles. The median gain for upward breakouts from ascending triangles was 21% over the S&P 500 and 19% for downward breakouts.

### Failure

The failure to reach a 10% gain was 17% in upward breakouts and 24% in downward breakouts. These are considerably higher percentages than in descending triangles and are about average for all patterns, but they are still better than the breakeven percentage of 33%. Traps were about normal for both upward and downward breaking formations at 17% and 24%, respectively.

### Symmetrical Triangle (Also "Coil" or "Isosceles Triangle")

When the upper bound is downward sloping and the lower bound is upward sloping, a symmetrical triangle is formed (see Figure 15.10). The term "symmetrical" give the impression that both lines should have the same angle but in different directions. However, that the slope of the two boundaries be formed at congruent angles is not a requirement. Thus, "symmetrical" is not an accurate description but is the term most commonly in use for this partem. The less commonly used term "coil" is often a more accurate description.

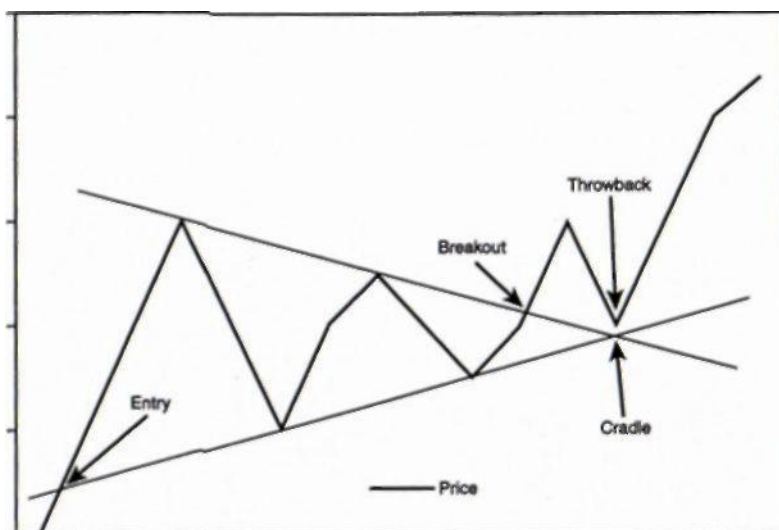


FIGURE 15.10 Symmetrical triangle with breakout up

Like the other standard triangles, the symmetrical triangle has many false breakouts and must be watched carefully. A strict breakout system must be used that allows for such false moves. This formation does not occur as frequently as the descending or ascending triangle, but it is still very common relative to other chart patterns.

Generally, a shorter period from a prior significant reversal, up or down, produces the most profitable symmetrical triangles. The longer the trend preceding the triangle, the less reliable and less profitable it will be. There seems to be a 50/50 chance that the breakout will be in either

direction, and a 50/50 chance that once the breakout occurs, a throwback or pullback will occur. What is interesting is that when a throwback or pullback does occur, it considerably diminishes the performance of the symmetrical triangle. This implies that for actual investment or trading, the initial breakout should be acted upon, and if a pullback or throwback occurs, the protective stop should be tightened. It does not imply that a pullback or throwback should be ignored, but that instead, performance expectations should be less than if no pullback or throwback had occurred. Gap breakouts do not seem to affect the performance on the upside but do give a few extra percentage points on the downside.

Volume more commonly declines during the formation of the symmetrical triangle, just as in the others, but an increasing volume trend seems to be associated with better results once the breakout occurs. High volume on breakouts, both upward and downward, adds considerably to the performance of the formation and is something to look for.

#### Performance

Symmetrical triangles, like the other standard triangles, are some of the most profitable patterns. Indeed, it seems not to make much difference which way the breakout occurs; the performance in either direction is better than average. Added with the frequency of occurrence, this is a formation that the technician should study and be able to identify. Performance for over 600 examples provided a 25% median gain over the Standard & Poor's 500 on upside breakouts and a 16% median gain on the downside.

#### Failure

In addition to above-average performance, the symmetrical triangles provided a less-than-average percentage of failures and traps, both upward and downward. It is as if the symmetrical triangle takes the best attributes of both the descending and ascending triangles. The 10% failure percentage was 15% on the upside, far below the 33% breakeven level, and 24% on the downside, still below the breakeven and below the average for the median of downside classic patterns. Remember, any failure rate above the 33% breakeven level has minimal chances of making a profit versus the risk of failure. It is not to say that such a pattern should necessarily be completely discarded, but it certainly implies that it should be treated with extreme caution.

#### **BOX 15.6 Trading Triangles**

The ideal situation for trading triangles is a definite breakout, a high trading range within the triangle, an upward-sloping volume trend during the formation of the triangle, and especially a gap on the breakout. These patterns seem to work better with small-cap stocks in a rising market

Triangles are plentiful. For example, the upward failure of a head and shoulders top before any break through the neckline is a form of an upward breaking descending triangle. This is one likely reason that such head and shoulder top pattern failures are so profitable.

*(continued)*

Although triangles are plentiful, their patterns suffer from many false and premature breakouts. This requires that a very strict breakout rule be used, either a wide filter or a **numbeT** of closes outside the breakout zone. It also requires a close protective stop at the breakout level in case the breakout is false. Once these defensive levels have been exceeded, and price is on its way, the trader can relax for a little while because the failure rate after a legitimate breakout is relatively low. Trailing stops should then be placed at each preceding minor reversal.

There are many old rules about when a breakout should occur within a triangle. Some, such as Murphy, say that one-half to two-thirds the distance from the base to the apex is appropriate. Others, such as Edwards and Magee, use one-half to three-quarters rule. In fact, the breakout can occur at any time once the triangle has been defined by legitimate upper and lower converging trend lines. Edwards and Magee do point out that the longer the distance, the more likely the performance will be less, but this also is not necessarily true. The highest percentage performance does come from breakouts generally around 60-70% of the distance from the base to the cradle. However, in symmetrical triangles, the best performance comes from late breakouts in the 74-79% distance. Thus, the old rules are partially correct but not strictly so.

Generally, the volume trend during the formation of a triangle declines, but in the case of an upward breaking descending triangle, an ascending triangle, and a downward breaking symmetrical triangle, an upward-sloping volume trend gives better results. Declining volume is not a reason to disregard the pattern, however. Volume on the breakout seems more desirable in symmetrical triangles, but it cannot hurt in others. Gaps are better predictors of performance in the upward breaking descending triangle and the downward breaking symmetrical triangle, but they are not necessary.

An initial target for these patterns is calculated by adding the base distance—the vertical distance between the initial upper and lower reversal point prices—to the price where the breakout occurred. In an upward breaking descending triangle, for example, this target is reached better than 67% of the time. Other triangles have relatively the same success rate—higher in upward trends than in downward trends. This is why a wide trading range is preferred within the triangle—it suggests a higher target price on the breakout.

## Broadening Patterns

A broadening pattern exists when we take the standard rectangle pattern and draw the bound line: diverging from each other into the future rather than converging as in a standard triangle. As pictured in Figure 15.11, the price range is increasing during the broadening pattern, as opposed to the narrowing price range that is associated with the standard triangle patterns. The terms "mega phone," "funnel," "reverse triangle," and "inverted triangle" all refer to broadening patterns.

Broadening formations are the least useful patterns for a number of reasons. First, they are relatively rare in occurrence and are often difficult to identify. Second, and more important, they are difficult to profit from. Because the boundary trend lines are separating over time, the breakout lines are constantly moving away from each other. In an upward breaking broadening pattern, this means the upper breakout level is getting higher and higher along the upper trend line (see Figure 15.11). By getting higher and higher, not only is it using up much of any potential gain after a breakout, but it is also moving farther from any realistic protective stop level, thus increasing the risk. Finally, the raw performance statistics show that performance of a broadening pattern is average at best, and its failure and trap rates are above average. The only time that a broadening pattern has useful performance is when it is combined with a symmetrical triangle into a diamond top, which we discuss next.

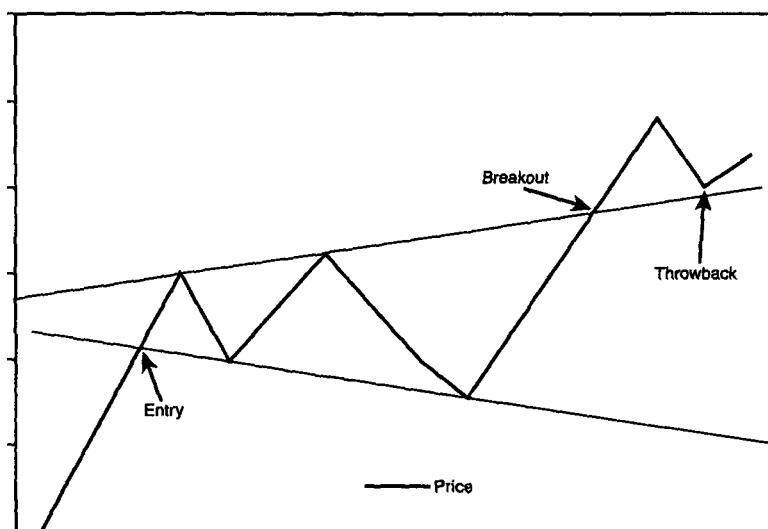


FIGURE 15.11 Broadening formation with breakout up

## Diamond Top

### Description

One of the less frequent but very profitable patterns is the diamond (see Figure 15.12). It consists of a combination of a broadening pattern and a symmetrical triangle and usually occurs at the top of a very sharp upward rise in prices. It is rare at price bottoms.

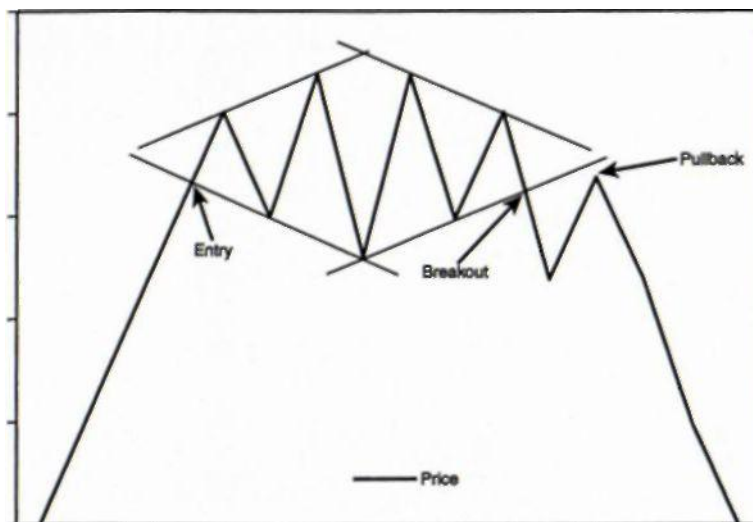


FIGURE 15.12 Diamond pattern with breakout down

Because it combines two types of triangles, the diamond is the most difficult to observe. Remember that to establish a trend line, two extreme points that a line can be drawn between must be identified. In a broadening formation, the upper trend line slopes upward and must, therefore, have two peaks—the latter higher than the former. Likewise, the lower trend line must have two troughs—the latter lower than the former—and each line must be formed at the same time as the other. The first reversal point depends on the entry direction, of course, and because diamonds are mostly top formations, the entry direction is generally from below. This means that the first reversal point will be a peak. After that, the first trough will appear, then the next higher peak, and then the next lower trough. When trend lines have been drawn to connect these reversal points, we have a broadening formation. Now we must observe a symmetrical triangle immediately after the broadening formation to establish a diamond pattern. The trend lines in a symmetrical triangle converge, as in all standard triangles, and must also have at least two peaks and troughs to establish each trend line. The first reversal peak and trough may be the last reversal points in the broadening formation or the next reversal points following the broadening formation. Often the trend lines in the symmetrical triangle will be parallel to the trend lines in the broadening pattern, but this is not a requirement.

Bulkowski's figures show that around 58% of the time, the preceding price action in a diamond top was a steeply rising trend. When this occurs, the odds increase that the breakout from the diamond will be downward and will be equally as steep, and 82% of the time it will retrace the entire prior rise. These figures are only valid for downward breakouts from a top. Action should thus only be taken once the pattern has been identified and the downward breakout has occurred.

Overall market direction seems to have little effect on a diamond top. It apparently occurs based on specific information or action by the underlying company. As in most patterns, volume

usually declines during its formation, but declining volume is not necessary. The post-performance of the pattern is unrelated to whether volume increased or decreased during formation. The same can be said for the volume on the breakout. A large rise in breakout volume occurs infrequently, but when it does, it seems not to influence post-performance of the pattern.

#### Performance

The median performance gain over the Standard & Poor's 500 was 24%. This is significantly above the average 15% gain for downward breakout classic patterns. Indeed, it was the best of them all. As suggested previously, this decline is independent of the general market and is due largely to the underlying company.

Pullbacks are very common in diamond patterns, occurring roughly 54% of the time. These pullbacks tend to detract from performance when they occur but are not that significant. The best combination is when downward breakout occurs on below-average breakout volume and no pullback. Post-performance in these instances outpaced other combinations by five percentage points.

#### Failure

The 10% failure percentage rate is relatively low at 16%. This is well below the average for most downward breaking patterns and suggests that 84% of downward breaking diamond patterns will be successful at least to a 10% gain. This low percentage of failures is also reflected in the average 16% of bear traps that occur. These low numbers equate, to some extent, with risk. Combined with the above-average median return, these numbers suggest that though rare, when a diamond top is identified, it has an above-average chance of being profitable with minimum risk.

#### **BOX 15.7** Trading Diamonds

The diamond formation, once properly defined, tends to have a fast-moving price run on the breakout. Indeed, if the post-breakout price behavior is sluggish, the position should likely be closed or a close trailing stop placed near the current price.

## Wedge and Climax

### Description

A wedge pattern is a triangle pattern with both trend lines heading in the same direction. A rising wedge has both lines headed upward, with the lower bound rising more quickly than the upper bound, as pictured in Figure 15.13. The declining wedge has both lines headed downward, with the upward bound falling more quickly than the lower bound. The lines cross in the future, just as in a standard triangle, and the nomenclature for the crossover and height is the same.

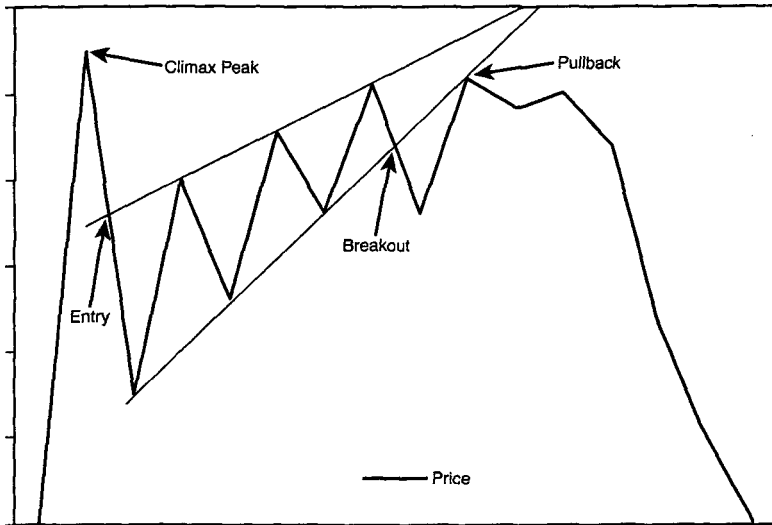


FIGURE 15.13 Rising wedge with breakout down from a climax peak

Rather than the rectangle as the basis for this formation as it is with standard triangles, consider a channel (see Chapter 12). A *channel* is two parallel trend lines either rising or declining. In the earlier discussion of channels, we noted that when the channel line, drawn parallel to the trend line through the opposite set of reversal points, begins to slope toward the trend line, it suggests that players are becoming less enthusiastic with the trend line direction. For example, in an upward-sloping channel, the channel line above the trend line connecting the downward reversal points begins as a line parallel to the upward trend line. If a later rally within the channel fails to reach the channel line, the new channel line through the new downward reversal and the last downward reversal will have a lesser slope than the underlying trend line, and if projected into the future, it will eventually meet the trend line. This new configuration of channel and trend line is a wedge. It suggests, in the example, that sellers have become a little more anxious than before, and by implication, it suggests that the trend line will soon be broken. Indeed, the statistics bear this out. Almost all declining wedges (92%) break out upward, and almost all rising wedges (82%) break out to the downside (Bulkowski, 2000).

Wedges are one of a few patterns that can be consolidation patterns against the prevailing trend, consolidation patterns with the trend, or topping patterns, especially when accompanying a climax. They occur more often during consolidations but are more dramatic after a climax.

Let us look at rising wedges first. Rising wedges occur either during a long downward price trend or after an upward climax. The ones that occur during a downtrend appear as very weak rallies against the trend. As mentioned previously, they invariably break again to the downside and continue the downtrend. Declining wedges are almost the same pattern and occur under similar circumstances, only in the opposite direction.



A market climax occurs when prices accelerate, as shown in Chapter 12. At these times, the underlying trend line is gradually adjusted at a steeper slope in line with the direction of prices. In an upward accelerated trend, the support reversal points occur at levels higher than the projected trend line and cause that trend line to be adjusted to a steeper slope. This can occur several times as prices accelerate upward. The climax itself usually comes on extremely high volume and a sharp reversal. It will be discussed later in Chapter 17. After a climax has occurred and prices settle down, invariably a "test" occurs that attempts to rally back through climax extreme peak. The pattern most often associated with the failure of that test—in other words, when the test fails to exceed the climax extreme or only exceeds by a small amount—is a rising wedge (see Figure 15.13). In the case of a climax low after a panic, the test wedge is the declining variety (see Figure 15.14).

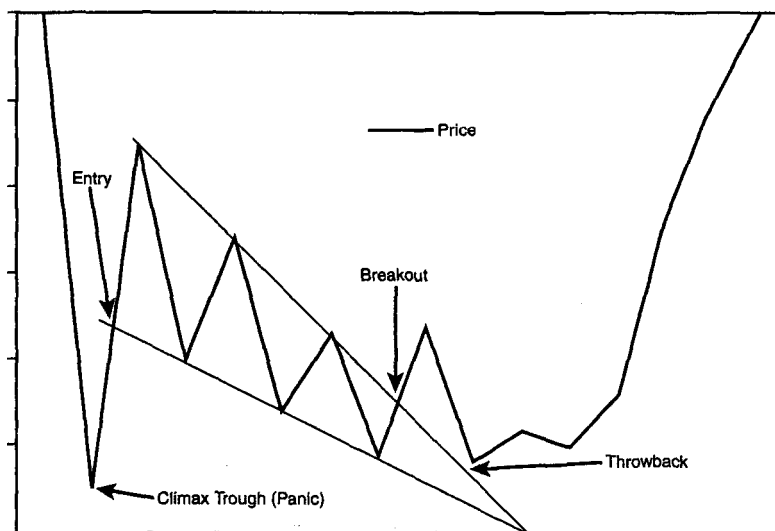


FIGURE 15.14 Declining wedge with breakout up from climax trough

At a climax peak, when the test is a rising wedge pattern, the odds are extremely high that the breakout will be downward. Because the emotion and commitment have been exhausted at the climax peak and are unable to return during the test, the downward break in the wedge pattern is the sign of a longer-term downward reversal. Thus, the wedge is a reversal partem, even though it may not occur at the actual climax peak high.

Other rising wedges can occur as a consolidation during a sustained downward trend and occasionally will end at the top of weakening upward trend. The latter we will see as a "fifth wave diagonal" in the discussion of Elliott Waves in Chapter 20, "Elliott, Fibonacci, and Gann."

Because trend lines often converge in the same direction when a wedge is not present, Bulkowski requires that at least five reversal points be touched to qualify the pattern as a wedge.

This means three points on one trend line and at least two on the other. Otherwise, the pattern is not accurately identified and may fail to show the results seen in actual wedge patterns.

Another characteristic of wedges, in both the consolidation and reversal varieties, is declining volume during the formation of the wedge. Declining volume occurs in three-quarters of the formations, and when it does, the post-performance improves over those wedges with increasing volume. Breakout volume seems to be irrelevant to post-performance. Pullbacks and throwbacks have about 50/50 odds of occurring.

#### Performance

The performance of wedges is about average with all the other classic patterns, slightly higher for the falling wedge, and about even for the rising wedge.

#### Failure

It is extremely important to wait for the actual breakout from a wedge. Even in the instances where the breakout is opposite from the expected direction, the failure rate is extremely low. In rising wedges, the failure rate is only 6%, and in declining wedges, it is only 2%. Thus, it pays to wait for the actual breakout, even though anticipating the breakout is tempting. Not waiting for the breakout increases the failure rate from 6% to 24% in rising wedges, and from 2% to 10% in declining wedges.

Previously we mentioned that pullbacks and throwbacks occur roughly 50% of the time after a breakout. The low failure rate, however, suggests that unlike other patterns where the post-performance often suffers in situations with a high percentage of pullbacks or throwback, wedges can be acted upon at the retracement as well as the actual breakout. Another danger in other patterns is the problem of false or premature breakouts. Wedge patterns have a high percentage of premature breakouts, but the percentage of premature breakouts that run into failures is extremely low. Thus, a premature breakout may be followed by prices reentering the wedge formation, but the original breakout direction is still very likely to be valid. There is one variation of the false breakout called a "throw over" in Elliott Wave analysis. The reversal from a throw over occurs very quickly, and prices barely stop at the actual breakout bound before continuing through.

#### **BOX 15.8** Trading Wedges

Because the wedge failure rate is negligible after a breakout, it pays to wait for that breakout and to act immediately on it. In addition, because wedges have such a high percentage of breakouts in the direction opposite from the wedge direction, the direction of breakout is clear once the wedge is forming. A rising wedge invariably will break downward, and a declining wedge upward. Whenever a climax has occurred, whether up or down, look for a wedge to form on the test. This is one of the most profitable patterns of all. Just be sure that a wedge as described previously is valid before you take any action. Otherwise, any wedge, once defined, is usually profitable and has minimum risk once the breakout occurs.

## PATTERNS WITH ROUNDED EDGES—ROUNDING AND HEAD AND SHOULDERS

### Rounding Top, Rounding Bottom (Also "Saucer," "Bowl," or "Cup")

#### Description

When we begin to define patterns with curved lines, we become more indefinite than with using straight lines such as trend lines. This does not make the patterns any less useful, but it does make them more difficult to describe specifically. This is the case with the rounding tops and bottoms. Rounding is generally considered price action that reverses slowly and gradually, rather differently from the spike with very definite and sharp reversal characteristics. Volume in the bottoms seems to follow the same trend of lessening as prices gradually approach the bottom and increasing as they gradually turn upward again. In a rounding top, volume tends to follow the same pattern of lessening as prices decelerate and increasing as prices gradually turn down. Rounding usually takes time, and within its process, it has many minor up and down, very short-term trends. Rounding is thus more conceptual than specific.

However, many formations depend on rounding for their description. The most famous is the cup and handle formation described in detail by O'Neil (1988) but referred to in many earlier publications. These formations are a variation of the rounding bottom that show a "lip" after the rise from the bottom, and a small congestion area that reverses downward for a short while called a "handle." The high of the lip establishes, in this type of rounding bottom, the resistance level to watch for an upward breakout. Sometimes the breakout never occurs, and prices keep declining in the handle, continuing to new lows.

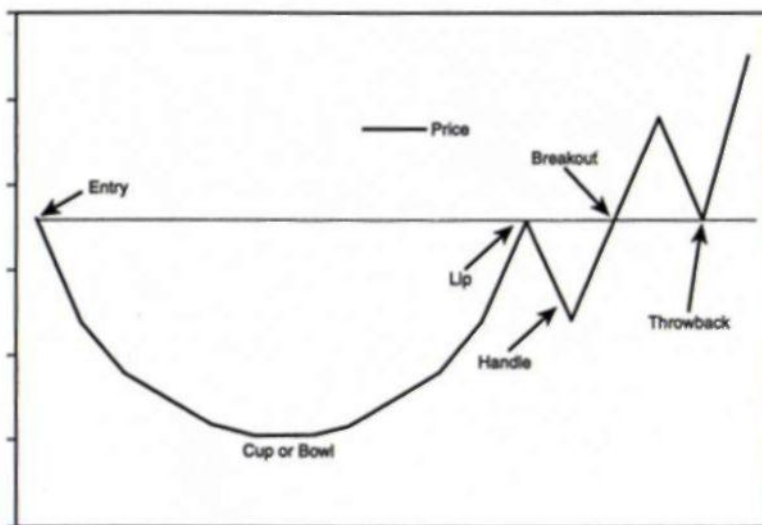


FIGURE 15.15 Cup or Bowl and Handle variety of a rounding bottom with breakout up

Rounded bottoms are more common than rounded tops, but neither materializes very often. They tend to be longer-term patterns, more easily identified in weekly or even monthly charts. They are reversal patterns but can also appear in very long price consolidations. Shorter-term rounded formations, often called "scallops," are usually continuation patterns and are equally difficult to define.

#### Performance

Performance of rounded bottoms and tops is not impressive. First, the breakout level is not easily denned, except in cup and handle patterns. Second, it is slow in developing and often fails. Its failure rate is exceedingly high. Although perhaps interesting and novel, all rounded formations are really not worth identifying. The only exception is the cup and handle pattern.

## Head and Shoulders

#### Description

The head and shoulders pattern is probably the most famous technical pattern. Its name is often used when ridiculing technical analysis, yet its profitability is very high, relative to other patterns, and it is one of the few that the Lo and MacKinlay study showed had statistical significance.

Head and shoulders is a complex pattern because it combines all three potential characteristics of a pattern: trend lines, support or resistance lines, and rounding. It is most often seen at a top or bottom, but it can occur in its normal state or as a failed formation in a consolidation. Mostly, it should be traded only after it has formed completely. Its complexity causes many impatient analysts to anticipate its formation and to act prematurely. Its performance and success rate are high, but only after it has formed completely and satisfied all its requirements. We describe the traits of a head and shoulders top. The bottom formation (see Figure 15.17) is the reverse in every way except where noted.

An uptrend, but not necessarily long-term trend, precedes a head and shoulders top. Thus, as shown in Figure 15.16, the head and shoulders top pattern is entered from below. (The head and shoulders pattern can also occur within a consolidation rather than at the end of a trend, but such occurrences are rare and more likely a series of triangles or a rectangle with a false downward breakout at the "head.")

The head and shoulders top pattern is a series of three well-defined peaks, either sharp or rounded. The second peak is higher than the first or third peak. This middle, higher peak is called the "head." The first peak is called the "left shoulder," and the third peak is called the "right shoulder." The left and right shoulders must both be lower than the head, but the two shoulders do not have to be the same height. In fact, a left shoulder peak slightly higher than the right shoulder peak adds a little to the post-breakout performance of a top formation. (A head and shoulders bottom is pictured in Figure 15.17. In the bottom pattern, a right shoulder low that is slightly lower than the left shoulder low adds to performance.)

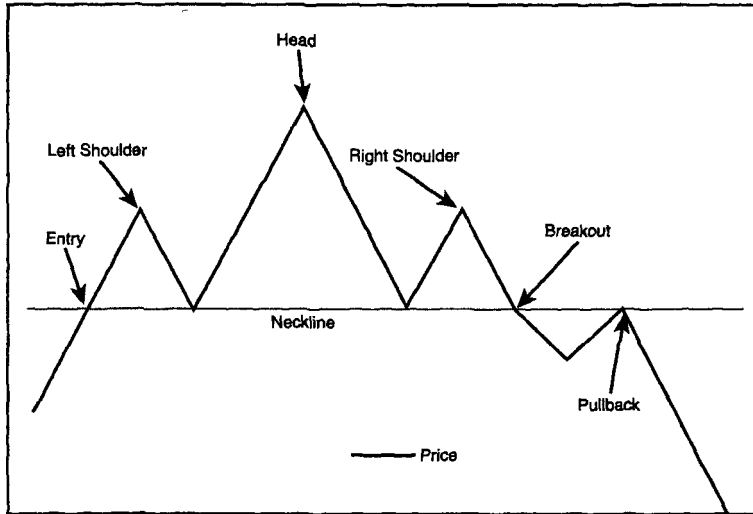


FIGURE 15.16 Head and shoulders top with breakout down

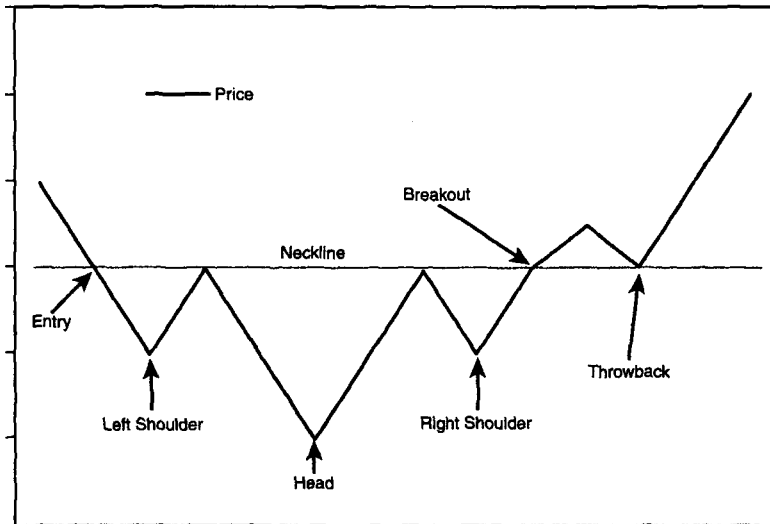


FIGURE 15.17 Head and shoulders bottom with breakout up

The peaks in the head and shoulders formation are roughly equidistant from each other. The shoulders should appear roughly symmetrical about the head and should peak at roughly the same level. Symmetry is important and makes the formation more identifiable. Occasionally, more than two shoulders appear. These formations are called "complex head and shoulders" and have the same performance and failure rates as the standard two-shoulder variety. As in the standard, the multiple shoulders appear symmetrically on both sides of the head. Rarely, a "two-headed" variety appears, and it, too, shows the same performance and failure rates as the standard. There is also the "unbalanced" version, as described by Edwards and Magee, but it is difficult to describe accurately and seems to fit only those formations that might be head and shoulders but cannot be formally categorized as such. The standard is the most common, and *the* one to look for.

The bottoms between the peaks form a recognizable trend line. Technicians call this line the "neckline." Although the neckline is often horizontal, as in a support line, it also can be downward or upward sloping. Indeed, there is some evidence that an upward-sloping neckline in a top formation produces better performance than the standard horizontal neckline. (In a bottom formation, the same rules hold except the neckline is now resistance rather than support. In a bottom formation, a downward-sloping neckline increases post-breakout performance over an upward-sloping neckline but not over the horizontal one.) Tilting the slope of the neckline to an extreme, however, destroys the head and shoulders pattern and its likely consequences.

Volume is usually highest on the rise into and at the peak of the left shoulder and decreases throughout the formation. This is not a requirement, however, as those formations with increasing volume, though slightly less frequent, seem to have a slight performance edge at tops. (Declining volume has a slight edge in head and shoulders bottoms.) Higher volume on either shoulder does not affect performance at a top, but at a bottom, higher volume on the right shoulder than on the left shoulder adds considerably to post-breakout performance.

Breakout and action signals occur when prices, after completing the right shoulder, break below the neckline. The breakout is a requirement for the formation. Second-guessing before completion of the pattern can be dangerous. Sometimes, the right shoulder does not form completely, and prices fall short of breaking the neckline and rise to penetrate above the right shoulder peak. Not only is this a failure, but it also is an opportunity, provided the analyst had not anticipated a breakdown and acted prematurely. The head and shoulders failure of this type is very profitable, according to Schwager (1996). The standard failure, however, is when prices break below the neckline and then reverse back upward. This kind of failure is relatively rare.

The breakout often occurs on increased volume, but decreased volume is not a sign of an impending failure. It just occurs less frequently. Increasing volume on a bottom formation improves performance, whereas decreasing volume on the breakout from a top pattern increases performance.

Pullbacks or throwbacks are frequent—roughly 40% for bottoms and 47% for tops. These figures are less than the median for all other classic patterns. In summary, the head and shoulders pattern—aside from being the best known, even among nontechnicians—is the most reliable and profitable of the classic formations.

#### Performance

The performance above the S&P 500 buy-and-hold for tops was 19% and for bottoms was 25% (Bulkowski, 2000). For the head and shoulders bottom, this performance ranks second behind

the upward breakout from a descending triangle, and for the top partem, this performance ranks second behind the diamond. Both patterns, therefore, are high on the list of performance.

We have seen in most other patterns that when a pullback or throwback occurs, the comparative performance suffers. This is also true in head and shoulders patterns. The patterns with no throwback or pullback improved in performance by 13-17% on bottoms and 1-8% on tops, depending on whether the breakout was on high or low volume. High or low breakout volume, however, had no predictive ability as to whether a pullback or throwback would occur.

### **Failure**

The failure rates for both top and bottom formations are very low. Only 10% failed a 10% gain or more from bottoms, and 18% failed a 10% gain from tops. For bottoms, this failure rate is the second lowest to breakouts upward from descending triangles and from declining wedges. For tops, this failure rate is only bettered by the rising wedge and the diamond. In short, the head and shoulders formation has a high rate of reliability as well as profitability.

#### **BOX 15.9 Trading Head and Shoulders Patterns**

Once a pattern has been observed using the preceding descriptive features, the neckline becomes the most important factor. The neckline is where the breakout level resides. Never act in anticipation of a break through the neckline. The risk of failure is too great and as we have seen with the upward break of a descending triangle, the strongest upward formation, the rise from descending peaks and a flat neckline, can be substantial. This is equally true with head and shoulders bottom formations. The ascending triangle with a breakout down is also a powerful formation. Thus, breakout stops should be placed both outside the neckline from the formation and outside the right shoulder reversal point. Once either is triggered, the risk of failure declines substantially. If the breakout is through the neckline, use the standard statistics as a guide, but if the breakout is a failed head and shoulders through the right shoulder extreme, use the appropriate triangle statistics as a guide.

The price target for a head and shoulders pattern is relatively accurate. It is calculated like the others by taking the height of the formation and projecting it up or down from the breakout price. The height is measured by drawing a vertical line from the peak of the head to where it intersects the neckline and measuring the number of points between the two. This holds for flat as well as sloping necklines.

### **Shorter Continuation Trading Patterns—Flags and Pennants (Also "Half-Mast Formation")**

For efficient use of trading capital, consider trading with flags and pennants. They are frequent formations with extremely rapid and relatively reliable outcomes. After a breakout in either direction or either pattern, prices usually run immediately, having very few pullbacks or throwbacks

and low rates of failure. Some successful traders use only flags and pennants because of these advantages.

#### Description

Rags and pennants are really variations of the same formation. The flag is a short channel that usually slopes in the opposite direction from the trend. The pennant is a short triangle that does the same. Both of these patterns are pictured in Figure 15.18.

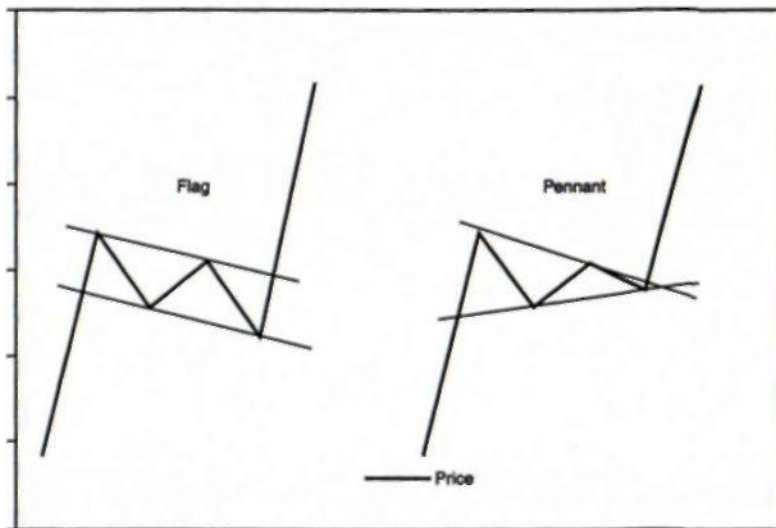


FIGURE 15.18 Flag and pennant in upward trend

Both flags and pennants are preceded by a steep, sharp price trend (average of 19%). Two parallel trend lines, forming a small channel, bound a flag. Flag formations occur over a short period, usually a few days to a few weeks; the average flag is a 10- to 11-day pattern. Volume usually declines throughout the formation of the flag. In fact, this downward trend in volume is found in almost four out of every five flags that occur.

The pennant pattern is the same as the flag except that the trend lines converge, forming a miniature triangle, instead of being parallel. The direction of the formation is usually opposite from that of the immediately preceding price trend, but in stronger moves, it can be horizontal or even trending in the same direction as the underlying trend. Pennants differ from wedges in that they are shorter in time and require a sharp move preceding them. Wedges tend to be longer-term patterns. Falling volume throughout the formation is even more common with pennants; 90% of pennants are characterized by a downward trend in volume.

Throwbacks and pullbacks are relatively rare with both flags and pennants. They occur in only about 10%-20% of flags and in only about 16%—17% in pennants.



### Failure

Two types of failures can occur. First, a breakout in the opposite direction from the previous trend can occur. Second, a failure can occur after breakout. Because a flag or a pennant is usually a continuation formation, the breakout should be expected in the direction of the preceding trend, provided it is steep and sharp. When the breakout goes opposite to that trend, the failure invariably returns to the earlier trend, but only after a few heart palpitations have occurred first and a few protective stops have been triggered. These kinds of failures occur in about 12-13% of flags and more often in pennants (19% in upward trends and 34% in downward trends). These are still very low rates of failure, except for the downward trend pennant that should be removed from consideration.

#### BOX 15.10 Trading Flags and Pennants—Measured Rule

Because these patterns have low failure rates, few pullbacks or throwbacks, short time periods, and steep trends preceding and following their occurrence, they are very good trading patterns. One of the most important identification features is the steep trend preceding the pattern. It is important to be cautious to make sure that a complete formation has occurred and to wait for the breakout. The price target for these patterns is calculated by taking the distance from the beginning of the sharp trend, not necessarily the beginning of the entire trend, to the first reversal in the pattern and adding it to the breakout price. This method is called the "measured rule" and usually only applies to flags and pennants. It implies that the formation will occur roughly halfway through the entire steep price trend; because of this, these patterns are also called "half-mast" patterns. The projection of a target is only partially accurate, but because of the steepness of the subsequent trend, close trailing stops are the best manner of protecting profits.

## LONG-TERM BAR CHART PATTERNS WITH THE BEST PERFORMANCE AND THE LOWEST RISK OF FAILURE

We have selected several patterns to highlight based upon their combination of high gains and minimum failure rates. Other patterns can also be successful if monitored closely, but the "edge" appears to be in these patterns.

The most profitable with least risk bullish formations are the upward breakout from a descending triangle, the declining wedge, the head and shoulders bottom, and the symmetrical triangle breaking up. A table comparing these patterns is provided in Table 15.2.

The most profitable with least risk bearish formations are the diamond top, the rising wedge, the head and shoulders top, and the symmetrical triangle breaking down. Table 15.3 provides a summary comparing these four formations.

**TABLE 15.2** Comparative Results in Most Favorable Bullish Classic Bar Chart Patterns

Bullish Patterns	Performance vs. S&P 500	Failure to Reach 10% Gain After Breakout	Percentage Gaining over 50%	Percentage Reaching Price Target	Percentage Throwbacks	Most Favorable Volume During Formation	Increasing Volume on Breakout
Descending Triangle, breaking up	29%	9%	34%	67%	29%	Rising	Irrelevant
Declining Wedge	25%	2%		88%	47%		
Head and Shoulders Bottom	25%	12%	26%	83%	40%	Declining	Desirable
Symmetrical Triangle, breaking up	25%	15%	28%	79-81%	51%	Irrelevant	Desirable

Source: Bulkowski (2000, 2002)

**TABLE 15.3** Comparative Results in Most Favorable Bearish Classic Bar Chart Patterns

Bearish Patterns	Performance vs. S&P 500	Failure to Reach 10% Gain After Breakout	Percentage Gaining over 50%	Percentage Reaching Price Target	Percentage Throwbacks	Most Favorable Volume During Formation	Increasing Volume on Breakout
Diamond, breaking down	24%	16%	3%	79%	54%	Irrelevant	Irrelevant
Head and Shoulders Top	19%	18%	2%	63%	47%	Rising	Irrelevant
Rising Wedge	15%	6%		63%	53%	Declining	
Symmetrical Triangle, breaking down	16%	24%	4%	57-67%	51%	Rising	Desirable

Source: Bulkowski [2000, 2002]

## CONCLUSION

In summary, the profitable use of chart patterns is not easy. The potential problems with recognizing and acting upon chart patterns that we have discussed in this chapter highlight the need to know thoroughly what we are doing. There are many variables in price behavior, mostly human, and being human ourselves and subject to the same biases, we must be adaptable and recognize that chart patterns are flexible.

It is unlikely that researchers will ever be able to prove definitively that patterns exist, because the mathematics are so complicated and because the marketplace is always changing. In addition, many different patterns have been recognized, and right or wrong, they have been described in the literature with nothing more than anecdotal evidence as to their reliability. If you see a pattern described with no background statistical evidence as to its usefulness, it is best not to bother with it. Today, most writers describing patterns will give some realistic evidence. Although this evidence may be flawed, it at least shows that it has been the subject of some serious study and, thus, is not merely a superstition.

The most reasonable approach for any chart reader is to take the classic patterns described in this chapter and become experienced in their use. Although the performance of these patterns will differ with different securities and with different trends in the general market, the behaviors of these patterns have remained relatively consistent for over 100 years. We have discussed general attributes of patterns that in several studies show promise, but the analyst must always adjust parameters to fit the peculiarities of the security being analyzed. Profitable chart pattern analysis is the result of determined study.

## REVIEW QUESTIONS

1. A pattern is a configuration of price movement that is bounded by lines and/or curves. Explain what is meant by this definition.
2. Define each of the following terms as they relate to the characteristics and formation of patterns:
  - a. Pullback
  - b. Throwback
  - c. Failure
  - d. Trap
3. Explain the differences among an ascending triangle, a descending triangle, and a symmetrical triangle.
4. Describe both a rising wedge and a falling wedge. What trading strategy might you follow in each of these instances?
5. Explain the difference between a flag and a pennant.

6. Flags and pennants are often said to be "half-mast" formations. Explain what is meant by this and how you would use this information to set a price target.
7. Explain the formation and characteristics of a head and shoulders top.
8. Explain the formation and characteristics of a head and shoulders bottom.
9. Select three companies, and look at the price charts for those companies over the past three months. Can you recognize any of the formations discussed in this chapter in those charts?

# POINT-AND-FIGURE CHART PATTERNS

## CHAPTER OBJECTIVES

After studying this chapter, you should be familiar with

- The difference between one-point reversal and three-point reversal point-and-figure charts
- How to construct trend lines, recognize areas of consolidation, and determine the count using one-point reversal point-and-figure charts
- How to construct trend lines, recognize basic patterns, and determine the count using three-point reversal point-and-figure charts

In the previous chapter, we studied patterns that can occur when price information is displayed on a bar chart. We continue our study of patterns, but now we focus on formations that are related to point-and-figure charts. As we do this, we will notice that many of the patterns that the point-and-figure analysts use are the same as those found on bar charts. For example, we will see the head and shoulders pattern that we discussed in Chapter 15, "Bar Chart Patterns," appear in this chapter.

Before we delve deeply into point-and-figure chart patterns, let us take some time to review point-and-figure charts. We learned about basic point-and-figure chart construction in Chapter 11, "History and Construction of Charts." Because these charts are not familiar to most people, we will begin this chapter by exploring their construction in a bit more depth.

You will often see "box" and "point" used interchangeably in discussing point-and-figure charts. Although "box" is the proper word to use because it refers directly to the chart pattern, "point" also is used to represent a box. A "point" in point-and-figure charts is not necessarily a one-dollar price move, as in "the stock was up a point today" but represents one box on the chart.

Obviously, the box size can be any consistent price difference, such as one dollar, two yen, twenty cents, and so on. We will also interchange the terms "point" and "box."

## WHAT IS DIFFERENT ABOUT A POINT-AND-FIGURE CHART?

"I should say that if anybody has a good enough memory to recall thousands of changing figures, in hundreds of stocks, in a dozen averages, over a period of years, he can absolve himself from the labor of keeping charts." —de Villiers (1933, p 16)

### Time and Volume Omitted

Point-and-figure charts appear odd at first because we are accustomed to having charts with time along the horizontal axis. Those familiar with bar charts are also used to having volume plotted along the horizontal axis. Point-and-figure charts, of course, have neither time nor volume portrayed. Both are considered irrelevant to the point-and-figure advocate. Price action is all that such an analyst is interested in. Price is the focus. In this sense, a point-and-figure technical analyst is a purist. In the beginning of this book, we pointed out how price, not time or volume, is the single result of all information. Time and volume are ancillary factors that may or may not have an effect on price. The analyst must concentrate on what a price change alone might suggest for the future.

Of course, price change is the result of changes in supply and demand. Time is but one factor, and it is not important to those utilizing point-and-figure analysis. Similarly, volume may be important but not by itself. An increase or decrease in volume is meaningless if the price remains unchanged. Only when the volume affects price change does it become important. The point-and-figure chart only plots price change, and volume and time then become unimportant.

As we saw in Chapter 15, volume is also suspect as a predictive factor for performance. Increased volume can appear or not appear, for example, on breakouts, and the results are roughly the same. Thus, the concept of volume has some weaknesses, all of which are avoided in point-and-figure charts.

### Continuous Price Flow Necessary

Point-and-figure charts require a continuous price flow to be accurate. Other methods of charting prices divide price action into arbitrary periods and analyze the price action from period to period. This creates the arbitrary time of open, close, high, and low, and although depictions of these price points can be used, as we saw in the previous chapter, we must remember that they are arbitrary, human divisions of time that may be unrelated to price action. Conversely, point-and-figure analyzes all price action. In some periods, price action may be relatively dormant and meaningless, while in other periods price action may be active and meaningful. Point-and-figure relates only to that active period and disregards the inactive period. It thus screens out price action that has little predictive ability and concentrates on that which does.

Often, price action outside of the local normal trading day is lost when using time period charts. Requiring a continuous flow of price information, point-and-figure analysis is ideal for interpreting the 24-hour markets that do not have a beginning or end in time and can flair up into activity, especially in foreign exchange, at any time during the 24-hour period. Point-and-figure analysis disregards those periods when trading is dormant and only concentrates on those in which important activity occurs. After all, the point-and-figure method of charting developed as a result of the invention of the ticker tape, the first means by which prices were reported in a continuous flow. Until then, prices were only recorded on a daily basis, an arbitrary cut-off that could easily mask important price change information intraday or overnight. Point-and-figure is also useful in futures markets where volume is unknown and not a consideration in trading. In short, although seeming to be archaic, point-and-figure still has many uses and, as we shall see later in this chapter, has been tested and found to have statistically positive results.

### **"Old" and "New" Methods**

Only two variables, determined by the analyst, describe a point-and-figure chart: box or point size and the number of boxes or points required for a reversal, called the "reversal amount" or "reversal size." This is important to understand because the early point-and-figure charts were strictly one by one. In other words, the box size was one price interval such as a dollar in a stock price, and the reversal amount was one box. The patterns that evolved using this method are more complicated, subject to analyst interpretation, and thus are more difficult to test statistically. They are accurate portrayals of price action, however, because they include every price transaction in the particular security. Later, the one by three point-and-figure, called a "three-point reversal point-and-figure" chart, became popular because it did not require as much data flow. It should be plotted, as the one-box chart, using a continuous flow of price data, but it can be estimated from daily prices in the newspaper. When estimated from daily prices alone, it loses its accuracy because intraday price action that might have been meaningful is eliminated. The three-box reversal chart does simplify analysis, however, because its method still screens out some unimportant price changes and produces an extremely simple, well-defined picture that can be tested, as we shall see later.

When discussing point-and-figure, many people confuse the two types—the old and the new—and assume that the rules and patterns for one are the same as for the other. As we will see, however, the rules and patterns are quite different. Thus, the usage of the term "point-and-figure" should always be qualified as to whether "one-box reversal" or "three-box reversal" is being discussed.

### **HISTORY OF POINT-AND-FIGURE CHARTING**

We briefly discussed the history of the point-and-figure method in Chapter 3, "History of Technical Analysis." Unfortunately, there are only a few written references to the method, mostly books or pamphlets. Academic references are very few and generally unfavorably disposed,

being still caught in the old finance theory cult and not understanding how point-and-figure is used by professionals.

One of the oldest written references is *The Point and Figure Method of Anticipating Stock Price Movements* by Victor de Villiers (1933). He sums up the advantages of using charts: They "dispense with statistics, fundamentals, values—real, absent, or presumed—news—past, present, and future—the necessity for impulsive action, decisions based on conjecture, compulsion to interpret or determine the effect before the cause, and the confusion of mental processes in the task of prematurely anticipating or discounting coming events." de Villiers sounds like a true technician. Indeed, some analysts refer to the old method of one-box reversal as the de Villiers method.

The next published pamphlet, which is extremely useful in the description and use of one-point reversal charts, was by Wheelan (1954). It is still in print, and for anyone interested in the original method of analysis, it is a gem. Wheelan's pamphlet takes the form of a lesson plan and includes many practice exercises, chart paper, and subsequent commentary. It provides the best summary of the chart patterns used in the original one-box method. Wheelan suggests that the student of point-and-figure keep an active chart on some commodity future because those are so fast acting that chart patterns unfold rapidly and give rapid feedback of pattern analysis. He also suggests that two students work alongside each other because "points that are obscure to one may be clear to the other, and the opportunity to exchange ideas will greatly hasten the mastery of this analytical technique." His advice is still valid today.

In the 1960s, Dines, Andrews, Granville, and several others each published one-box reversal chart services. The advent of the easier three-box reversal and the beginning of computer plotting gradually put these services out of business. Until recently, several brokerage firms still kept one-box reversal charts by hand, but these firms are getting fewer and fewer because the computer has taken the job of plotting continuous data very well. Some specialists, market makers, and short-term floor traders keep a card for recording intraday price changes, which at one time the exchanges provided, that are used for short-term trading and gauging price strength and weakness. This method is also dying out. However, because these trading professions gradually are being phased out as electronic trading takes over their functions on the trading floors. "Upstairs" traders can rely on software that is designed to plot one-box charts, but they must be careful that the data flow is continuous and not just the high and low of a time bar.

The newer method of point-and-figure, the "three-point reversal" method, is not a true point-and-figure method because it does not rely on a continuous data stream. In some cases, only the closing prices are used, but more often the high and low are interpreted as representing price flow during the trading day.

Earl Blumenthal, the originator of the Chartcraft Service, devised and marketed the three-box reversal method starting in 1947. Blumenthal introduced the three-point reversal method in a privately published book titled *Stock Market Trading*. Updated revisions of the book were published under similar names by Abe Cohen and later, Michael Burke, owners of the Chartcraft service. In 1948, Blumenthal began the Chartcraft Weekly Service, which used three-box reversal charts to keep subscribers up to date on the most active stocks traded at that time. The service has since been sold to StockCube Ltd of Great Britain and is on the web under the address [www.investorsintelligence.com](http://www.investorsintelligence.com).



In 1965, Professor Robert Earl Davis of Purdue University compiled a widely quoted performance study on the eight basic three-point patterns. He examined the eight basic three-box reversal patterns for 1,100 equities between 1954 and 1964. We will refer to his study later in looking at the effectiveness of this method. More recently, Dr. Carroll Aby (1996) and Thomas Dorsey (2001) have written more complete books that bring the three-box method up to date. The influence of these pioneers in the three-point method has been so successful that many analysts are unaware of the original more accurate but less definite one-point method.

Excellent compilations and descriptions of the point-and-figure method are available in Zieg and Kaufman (1975) and Murphy (1999). The performance statistics in Zieg and Kaufman are from Davis (1965). Academic literature is limited to German publications (Hauschild and Winkelmann, 1985, and Stottner, 1990). Also, a working paper by Professor John Anderson of Queensland University of Technology presents a study of three-point patterns on the S&P 500 futures market from 1990 to 1998.

## ONE-BOX REVERSAL POINT-AND-FIGURE CHARTS

Like bar chart patterns, patterns in one-box point-and-figure charts are not precise and require an experienced analyst to interpret. This is likely another reason why they have lost their popularity to the three-box version. Being imprecise also means that performance figures for patterns are almost impossible to determine. No one has done the research into interpreting one-box point-and-figure patterns as Bulkowski has in bar charts, so we are left with much conjecture and a difficult methodology.

One-box chart analysis focuses on consolidation areas, as do most chart methods, and attempts to determine the next directional move and by how much that move will likely carry. The one advantage of the one-box method is called the "count," a means of anticipating the expected price move by measuring the width of an observed price base. We will cover the count later in this chapter. In point-and-figure analysis, as in bar chart analysis, observation and analysis of patterns is largely subjective and based on the experience of the analyst. Like fundamental analysis, the experience of the analyst is the key to success.

### **Consolidation Area on the One-Box Chart (Also "Congestion Area")**

As we know from bar chart analysis, a consolidation area is a sideways movement in prices that interrupts or reverses a trend. It is during this period of nontrending action that patterns develop that signal the new direction once a breakout occurs and potentially the extent or target price for the new directional price move. In point-and-figure, a consolidation area serves the same purpose. Various patterns have been recognized over the past that inform the analyst what is likely to occur in the future.

One observation, for example, is that when price changes occur more frequently at the lower level of a consolidation area, the odds favor a breakout to the upside. The converse is true when price changes occur frequently at the upper level of consolidation. Because one-box charts plot so much information, the consolidation areas are often very wide, being made up of many

smaller price oscillations, just as in a bar chart. The important point in analyzing point-and-figure charts is to consider the consolidation area as a whole and ignore the smaller separate parts. The analyst must determine where the price change work has been done, either in the lower or upper level of the area, and place more emphasis on recent work than on past price changes. Figure 16.1 is an example of a one-box reversal chart with price action predominately in the lower level of the consolidation and a subsequent breakout upward.

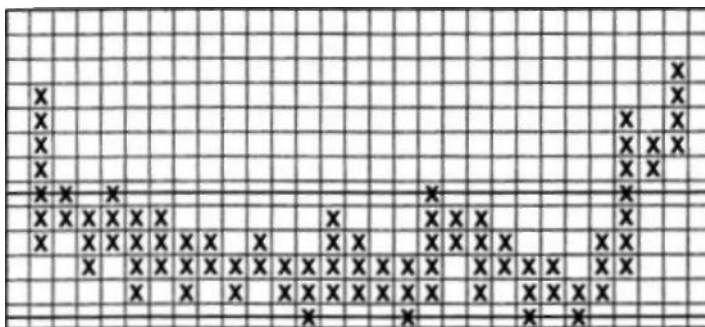


FIGURE 16.1 Consolidation area with majority of price action at lower level of area, suggesting breakout will be to the upside

### Trend Lines in One-Box Charts

Trend lines are drawn on a one-box reversal chart just as they are on a bar chart, connecting highs and lows to lows. These lines frequently outline standard patterns that we have seen in bar chart analysis, such as triangles, rectangles, broadening formations, wedges, and even flags and pennants. The same type of analysis used with bar charts can be applied to one-box reversal charts. Figure 16.2, for example, shows a one-box reversal chart with a triangle formed by two trend lines.

**Symmetrical Triangle  
with Upward Breakout**

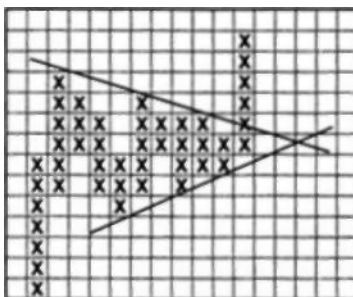


FIGURE 16.2 One box reversal chart with a triangle

In consolidation areas, the one exception to the rule about where the majority of price changes occur, suggesting the direction of the breakout, is when a trend line is penetrated in the opposite direction from that which is developing as the most likely. Figure 16.3 shows an example of a consolidation area with the most recent and majority of action occurring at the upper end of the area, suggesting a breakout downward. However, this suggestion was negated when prices broke above the trend line.

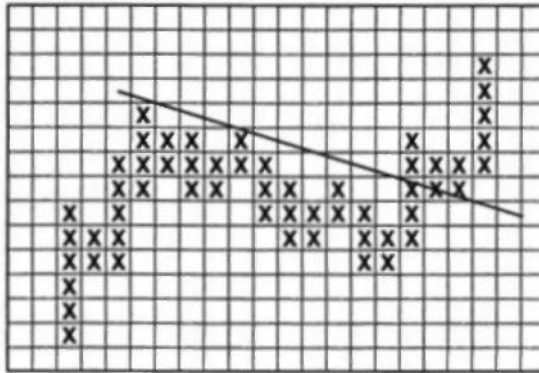
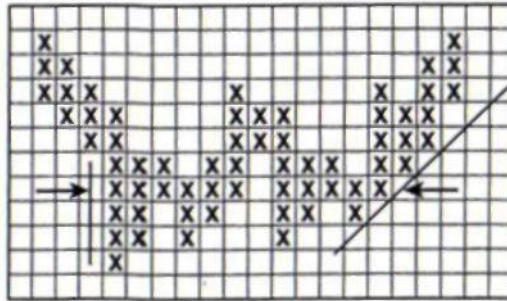


FIGURE 16.3 Consolidation area with most activity on upper level, suggesting a downward breakout, but reversed with a breakout upward through a trend line

### The Count in a One-Point Chart

The count is calculated by counting the squares across a consolidation area. As shown in Figure 16.4, the price level in the consolidation area that has the most squares filled is used for the count. The count includes all squares along a horizontal price line from the left to the right of the consolidation area, including any blank squares that might occur. When each side of the consolidation is a vertical line of some proportion, called a "wall," the determination of where to locate the horizontal line from which the count is determined is relatively easy. In most cases, a wall does not exist, however, and the analyst must judge along what price line in the consolidation the most number of filled squares occur. Figure 16.4 shows a consolidation with the left side being a wall that is relatively easy to determine, the right side with a more difficult configuration, and where the count might be applied. When the consolidation is irregular, the analyst must determine from experience with counts what the best price level to use would be.



**FIGURE 1M** Determining the "count" in a consolidation area by using the price at which the most number of squares are filled

The count is used to determine the approximate extent of the next move. There appears to be a direct relationship between the width of a consolidation and the vertical extent of the next rise or decline. The count is one of the most valuable features of the one-box method. The three-point method also has a count, but it is far less accurate, presumably because the three-point chart fails to represent the complete flow of prices.

Generally, the count is more accurate in those stocks and commodities with a wide public following. From the count, the analyst can estimate whether the next move will be small or large and can determine risk-reward relationships to help in deciding whether to act or not on the breakout signal.

Normally, the longer the consolidation area, the more difficult it is to establish a count because of the many smaller rallies and declines within the base area that obscure the real beginning and end of the consolidation area. Often a good starting point is the absolute high or low of the area, but sometimes the price has been consolidating for a while before these levels are reached. There are no definite rules for establishing the count, and academics have a fit over this because the count cannot then be analyzed and evaluated. Nevertheless, despite the count's problems, the width of the consolidation area does seem to have a relationship with the eventual distance of the next price move, and any reasonable estimate will have some value.

Once the count is determined, the distance of the count is then added to the right-hand square with the last entry in the consolidation area. This is the standard method, though there are variations. The result is as if the count line was rotated upward or downward around the last square in the count (see Figure 16.5). The resulting price level projected from the distance of the count is the objective for the next price move. It is surprising how accurate this method can be, but, of course, it should never be depended upon solely. Other factors such as market direction, change in supply or demand, or other informational changes can affect the eventual price target. It is only an approximation.

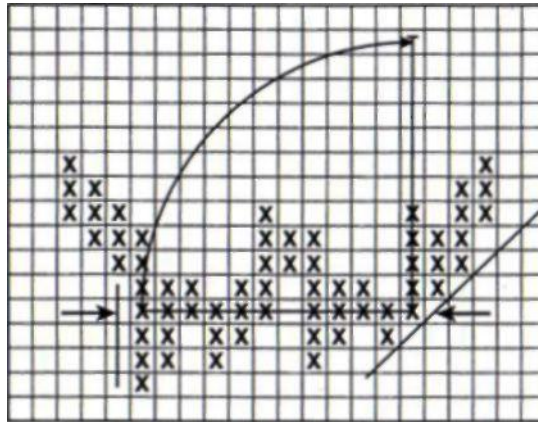


FIGURE 16.5 Target determined by rotating count around the right-hand edge in the direction of the breakout

### Head and Shoulders

Many of the patterns observed in bar charts are also observed in one-box charts. The most common is the head and shoulders pattern (see Figure 16.6), but the rounded, double, and triple formations are also seen. The implications of these patterns are the same as in bar charts, except that with the ability of the count to estimate a price target, the patterns are more easily assessed for reward versus risk. One-box reversal charts also have a few patterns of their own.

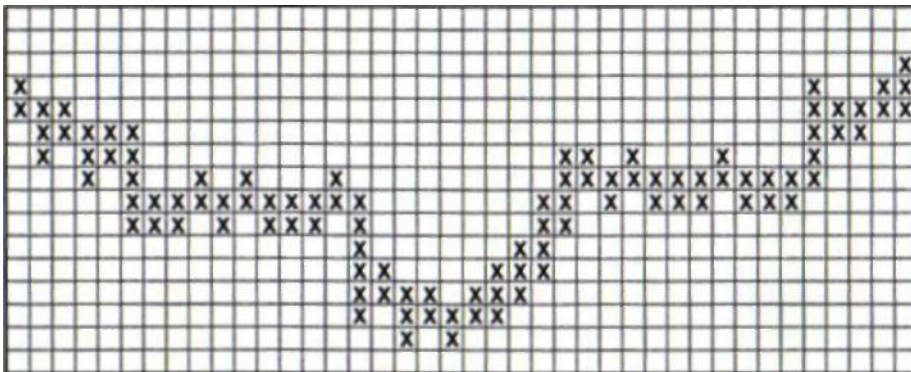


FIGURE 16.6 Head and shoulders bottom on a pointand-figure chart

## The Fulcrum

The fulcrum is a distinctive one-box reversal chart pattern. It is easily recognized, can occur at both tops and bottoms, and gives a reliable count because distinct walls usually contain it. Common characteristics in the fulcrum bottom (see Figure 16.7) are the following:

1. A downward trend entering the consolidation area
2. Sideways price activity near the low of the downward trend
3. A "mid-fulcrum" rally of short duration and around 15% amplitude that sometimes is mistaken for the beginning of a larger move
4. A testing of the earlier lows with some more sideways price activity
5. A "catapult" rally above the mid-fulcrum rally

All these variables can vary, of course, but the general pattern is easily recognized. Occasionally more than one mid-fulcrum rally occurs, and the test can occasionally break below the initial sideways price action without damaging the implications of the formation. Two fulcrums side-by-side is called a "compound fulcrum," and a compound fulcrum with the second fulcrum lower than the first is called a "delayed-ending fulcrum." These formations are more powerful than the single fulcrum once completed with the catapult breakout. Being familiar with these fulcrum patterns, an analyst can spot similar patterns even in bar charts.

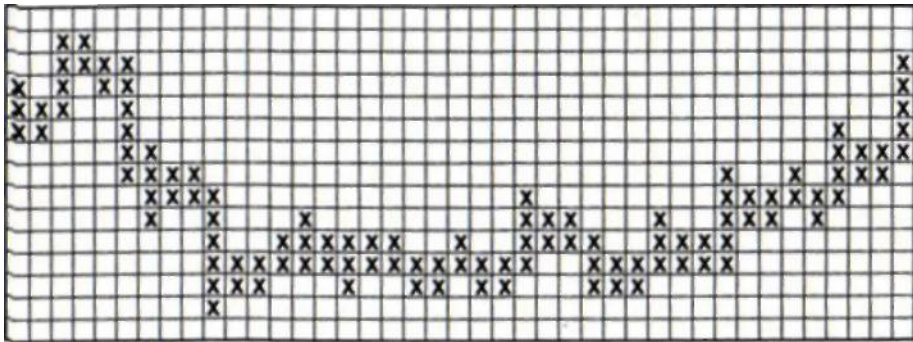


FIGURE 16.7 Fulcrum bottom

## Action Points

"We have looked at the characteristics of the one-box point-and-figure chart. How can this information be used to help us trade stocks? In his pamphlet, Wheelan outlines the conditions that

constitute ideal buying and selling points. When all of the following appear in the one-box point-and-figure chart, the ideal buying situation exists:

1. The technical position of the market is favorable.
2. A clear and broad fulcrum appears after an extended downward trend.
3. The bottom of the fulcrum fulfills the maximum count from the previous top.
4. The bottom of the fulcrum occurs at a major support area.
5. The catapult occurs coincidentally with the breaking of a downward trend line from within the fulcrum or from the previous top.
6. The catapult occurs at a price level that has little or no resistance immediately above.

The ideal selling point occurs when all of the criteria are reversed.

### **THREE-POINT (OR BOX) REVERSAL POINT-AND-FIGURE CHARTS**

The interpretation of one-box charts is obviously difficult and takes considerable skill and experience. The three-box reversal chart was promoted as a more user-friendly method. It had the advantages of being plotted from prices in the newspaper and required the knowledge of only a few basic patterns. It appealed to academia because the patterns could be identified and tested, and it appealed to nontechnicians because it was easy.

The method for plotting three-box reversal charts has become standardized to the point where the Chartcraft price scale is now referred to as "traditional." Price scales have also evolved, however, to account for percentage change rather than arithmetic change, and logarithmic scales are often a choice in the popular software programs that plot point-and-figure charts. Although the method has other peculiarities, such as trend lines at 45-degree slopes and odd-named patterns such as high poles and long tails, the various tests of its success rate, though few, have shown extremely good results from following the signals on a mechanical basis.

Professor Davis (1965) studied the results from each of the eight basic patterns over ten years and 1,100 stocks. His method was to act on a signal from one of the patterns and close the position when a simple reversal signal occurred. Sometimes theoretical positions would overlap, as when more than one signal occurred before the closing criteria was met, but the data was accrued for each signal as if it were independent. Davis's results were tabulated by signal and the percentage profitable as well as the average gain or loss was recorded.

Professor Anderson used the same method on eight years of S&P 500 futures prices, by year, and tabulated the gains and losses and percent profitable from each of the eight standard patterns adjusted for different box sizes (\$100 and \$200) and reversal numbers (three, four, and five boxes). Unfortunately, Professor Anderson used a \$100 commission rate for round-turn trades when a more accurate commission would have been closer to \$5. His results show worse performance than would be expected today but even with the high commission are still largely positive. We have adjusted the overall profitability of his results, but not knowing the details of

each trade, we could not adjust the profitability percentage for each signal. In both studies, Davis and Anderson, the results show very favorable results for all eight signals.

### Trend Lines with Three-Box Charts

Trend lines in three-box reversal charts are drawn at 45-degree angles, as demonstrated in Figure 16.8. This method is somewhat spurious. There is little reason for drawing trend lines in this manner, but regardless, it has become the convention for these charts.

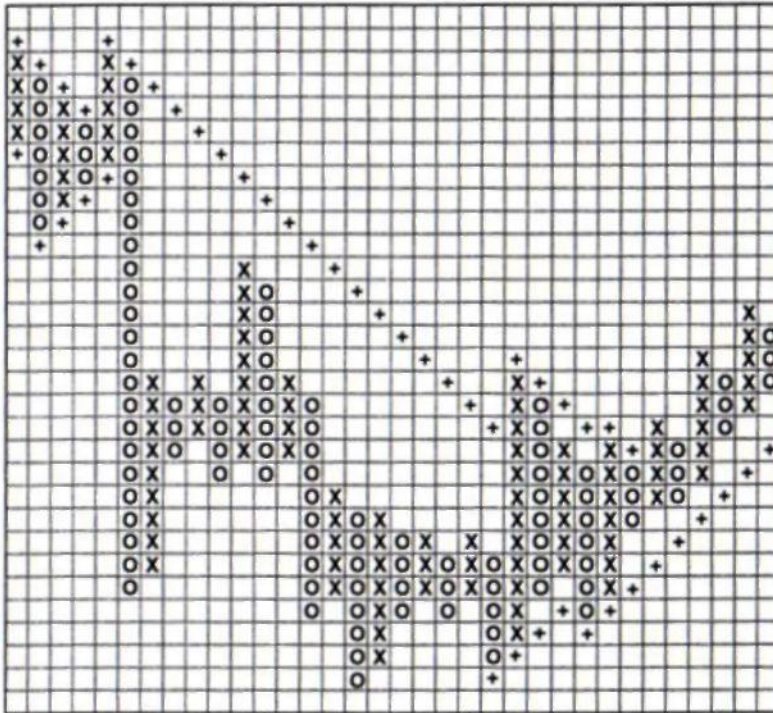


FIGURE 16.8 Trend lines

Because the method only allows one upward and one downward trend line, each has a separate name. The upward trend line, drawn one box below the last observable column (always an O column) after a buy signal from a base, is called the bullish support line. The opposite, the down trend line drawn one box above the latest top column (always an X column) after a sell signal from a top, is called the bearish resistance line. Each is treated equivalently relative to its direction.



The general rule for these lines is that one should never buy unless prices are above the bullish support line, and conversely never sell unless prices are below the bearish resistance line. The initial lines may last for years, depending on the slope of the subsequent advance or decline. When a price penetrates a trend line by one box at the same time that a pattern signal occurs, the signal has added importance. Unfortunately, the tests on signals did not include this qualification.

Another, even more questionable, line is drawn on three-box reversal charts. This is a line similar to the channel line in a bar chart in that it runs parallel to the trend line through the opposite extreme prices. Thus, a bullish support line that travels upward beginning at the bottom of the base can have several "bullish resistance lines" drawn through successive peaks in the price rise. These lines are considered to be levels at which future rallies will halt, similar again to the standard channel line.

### The Count Using Three-Box Reversal Charts

Analysts use two methods of determining a target price on three-box reversal charts—the vertical and the horizontal count. However, because the three-box reversal method eliminates much of the price action that might occur within the three boxes and often does not include the continuous stream of prices, the counts are not as accurate as in the one-box method. Nevertheless, they do provide an approximate target, one that can be more confidently accepted if both the vertical and horizontal counts agree.

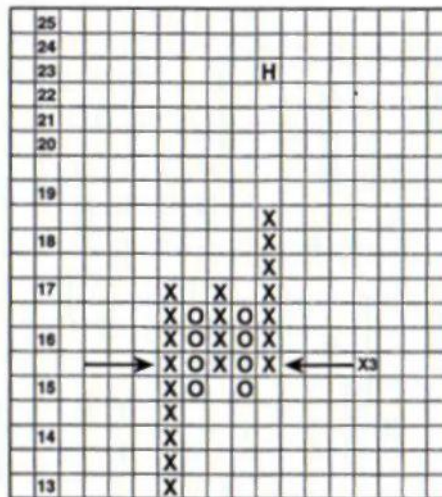


FIGURE 16.9 Horizontal count  $(3 \times \text{total width of base in boxes}) \times \text{price/box} + \text{lowest price in formation } (15) = \text{price target } (23)$



## The Eight Standard Patterns for Three-Box Reversal Charts

There are eight standard patterns used with three-box reversal charts. They are as follows:

- Double top or double bottom
- Rising bottom or declining top
- Triple top or triple bottom
- Ascending triple top or descending triple bottom
- Spread triple top or spread triple bottom
- Bullish or bearish triangle
- Above bullish resistance line or bearish support line
- Below bearish resistance line or bearish support line

Let us look at each of these eight patterns. Then we will look at a few additional minor three-box reversal formations.

### Double Top and Double Bottom

Double tops and bottoms are the simplest of all patterns. The double pattern consists of only three columns: two X columns and one O column for the double top or two O columns and one X column for the double bottom. The nomenclature is different from both bar charts and one-box point-and-figure charts in that "top" designates the point at which a breakout occurs rather than a description of the pattern formation as being bearish. Indeed, a "top"—double or triple—is a bullish formation once the upward breakout occurs. The signal comes when the third column breaks above or below the first column, as shown in Figure 16.11. All other standard formations with the exception of lines have a double top or bottom within them. Davis found the double top to be profitable 80.3% of the time and the double bottom to be profitable 82.1% of the time. Anderson found their combined profitability to be tied for third of the eight patterns, returning \$1,371,810 in 18,278 trades over nine years.

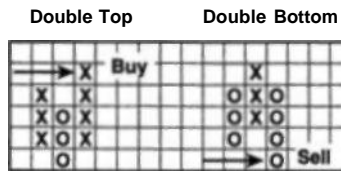


FIGURE 16.11 Double top and double bottom

**Rising Bottom and Declining Top**

The rising bottom and declining top are variations of the double top and double bottom. Four columns are required for these formations. The rising bottom is formed by an initial X column, followed by an O column, a second X column, and then a second O column. For the pattern to be a rising bottom requirement, the first column of Os in the double top must have a lower low than the most recent column of Os. The rising bottom pattern is pictured in Figure 16.12.

Usually the first column of lows declines from a much higher level than shown in Figure 16.12. One possible variation is for the prior column of Xs to be stronger. The declining top pattern is just the opposite of the rising bottom pattern. Figure 16.12 also shows a diagram for a declining top formation.

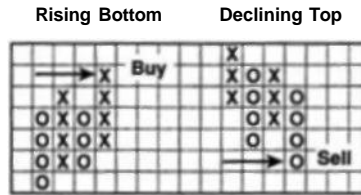


FIGURE 16.12 Rising bottom and declining top

Davis claimed that the rising bottom was profitable 80.4% of the time, and the declining top was profitable 88.6% of the time. In the Anderson study, these patterns combined tied for third best. They produced a \$666,635 gain over nine years and 8,433 trades.

**Triple Top and Triple Bottom**

The triple top and bottom patterns require that prices break above or below two prior highs or lows. It, thus, provides more confirmation that a change in trend has occurred. As a result, it tends to be more profitable than the double top and bottom but occurs less frequently. Figure 16.13 shows a triple top and a triple bottom.

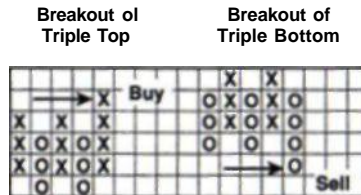


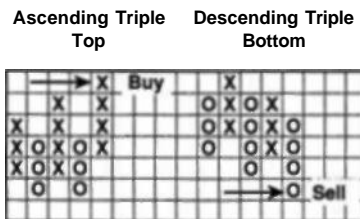
FIGURE 16.13 Triple top and triple bottom breakouts

Davis reported that the triple top formation was profitable 87.9% of the time and that the triple bottom was profitable 93% of the time. Anderson found the pattern to be the second best of the eight standard patterns and produced \$320,795 over nine years and 2,201 trades for an average profit per trade of \$145.70.

#### Ascending Triple Top and Descending Triple Bottom (Also "Diagonal" Triple Top or Bottom)

Ascending triple tops and descending triple bottoms are varieties of the triple top and bottoms. In the ascending triple top, three rows of Xs occur, with the second row of Xs breaking through the top of the first and the third row of Xs breaking through the top of the second. This is really two double top formations right after each other, denoting a strong upward price trend. An ascending triple top is shown in Figure 16.14.

The descending triple bottom is the opposite of the top. In this formation, the three rows of Os show progressively lower levels. Figure 16.14 also shows this bottom formation.



**FIGURE 16.14** Ascending triple top and descending triple bottom

Davis reported that the ascending triple top was profitable 79.5% of the time, and the descending triple bottom was profitable 83.3% of the time. Anderson reports that this pattern produces profits but at a level below the average of the other eight standard patterns.

#### Spread Triple Top and Spread Triple Bottom

The spread triple top (bottom) is a special case of the triple top (bottom). Spread triple tops and bottoms are a little more complicated, and, thus, occur less frequently. The pattern requires at least six columns and usually more. It is somewhat similar to the fulcrum pattern in the one-box chart because it has a congestion area followed by a premature breakout and then another congestion area. The signal comes when the premature breakout is exceeded, just as in the fulcrum pattern.

Thus, in a spread triple top, there are three tops to be exceeded, with one or more lesser tops in between the major ones. A breakout must rise above all. Figure 16.15 provides a graph of a spread triple top and the spread triple bottom. You will notice that in the spread triple bottom, three major bottoms occur, with lesser bottoms between the major ones.

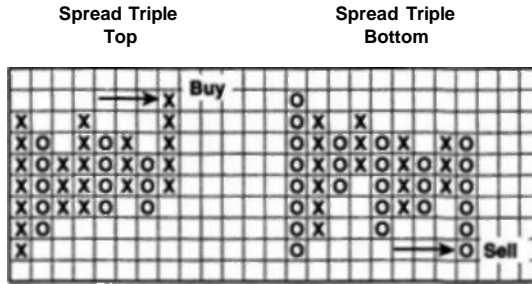


FIGURE 16.15 Spread triple top and spread triple bottom

Davis reports that the spread triple tops are profitable 85.7% of the time, and spread triple bottoms are profitable 86.5% of the time. Anderson's results are not as favorable. His report shows very small profits (only \$37.9 per trade) and rare occurrences (429 over nine years). They are thus patterns that probably should be eliminated from the list of useful three-box reversal patterns.

### Triangle

The triangle in three-box reversal charts is similar to the symmetrical triangle we saw in bar chart patterns in Chapter 15. Figure 16.16 depicts both a bullish and bearish three-box reversal triangle. The triangle is very rare in three-box reversals, however, because it is relatively complicated and because three-box reversals cover a longer period of time than it takes for most bar chart triangles to form. The three-box reversal, therefore, only picks up those triangles that form over a longer period and that are uncommon. The pattern requires that columns converge by having successively lower highs and higher lows, as depicted in Figure 16.16.

The patterns studied by Davis and Anderson are continuation patterns, because the break-out is required in the direction of the previous trend. As we know, triangles can be reversal patterns also, but these have not been analyzed for performance.

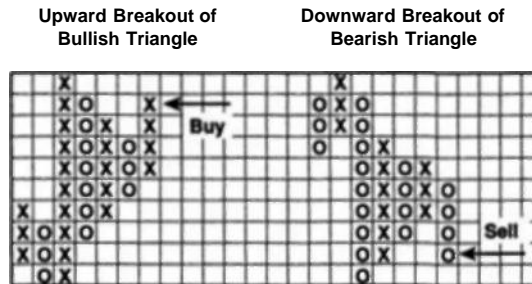


FIGURE 16.16 Bullish and bearish triangles

Davis reports that the upward breaking bullish triangle was profitable 71.4% of the time and the downward breaking bearish triangle was profitable 87.5% of the time. Anderson could only find a combined 70 examples of these formations, and their performance was a miserable \$11.70 per trade. This is another pattern that could easily be disregarded.

### Rising Trend Lines

In a rising trend, a trend line is usually drawn below the lows of each smaller correction within the trend. In three-box reversal charts, the trend line is drawn at a 45-degree angle from the bottom and is labeled the bullish support line. Another parallel line, similar to a channel line, is often drawn through the earliest peak in the upward trend, again at a 45-degree angle, and is called the bullish resistance line.

Prices can penetrate these lines in only two ways. They can break below the bullish support line, traditionally considered a major change in the long-term trend and called a "bullish reversed pattern" without the trend line, or prices can break above the bullish resistance line, suggesting that the upward trend has accelerated.

The upward breakout through a bullish resistance line, as shown in Figure 16.17, comes at the end of a strong move. This type of breakout is likely the last gasp in the trend direction. To be jumping on the trend at this late time is dangerous and likely wrong. On the other hand, the break of the underlying bullish support line has more validity because it signals a potential reversal in trend, just as breaking a trend line in a bar chart would imply.

**Upward Breakout Above a Bullish Resistance Line**      **Downward Breakout of a Bearish Support Line**

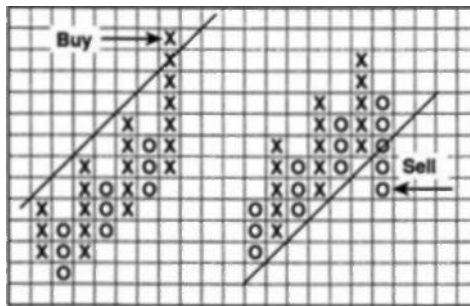


FIGURE 16.17 Breakouts from bullish resistance and bullish support lines

These breakouts are not specifically a pattern in the sense that a pattern usually is defined by two boundaries, but because of the peculiar nature of the trend being drawn at 45 degrees with little supporting evidence, the breaks have been evaluated for performance. In truth, the results from these two combinations of trend lines should not have been combined as they were. Instead, it would have been more informative to combine the "channel lines" together and the trend lines

together. For this reason, the results from both studies are likely flawed and not good guides as to the success or failure of any of these techniques.

Nevertheless, Davis reported that the upward break profited 82.6% of the time, and the downward break profited 85.7% of the time. Anderson found only 49 examples in nine years, but these examples produced a profit per trade of \$219, the highest per-trade profit of all the eight patterns. It's too bad they occur so infrequently.

#### Declining Trend Lines

Declining trend lines are just the opposite of the rising trend lines we just discussed except that they appear in declining trends. There is an upper line, the bearish resistance line, and a lower line, the bearish support line. Both the bearish resistance line and the bearish support line are pictured in Figure 16.18.

Davis claimed a profit an extraordinarily high 92.0% of the time for breaking upward through the bearish resistance line, what is also called a "bearish reversed pattern" without the trend line. Zieg and Kaufman did not provide statistics from Davis's work on the profitability of a downward break. Anderson, however, found that the combination of breaks lost money. This makes sense. A 45-degree downward trend line is not usually steep enough during a decline to capture the price movement. Declines tend to occur more quickly and at a steeper slope than advances. Thus, a number of premature breakouts downward would not be surprising and seem to be what occurred in the S&P futures that Anderson monitored. The number of occurrences he noticed was only a paltry 63 over nine years.

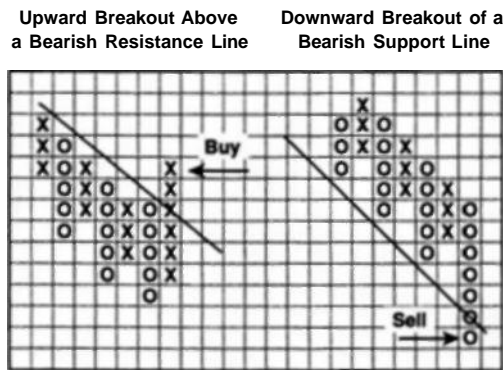


FIGURE 16.18 Breakouts from bearish resistance and bearish support lines

#### Other Patterns

##### Catapult

Dorsey calls the catapult a "confirming" formation. It results from the pullback or throwback after the breakout from a triple top or bottom formation. Cohen maintained that a catapult would



occur in roughly 50% of triple formations. As such, it is just a combination of a triple formation and a double formation.

Figure 16.19 depicts a bullish catapult. In this chart, the triple breaks out in the third column of Xs. A column of Os follows, in a throwback. As the next column of Xs occurs, a double formation then occurs.

As a formation, the bullish catapult is powerful, but it also provides a chance to enter at a slightly more favorable price. The time to enter is on the throwback, perhaps only a half position. Place a stop outside of the reversal point prior to the throwback. In the bullish catapult (see Figure 16.19), the throwback enters the triple top formation and provides a better buying price than when it originally broke out. In addition, the bottom at which a protective stop should be placed is closer, giving better risk-reward odds. Another buy order can be placed when there is a breakout from the double top.

A bearish catapult is also pictured in Figure 16.19. It is the same thing as the bullish version except in reverse. Sell orders should be handled in the same manner that buy orders were handled with the bullish catapult.

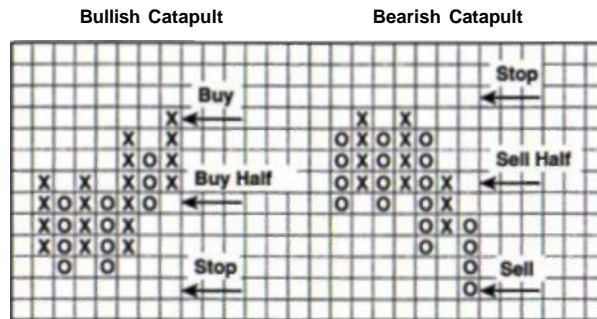


FIGURE 16.19 Bullish and bearish catapults

### Spike (Also "Long Tail")

Occasionally, a price change continues in a straight line for a considerable distance on a three-box reversal chart, leading to a tall column of Xs or Os. This often occurs at a climax after an accelerated trend has reached its climax. In Figure 16.20, the long column of Os forms what looks like a long tail.

How should trading be handled when a long tail or spike occurs? Using traditional signals, the next reversal (the X column) would have to travel the entire distance back to the starting point before a signal is given. It would be fairly obvious that prices are in an uptrend, and an uptrend that the investor would want to be riding, before prices made it all the way back up the length of the tail. Therefore, different authors have tried to develop rules for trading when these tails and spikes occur.

The main question to be resolved is how far the straight line run in prices has to travel before it is considered a spike. Cohen argued that 10 boxes were sufficient to establish a spike;



## Chapter 16 Point-and-Figure Chart Patterns

Trading in this situation can be tricky. It is important to remember that this pattern occurs early during a strong uptrend. Dorsey provides several rules to make sure the pattern is used correctly:

- The stock and market must be in an uptrend.
- The stock should be trading above its bullish support line.
- The stock price must form two tops at the same price.
- The reversal from these two tops gives a double bottom sell signal.
- This sell signal is the first that has occurred in the uptrend.
- The relative strength chart must be showing Xs in the recent column or be on a buy signal.

The signal to buy is on the reversal back upward from the double bottom sell signal, as shown in Figure 16.21. A protective stop can then be placed just below the prior low.



FIGURE 16.21 Shokeoul pattern

## CONCLUSION

The charts we have considered in this chapter may not look as familiar to you as the bar charts we have focused on in previous chapters. These point-and-figure charts record only price action; time and volume figures are omitted. Remember, the main objective of the technical analyst is to determine price trends in order to profit.

The original, one-point reversal point-and-figure charts require continuous price data. Many investors do not have access to this detailed intraday data. The three-point reversal point-and-figure method was developed as a way in which investors could use noncontinuous data, such as that reported daily in newspapers, to construct charts. Although some of the price action is lost in these charts, the three-point reversal point-and-figure chart has become the more standard type of point-and-figure charting. These charts have some unique characteristics, such as trend lines drawn at 45 degrees, which we have looked at in this chapter. Because of their uniqueness, these charts require extra study time and effort to learn; however, this study can be profitable for the serious student of technical analysis.

## REVIEW QUESTIONS

1. Time and volume are not pictured on a point-and-figure chart. Explain why point-and-figure analysts might consider these two factors irrelevant to their analysis.
2. Why might one-point reversal point-and-figure charts be a useful tool for an analyst following currency trading?
3. Explain the major difference between the one-point reversal method and the three-point reversal method, highlighting the advantages to each approach.
4. Explain each of the following terms as it relates to point-and-figure charting:
  - a. Congestion area
  - b. Trend line
  - c. Wall
  - d. Count
5. How is count used in one-point reversal charts to determine a price target?
6. Explain how the term "top" is used differently with three-point reversal charts than with bar charts and one-point reversal point-and-figure charts.
7. How is horizontal count determined in a three-point reversal chart? How is vertical count determined in these charts? How would this count be used to determine a price target?
8. How do the trend lines that are drawn on three-point reversal point-and-figure charts differ from trend lines drawn on other types of charts? Describe each of the following types of trend lines on the three-point reversal chart:
  - a. Bullish support line
  - b. Bearish support line
  - c. Bullish resistance line
  - d. Bearish resistance line

# SHORT-TERM PATTERNS

## CHAPTER OBJECTIVES

After studying this chapter, you should be familiar with

- How short-term patterns can be used as a tool to identify reversals in longer-term trends
- The types of gaps that occur on bar charts and the significance of the various types
- Wide-range days and narrow-range days and their implications for volatility
- The formation and interpretation of the most common candlestick patterns

In previous chapters, we have looked at longer-term patterns in bar charts and point-and-figure charts. We now turn our attention to short-term patterns. In this chapter, our focus is on short-term patterns on bar charts and candlestick charts. These patterns concentrate on the configuration and characteristics of individual bars, such as the height of the bar and the position of opening and closing prices on the bar. Some patterns also compare one period's bar with the preceding bar. Despite what their title suggests, short-term patterns are not limited to a particular short-term period, like one day. In this instance, "short-term" means a small number of bars. For example, on a daily bar chart, short-term patterns may form from one or two days of trading data, but on a weekly bar chart, a two-bar short-term pattern would include two weeks' worth of trading data.

Although the longer-term patterns we have considered can be useful by themselves, they occur less frequently than shorter-term patterns. On the other hand, the shorter-term patterns we consider in this chapter are not useful by themselves but are very common. Why do short-term patterns occur more frequently than longer-term patterns? Think of a common bar chart; four pieces of data are represented on each bar: an open, close, high, and low. With only four pieces of information, the number of various combinations in which these variables can occur is small.

Even though stretching out the pattern to several bars increases the number of possible combinations, the number is still relatively small, and these combinations occur very frequently.

Unfortunately, frequent patterns often give false signals. Although most market turning points include one or more of the short-term patterns covered in this chapter, these same patterns also occur at places where a reversal fails to follow. As Schwager (1996) states when referring to the one-day reversal pattern, it "successfully call(s) 100 out of every ten highs." Like Schwager, many others have been skeptical about the validity of short-term patterns. Just how useful and effective are they? Although some empirical tests suggest that these short-term patterns are not effective, many of the tests have covered longer testing periods than would be seen in practice. In most successful tests, short-term pattern entry signals are closed either at the close of the same day, the opening of the next day, the first profitable opening (called the "bailout" by Larry Williams) or the first profitable closing, which usually is only a few days later, barring the position first being stopped out. The ability to test over these short periods requires high-frequency data on a tick-to-tick basis and is usually beyond the capability of the normal investor or academic.

Nevertheless, once fully understood, short-term patterns are useful not only for trading but also for entering and exiting longer-term positions at more favorable prices. Although the average investor would not usually have the time or computer equipment and data feed to watch for short-term patterns, the professional trader certainly has the ability to watch intraday price behavior and can improve job performance and profits by understanding the nature of short-term patterns.

The basis for short-term patterns is to anticipate a sudden move, similar to the breakout concept in larger patterns, to take advantage of a period when prices have reached an emotion extreme, or to enter into a trend at an advantageous price as on a pullback or throwback. The methods usually have what is called a "setup." A setup occurs when certain known factors needed to establish the pattern have occurred, and the trader is waiting for the action signal to occur. In larger charts, we have seen this concept in patterns. When the pattern, such as a triangle, forms, the setup is the pattern formation. If this pattern formation does not abide by the rules of triangle formations during its creation, it is not a setup, and we ignore it. If it does form correctly, we wait for the breakout, which is the action signal. Traders use the short-term patterns in the same manner, but over shorter time horizons, and they use tighter stops and exit signals.

Because short-term patterns are relatively frequent and usually depend on the previous trend as well as other factors, the prior trend must be known before short-term patterns can be used. A top pattern in a downward trend is obviously meaningless, for instance, and thus all top patterns can be eliminated from consideration during a declining trend. This leaves only bottoming patterns to consider during a downward trend. Also, a short-term reversal pattern should only be considered necessary when prices are at some kind of support level, resistance level, or trend line. Whenever many bits of evidence occur at a particular price and time, it is called a "cluster" of evidence. Once a cluster of evidence begins to form, the analyst should begin looking for a short-term pattern. It then can be useful in signaling when and where to act as well as what the price risk might be.

Short-term patterns can also be used to determine when upward or downward momentum is slowing. In the next chapter, "Confirmation," we will cover oscillators and indicators that

determine momentum, but for now, remember that instead of using a momentum signal for action, using short-term patterns can often signal more precisely when to act and what risk exists once momentum begins to slow.

Although short-term patterns are usually reversal patterns, they can be used as continuation patterns in corrections within a trend. For example, in a strong upward trend, when the price corrects or retraces in a normal manner and a cluster of evidence forms that indicates the earlier, longer trend may soon continue, a short-term bottom reversal or continuation pattern may signal when to act. Usually, however, short-term patterns are best when they occur right at a peak or trough. Minimum action should be taken, however, unless there is a cluster of evidence that a longer-term reversal is due or that a strong trend is due to continue. For example, in an uptrend, if a price is near previous resistance, under but close to an important moving average, and has reached a price target, a short-term reversal top pattern is likely valid and worth acting upon. If a short-term reversal pattern of any kind occurs without supporting evidence, it may or may not signal an actual price reversal; it may simply signal that a slight consolidation period is next.

Short-term patterns are also the first sign that a reversal is nearing. They act very quickly, often occurring on the actual peak or trough day. As such, they lead most other patterns, which take time and further price action to develop. In a head and shoulders top pattern, for example, the analyst must wait for the actual breakout below the neckline before acting, but a short-term reversal pattern may have already indicated a potential reversal right at the top of the head.

In experimenting with short-term patterns, the technical analyst should consider several variables:

- The more complex the pattern, the less frequently it is going to occur. Some analysts have libraries of hundreds of patterns they have found useful in the past and through experimentation and use a computer-screening program that will pump out all the relevant patterns before each trading day. This gives them an edge but is impractical for most traders.
- The relationship between bars in a pattern need not be just a matter of the position of the high, low, open, and close to each other. The relation can be a proportional one rather than an exact one (Harris, 2000) where, for example, the close is in the lower 33% of the trading range, or the range that is three bars earlier is one-half the range of the last bar.
- The pattern may be split between two time periods, whereby one pattern appears at one time, and at some predetermined time later, another pattern must appear.
- The entry may be delayed by some predetermined time.
- The pattern may relate to another market entirely, whereby, for example, a pattern in the bond market may give a signal in the stock market or a currency.

These variables make the search for reliable patterns exceedingly complex and likely beyond necessity. The old principle of keeping things simple should be applied to any kind of pattern recognition search.

We divide the types of patterns into traditional bar chart patterns and candlestick patterns. Candlestick patterns portray the raw data of open, close, high, and low differently than a bar chart, but their patterns are very similar to bar chart patterns. Part of the appeal of candlestick charts is not so much the patterns but the visual ease with which the analyst can "see" intraday pressures on price and the price trend. They also have peculiar but memorable names for specific patterns that make them engaging.

As in all patterns, experience will separate the winners from the losers. Anyone using such patterns should record in a notebook the successes and failures from interpreting short-term patterns and thus develop a better "feel" of one's ability to act profitably and where mistakes more frequently occur. Every trading vehicle has its own "personality." Success is often a function of understanding the peculiarities of the trading vehicle most commonly traded.

## **PATTERN CONSTRUCTION AND DETERMINATION**

The principal data used in short-term patterns—both traditional and candlestick, regardless of bar time—is open, close, high, and low. The open traditionally has been considered the price established from any news, emotion, anticipation, or mechanical signals that have built up overnight. It is a price that most professional day traders, scalpers, and even swing traders avoid. They wait for some action—a gap or opening range—to take place before judging the tone of the market.

Because the close is the final price of the day and the one at which most margin accounts are valued, it is like a summary of the bar's activity, if the close is up, the majority and most recent action was positive; if the close is down, the majority and most recent price action was to the downside. Professionals use it as a benchmark with which to compare the next day's price action. It is the price that most people reading the financial news remember and use to value their accounts. The closing price becomes a benchmark for future action, both long and short term. Some traders consider it the most important price of the day, even though it is somewhat arbitrary.

The high is the upper extreme reached by buyers during the bar and is, thus, a measure of buying ability and enthusiasm. On the other hand, the low is the lower extreme reached by sellers during the bar and is, thus, a measure of selling ability and fear.

The configuration, length of the bar, position on the bar, preceding bar data, and price distance between each determine the pattern. As you might guess, there is a multitude of potential combinations, and all have been investigated for ways to profit. We present next just a few of the large array of short-term patterns that have shown promise in the past.

## **TRADITIONAL SHORT-TERM PATTERNS**

Let us look at some of the short-term patterns and their trading implications. These are patterns in use today that by themselves are warnings, at best, but not necessarily action patterns that should be followed without a cluster of other evidence. You will notice that none of the patterns includes moving averages. Over short time periods, especially when the period is interrupted by inactivity,



moving averages are not reliable. For example, when using five-minute data, the only moving average with any value would be very short because the period from one day to the next is interrupted by a long period overnight when no trading activity occurs. In 24-hour markets, short-term moving averages have more value because the markets are open continuously.

## Gaps

Gaps occur when either the low for the current bar is above the high for the previous bar or the high for the current bar is lower than the low of the previous bar. Figure 17.1 pictures a gap down. The "hole" or "void" created in the price history is a "price range at which no shares changed hands" (Edwards and Magee, 2003). A price gap may or may not have significance. We have seen them before in analyzing breakouts from classic patterns, trend lines, and support or resistance zones, and in those instances, the gaps were demonstrating the beginning of a new trend. However, gap types differ based on the context in which they occur. Some are meaningful, and others can be disregarded.

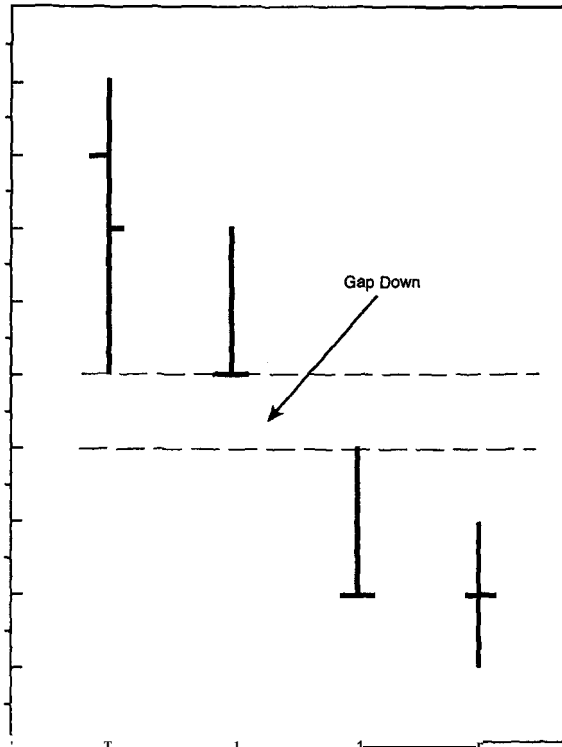


FIGURE 17.1 A gap down

Gaps often do not occur in market averages that are not themselves traded. For example, the day following Saddam Hussein's capture on December 13, 2003, a majority of stocks opened strongly upward on gaps, while the Dow Jones Industrial Average showed an opening price roughly the same as that at the close of the previous day and then rose as the prices of the component stocks gradually opened. No gap existed in the DJIA because it is an average, not a security. On the other hand, the DJIA future showed a gap because it is a traded security.

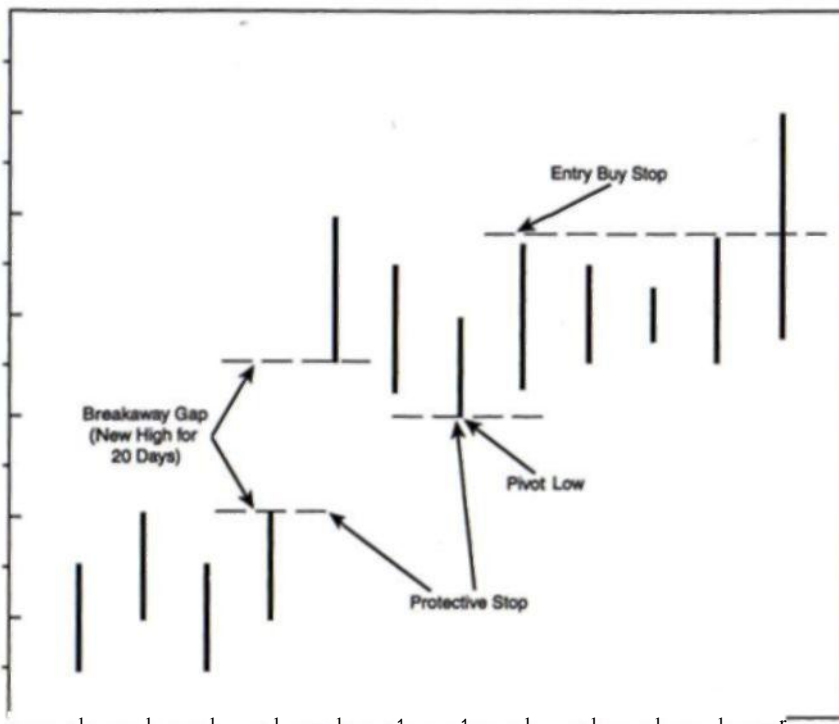
#### Breakaway (or Breakout) Gaps

The most profitable gaps are those that occur at the beginning of a trend, called breakaway gaps. We have seen these before when prices suddenly break through a formation boundary and a major change in trend direction begins. Breakaway gaps signal that a pattern has been completed and a boundary penetrated. The size of the gap—the space between the two extremes in which no activity occurs—appears to be proportional to the strength of the subsequent price move. Upward gaps usually are accompanied by heavy volume; downward gaps are not necessarily accompanied by heavy volume. The best manner of trading breakaway gaps is to wait a short while for the initial fading or profit-taking by the professionals to see if the gap is filled and if not, to enter in the direction of the gap with a stop at the point where the gap would be filled. If the gap is filled immediately, a stop and reverse may be appropriate, because a sudden failure in a gap is often followed by a large move in the opposite direction from the gap direction, similar to a Specialist's Breakout.

David Landry (2003) suggests a method of mechanizing the breakaway gap known as the explosion gap pivot. A reversal point, often called a pivot, is used to establish not only where prices have reversed direction, but also where supply and resistance are likely to occur in the future.<sup>1</sup> In Landry's method, a pivot low is the low of a bar that is surrounded on both sides by a bar with a higher low, as shown in Figure 17.2. This establishes a reversal point. Requirements that are more restrictive can be placed on the pivot point; for example, higher lows may be required for two or more bars on either side of the pivot point. For Landry's method, however, one on both sides is sufficient.

We know that a breakaway gap can be a false gap and that if it is filled, the odds of it being false increase. Thus, we want a breakaway gap to establish a new high, for at least 20 days, and for the subsequent retracement not to fill the gap. If either of these requirements is not met, the gap is ignored. When the retracement does occur, eventually it will create a pivot low above the lower edge of the gap. Once this pivot low occurs, a buy entry stop is placed above the high of the next bar from the pivot low (the one that establishes the pivot), and a protective stop is placed just above the gap lower edge (or Landry suggests just below the pivot low). If the gap is then filled, the protective stop will exit the position. Occasionally, the pivot low will be penetrated again, but as long as the gap is not filled, the position should be kept. The reverse configuration is equally applicable to downward breakaway gaps.

**1. This reversal "pivot" should not be confused with the "pivot point" used in intraday trading for anticipating potential support and resistance levels.**



FKHJRE 172 Explosion gap pivot

### Opening Gap

When the opening price for the day is outside the range of the previous day, it is called an opening gap. After the opening, prices may continue in the direction of the gap, and the gap becomes a breakaway gap, or prices may retrace from the opening and fill the gap. Figure 17.3 shows an opening gap to the downside, with prices retracing and filling the gap during the day. This type of pattern is sometimes useful in determining a short-term trend reversal. The history of opening gaps in index futures suggests that they should be "faded" (or sold into) on large upward openings because they most often "fill" (retrace through the price vacuum) during the day. In downward opening gaps, a fill is not as common (Kaufman, 1998). In individual stock issues and commodities, a fill is a sign of weakness and should not occur in a breakaway gap. If the gap is not filled, usually within the first half hour, the odds of the trend continuing in the direction of the gap increase.

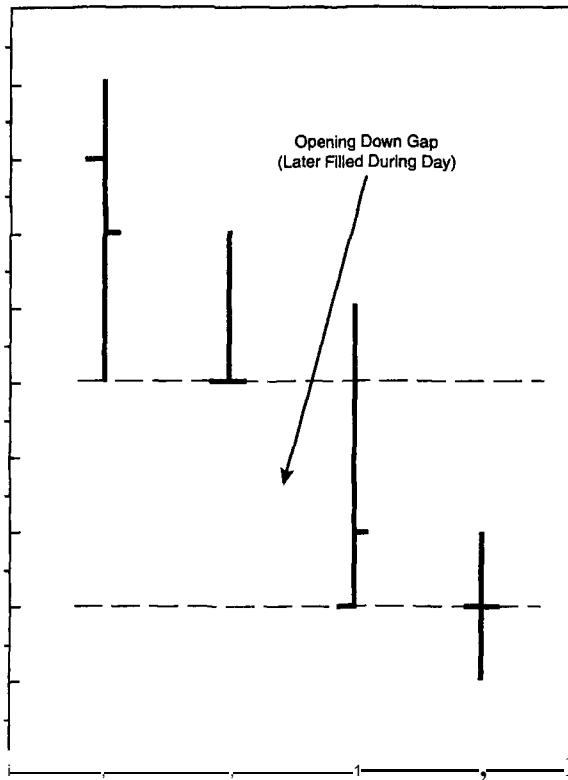


FIGURE 17.3 Opening down gap

One way potentially to profit from an opening gap is to watch the first three five-minute bars (a three-bar range) and determine the high and low of this range. A breakout of that range in the direction of the gap often indicates that the trend will continue in the gap direction; a breakout that moves in the direction of filling the gap will often continue to fill the gap. A danger is that the first run from the gap can last longer than the three bars. The three bar range must, therefore, be obvious, not a continued run in the gap direction. In addition, the breakout from the three-bar gap range in the direction of the gap may be false. A tight stop is necessary, or a wait for a pullback or throwback from the breakout, a narrow range bar break, or even a small cup and handle.

If the price breaks the three-bar range in the other direction toward the fill, the previous day's close, the fill line, will likely be the target. A bounce between the fill line and the range breakout line suggests that the longer-term move will be in the direction of the fill, a reversal of the gap. On the other hand, if the prices after a range break in the direction of the fill turn and retest the outer extreme of the three-bar range, the odds increase that the longer-term move will be in the direction of the gap.

### Runaway Gaps (or Measuring Gaps)

Gaps that occur along a trend are called runaway gaps. They can appear in strong trends that have very few minor corrections and just keep rising or declining without retracements or other interruptions. They are also called measuring gaps because, like pennants and flags, they often occur at about the middle of a price run, and thus the initial distance to them can be projected above them for a target price. This seems to work about 60% of the time (Bulkowski, 2000).

### Exhaustion Gaps

Exhaustion gaps occur at the end of moves but are not recognized at the time because they have the same characteristics as runaway gaps. If a gap is later closed, it is likely an exhaustion gap. These gaps appear when a strong trend has reached a point where greed or fear has reached its apex. Usually they represent latecomers to the trend who are anxious to jump on or jump off. They can occur on light volume but more often occur on heavy volume.

The sign that such gaps are not runaway gaps is an immediate fill within a few bars of the gap. Remember that a runaway gap often occurs mid-stream in a price run. Prices should not immediately reverse and fill a gap unless the end of the run is approaching. Exhaustion gaps are seen at the end of a move and signal a potential trend reversal. Usually more evidence of an exhaustion gap is necessary before an action signal can be justified. Sometimes prices reverse immediately, and sometimes they enter a congestion area.

### Other Minor Gaps

Common gaps are those that occur frequently in illiquid trading vehicles, are small in relation to the price of the vehicle, or appear in very short-term trading data. They are of no consequence. Pattern gaps occasionally appear within the formation of larger patterns, and generally they are filled. Their only significance is to suggest that a congestion area is forming. Ex-dividend gaps sometimes occur in stock prices when the dividend is paid and the stock price is adjusted the following day. These have no significance and must not be misinterpreted. Often gaps occur in 24-hour futures trading when one market closes and another opens, especially if one market is electronic and the other open outcry. These are called suspension gaps and are also meaningless unless they occur as one of the four principal gaps described previously.

### BOX 17.1 Gaps and Classic Patterns—A Case Study of Apple

Figure 17.4 contains daily bar charts for Apple Computer (AAPL) for March through August 2005. What actions might we have taken in this stock, given our knowledge of classic patterns and gaps?

First, we see a flag formation. This particular flag consists of two upwardly sloping trend line boundaries and gradually declining volume. Remember that flags are generally continuation patterns. Therefore, we expect that the breakout from the flag will be downward in line with a continuation of the previous trend. We would

*{continued}*

want to place an entry stop above and below the flag. We would place a buy stop above the flag, in case we are wrong and an upward price trend begins. We would want to place a sell stop at the bottom of the flag. Where exactly do we place this sell stop? We might not want to place the sell stop right on the lower boundary; as a precaution in case of a false breakout, we may choose a price slightly below the lower boundary. Being cautious, let us assume that we choose \$39 as our stop price.

This sell short order would be executed on the gap that occurs at (1). At first\* we may not be sure what type of gap this is, but we do note that volume increased significantly on the break. Over the next few days\* there is no pullback to fill the gap, so we know that this downward gap at (1) is a breakaway gap from the flag partem. We may close this position during the next few days because price reached its measured move target from the flag pattern.

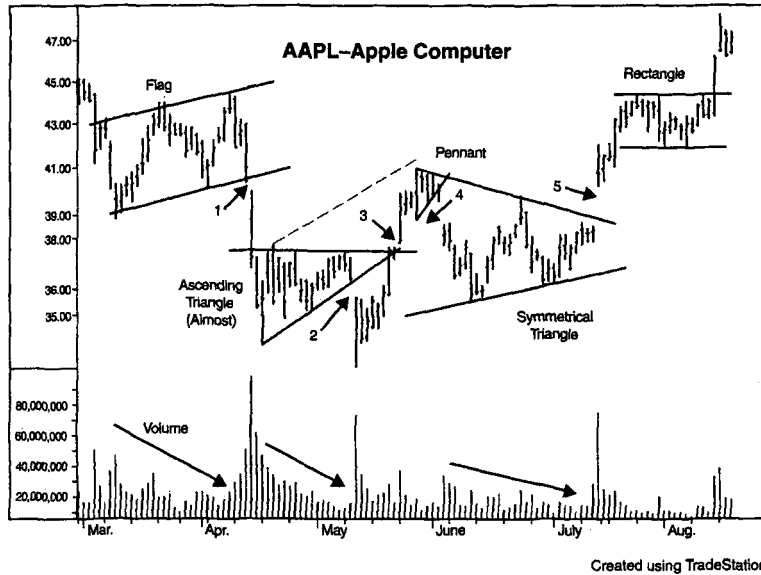


FIGURE 17.4 .Patterns (daily: 2FJ05)

*Second*, we see prices enter into an ascending triangle where the upper bound is a resistance zone and the lower boundary is an upward sloping trend line. At ( 2 ) , another gap occurs, again on heavy volume. At that point, we are left wondering

whether this high volume suggests that (2) is another downward breakaway gap. We may choose to sell short on this gap. If we do choose to sell short, we will want to place a buy-to-cover stop to get out of our position should the gap be filled.

Within six days, the gap is indeed filled. This suggests that what we were seeing develop was not really an ascending triangle breakaway gap. Instead, it is likely a failed ascending triangle and an exhaustion gap from the long decline since March of \$13, or almost 30%. Had we made the choice to sell short on this gap, we would have been stopped out when the gap was filled, and we would have taken a slight loss.

Would we want to take a long position once this gap is filled in the hopes that an uptrend is beginning? We could do a SAR (stop and reverse) and buy on the filling of the gap. However, remember that the filling of the gap has about a 50% chance of being just a pullback. Waiting and seeing what happens next would be the wiser path. Let us assume, then, that we decide to wait.

*Third*, we watch as prices pull back to the cradle of the ascending triangle and then break above it in gap (3). This breakout occurs on high volume, but not as high as the volume on earlier breakouts. This is a warning that enthusiasm for the stock is not as high as the fear was during the earlier declines. This gap is a breakaway gap from the failure of the ascending triangle. So, we buy on the gap and place a protective sell stop at the lower edge of the gap. Notice that this gap is not particularly wide—not as wide as the others we have seen during the earlier decline. This is also a warning sign because gap widths often are proportional to the subsequent price run. • • •

*Fourth*, a small pennant forms. A pennant is usually a continuation formation and, thus, we expect it to break upward when it is completed. We now cancel our earlier protective stop at the gap and establish a trailing stop at the lower boundary of the pennant. Remember that we are in a long position, riding the upward trend, and are using the trailing stop to protect us from price declines should a change in trend occur.

Instead of breaking upward as we were expecting from the pennant, we see prices break down at (4). Fortunately, we had our trailing stop in place. The break down triggered our trailing sell stop, leaving us with a small profit. We also notice that breakaway gap (4) is particularly large because many traders were anticipating a break upward from the pennant and were in long positions. They were forced to sell on the break downward.

*Fifth*, a symmetrical triangle forms. As in the flag and the ascending triangle earlier, volume confirms the triangle formation by gradually declining during its formation. How do we respond to this triangle formation? Remember that symmetrical triangles can break in either direction. Therefore, we choose to place an entry stop at the upper and lower bounds of the triangle.

An upward breakaway gap occurs at (5), triggering our upper entry buy stop. This gap is substantial and occurs on the high volume we saw in earlier gaps.

(continued)

Furthermore, no immediate throwback occurs. We place a protective stop at the lower edge of the breakaway gap and wait.

*Sixth*, a rectangle forms. We convert our protective stop to a trailing stop and move it up to the lower bound of the rectangle, thus locking in a nice profit. When prices break upward and out of the rectangle, we again raise our trailing stop to the upper bound of the rectangle that has now changed from resistance to support and lock in an even greater profit.

The preceding example shows what can be done with just technical analysis alone. We did not act on any news or outside market behavior. We simply watched the price very closely. Stops were an important part of our strategy. If we had not moved stops when we did, we would have suffered at the breakdown from the pennant and from the failure of the ascending triangle. Risk control is sometimes more important than entry technique. Technical analysis takes knowledge, patience, and close watching of price action, but profits can be made.

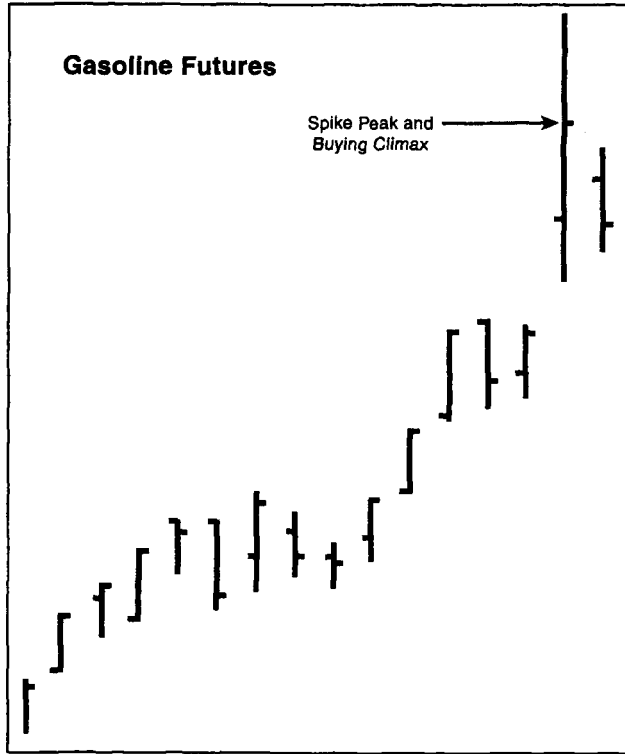
### **Spike (or Wide-Range or Large-Range Bar)**

Spikes are similar to gaps except that the empty space associated with a gap is a solid line (in a bar chart). Should a breakaway gap occur intraday, for example, the daily bar would not show the discontinuity from the gap but instead would show a long bar. The importance of a spike, as in a gap, depends on the context surrounding it. A spike can occur on a breakout from a formation, mid-point in a strong, accelerating trend, and as the final reversal day at the end of a trend. In the earlier discussion of breakouts, we demonstrated the Specialist Breakout. This is often a spike because it usually occurs intraday. At the ends of trends when either gross enthusiasm or panic appears, the last few bars are often spikes. At the end of an accelerated trend, the last bar within the trend is often a spike called a climax (see Figure 17.5). Thus, spikes can represent the beginning or end of a trend. On the other hand, some stocks and commodities, especially those awaiting a news announcement, will have wide-range bars that subside almost immediately within the next few days with little net change in trend direction. This behavior is generally associated with a stock or commodity that will not follow standard technical rules.

### **Dead Cat Bounce (DCB)**

Dead Cat Bounce is a graceless term for a failed rally after a sharp decline. Although the term has been used for many years on Wall Street and in Chicago, it was probably first used in print either in a 1985 *Financial Times* article by reporter Chris Sherwell in a comment on the sharp decline in the Singapore stock market or by Raymond Devoe Jr., research analyst and professional cynic, who advocated using a bumper sticker "Beware the Dead Cat Bounce" in 1986.





Created using TradeStation

FIGURE 17.5 Spike peak and buying climax (July-September 2005)

The DCB is most profitable and more easily recognized after a large downward breakaway gap or downward breakaway spike. The sudden downward motion is called an event decline because it usually occurs on an event such as a bad news announcement. It lasts just a few days and usually begins a longer-term downward price trend. The DCB's characteristics include a short rally of several days up to two weeks following the initial bottom from the sharp initial news event sell-off. Ideally, the rally should follow an event decline of over 20%. Normally, the larger the first decline, the higher the bounce. In Figure 17.6 of Apple Computer, the first DCB had only a very small two-day DCB before declining again. The second downward gap was followed by a larger DCB that lasted 13 days and covered more ground. The "bounce" comes from bargain hunters and bottom-fishing traders who are second-guessing when the actual bottom will take place. It gathers momentum from short covering and momentum signals. The buyers are usually wrong. In over 81% of DCBs (Bulkowski, 2000), the price continues lower after the

DCB and breaks the earlier news event low. The second decline in a DCB is characteristically less intense but equally deceiving. It also tends to be accompanied by much lower volume. Not all event declines include a DCB.

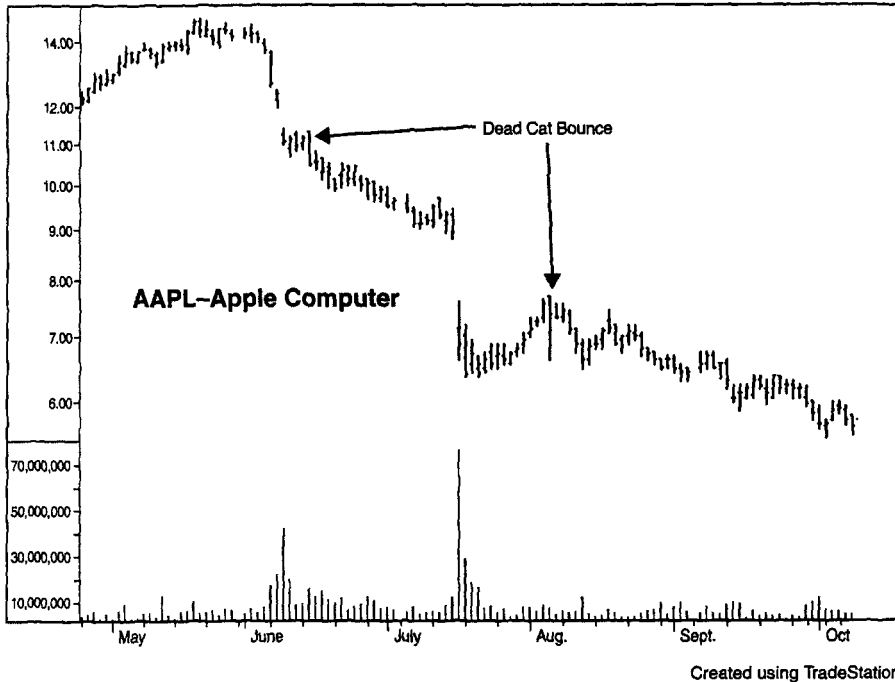


FIGURE 17.6 Dead cat bounce (daily: 1993)

To trade the DCB, the event decline must first be recognized. This is usually easy because almost every day, somewhere, some bad news comes out about a company or commodity. Wait for the initial sell-off volume to decline and then look for a rally on lesser volume, sometimes back as far as the lower edge of the breakaway gap, and lasting only a few days (56% occur in less than two weeks). If the downward rush occurred as a spike rather than a gap, look into the intraday trading to see where the news event gap occurred, and use that gap just as if it had occurred between the daily bars. In the Apple chart (Figure 17.6), the rally retraced back to the gap but did not fill the gap in both DCBs. The short-selling trading requirement then is for a topping of the bounce or a short-term top partem, close protective stops above the entry, and a longer time horizon. For those wishing to purchase the stock, the odds are against profiting from a purchase for at least six months. Most bullish chart patterns fail during this period.

## Island Reversal

An island reversal can occur at either a top or a bottom and only occurs after a relatively lengthy trend. It can occur in a congestion area, but only infrequently. It requires two gaps at roughly the same price: the first in the direction of the trend, an exhaustion gap, and the second in the reverse direction, a breakaway gap. The Apple Computer Figure 17.4 in Box 17.1 shows an island reversal bottom between the gaps marked (4) and (5). The larger the gap, the more important is the formation. Between the gaps, low volatility trading can occur for a number of days or even weeks. Volume usually increases on the second gap from an island top but not necessarily from a bottom. The extreme price in the island must be either higher than previous highs at a top or lower than previous lows at a bottom. Pullbacks and throwbacks are frequent (65-70%), and failures are low, around 13-17%. This pattern is not very common and has mediocre performance results (Bulkowski, 2000).

Trading island reversals can be difficult. The average rate of expected return is only 10-20%. Pullbacks and throwbacks are very common and should be used as the entry point. Bulkowski notes that island reversals often occur near trend lines. The best entry point then is on the second gap when it penetrates the trend line. A protective stop should be placed either slightly above or below the extreme within the island's formation or outside the trend line.

## One- and Two-Bar Reversal Patterns

The following one and two bar reversal patterns are very common. Therefore, each of these patterns needs confirmation before use.

### One-Bar Reversal (Also Reversal Bar, Climax, Top or Bottom Reversal Bar, Key Reversal Bar)

When a trading bar high is greater than the previous bar high and the close is down from the previous bar close, it is called a one-bar reversal. It is sometimes preceded by a gap, at least an opening gap, and its bar length is not as extreme or intensive as in a spike. It is not a spike, because a spike is not necessarily a reversal, but a combination of spike and reversal can elevate its meaning. This pattern will occur in reverse at a bottom. It is very common, but unfortunately, its top and bottom version will also occur within a trend, making it practically useless as a signal by itself. To be useful, but also cutting down on the number of profitable signals, it needs more stringent requirements. For example, rather than just closing down, the close may be required to exceed the previous bar low or even the low of the two previous bars. Kamich (2003) argues that a close is more reliable after a sustained advance than after a short rally. This may require that it be the highest high or lowest low over a specified period or that a series of higher highs or lower lows precede it. When combined with a cluster of other evidence, a close's significance improves. Whatever signal it gives is completely negated once prices exceed its reversal peak or trough.

### Two-Bar Reversal (Also Pipe Formation)

The two-bar reversal pattern, like the one-bar reversal, occurs at the end of a trend, upward or downward, but extends the reversal over two bars. Bulkowski calls it a pipe formation. A two-bar reversal formation is pictured in Figure 17.7. In the bottom pattern, the first bar usually closes in the lower half of the bar, and the second bar close ends near its high. Usually high volume is seen on both bars. In its extreme and more reliable version, it consists of two side-by-side spikes, but it can also be above-average length side-by-side bars of roughly equivalent length, peaking or bottoming at close to the same price, and occurring after a lengthy trend. Following and prior to the two-bar reversal, low bar prices should be in the vicinity of the top of the bars (in a bottom, the opposite for a top). It thus stands out quite easily in retrospect. It is preferable for the second bar to be slightly longer than the first bar, and volume is preferably higher on the left bar than on the right. Rarely this pattern acts as a consolidation area within a trend. Many pipes occur at the end of the retracement of a longer-term move. The directional clue is the direction of the breakout from it.

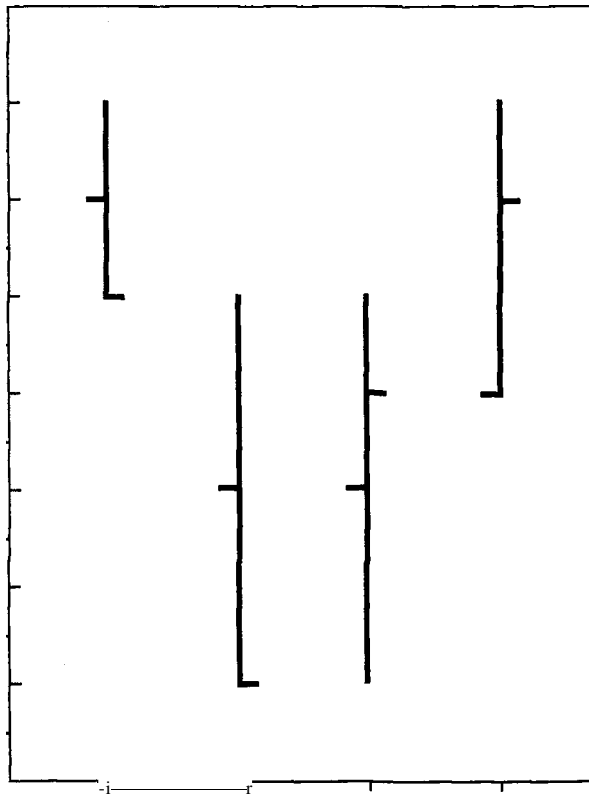


FIGURE 17.7 Two-bar reversal bottom (or pipe bottom)

Failure rates are in the 5% range, which is very low for a pattern (Bulkowski). Usually the failure occurs when the previous trend has been less than 5%. If the earlier trend is lengthy, the pattern rarely fails. Once the pattern has formed and prices have reversed direction, it is common for a test of the bars to occur soon thereafter. In most cases, the bars hold their extreme within a small percentage during the test, and this presents a good spot to place an initial protective stop. Both Kamich and Bulkowski maintain that the formation in weekly bars is more reliable than in daily bars.

#### Horn Pattern

Bulkowski describes the horn pattern as being almost identical in behavior to the pipe except a smaller bar separates the two lengthy bars. The two long bars become the "horns" of the formation (see Figure 17.8). As in the two-bar reversal, the formation is more reliable with weekly bars and otherwise has the same characteristics as the pipe. It is equally as effective as the pipe at bottoms and tops, and its failure rate increases when the trend preceding the pattern is short.

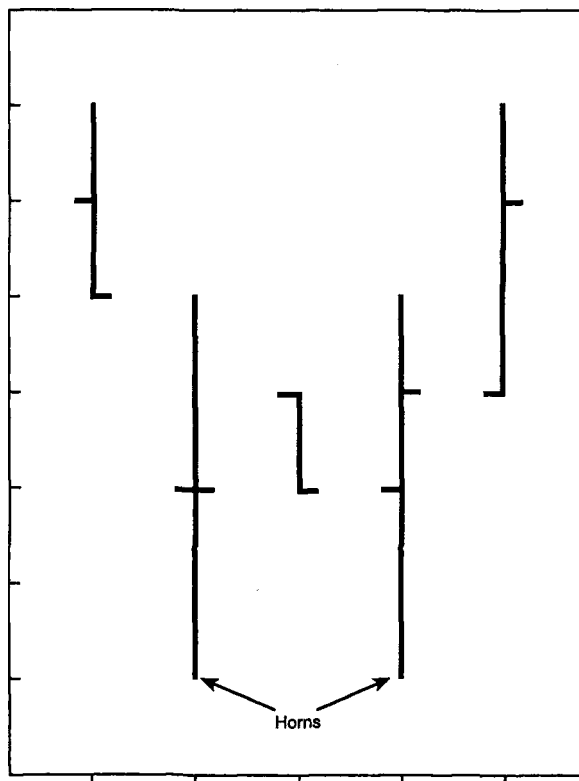


FIGURE 17.8 The horn pattern

### Two-Bar Breakout

The two-bar breakout is an extremely simple pattern. Indeed, it is so simple it is hard to believe that it will work, but the testing column in *Active Trader Magazine* (November 2003) tested it and found it to be successful for stocks and commodities (more so with commodities). The rules they used and which could easily be experimented with are for longs: the next day buy oil a stop one tick above today's high if (1) today's low is less than yesterday's low; (2) today's high is less than yesterday's high; and (3) today's close is less than today's open. Exit on a stop at the then-current day's low. The sell side is just the opposite. Results should be tested against a better exit strategy, but as it is, the pattern produced reasonable profits in commodities and an extremely low drawdown. In stocks, the results were not as favorable but likely could be improved upon with money management and a better exit strategy.

### Inside Bar

An inside bar is a bar with a range that is smaller than and within the previous bar's range, as shown in Figure 17.9. It reflects a decline in momentum in a trend, a bar where a short-term

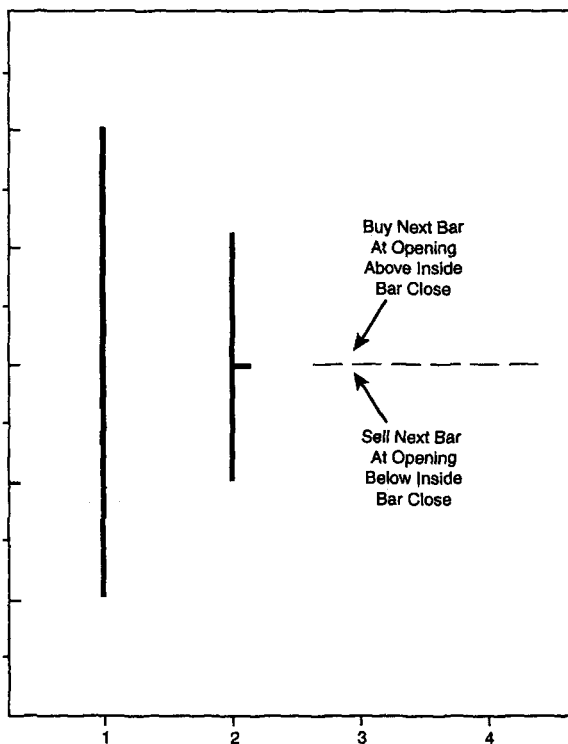


FIGURE 17.9 Inside bar

congestion area is formed. As in most congestion areas, it reflects a pause, a period of directionless equilibrium waiting for something to happen that will signal the next trend direction. During a larger congestion pattern, such as a triangle or rectangle, an inside bar has little meaning because it is just reflecting the lack of motion in the larger pattern. Some analysts plotting larger patterns delete inside bars, especially when determining pivots, because these bars fail to represent any important price action, similar to how the point-and-figure chart eliminates dull periods. Within a trend, however, the inside bar provides some useful information and can generate profitable very short-term signals. As in the gap pattern, the context of the pattern's location is more important than the pattern configuration.

Tony Crabel found that without a cluster of other information, a number of inside bar combinations during the 1982-1986 period in the S&P futures achieved a better than average winning percentage. Crabel tested buying at the next opening, if it occurred above the inside bar close and selling at the next opening, if it occurred below the inside bar close (see Figure 17.10). This strategy produced a 68% winning percentage. This winning percentage could then be improved by adding even other requirements, mostly having to do with characteristics of the bars

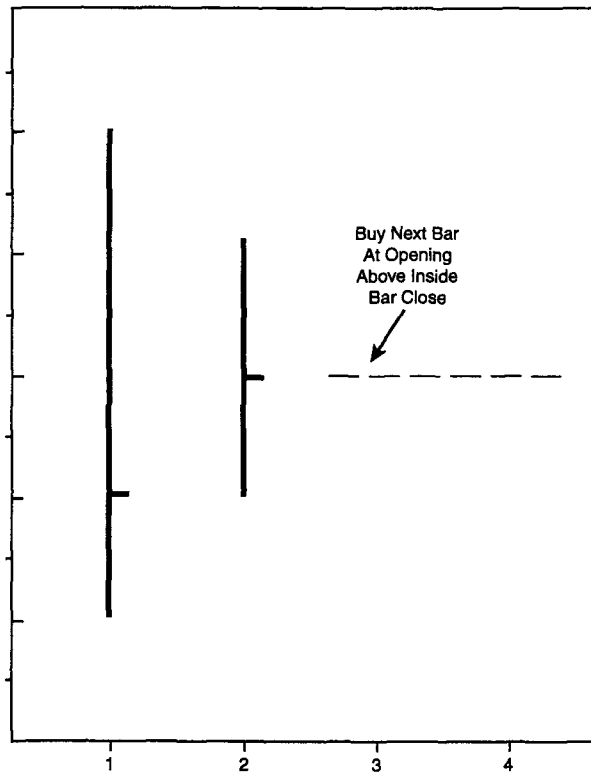


FIGURE 17.10 Inside bar with higher close

preceding the inside bar and with the preceding trend. One strategy, for example, is to buy if the inside bar close was higher than the previous day close and there is a higher open on the current bar and to sell when the inside bar close was below the previous day close and the opening on the current bar is below the inside close. For this slightly more complex strategy, a 74% winning percentage occurred.

Crabel took his inside tests a little further, looking for a four-day partem. If Day 2 had a higher low than Day 1, Day 3 was an inside day, and if Day 4 opened lower than the mid-range and close of the inside day, a sell signal was generated. This strategy is pictured in Figure 17.11. During Crabel's test period, this strategy had an 80% winning percentage. The opposite strategy would occur when Day 2 had a lower high than Day 1, Day 3 was an inside day, and Day 4 opened above the inside day close, triggering a buy signal. This strategy produced a 90% winning percentage. Although these strategies had extremely high winning percentages, they only occurred on average twice a year.

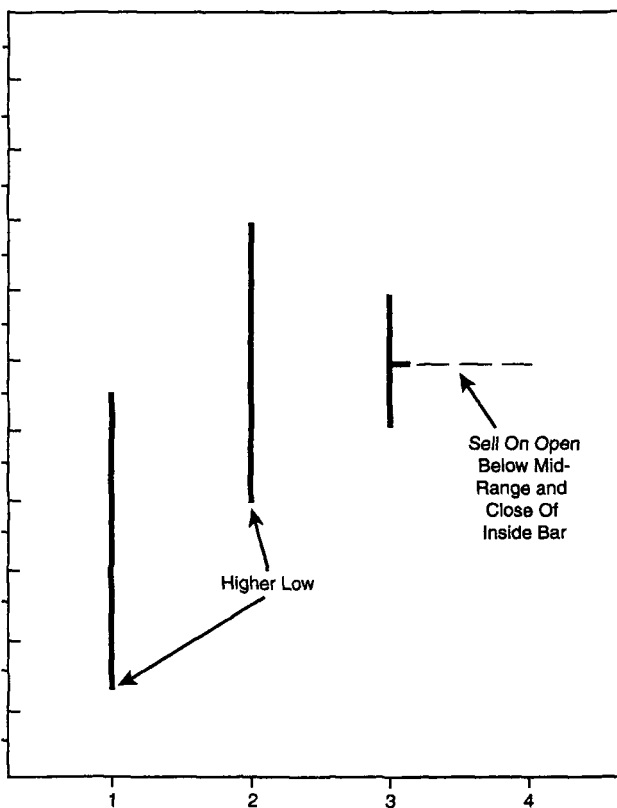


FIGURE 17.11 A four-bar sell pattern with an inside bar



What Crabel was demonstrating, regardless of the percentages, was that the opening of a bar after an inside bar shows a strong bias toward the new price direction. Granted, his testing was done during a bull market in the late 1980s and is somewhat dated today, but nevertheless, the tests showed some correlation to the inside day breakouts and future performance. His exit criterion was to close the position on the close of the day the trade was entered. This limits such trades to day traders. However, an inside bar can also occur on weekly bar charts and usually signifies a larger congestion area similar to a pennant or flag on a daily chart. In these cases, the inside week can be useful for longer-term trading.

Several other common patterns use the inside bar concept.

#### Hook Reversal Day

Hook is a common term for a quick loss when a profit was expected. It comes from the fishhook that the fish bites thinking that the bait is a free meal. As outlined by Kamich (2003) and Crabel, a hook reversal occurs after a series of upward thrust bars (called run bars when they occur right after each other (Schwager)). Then suddenly, a narrow-range bar occurs with specific characteristics. The narrow-range bar must open at above the previous high and close below the previous close. Kamich's variation is for an inside bar that opens at its high and closes at its low. This signals that the momentum built up during the run has reached a climax. A downward break would be an action signal.

Another hook formation occurs when traders are "hooked" into believing that the trend has reversed. This occurs when an open is above the previous high, but prices reverse direction and close down on the bar. This is the hook. It must have a narrower range than the previous bar, but it often fools traders into believing that a top has occurred. The action signal is when the price breaks back above the close of the first. It also works in reverse.

#### Naked Bar Upward Reversal

A variation of the hook, a naked bar is one that closes below previous low (suggested by Joe Stowell and Larry Williams) and is a down bar (close less than open). It is the most bearish close possible. If an inside bar follows a naked bar with open greater than naked bar close, it is a sign that the downtrend is reversing. An upward break from the inside bar would suggest the bears are caught.

#### Hikkake

The hikkake is an inside bar signal that fails and become a signal itself (see Figure 17.12). As described by Daniel Chesler (2004), in Japanese, "hikkake" is a term meaning to trap, trick, or ensnare. It is a pattern that starts with an inside bar. When prices break one way or the other from an inside bar, the conventional belief is that they will continue in the same direction. The hikkake pattern occurs when the breakout fails to continue and prices in the following bars return to break in the opposite direction through the previous inside bar extreme. The reversal and opposite breakout must occur within three bars after the first breakout, and the open and close of each bar seems to be unimportant.

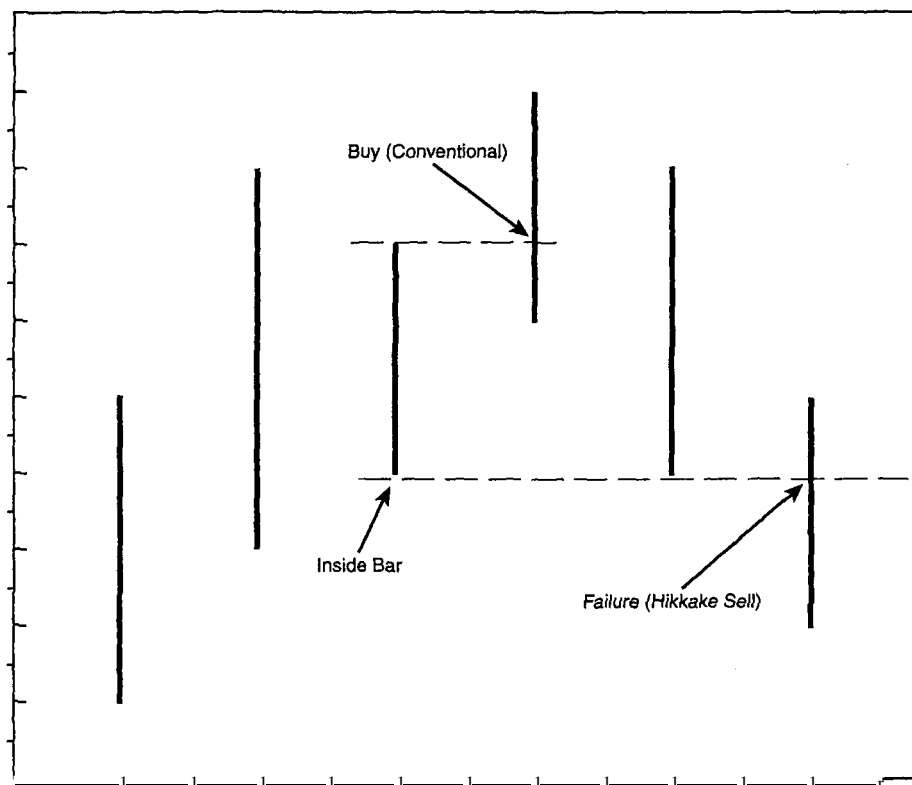


FIGURE 17.12 Hikkake buy failure

#### Outside Bar

An outside bar occurs when the high is higher than the high of the previous bar and the low is lower than the low of the previous bar. It is a specific kind of wide-range bar that "covers" all the previous bar's price action. In other words, the outside bar is longer than the previous bar and contains the entire price range of the previous bar. Traditionally, an outside bar is thought of as a bar of increased volatility, and, depending on the close, perhaps the beginning of a trend. Larry Williams (1988, 1995, 1999, 2000, 2003) has done considerable study of outside bars, and the results are available in his various books.

When an outside bar closes near an extreme—that is, a high or low—and above or below the previous close and its current opening, it suggests further action in the direction of the close

into the following bar. Bulkowski, using daily lows observes that the close, if located within the upper or lower 25% of the range, tends to predict the future breakout upward about 66% of the time and downward 62% of the time. However, it often is a false signal. For example, one of the more reliable, though less frequently seen, setup patterns with an outside day is when the outside day closes at below the previous day's low and the next day opens lower than the outside day close. Buy the following day opening (Williams, 2000). Standard opinion would suggest that the series of lower closes was bearish, yet the setup is bullish.

## Multiple Bar Patterns

### Trend Correction

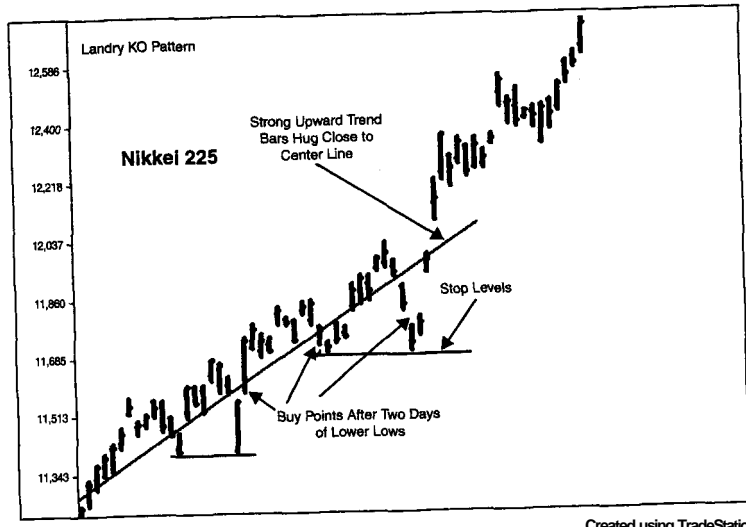
Many studies have shown that acting in the direction of the trend is more advantageous after waiting for a correction to that trend. The reward of catching the trend at a cheaper price as well as having a closer stop level outweigh the potential opportunity loss of missing the trend.

There are at least two different types of trend correction patterns. One is to recognize a trend and act on a percentage pullback from that trend. *Active Trader Magazine* (March, 2003) tested on 18 stocks a long-only 6% pullback system. It demonstrated during the period 1992 through 2002, a generally rising period, entering a buy at 6% below the previous bar close and exiting on the next open would produce an excellent equity curve when triggered. The gain over the period was the same as the buy-and-hold, but the market exposure was only 17% due to the limited number of trades and the quick exits.

A second trend correction method, used by David Landry (2003), is called the "knockout" (see Figure 17.13). The first requirement for this pattern is that an extremely strong and persistent trend must be present. In an upward trend, Landry's criteria for a strong uptrend is that the stock must have risen at least 10 points in the past 20 trading days and a trend line drawn through the prices touch almost all bars. Thus, if we think about a linear regression line, the bars should have a small deviation from that line, not wide swings back and forth. At some time, the stock will develop a throwback of two to five days in which two prior lows will be exceeded. Place a buy entry stop at the high of the bar with the second low. If the next bar is lower, move the buy stop to its high until the position is executed. Place a protective stop below the last low, or use any reasonable stop method. According to Landry, the reverse is equally as successful in a downtrend using the criteria in reverse.

### Oops!

Larry Williams (1979) coined the expression "Oops!" (see Figure 17.14). The setup for this pattern occurs when the opening price on today's bar is outside the previous day's range. Assume, for example, that a stock opens today at a price below yesterday's range. A buy stop is then placed just inside yesterday's range in case the market closes the gap, indicating a reversal. This pattern depends on traders acting in the direction of an opening gap and being caught when prices reverse.



Created using TradeStation

FIGURE 17.13 Landry KO pattern (June-September 2005)

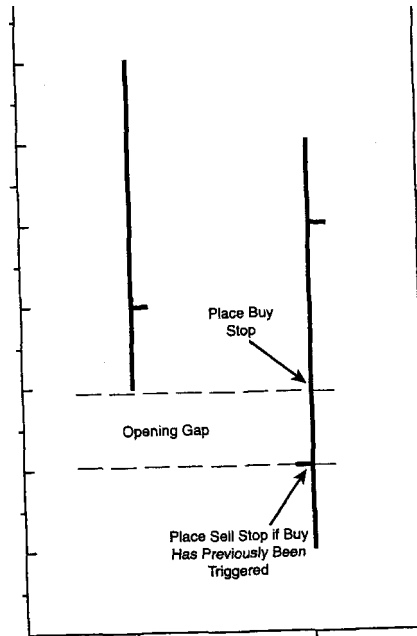


FIGURE 17.14 Oops! buy pattern

Larry Connors (1998) uses a 10% qualification variation of the Larry Williams Oops! pattern. The pattern is for the first day to have a close within 10% of the low. The second day must open on a downward gap. If these conditions are met, place a buy stop at the first day's low with a sell stop near the second day's opening. A sell pattern is just the reverse on a day when the close is within 10% of its high.

### Shark

The shark pattern is a three-bar pattern. The most recent bar high must be lower than the previous high and the recent low above the previous low. In other words, the recent bar is an inside bar. The previous bar must also be an inside bar. The progression in bars, therefore, is one base bar and two successive inside bars, as shown in Figure 17.15. In effect, it is a small triangle or pennant. The name "shark" comes from the pattern's fin-like shape.

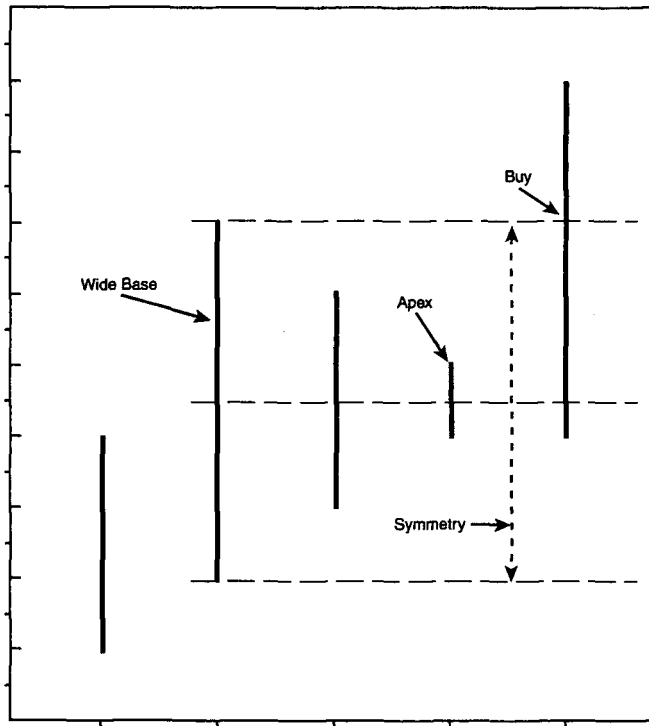


FIGURE 17.15 Shark pattern with break to the upside

In a *Stocks and Commodities* article, Walter Downs demonstrates that the short-term pattern called the Shark-32 has implications for the longer-term as well as the immediate future. This study was an interesting approach to determining the success or failure of the pattern in that Downs questioned whether the symmetry of the pattern added to or detracted from its performance. Symmetry was measured by determining the amount by which the center of the final inside day range, called the apex, deviated from the center of the base day range. Although there can be many shark patterns, Downs limited his study to those patterns that fit a specified symmetry. The test was ran on Harley Davidson stock from July 1986 to April 1998, a period of generally rising stock prices. The entry was to buy on the close of the first day after a day in which the close exceeded the widest point in the pattern, usually the base day. The exit was a trailing stop or a reversal on the opposite signal.

The results of Downs's study were useful in that they suggested that the more symmetrical the shark formation, the more likely prices would continue in the same direction and improve performance at least out to 30 days thereafter. As the symmetry became very tight, the results did not change, but the number of patterns that fit into the requirements declined. One example was that if the symmetrical variance of the apex mid-range was within 12% either side of the center of the base day range, the trend continued in the same direction as the prepattern direction 91% of the time, strengthened in 36% of the instances, and increased in momentum 34% of the time within 30 days.

## Volatility Patterns

Most short-term patterns rely on an expansion in volatility. The inside bar strategies, for example, are based on the notion that inside bars represent low volatility and that when prices break one way or another, volatility expands. To take this concept of volatility further, many patterns look directly at volatility itself—either historical volatility as defined in the option markets, changes in trading ranges, or indicators such as the ADX. An expansion in volatility is used as a signal for action in most patterns, but sometimes a contrary action is suggested when volatility becomes extreme. Following are examples of some of these patterns.

### Wide-Range Bar

A wide-range bar is a bar in which the range is "considerably" wider than the normal bar. The bars are relatively long compared to the previous bar. How large does the range have to be in order to be considered "wide," and how far back must the comparison be made? There are no definitive answers to these questions and, therefore, there is no specific definition of a wide-range bar other than its range is "considerably" wider than the normal bar. In any case, a wide-range bar is usually a bar with increased volatility. Increased volatility can imply the beginning of a new trend as in a breakout bar, or if the trend has been in existence for a long time and is accelerating, the wide-range bar may act like an exhaustion gap and warn of the trend's end. As a sign of impending trend reversal, it is more often seen at panic lows, as the emotions of fear accelerate prices downward. Emotional spikes and two-bar reversals are often wide-range bars. Otherwise, it is usually found on a breakout from a pattern, small or large, or as the base for a pennant or flag, indicating that the trend reached a very short-term peak and is about to consolidate. On the other hand, not all wide-range bars are meaningful. Consideration of trend, as

always, areas of support and resistance, patterns, and the relative location of opens and closes are necessary before a judgment of the significance of the wide-range bar can be determined.

Larry *Connors* gives an example of a wide-range pattern. Connors first looks for a wide-range day in which a stock experiences a two-standard deviation decline. On the following day, if the opening is a downward gap, place a buy entry stop at the first day's close with a protection stop at the first day's low. If the buy is near the previous day's low, then lower the stop to give some room for the pattern to develop. The reverse set of signals is valid on the sell side at a top. The exit is to sell on the close, or if the close on the action day is within 10-15% of the high sell on the next day opening.

#### Narrow-Range Bar (NR)

Although wide-range bars indicate high volatility, narrow-range bars indicate low volatility (see Figure 17.16). Determining narrow-range-bars is useful because the low volatility will eventually switch to high volatility. As with the wide-range bar, the criteria for determining a narrow-range bar are not precise.

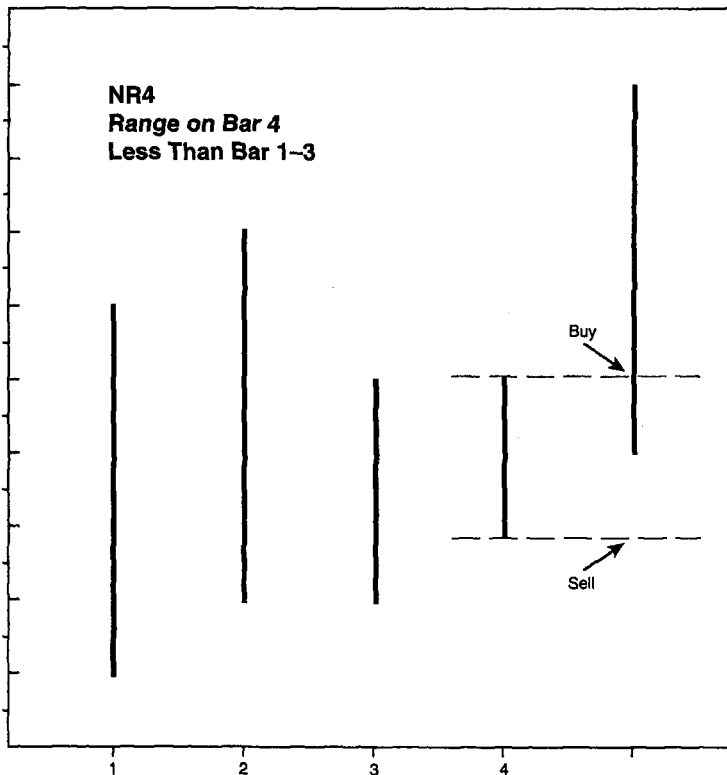


FIGURE 17.16 Narrow-range bar

Tony Crabel designed one method of defining and using narrow-range days. In his method, he determines whether the current day has a narrower range than the previous day and if so, over how many past days. For example, if the current day has a narrower range than the past three days, it is called an NR4 day (to include the current day and the past three days); in other words, the current day represents the narrowest trading range of the four days. The common narrow days of this type are the NR4 and NR7 day. Their entry signal is a breakout from the most recent narrow-range day. Thus, if today is an NR7 day, we place a buy and sell entry stop on either side to be acted upon tomorrow or the next day.

Linda Bradford Raschke ([www.lbrgroup.com](http://www.lbrgroup.com)) is one of the leading proponents of using narrow-range days to determine low-volatility setups. Raschke adds another constraint to Crabel's method. She calculates the historic volatility of the vehicle over 6 days and over 100 days. If the 6-day historic volatility is 50% less than the 100-day, the conditions are right for either an NR4 day or inside day signal, provided today meets the criteria for each of these types of days. The buy and sell entry stops are placed at the high and low of the qualified NR4 or inside day. If the entry stop is executed, an additional exit stop is placed where the opposite entry stop currently exists. Exit the position at the close of the day if not already stopped out.

## VIX

In our discussion of sentiment indicators in Chapter 7, "Sentiment," we introduced the VIX, a measure of implied volatility in the S&P 500 options. Remember that the VIX is a reflection of anxiousness in the market. Traders and investors become anxious when the market declines and become complacent when the market advances. Thus, VIX becomes a sentiment indicator. Generally, when the market is bottoming, VIX is high, because of the investor anxiousness. When the market is topping, VIX is generally low, indicating the complacency among investors.

Larry Connors (1998) introduced a number of short-term price patterns that were based on the behavior of the VIX. The principle behind these patterns is to watch for changes in VIX, as a measure of sentiment, at extremes, as for example, either after X number of days or combining with an oscillator formula to determine when VIX is overbought or oversold. A more general strategy for the VIX is to look at the deviation from a moving average (Connors, 2004). VIX has changed levels over the past decade, but a moving average dampens those changes. Connors uses a 5% deviation from a ten-day simple moving average. If the VIX is below the SMA by 5% and the market is above its 200-day moving average, the odds favor a continuing upward trend but not necessarily a good time to buy except on throwbacks. When the ratio is above 5%, and even more so when it is above 10% of the SMA, the time is usually excellent to buy. Thus, the VIX in this instance gives general zones of when action in certain directions can be contemplated. The opposite relationship is valid when the market is below its 200-day moving average. Generally, bottoms are more reliably signaled by the VIX than tops.

## Intraday Patterns

### Opening Range

The opening range is the range of a daily bar that forms in the first few minutes or hour of the trading day (see Figure 17.17). It can be defined as either the high and low after a certain time,



such as the high and low price that occur during the first 15 minutes of trading, or it can be a pre-determine range about the opening price. A horizontal line is drawn at the opening range high and low on the intraday bar chart as a reference for the rest of the day. Other lines from the opening price, the close yesterday, the range yesterday, and so forth may also be drawn. These lines often become support or resistance levels during the day.

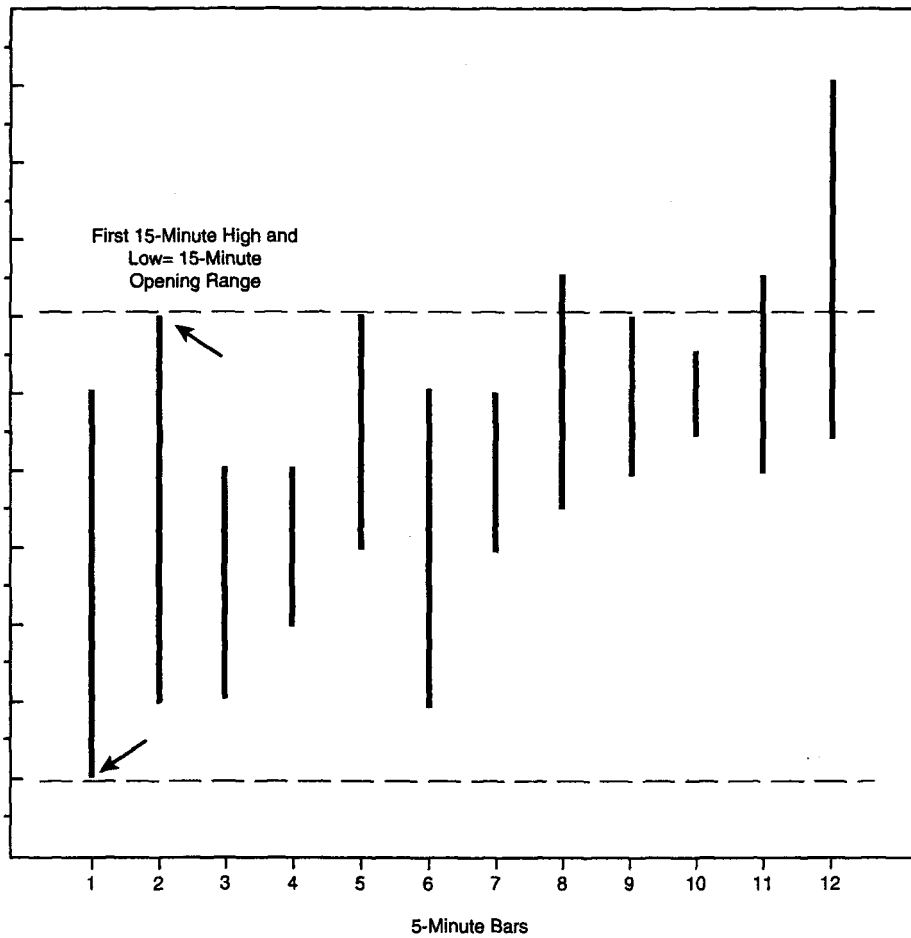


FIGURE 17.17 Opening range

The opening range breakout (ORB) is a popular method of entering a position once a setup has been established from a previous short-term pattern. As reported in *Stocks & Commodities Magazine*, Tony Crabel experimented with NR days as setups and used an ORB defined by a specified, predetermined amount above or below the opening range. He compared these results to using a wide-range day setup. He found, first, that the wide-range day setup over both four and seven days vastly underperformed the NR days over the same period, thus confirming that more profit can be obtained from an expansion in volatility than contraction. Second, he found that once the price had moved away from the open in one direction after a NR2, it normally did not return to the opening.

In a series of articles for *Stocks & Commodities Magazine*, Crabel describes methods of trading from an ORB in considerable detail. In the first article, he describes how he calculates the specified amount, called the stretch, above and below the opening that establishes the ORB. Crabel uses the ten-day average of the past differences between the open for each day and its closest extreme to the open for that day. Analysts use a number of other methods for calculating stretch, including specifying a number of ticks or calculating a range based on the ATR over some past period.

Crabel found that the use of ORBs worked well with NR4, NR7, inside days, and hook days. He found that the earlier in the day the ORB was penetrated, the better the chance for success. Even without the previously mentioned setups, trading on the ORB within the first five to ten minutes would also work, but after that short interval, if the prices have not penetrated out of the range, all orders should be cancelled because the day will likely revert to a listless trading day rather than a trending day.

By analyzing the action around opening range levels, a good trader can find ways to take advantage of the tendency for these levels to act as support and resistance. One method of accomplishing this is called the "ACD method," developed by Mark Fisher (2002). This somewhat complicated method uses the opening range determined over the initial minutes of trading, an additional filter that is added to the upper bound of the range, and another subtracted from the lower edge, as shown in Figure 17.18. Entry signals occur when the outer bounds are broken during the day, and exit signals occur when the range bounds are broken. Fisher's method is not quite this simple because he uses numerous other rules and confirmations. However, Fisher, who reportedly has a trading room of over 75 day traders using this method to make their daily bread, has appeared to be very successful.

## SUMMARY OF SHORT-TERM PATTERNS

Although there appears to be value in short-term patterns, they are not immediate sources of wealth without study, experience, and trial-and-error testing. We have only touched the edge of methods being used. Others include performance around national holidays, days of the week, time during the day, and even the new moon. There seems to be no limit. The point in this exercise, however, is to demonstrate the many ways that prices are analyzed over the short term. If interested, you can continue to experiment on your own.

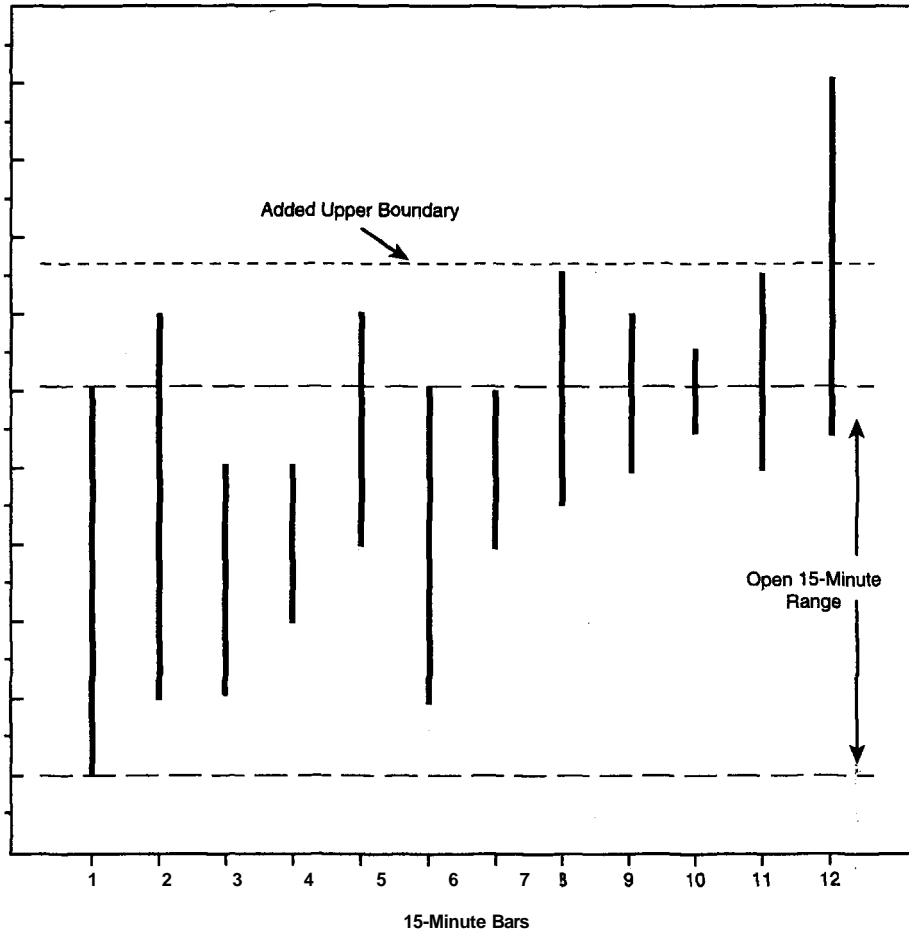


FIGURE 17.18 The ACD method of determining opening range

## CANDLESTICK PATTERNS

In Chapter 11, "History and Construction of Charts;" we learned how to construct a candlestick chart. As you will recall, the raw data used in the candlestick chart is the same as the raw data used in the bar chart: open, close, high, and low price per specific period.

The candlestick chart has become popular because it represents price action in a more striking way, and furthermore, the patterns that result have interesting and novel names. One advantage of the candlestick chart is that it can still use the Western methods of analysis—patterns, trend lines, support, and resistance—yet it has a set of unique patterns of its own. These patterns are mostly short term of only one to five bars, and by themselves have not tested very well. Many patterns have their Western equivalents that we have seen before. They are generally reversal patterns and can reveal price reversals early in overbought or oversold conditions, at trend lines, or at support or resistance levels. However, they are tools, not a system. Their disadvantage is that one must wait for the close before a pattern can be recognized, and they are useless in markets that do not accurately report the opening prices. The best resource on candlesticks is *Japanese Candlestick Charting Techniques* by Steve Nison (2001), the person who introduced this ancient method to the West.

The principal analytical difference between candlestick patterns and Western bar patterns is the emphasis on the opening and close. Western traders have recognized the importance of the opening and close, but bar charts treat them without special weighting. In candlestick charts, the "real body" is the wider area between the open and close. The "shadow" is the vertical line from the real body up to the price high and down to the price low. A long shadow indicates the inability for prices to maintain their highs or lows and is thus a warning of trouble. The real body is a heavy color, such as black, when the close is lower than the open, and usually white when the close is higher than the open. A black body denotes, therefore, a "down" day, and a white body indicates an "up" day. (This definition is different than in the West, where a down day is a day in which the close is lower than the previous close.) A large body (in relative terms) indicates strength in the direction of the trend, and a small body indicates indecision and a potential reversal, especially after a meaningful prior trend.

Patterns are made by the relative position of the body and the shadow, the location of the candlestick in relation to its neighbors, and the confirmation the next day. Because candlestick patterns usually are defined as top or bottom patterns, the analyst must be sure that the preceding price action is in a trend, either up or down. A single pattern may or may not be meaningful depending on the direction of the previous trend. Similar to Western short-term patterns, a candlestick pattern cannot predict the extent of the subsequent move or the significance of the pattern—that is, whether it occurs at a major or minor reversal. Thus, the pattern should always be used with other evidence before action is taken. Being more often a reversal pattern, however, candlestick patterns are often useful in determining support and resistance levels on their own. At first, the analysis of these patterns seems to be filled with an endless set of rules and names, but as you become more familiar with the nomenclature, you will see that the basis of these patterns is not much different from the basis for Western short-term patterns.

There have been few tests on the effectiveness of candlestick patterns. This is odd because the patterns are easily computerized. As with tests of other short-term patterns, many of the existing studies are flawed in that the signal outcomes are often assumed to last longer than they should. Measuring the effectiveness of patterns over weeks or months is useless because these patterns are only useful in short-term situations. However, even over shorter periods, the patterns

do not test well. Their profit factors are relatively low, and their drawdowns are high and in all cases greater than net profits. Some of the variables in each pattern can be tweaked to improve performance, but the basic patterns, by themselves, are not outstandingly profitable.

Two relatively recent studies with short-term results are by Caginalp and Laurent (1998) and by Schwager (1996). The Caginalp and Laurent tests included eight three-day patterns in S&P 500 stocks from 1992 to 1996. Their purpose was to demonstrate that the patterns had value above what could be expected from a random walk; however, drawdowns were not considered. Schwager tested six major patterns in ten commodities from 1990 to 1994 and included a momentum filter to account for trend, an important factor in candlestick pattern analysis. A criticism, however, is that Schwager estimated commissions and slippage to be \$100 per trade, considerably higher than what can be achieved now. Both studies suffer from the type of exit method in that they depend on a holding period that is arbitrary and not based on the behavior of prices. The results could be considerably improved with testing of each pattern in combination with others and the use of protective stops. At least stops and other exit signals would reduce the extremely large drawdowns. In our presentation of the patterns covered by Schwager, we average the results from the ten commodities for each pattern and give the relative ranking rather than the raw percentages. This avoids, to some extent, the problem of commissions and slippage.

Following are some examples of the more common candlestick patterns.

## **One- and Two-Bar Candlestick Patterns**

### **Doji**

A doji pattern is formed when the open and close are identical, or nearly identical. This creates a candlestick with a real body that is simply a horizontal line, as shown in Figure 17.19. It suggests that the market is in equilibrium and affected by indecision. In some respects, it is like an inside bar in its meaning because in a trend it shows a point at which the enthusiasm of the trend has stalled. It is, thus, often a warning of a reversal, but not necessarily a reversal pattern by itself. It can also occur about anywhere during a trend or within a trading range and is thus difficult to assess. As a result, its performance statistics were low (Schwager, 1996). It ranked at the bottom of our scale based on net profit, average trade, maximum drawdown, and percent winners.

### **Windows**

Windows are simply the gaps that we discussed earlier in this chapter. Nison believes they are the most reliable formations, and evidence from short-term bar patterns tends to confirm his opinion. Because the interpretation of candlestick windows is the same as for Western gaps, we will not spend time discussing them.

### **Harami**

A harami pattern is a two-day pattern consisting of a large body of either color followed by a small body of either color that is completely within the boundaries of the large body. The harami

pattern is pictured in Figure 17.20. The second candlestick pictured in the harami pattern in Figure 17.20 is called a spinning top. This second candlestick can also be a doji (resulting in a harami cross pattern), a hammer, a hanging man, or a shooting star, the only requirement is that the second candlestick body is within the first candlestick body.

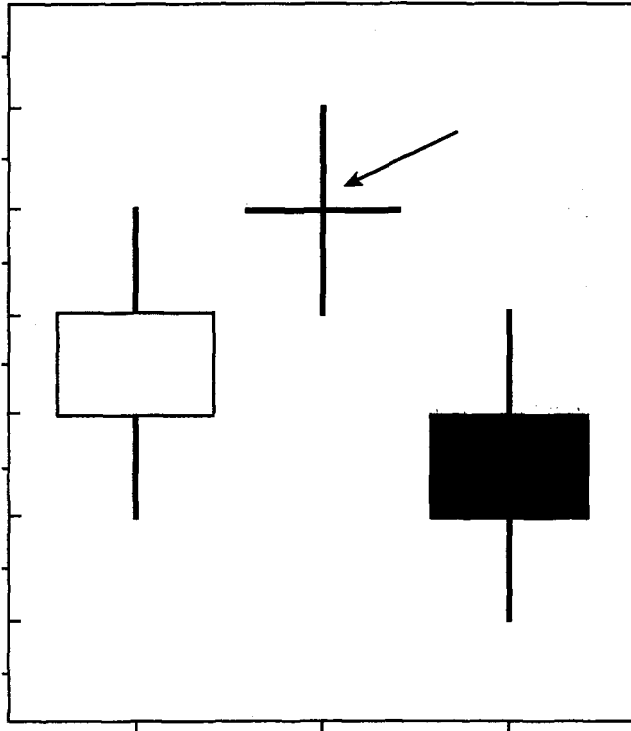


FIGURE 17.19 Doji candlestick

The harami pattern is very similar to the inside bar pattern; however, with the harami, the range, or wick, of the second bar does not have to be within the range of the first bar. The real body of the second candle must be within the real body of the first candle. Thus, the open and close range, rather than the range, determines whether the harami criterion is met.

We know that the inside day demonstrates a contraction in volatility, and the same can be said for the harami pattern. We also know from studies of short-term bar patterns that low volatility turns into high volatility and often begins a new trend. Thus, a harami pattern can be a powerful way of signaling either the reversal of a trend or an increase in velocity of the current trend, depending on which direction prices break.

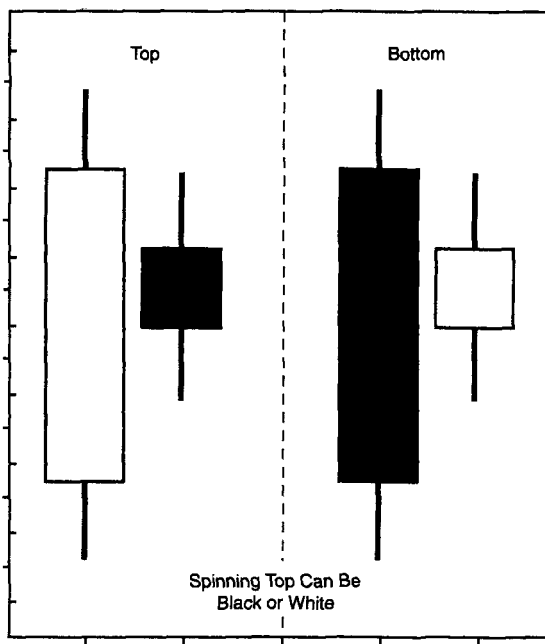


FIGURE 17.20 Harami candlestick pattern

#### Hammer and Hanging Man

Both the hammer and the hanging man are candlesticks in which the real body is located at the upper end of the trading range, as pictured in Figure 17.21. For these formations, the lower wick is at least twice to three times as long as the body, and the upper wick is small or nonexistent. In other words, the open and close both occur within approximately the top one-third of the bar's trading range, and either the open or close is, or nearly is, the highest price of the bar. The color of the body is irrelevant.

If this formation occurs at a peak, it is called a hanging man. When the same formation occurs at a trough, it is called a hammer. These formations ranked best in our scale and were close to a tie with morning and evening stars.

#### Shooting Star and Inverted Hammer

The shooting star and the inverted hammer can be thought of as an upside down hanging man or hammer. For these formations, the real body occurs in the lower end of the trading range. A shooting star occurs at peaks, and the inverted hammer occurs at bottoms. Both have long shadows above their bodies and very short or nonexistent shadows below their bodies, as shown in Figure 17.22. Again, the color of the body is irrelevant. In our ranking of patterns, they fell into the middle, nowhere near the best performing hammer and hanging man to which they are related.

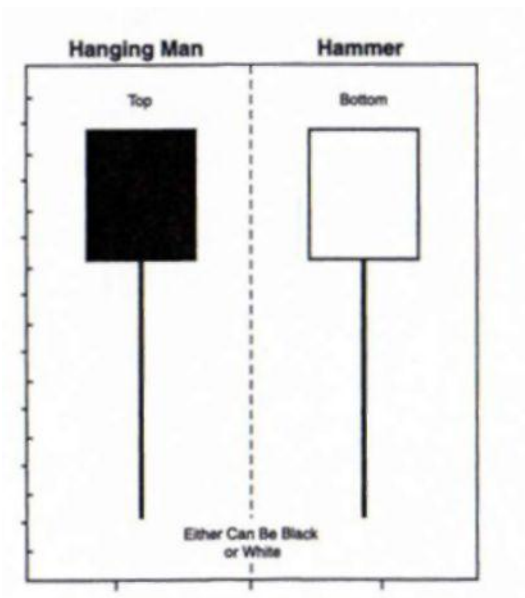


FIGURE 17.21 Hanging man and hammer

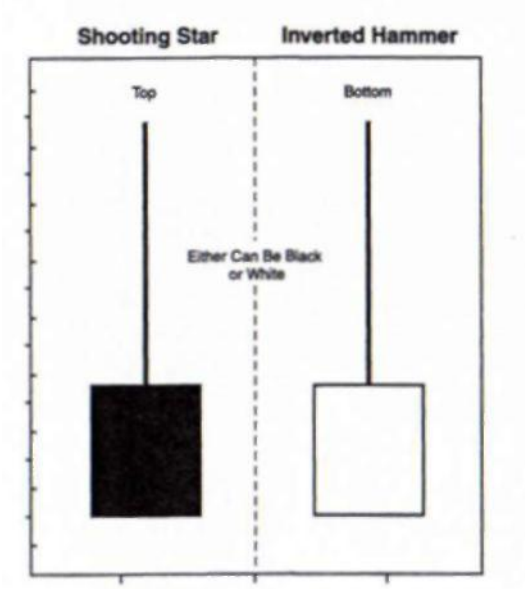


FIGURE 17.22 Shooting star and inverted hammer



### Engulfing

An engulfing pattern is a two-bar pattern in which the second body engulfs the first body (see Figure 17.23). This pattern is similar to an outside day reversal in bar patterns. Because this pattern is designed to recognize a trend reversal, there must be a clear trend preceding the engulfing pattern. In a market uptrend, a bearish engulfing pattern would indicate a market top. The bearish engulfing pattern consists of a small white-bodied candle followed by a black body that engulfs the white body. The bullish engulfing pattern would indicate that a downward trend is reversing. This bullish engulfing pattern consists of a candle with a small dark body on one bar followed by a candle with a larger white body that engulfs the dark body. For both the bearish and bullish engulfing pattern, the signal is much stronger when the first body is very small and the second body is very large. However, performance of engulfing patterns is near the bottom of the six pattern types tested by Schwager. They had the worst net profits and the largest maximum drawdowns.

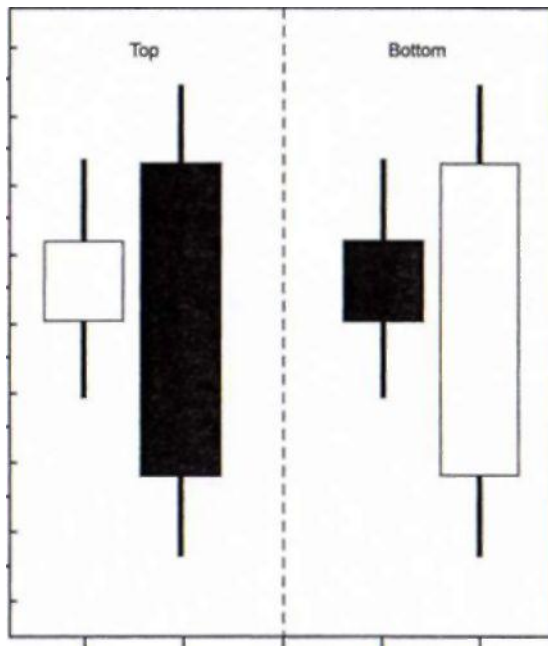


FIGURE 17.23 Candle engulfing pattern

### Dark Cloud Cover and Piercing Line

A dark cloud cover is a two-body pattern at a top. The first body is large and white, and the second body is large and dark. The second open should be above the upper shadow of the first bar.

an opening gap upward, and the close well within the first bar's white body, preferably below the 50% level. The pattern resembles the Oops! pattern in bar charts. Performance of this pattern is supposedly enhanced by a deeper penetration of the white body. (A complete penetration would be an engulfing pattern.)

The opposite pattern, a piercing line pattern, would indicate market bottom. The piercing line follows the same rules as the dark cloud pattern, only in reverse. Both the dark cloud cover and piercing line formations are pictured in Figure 17.24. These patterns ranked in the lower half of the six types followed. They had the second to least drawdown, lowest average profit per trade, and the lowest winning percentage.

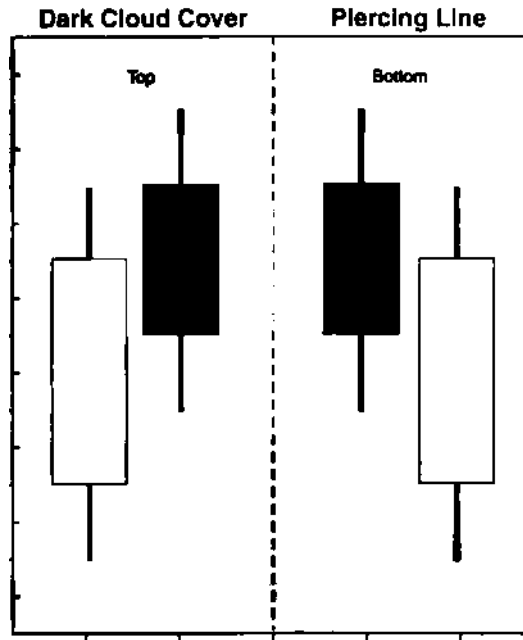


FIGURE 17.24 Dark cloud cover and piercing line

## Multiple Bar Patterns

### Morning and Evening Star

The evening star is a three-bar candlestick pattern that occurs at market tops, and the morning star is a three-bar, market bottom pattern. In each of these patterns, the second bar, or middle candlestick, is known as a star. A star is a candlestick that has a small body that lies outside of the range of the body before it. It implies an opening gap, as does a dark cloud and piercing line

pattern, but it can later cover part of the previous bar's shadow. The important point is that its body does not overlap the previous bar's body at all. It is similar to a doji in that it represents a sudden halt in a trend and some indecision between buyers and sellers. Indeed, a doji can be a star, called a doji star, if the doji body occurs outside the body of the previous bar's body.

The evening star pattern, pictured in Figure 17.25, starts with a long white body followed by a star of either color. If the third bar forms a large black body that closes well within the body of the first bar, the pattern is confirmed. Ideally, the third body should not touch the star's body, but this rarely occurs, and it is not a necessary condition for the pattern. The amount of penetration into the first white body is more important. The evening star is similar to the island reversal bar pattern without the necessary second gap.

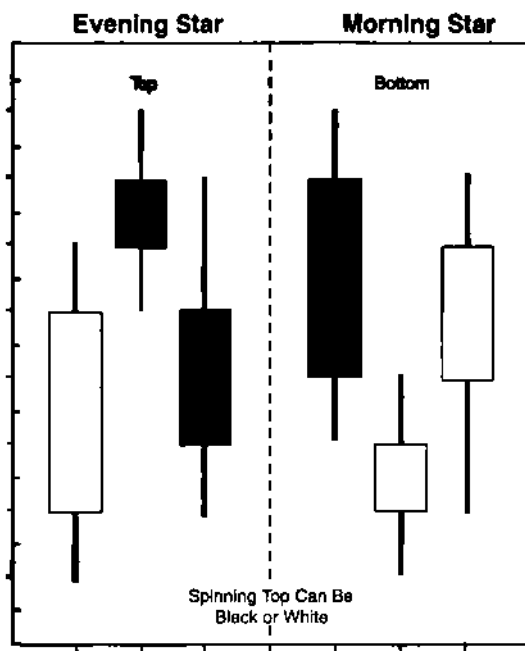


FIGURE 17.25 Evening star and morning star candlestick patterns

The morning star, which occurs at a market bottom, is the opposite formation of the evening star. As shown in Figure 17.25, it begins with a black-bodied candlestick, followed by a star. The body of the star lies completely below the body of the previous candlestick. The pattern is then confirmed if, on the third bar, a white-bodied candlestick closes well within the range of the first candlestick.

The morning and evening stars were the second-best patterns in our ranking of Schwager's tests. They were first in net profits, had the least drawdowns, and were second in the percentage of winning trades. In the Caginalp and Laurent study, the morning and evening star pattern ranked third out of the four multibar types studied.

#### Three Black Crows and Three White Soldiers

White soldiers are white bodies and black crows are black bodies. Three black crows is a pattern with three consecutive black bodies, preferably long, closing near their lows, openings within their previous day's body, and occurring after a meaningful upward trend. They are a top-reversal formation. As shown in Figure 17.26, three white soldiers is a bottom-reversing formation and requires the same parameters in the opposite direction.

Unfortunately, traders have difficulty profiting from these patterns because by the time they are recognized, a large portion of the new trend has already occurred. They are best played on a pullback or throwback. Nison believes that the first or second bar in the pattern is the best location for entry on the retracement. That level is often accompanied by another partem suggesting a short reversal in the direction of the trend signaled by the major pattern.

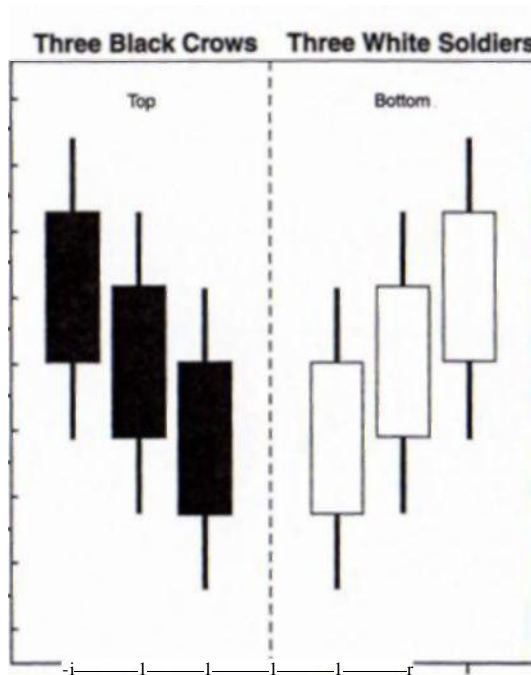


FIGURE 17.26 Three black crows and three white soldiers candlestick patterns

### Three Inside Up and Three Inside Down

The three inside up pattern is a reversal pattern that occurs at the end of a declining trend. The first bar of this pattern has a large black body, and the second bar is a white spinning top (or doji) that forms a harami partem. Then, the third bar is a large, white candle that breaks and closes above the large black body of the first bar. Although the name may sound like it, the three inside up pattern does not imply that three inside bars in a row occur, as we saw with the NR3 pattern. Instead, the three inside up pattern is similar to an upward breakout from an inside bar in a bar partem.

As shown in Figure 17.27, the three inside down pattern is the reverse of the three inside up pattern. The three inside down pattern consists of a large white bar followed by a black spinning top and a downward break by a large black body. This pattern signals that an upward trend has ended. From the Caginalp and Laurent study, we ranked this pattern type the best. It had the highest percentage of winning trades of the four pattern types studied.

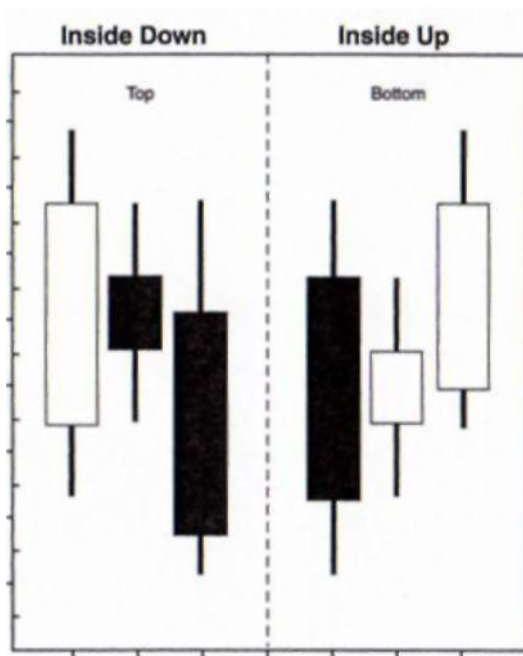


FIGURE 17.27 Inside down and inside up candlestick patterns

### Three Outside Up and Three Outside Down

This pattern type starts with an engulfing pattern after a trend, just as the inside up and down started with a harami pattern. The three outside up version occurs at market bottoms. The first body is small, a spinning top, and the second body is large, engulfing the smaller previous body. The first is black and the second is white. A white body that closes above the second bar and reaches a new high above the previous two bars follows the engulfing pattern. This pattern is pictured in Figure 17.28.

Figure 17.28 also shows how the three outside down pattern is the same with opposite parameters. For the outside down pattern, the first bar is a small, white body, and the second bar is a black body that engulfs the first. The third bar is also a black body with prices moving lower than the second bar. Outside down bars occur at market tops.

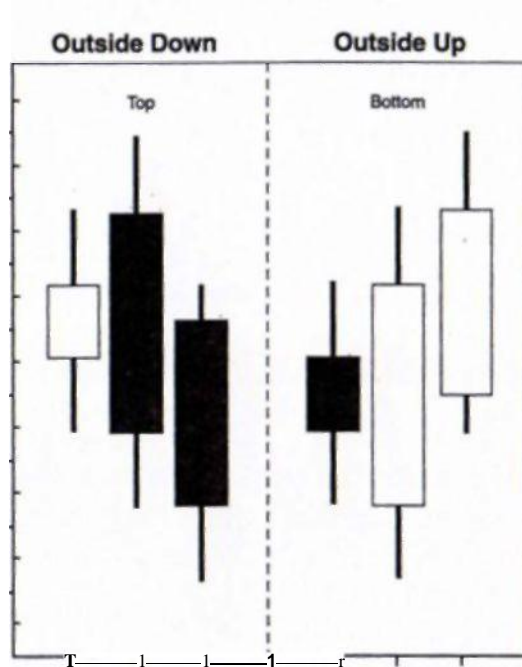


FIGURE 17.28 Outside down and outside up candlestick patterns

From our look at short-term bar patterns, we know that outside bars are less predictable and less profitable than inside bars because the volatility has already expanded and is open to contraction at any time soon thereafter. The results of the three outside bar pattern types show the

same decreased performance and were ranked fourth in our interpretation of the Caginalp and Laurent study.

## CONCLUSION

We have looked at a number of short-term patterns in this chapter on both bar charts and candlestick charts. To use these patterns successfully, a trader must be familiar with the underlying market trend. Remember that these short-term patterns are most often reversal patterns, giving the trader a hint that the underlying trend may be changing.

Short-term patterns forming as open, high, low, and close prices occur in particular combinations during a bar or over a few bars of trading. Particular short-term patterns occur frequently. Because of the frequency with which they occur, many times they are false patterns. Traders must be aware of this and not simply rely on a particular short-term pattern to make decisions. These short-term patterns can be useful indicators, but traders need to watch for a cluster of evidence instead of relying on a short-term pattern to make decisions.

Remember that the key to making money is riding a trend. Short-term patterns are a tool to help us determine when a new trend is beginning. These formations can also help us determine when a trend is ending. This allows us to participate in the trend as soon as possible and to exit the market as quickly as possible whenever the trend has ended. Using short-term patterns and protective stops can aid traders in maximizing their gains and minimizing their risk.

## REVIEW QUESTIONS

1. Why must investors know the underlying long-term trend before using short-term patterns?
2. Explain what is meant by the term "gap." How do breakout, runaway, and exhaustion gaps differ from each other? How would an analyst distinguish between these three types of gaps?
3. What is a spike? How is it similar to a gap?
4. In August 2005, Merck (MRK) lost an initial Vioxx product liability lawsuit. Create a daily bar chart for MRK for August-September 2005. Use this chart to describe the Dead Cat Bounce. Did MRK follow the typical Dead Cat Bounce pattern?
5. Define an inside day, outside day, narrow-range day, and wide-range day. Which of these days represents increasing volatility, and which represents contracting volatility? Explain your answer.
6. Schwager (1996) states that the one-day reversal pattern "successfully call(s) 100 out of every ten highs." What does he mean by this statement, and what is the implication for traders using these reversal patterns?

7. The candlestick chart in Figure 17.29 is of AmeriSourceBergen Corp. (ABC) for August 15-October 15, 2005. Find the following patterns in this chart. Does the price behave as you would expect after each of these patterns? Explain.
- Morning star
  - Doji
  - Hammer
  - Inverted hammer
  - Shooting star
  - Harami
  - Engulfing
  - Hanging man



FIGURE 17.29 Review Question 7



**PART V**

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**TREND  
CONFIRMATION**

**CHAPTER 18 CONFIRMATION**

# CONFIRMATION

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The methods of plotting volume information on charts
- Traditional general rules for interpreting volume statistics
- The major indexes and oscillators that are designed to use volume information as confirmation
- The concept of open interest and how it might be used for confirmation
- The concept of momentum
- The major indexes and oscillators that use price data

The odds increase that a technical Signal is correct if there is corifirmation from another unrelated indicator. In the days when only chart patterns were available as a means of interpreting price action, the technical analyst used volume as the confirming indicator. Sometimes, depending on the calculating ability of the analyst, moving averages, rates of change,- and momentum price oscillators were also used. After the introduction of the computer, the ability to calculate mote complicated indicators increased. Many analysts began to use more complicated indicators as the primary source of signals and deviated from the old price pattern analysis. The number of possible combinations of prices, volume, and other factors has become almost infinite. Indeed, there is some question as to whether all this computing power has increased the ability of technical analysts to interpret price action. Some would argue that most of the indicator calculations correlate with each other, and that the market is no more understandable today than it was 50 years ago. Others maintain that the proper use of confirming indicators helps considerably in decision making, and that many successful trading models depend almost exclusively on these complex calculations.

In this chapter, we will look at volume, the oldest confirming indicator, but which has developed some problems recently from the increase in program trading and other mechanical trading systems. We will look at open interest in the futures markets, and then we will look at price oscillators, indicators, and the discouraging evidence for their reliability in giving stand-alone signals.

## VOLUME CONFIRMATION

### What Is Volume?

*Volume* is the number of shares or contracts traded over a specified period, usually a day, but can be one trade (called tick volume) to months or years, in any trading market—stocks, futures, and options.

In markets where considerable arbitrage exists, volume statistics can sometimes be misleading. For example, arbitrage between two differently dated commodity contracts can cause volume figures in each to be distorted due to the arbitrage and not the price trend. This arbitrage problem in volume statistics is particularly troublesome in the stock market where there is not only arbitrage against index futures markets, but also arbitrage between baskets, bits, and options. This arbitrage is known as program trading, and as of 2004, it accounted for approximately 55% of all traded volume on the New York Stock Exchange. In the heavily traded stocks included in averages and widely owned by institutions, large levels of volume may thus be due simply to arbitrage trades and not the trend direction or strength. Any analyst using these volume figures for these actively traded stocks must be aware of this potential problem in analysis.

"Indeed, one criticism of program trading voiced by professional traders is that it distorts the information typically provided by trading volume. As our analysis here suggests, introducing trading volume unrelated to the underlying information structure would surely weaken the ability of uninformed traders to interpret market information accurately." —Blume, Easley, and O'Hara, 1994

### How Is Volume Portrayed?

Analysts display volume on a price chart in many ways. Some analysts like to see the volume statistics separately from the price statistics. Others have developed means of integrating volume data into the price chart.

#### Bar/Candle

The most common portrayal of volume is a vertical bar representing the total amount of volume for that period at the bottom of the price chart. A chart showing daily price data, for example, would show the volume for each day in a vertical bar below the price bar. Figure 18.1 shows

volume statistics for Apple Computer using this method. This method is simple and assumes no direct relationship between price and volume. It just displays the data.

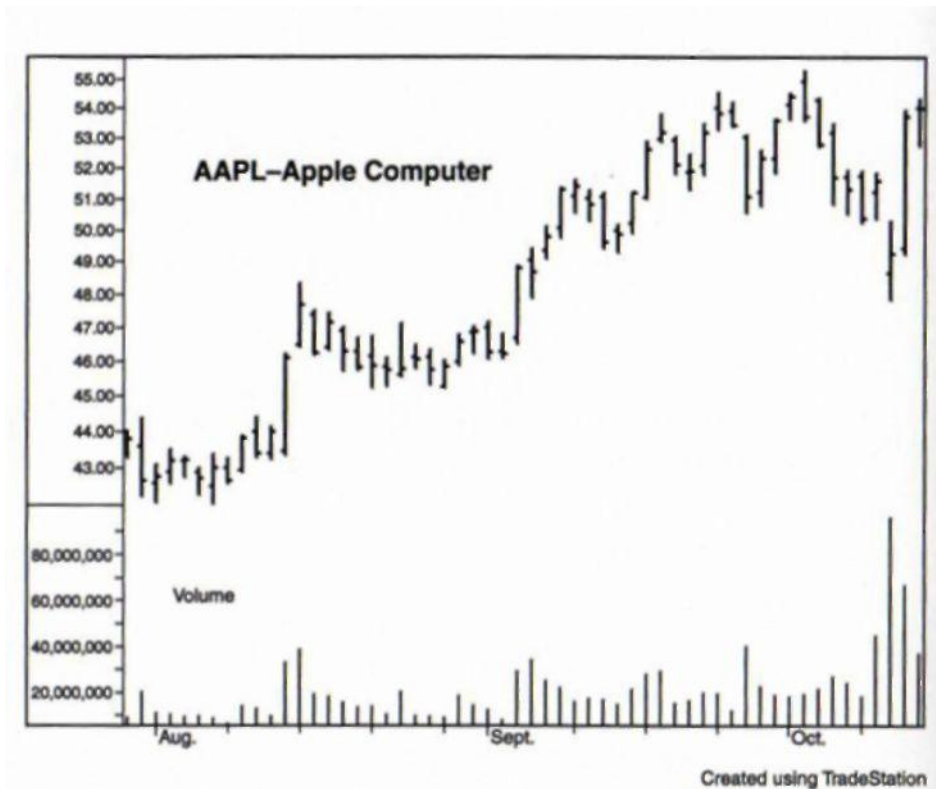


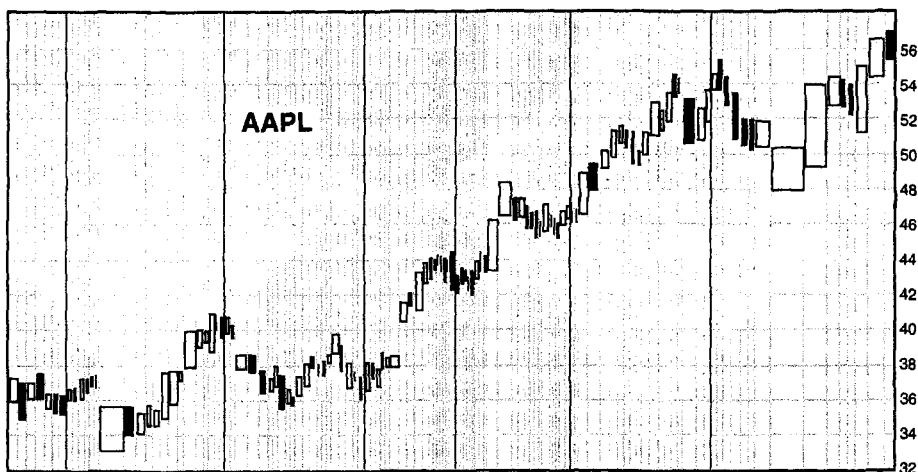
FIGURE 18.1 Price and volume (daily: August-October 2005)

### Equivolume

Many attempts have been made to integrate volume directly into a bar chart. Gartley (1935) mentions how traders before 1900 would record on a chart a vertical bar for every 100 shares traded at a certain price. For example, if 300 shares traded at a certain price, traders would record three bars at that price. A wide number of bars at a certain price showed that the majority of activity took place at that price. From this chart, traders could determine the price at which supply and demand were equalized and, thus, the support and resistance zones.

The first published service using a combination of price and volume was the Trendograph service by Edward S. Quinn (Bollinger, 2002, and Gartley, 1935). Quinn produced charts using a bar for the high and low each day separated by a horizontal distance based on volume traded during the day. More recently, Richard W. Arms, Jr. (1971) designed, utilized, and reported "Equivolume" charts. These are available in some of the current charting software programs.

Arms's method widens the vertical price bar into a rectangle, and thus widens the horizontal axis in proportion to the volume traded during the same period. For an example of an Equivolume chart, see Figure 18.2. The Equivolume chart resembles a regular bar chart except that the bars vary in width. Thus, wide bars portray large volume, and thin rectangles portray thin volume. The horizontal axis of the entire chart adjusts accordingly. The darker vertical grid lines in Figure 18.2 divide months. Notice that the first full month pictured is relatively wide, indicating heavy trading volume, while the third month is relatively narrow, suggesting much lighter volume.



Created using TradeStation

You will notice the wide, white "blocks" on the chart, especially in the final month pictured. The width of the box is proportional to volume traded that day, and the height is the high and low for the day. That is the true Arms's Equivolume chart. The color in this chart, borrowed from candlestick charts, indicates the relationship between the close and the open. A white, wide block indicates heavy volume on an upward day. At the end of a short correction, the heavy volume is a sign that buyers are entering the market. For example, see how a short correction occurred at the beginning of the last month pictured. About halfway into the month, the white, wide blocks occurred, suggesting that buyers were entering the market. Then prices rallied to new highs by the end of the month.

FIGURE 18.2 Equivolume style chart

Arms first interpreted the Equivolume charts by considering the rectangular shapes displaying the price range by the height of the rectangle and volume by the width. For example, after a strong upward trend, the formation of a box shape or flat rectangle suggested little price motion but heavy volume. This would indicate that the trend was meeting some heavy resistance. Arms also found that the standard patterns used in bar chart analysis also occur in Equivolume charts, and interestingly, trend lines and channel lines appeared to work as well. One would think that a trend line was totally price and time related in a bar chart, but Arms demonstrated that trend lines in price-to-volume also occur.

More recently, with the introduction of picturesque candlestick charts, some services have adopted the principles of Equivolume to include open, close, shadows, colors, and indications of direction. (An example is the charts used in [www.incrediblecharts.com](http://www.incrediblecharts.com).) These charts have the same rectangular appearance as the Equivolume charts but include other factors. Their interpretation is similar to Equivolume interpretation. The same trends, formations, and support and resistance levels as displayed in regular bar charts are visible.

#### Point-and-Figure

Point-and-figure charts, by their nature, do not include volume. This omission has forced point-and-figure analysts who believe that volume is important to find ways to integrate volume statistics into each point-and-figure box, usually through symbols or colors. The standard method is to sum the volume that took place while each box was in effect and portray it on the chart. From this, the analyst can quickly visualize where volume occurred in the formation. The individual analyst using the method must determine whether this information is helpful. A purist in point-and-figure would argue that volume is unimportant because the price action implies it.

### Do Volume Statistics Contain Valuable Information?

Academic papers using volume to confirm technical trading rules are rare. Most academic papers on volume are concerned with bid-ask spreads and intraday trading versus option trading. The intraday spread has been of interest because it is a cost of trading that has not been well quantified. Studies in this sector arose out of the legal requirement of institutions to measure the effectiveness ("best execution") of their traders and the brokerage firms that handled their orders. The difference between best execution and the execution received is a cost above the commission and slippage cost. Often institutions traded through firms that did not receive the best execution but provided research and other benefits to the institution. The legal question was, should the customer of the institution pay an extra cost for execution through a firm that did not receive the best execution? Determining the best execution then became a major area of study that remains relatively unanswered today.

Intraday trading relative to option trading was of interest to those attempting to explain why option prices lagged behind stock prices.

Stock buyer-initiated volume (that which transacts at the ask) minus seller-initiated volume (that which transacts at the bid) has strong predictive ability for subsequent stock and option returns, but call or put net-buy volume has little predictive ability.  
—Chan, Chung, and Fong, *Review of Financial Studies* (2002)

Finally, studies done on daily volume and subsequent price action came to the conclusion that volume statistics had valuable information.

Where we believe our results are most interesting is in delineating the important role played by volume. In our model, volume provides information in a way distinct from that provided by price . . . . Because the volume statistic is not normally distributed, if traders condition on volume, they can sort out the information implicit in volume from that implicit in price. We have shown that volume plays a role beyond simply being a descriptive parameter of the trading process. —Blume, Easley, and O'Hara, *Journal of Finance* (1994)

### How Are Volume Statistics Used?

*Volume indicators and signals are usually derived not from volume itself but from a change in volume.* Volume by itself may be a measure of liquidity in a security, but it is not helpful for price analysis. Volume is usually different in every security, based on factors beyond the ability for the security to rise and fall. For example, at the end of 2005, average daily volume for Wal-Mart was around 15 million shares. The average daily volume for Coca-Cola was only about half of that. The term "volume" used in conjunction with indicators and technical signals really refers to change in volume. We will also use that convention.

How should a change in volume be interpreted? These general rules date back to the work of H. M. Gartley in 1935:

1. When prices are rising:
  - a. Volume increasing is impressive.
  - b. Volume decreasing is questionable.
2. When prices are declining:
  - a. Volume increasing is impressive.
  - b. Volume decreasing is questionable.
3. When a price advance halts with high volume, it is potentially a top.
4. When a price decline halts with high volume, it is potentially a bottom.

In other words, price change on high volume tends to occur in the direction of the trend, and price change on low volume tends to occur on corrective price moves. Higher volume is usually necessary in an advance because it demonstrates active and aggressive interest in owning the stock. However, higher volume is not necessary in a decline; prices can decline because of a lack of interest, and thus potential buyers, in the stock, resulting in relatively light volume.

As in all technical indicators, exceptions to the preceding rules can occur. These rules are only guides. Bulkowski, in his analysis of chart patterns, for example, found many profitable

instances of patterns breaking out on low volume rather than the traditionally expected high volume. Larry Williams has reported on short-term studies of volume accompanying advances and declines and found little or no correlation. In a study of price-volume crossover patterns, Kaufman and Chaikin (1991) demonstrated that the prevailing wisdom is not always born out by fact. In a price-volume crossover chart, price closes within short trends are plotted on the vertical axis, and corresponding volume is plotted on the horizontal axis. Lines are drawn connecting these successive points, and when the lines cross, a crossover has occurred. The charts thus display the sequence of rising or falling price versus rising or falling volume. Kaufman and Chaikin found, for example, that rising volume in an advance was not necessarily positive, and that declines could occur on both rising and declining volume.

Nevertheless, we will look at specific examples in the indicator descriptions next. We will see that volume is a secondary indicator to price analysis, and that though it is not always consistent, it can often be useful as a warning of trend change, especially on any sharp increases. As always, one must thoroughly test each assumption made about volume characteristics. The correlations between signals and price are not reliable enough to be absolute rules, and using the traditional rules too strictly can often lead to incorrect conclusions about price action.

### **Which Indexes and Oscillators Incorporate Volume?**

Let us look at some specific examples of indicators that analysts use when looking at volume as a confirming indicator. These indicators are divided principally into two categories: indexes and oscillators.

Indexes are similar to the breadth line described in the market indicators discussion in Chapter 8, "Measuring Market Strength." They are cumulative sums of data, usually some variation of volume and price, that continuously measure supply and demand over time rather than over a specific period. They do not have an upper or lower bound and are plotted with price charts where they can be compared to price action. The level of the index is irrelevant. What is relevant is the trend of the index relative to the price trend. The only useful indexes are those that begin to change direction before prices, signaling a change in trend. The analyst thus compares the prices with the index, looking for divergences between highs and lows in each. (Refer back to Chapter 8 for a review of the concept of divergence.) Indexes can also utilize trend line, channel, and occasionally pattern analysis; however, their most important use is that of divergence analysis in trending markets.

Oscillators, on the other hand, are bounded and limited to a specified past period. They tend to "oscillate" within these bounds and demonstrate when volume or prices are relatively high or low. These indicators show the relative changes rather than the absolute changes demonstrated in indexes and are also amenable to divergence, trend line, and pattern analysis. Oscillators are used more successfully in trading range markets.

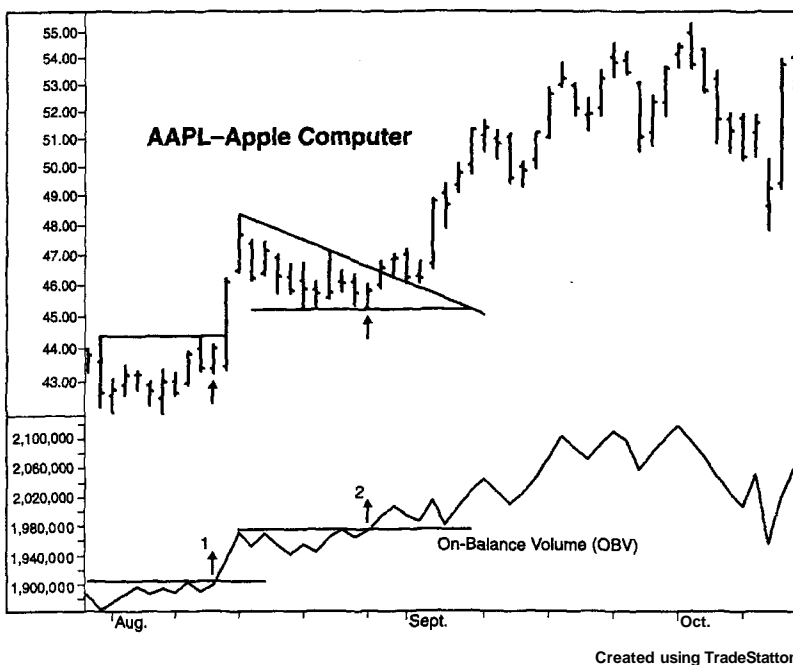
As with many technical indicators, research has not shown that indexes and oscillators are profitable on their own. The student must judge after thorough testing and experience whether to use them or not as secondary indicators to price analysis.



## Volume-Related Indexes

*On-Balance-Volume (OBV)*

On-Balance-Volume (OBV) is the granddaddy of all volume indexes. Joseph Granville proposed OBV in his 1976 book, *A New Strategy of Daily Stock Market Timing for Maximum Profit*. The daily data that is cumulated into the index is the volume for the day adjusted for the direction of the price change from the day before. Thus, it is the total daily volume added to the previous day index if the price close was higher and subtracted from the previous day index if the price close was lower than that of the previous day. This index is a cumulative sum of the volume data and is plotted on a daily price chart. Figure 18.3 shows what a plot of OBV volume looks like.



The idea behind the OBV index is simply that high volume in one direction and low volume in the opposite direction should confirm the price trend. If high volume is not confirming the price trend, then light volume in the price trend direction and heavy volume in the opposite direction suggests an impending reversal. Observing the OBV line by itself, therefore, is not helpful, but observing its trend and its action relative to price action is. For example, in a trending market, when prices reach a new high, confirmation of the price strength comes when the OBV also reaches a new high. If the OBV does not reach a new high and confirm price strength, negative divergence has occurred, warning that the price advance may soon reverse downward. A negative divergence suggests that volume is not expanding with the price rise.

FIGURE 18.3 On-Balance volume (daily: August-October 2005)

How can the OBV be used in prices that are in a consolidation pattern or trading range rather than trending? When prices are in a trading range and the OBV breaks its own support or resistance, the break often indicates the direction in which the price breakout will occur. Therefore, it gives an early warning of breakout direction from a price pattern.

Let us look a little more closely at Figure 18.3. At the beginning of the chart, prices seem to be in a trading range. Then, notice how the OBV broke to a new short-term high at Marker 1, warning of an equivalent directional break in price. Price did break upward one day later. Next, a descending triangle price formation occurs. However, at Marker 2, the OBV broke above its previous high, signaling that the descending triangle price pattern would likely break to the upside, which it did one day later. Finally, notice that after Marker 2, each successive high in price was accompanied by an equivalent new high in the OBV, confirming the upward price trend.

#### *Price and Volume Trend*

Another way of calculating a combination of price and volume is to determine daily the percentage price change, up or down, times the total volume for the day. This figure is then cumulated into an index called the price-volume trend. This index will be more heavily impacted when large percentage price changes occur on heavy volume. Signals are triggered in the same manner as for the OBV.

Figure 18.4 shows a price-volume trend index for Apple Computer. This chart shows the price-volume trend for August-October 2005, the same period as the OBV index pictured in Figure 18.3. Notice how the breakout signals from ranges and patterns in Figure 18.4 do not give a warning but occur coincident with the breakout. The price-volume trend thus has a slight delay relative to the OBV. Notice also, however, that a minor negative divergence occurred at Marker 3 that signaled a potential downward price reversal. The downward break in prices occurred almost immediately. Later, at Marker 4, an upward breakout in the price-volume trend line signals that Apple Computer stock will likely break to a new high in the next few days. Indeed, that occurred one day later.

#### *Williams Variable Accumulation Distribution (WVAD)*

Larry Williams believes that the open and close prices are the most important price of the day. The Williams Variable Accumulation Distribution (WVAD) calculates the difference between the close and the open and relates it to the range as a percentage. For example, if a stock opened at its low price of the day and closed at its high price of the day, this percentage would be 100%. The other extreme would be if a stock opened at  $P_o$ , moved higher (or lower) during trading, but returned to close at  $P_o$ , then the percentage would be 0%. This percentage is then multiplied by the daily volume to estimate the amount of volume traded between the open and close.

The new volume figure is then added or subtracted from the previous day WVAD and drawn on a price chart. It can also be converted into a moving average or oscillator. Interpretation of the WVAD is identical to the other volume indexes.

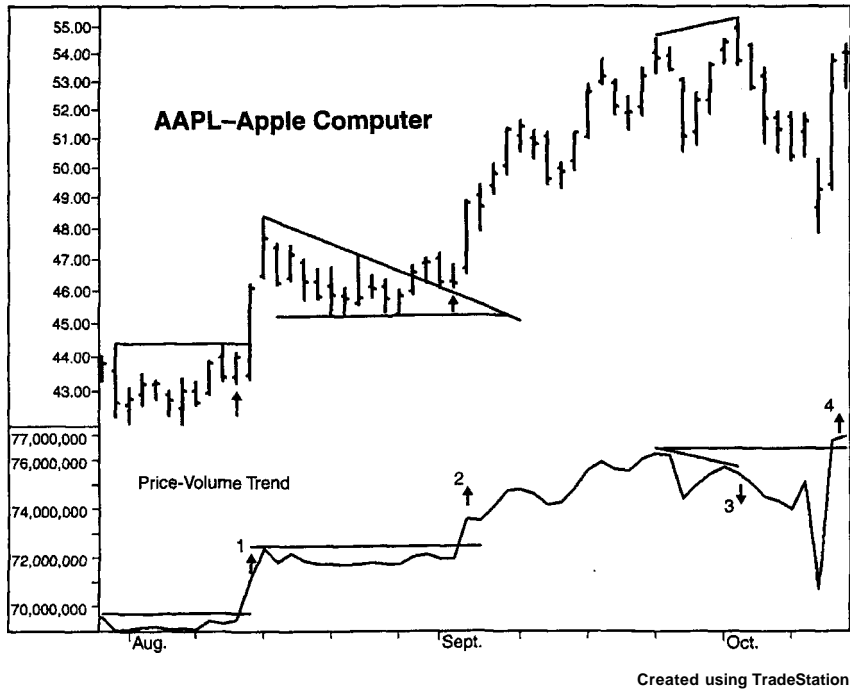


FIGURE 18.4 Price-volume trend [daily: August-October 2005]

#### *Accumulation Distribution (AD)*

In 1975, financial newspapers no longer published the opening prices of stocks. Marc Chaikin, using the Williams WVAD formula as a base, created the Accumulation Distribution (AD) index that uses the high, low, and close prices each day. The basic figure determines where within the daily price range the close occurs in the formula:

$$\text{Volume} \times \frac{(\text{close} - \text{low}) - (\text{high} - \text{close})}{(\text{high} - \text{low})}$$

Thus, if the close occurs above its midpoint for the day, the result will be a positive number, called accumulation. Conversely, a negative number occurs when a stock closes below its midpoint for the day, and distribution is said to occur. Each daily figure is then cumulated into an index similar to the OB V, and the same general rules of divergences apply.

Figure 18.5 shows a plot of the AD index using Chaikin's formula. You will see two divergences (solid lines) in the graph. First, a positive divergence occurs in early August. Second, a negative divergence occurs in late September. At roughly the same time that these divergences were signaling a possible trend change, trend lines in the AD were being broken. The arrows

indicate the price at the trend line breaks. The final upward break of resistance in the AX line suggested that prices would also reach new highs, because accumulation was considerably stronger than distribution. They did four days later.

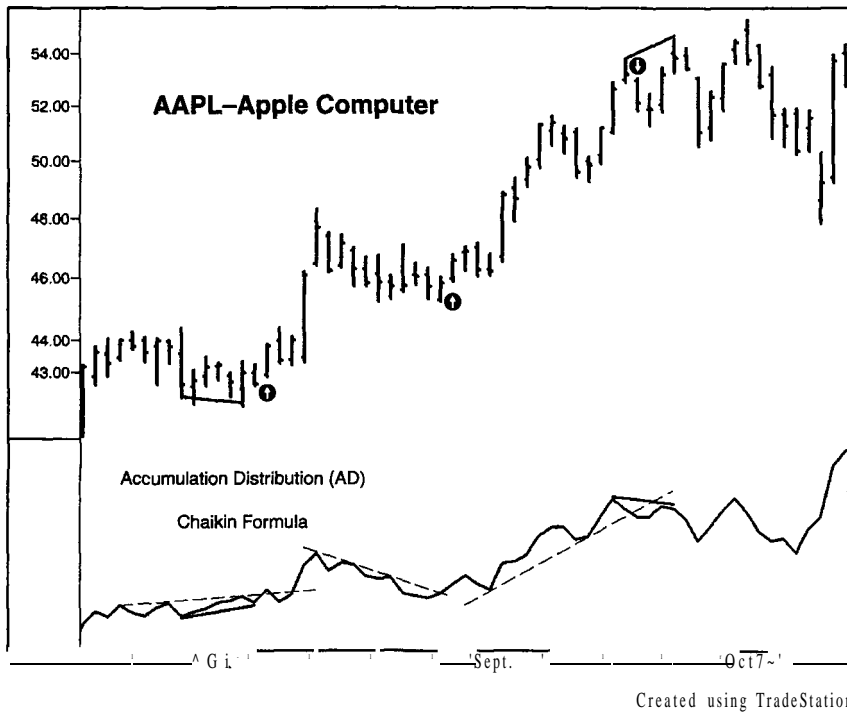


FIGURE 18.5 Chaikin Accumulation Distribution (daily: August-October 2005)

#### *Williams Accumulation Distribution (WAD)*

Not to be confused with the earlier Williams Variable Accumulation Distribution (WVAD) or Chaikin's Accumulation Distribution (AD), the Williams Accumulation Distribution (WAD) also eliminates the use of the open price no longer reported in the financial newspapers. This indicator uses the concept of True Range that J. Welles Wilder developed during the same general period.

The True Range uses the previous day's close as a benchmark and avoids the problems that arise when a price gaps between days. The calculations for the True Range high and low are based on a comparison. The True Range high, for example, is either the current day's high or the previous day's close, whichever is higher. The True Range low is either the current day's low or the previous day's close, whichever is lower.

In the WAD, accumulation occurs on days in which the close is greater than the previous day's close; the price move on these days is calculated as the difference between the current day close and the True Range low. Distribution occurs on a day when the close is less than the previous day's close; the price move on these days is the difference between the current day close and the True Range high, which will result in a negative number. Each price move is multiplied by the volume for the respective day, and the resulting figures are cumulated into an index, the WAD.'

## Volume-Related Oscillators

An *oscillator* is an indicator calculated from two moving averages. The oscillator represents mathematically the relationship between the two moving averages, usually in the form of a ratio of one moving average relative to the other moving average. Oscillators are calculated from moving averages, to dampen very short-term erratic motion. Using rates of change or ratios, however, makes them sensitive to changes in slope, and thus they are often called "momentum" indicators.

Oscillators are somewhat bounded, meaning that they usually have extremes beyond which they rarely go. When an oscillator approaches an extremely high level, an "overbought" condition occurs; when it approaches an extremely low level, an "oversold" condition occurs. Conventional overbought and oversold levels have been arbitrarily determined for each oscillator. The trader must be careful to test these levels for each specific security. Oscillators can have trend lines within them and will often show divergences from price. Mechanical signals based on them alone have not proven to be successful because the oscillator behavior depends on the nature of the underlying price trend. If prices are trending, the levels for overbought and oversold differ, or the oscillator remains in one or the other category for a long period and gives false signals.

Oscillators are extremely useful when prices are in a trading range. It is, thus, imperative not to use them alone without first understanding whether prices are trending. The trader can determine whether prices are trending by witnessing where recent prices are relative to a moving average or with other trend indicators such as the ADX (see Chapter 14, "Moving Averages").

### Volume Oscillator

The volume oscillator is the simplest of all oscillators. It is merely the ratio between two moving averages of volume. Its use is to determine when volume is expanding or contracting. Expanding volume implies strength to the existing trend, and contracting volume implies weakness in the existing trend. It is thus useful as a confirmation indicator for trend and for giving advanced warning in a range or consolidation formation of the direction of the next breakout. For example, if within the range, the oscillator rises during small advances and declines during small declines, it suggests that the eventual breakout will be upward.

Let us look at Figure 18.6. Like volume itself, the volume oscillator should confirm the price trend. In this example, the oscillator confirmed the price trend until early September.

1. Steven B. Achelis introduced a variation of the WAD in his book, *Technical Analysis from A to Z* (2001). This variation eliminates the multiplication by volume and is thus not a volume index but a price index, Achelis's variation is often incorrectly identified in software programs on price indicators as the Williams Accumulation Distribution.

Each time prices rose, the oscillator rose, and each time prices declined, the oscillator declined. This is the ideal picture for an upward trend. In early September, this relationship broke down, and volume failed to confirm the upward trend. This divergence was a warning that the stock trend was no longer healthy and that a longer-term downward reversal was likely.

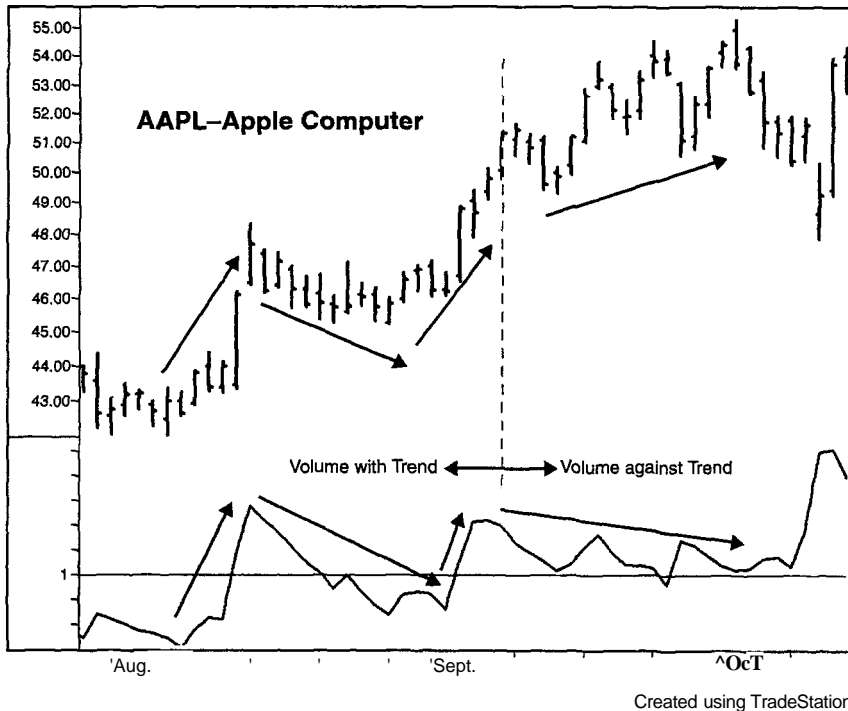


FIGURE 18.6 Volume oscillator (daily: August-October 2005)

### Chaikin Money Flow

The Chaikin Money Flow is an oscillator that uses the (Chaikin) AD calculation for each day. It is calculated by summing the ADs over the past 21 days and dividing that sum by the total volume over the past 21 days. This produces an oscillator that rises above zero when an upward trend begins and declines below zero when the trend turns downward.

Remember that each daily Chaikin AD calculation is based only on that particular day's high, low, and closing prices; therefore, if a gap occurs, it is not reflected in this oscillator. Another potential problem with this oscillator, as with all oscillators constructed using simple

moving averages, is that simply dropping the number that occurred 21 days prior from the calculation can influence the current value of the oscillator. Remember that as an oscillator, this tool is used for confirmation, not signal generation.

In Figure 18.7, the Chaikin Money Flow shows that Apple Computer stock price trend was healthy until the end of September, when a minor negative divergence developed. The oscillator then declined below zero, usually a sign that the trend has turned downward. The zero line is important because oscillators often turn up or down just before important peaks. From a very short-term prospective, this is useful information.

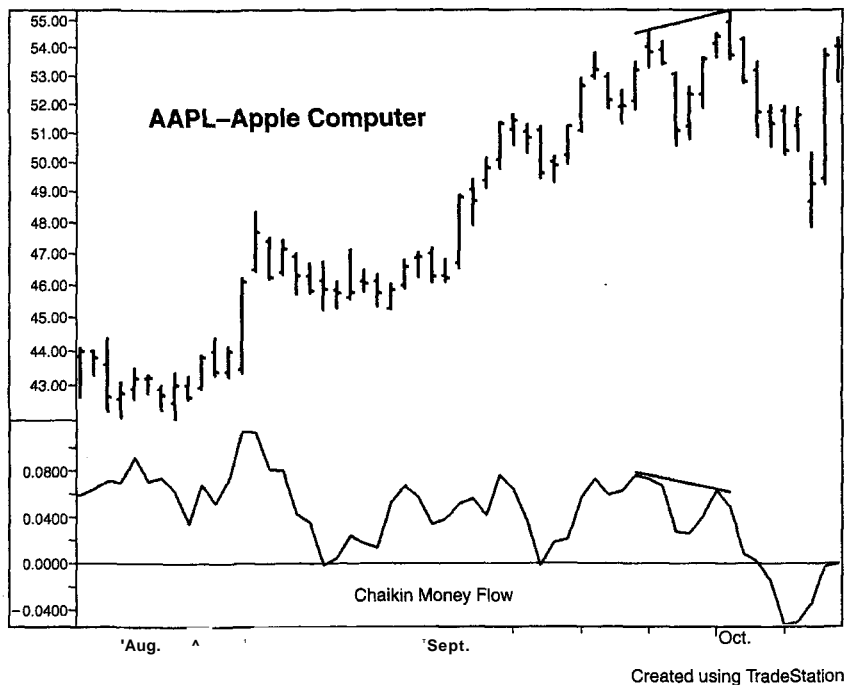


FIGURE 18.7 Chaikin Money Flow (daily: August-October 2005)

#### Twiggs Money Flow

Colin Twiggs of [www.incrediblecharts.com](http://www.incrediblecharts.com) has adjusted the Chaikin Money Flow to account for the potential problems of gaps and the 21"-day drop-off. Twiggs eliminates the problem of gaps influencing the price strength by using Wilder's True Range, similarly to how Williams uses it in his WAD. In addition, using Wilder's calculation of an exponential moving average solves the problem of the drop-off figure affecting the current oscillator.

### Chaikin Oscillator

Just **to** confuse things even more, Marc Chaikin invented the Chaikin Oscillator, as opposed **to** the Chaikin Money Flow. This oscillator is simply the ratio **of** the three-day EMA **of** the AD **to** the ten-day EMA **of** the AD. Chaikin recommends that a 20-day price envelope, such as a Bollinger Band, also be used as an indication **of** when signals from the oscillator will be more reliable. Most signals are from divergences.

### Money Flow Index (Oscillator)

Another method **of** measuring money flow into and out **of** a stock is the Money Flow Index. It considers "up" days and "down" days **to** determine the flow **of** money into and out **of** an equity. The money flow on any particular day is the day's typical, **or** average, price multiplied **by** the daily volume. The day's typical price is determined as the average **of** the high, low, and close. Therefore, money flow on Day *i* would be calculated as

$$MFi = \{ (\text{High} + \text{Low} + \text{Close}^*) / 3 \} \times \text{Volume}_i$$

If Day *i*'s average price is higher than the previous day's average price, there is positive money flow (PMF). Conversely, if Day *i*'s average price is lower than the previous day's average price, negative money flow (NMF) occurs. The analyst chooses a specific period **to** consider and sums all the PMF together and all the NMF for that period. Dividing the sum **of** PMF **by** the sum **of** NMF results in the money flow ratio (MFR):

$$MFR = \frac{\text{PMF}}{\text{ENMF}}$$

The Money Flow Index is then calculated using the formula:

$$\text{Money Flow Index} = 100 - 100 / (1 + MFR)$$

The Money Flow Index is an oscillator with a maximum **of** 100 and a minimum **of** 0. When positive money flow is relatively high, the oscillator approaches 100; conversely, when negative money flow is relatively high, the oscillator approaches 0. A level above 80 is often considered overbought and below 20 oversold. These parameters, along with the period, are obviously adjustable.

In addition, another variation **of** the Money Flow Index uses a ratio between positive money flow and the total dollar volume (rather than the NMF) over the specified period **to** calculate the money flow ratio. We used this method **of** calculation in Figure 18.8. Generally, the results **of** this method are not significantly different from the method we described earlier. **By** testing, we found that the best representation for Apple Computer over the time noted was a seven-day period and 80 and 20 as the overbought and oversold levels, respectively. Note that the negative divergences between price and the oscillator gave ample warning **of** a potential trend change. This example, however, is a demonstration **of** how overbought and oversold levels can also be used as setup signals. Acting only in the direction **of** the trend would have been generally profitable. As in all oscillators, however, testing and adjustment are necessary, and price trend is the most important factor.



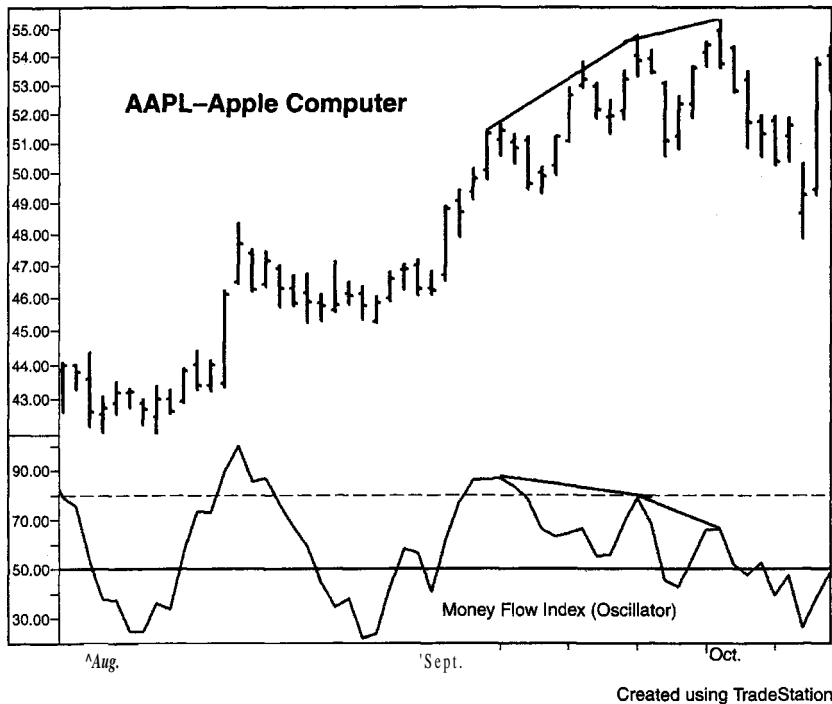


FIGURE 18.8 Money Flow Index (daily: August-October 2005)

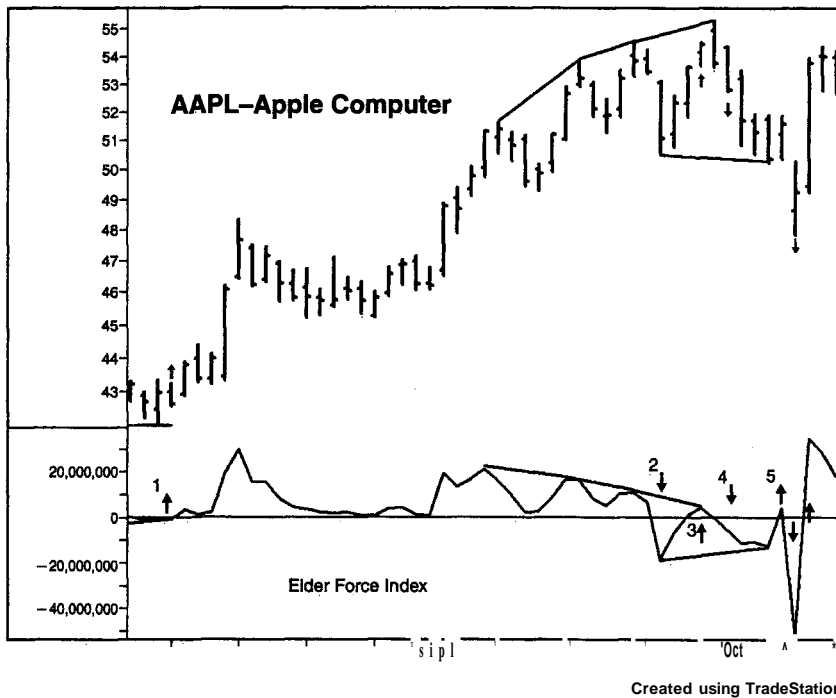
### Elder Force Index

The Force Index is an easy oscillator to calculate in that it uses only closing prices and daily volume. The daily price change is calculated as the daily closing price minus the previous day's closing price. This daily price change is then multiplied by the day's volume. The index is simply an exponential moving average over some specified period of the daily price change multiplied by the volume.

The purpose of this index is to measure the volume strength of a trend. The higher the level of the oscillator above zero, the more powerful the trend. A negative crossover through zero would thus indicate a weakening in trend power, and a deep negative would suggest strong power to the downside.

We have plotted the Elder Force Index in Figure 18.9. Elder suggests using either a two-day EMA for trading or a 13-day EMA for trend determination. However, we used seven days in our calculation for Apple because of an apparent 15-day price cycle in the stock. At Marker 1, a positive divergence occurred, followed by an upward break in the Force Index and, thus, a buy

signal. Then, for over a month, the Force Index remained above zero until a series of negative divergences developed in September. The negative divergences were followed by a break below zero at Marker 2, triggering a sell signal. The buy trade made at Marker 1 was a good trade, but several whipsaws have occurred. The sell signal at Marker 2 was immediately followed by a rally to new highs; the buy signal at Marker 3 was followed immediately by a new low. In both instances, a trader would likely have been stopped out for small losses, and the overall profit would have been admirable. This demonstrates why the trader must take more than just the oscillator into consideration. For example, just placing a sell stop at the low of the signal point (Marker 2) and moving it upward to the low of each successive day until finally triggered on the decline at Marker 4 would have kept the long position for a little longer and increased profit. Acting only after a divergence had occurred would have saved money. After the negative divergences in September, only short positions should have been taken on breakdowns through zero, with proper stop entries and exits. After the positive divergence in early October, only long positions should have been taken on the upward break of the zero line, again with stop entries.



Created using TradeStation

FIGURE 18.9 Elder Force Index (daily: August-October 2005)

### Other Volume Oscillators

We have just studied the most commonly used volume oscillators. As always, a large number of variations exist, a few of which we will mention here. Because these volume oscillators are variations of the more common ones we just discussed, the signals from overbought and oversold or divergences are similar.

Ease of Movement (EMV) is an oscillator developed by the volume expert Richard W. Arms. It uses a different calculation to determine daily price differences—namely, the average of the high and low for one day versus the average for the high and low of the previous day. The formula for calculating the EMV is the following:

$$\text{EMV} = \frac{[(\text{Low}_i + \text{High}_i) / 2 - (\text{Low}_{i-1} + \text{High}_{i-1}) / 2] + \text{Volume}}{[(\text{Low}_i + \text{High}_i) / 2]}$$

The result is a figure that measures the effect of volume on the daily range. The EMV is usually smoothed using a moving average because it can be erratic from day to day.

*Volume Rate of Change* is simply a ratio or percentage change between today's volume and the volume of some specified day in the past. For example, a ten-day rate of change would be today's volume versus the volume ten days ago. This method has problems because the drop-off number ten days prior, for example, will influence the current day's reading and may not have significance to recent trading. The ratio is used to identify spikes in volume (see the next section), but is not a reliable indicator by itself.

## Volume Spikes

Volume spikes (not to be confused with price spikes) are most common at the beginning of a trend and at the end of a trend. The beginning of a trend often arises out of a pattern with a breakout, and the end of a trend often occurs on a speculative or panic climax. Higher-than-usual volume tends to occur with each event. By screening for volume, the trader can often find issues that are either ready to reverse or that have already reversed. The usual method of screening for a volume spike is to compare daily volume to a moving average. The trader can look for volume that is either a number of standard deviations from the average volume or a particular percentage deviation from the average. As for interpretation of the spike when it occurs, it is often difficult to determine which variety of spike has occurred until after the spike peaks and you observe the subsequent price action.

Usually there is a reason for a volume spike, but the reason for the spike may be unrelated to the technical issues of price trends and behavior. Of course, heavy trading may be related to a news announcement made about the company. Or, heavy trading volume in a stock can occur if the stock is a component of an index or basket that had a large institutional trade that day. Options expiring can also influence volume figures. In all spikes, any outside reason must first be investigated because it may have nothing to do with the issue's trend and price behavior.

### Volume Spike on Breakout

Breakouts are usually obvious. High volume on a gap or on a breakout from a preexisting chart pattern is usually the sign of a valid breakout. Although breakouts do not necessarily require high volume, many analysts use a spike in volume as a confirmation of the breakout and ignore those without a volume spike.

### Volume Spike and Climax

A climax usually marks the end of a trend and either a subsequent reversal or consolidation. Climaxes come in many forms, however, and are not always identifiable except in retrospect. Generally, climaxes occur with one of the short-term reversal patterns outlined in Chapter 17, "Short-Term Patterns." These typically can be price spikes or poles, one- or two-bar reversals, exhaustion gaps, key reversals, or any of the other short-term reversal patterns.

## Examples of volume Spikes

A number of volume spikes appear in Figure 18.10. The first occurs on a breakaway gap from an earlier triangle formation. The second also occurs on a breakout, this time from a rectangle formation. However, the price peaks almost immediately at the top of the volume spike and goes into a consolidation that forms a descending triangle. The third volume peak is interesting because it does not occur on the breakout from the triangle but occurs later. The actual breakout includes low volume, bolstering Bulkowski's observations that volume does not necessarily occur on a breakout. The fourth volume peak comes on the break down from a rising wedge. This breakout is almost immediately reversed in a pullback to the wedge. Finally, the fifth volume spike, one considerably larger than any previous spike during this period, shows prices stopping at support and reversing intraday. The short-term pattern on the high volume day is almost a short-term Oops! Reversal partem (note the opening below the previous day's low), but the high failed to break above the previous day's low. Of course, it did break above it on the following day and rallied vigorously. These are just some examples of how a spike in volume often accompanies important price action.

### Shock Spiral

When we looked at the Dead Cat Bounce (DCB) in Chapter 17, we saw that a substantial volume spike occurs prior to the formation. Remember that the DCB occurs after a shocking news announcement causes a sudden and dramatic shift in price direction, usually accompanied by a large gap or a price spike. An extreme spike in volume accompanies that sudden shift. Tony Plummer (2003) uses the term "shock spiral" to describe the entire A-B-C pattern from the shock (A) to the DCB (B) to the final decline (C). The usual shock spiral is to the downside, but Plummer advocates that it can also occur on the upside.

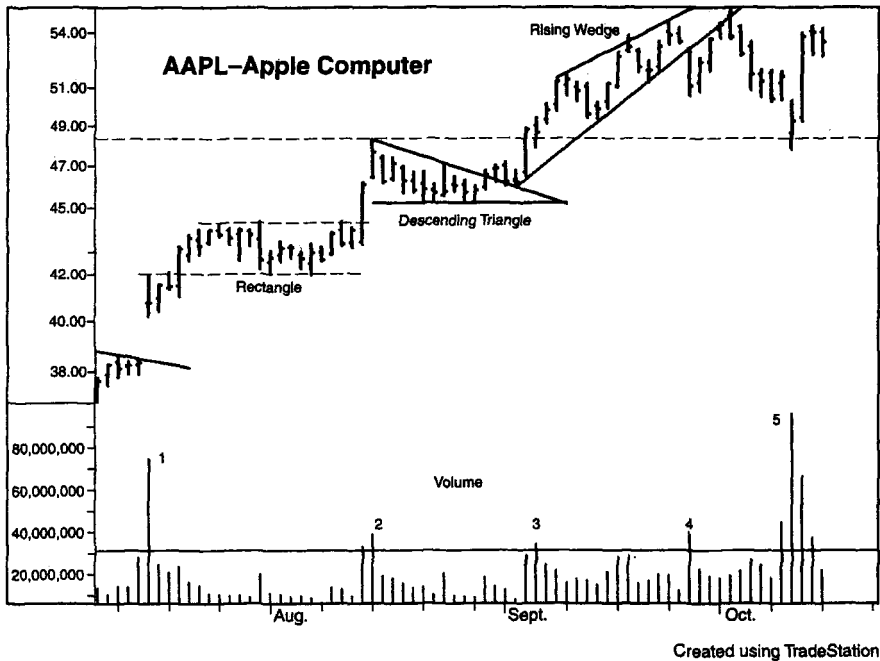


FIGURE 18.10 Volume spikes (daily: August-October 2005]

#### Volume Price Confirmation Indicator (VPCI)

In a series of two articles in *Active Trader Magazine* and one in the *Journal of Technical Analysis*, Buff Doremier (2005a, 2005b) introduces a method of comparing a volume-weighted price moving average to a simple price moving average to determine whether volume is confirming price action. A positive deviation in the VPCI suggests that the volume is confirming the price action, and a negative deviation suggests that the volume is contradicting price action.

#### Volume Dips

Sharp declines in volume are usually not meaningful. The decline in volume generally indicates a decline in interest in the security, which is usually accompanied by a decline in volatility. For that reason, the issue should be ignored during the period of low volume, but the trader should be watching for an increase in volume and volatility.

Look back at Figure 18.10. See how volume dips occur during consolidation areas: the rectangle and the triangle. This drop in volume is typical when interest in the issue is lacking. However, a volume dip is also typical for action just before a sudden expansion in price and volume, as in a breakout from a formation. Declines in volume can also occur before holidays, on summer days, and at other times when general activity is low.

## OPEN INTEREST

### What Is Open Interest?

In the futures markets, only contracts trade, not physical instruments or items. At the expiration of the specific futures market delivery month, the number of contracts reduces to zero as buyers and sellers "roll" their contracts into the next expiration, or make or take delivery of the product or cash as the contracts require. The number of contracts outstanding at any one time in each delivery month is its open interest. Total open interest is the number of contracts outstanding in all delivery months. It is an excellent tool in estimating the liquidity of most contracts. However, open interest is a different figure than volume. Volume is the number of contracts traded during a certain period in a specific futures market delivery month, not the number of contracts outstanding.

Although open interest is a good tool for estimating the liquidity of a contract, using it for technical trading can be a bit tricky. One problem is that open interest rises at the beginning and declines at the expiration of each contract market. This action is often unrelated to the trend. In addition, in many futures markets, the clearinghouse takes time to calculate the open interest and actual cleared volume. The figures are only available to the public on the following morning.

### Open Interest Indicators

Futures contracts are created as interest develops in the specific futures market and become eliminated as interest in the futures market recedes. Thus, the conventional interpretation of open interest is that expanding open interest confirms interest in the existing trend of the futures contract price. This expansion should also be accompanied by increasing volume. Expanding open interest and volume during an upward trend, for example, suggests buyers are creating more new contracts than old contracts. When the upward trend continues but open interest and volume decline, old contract holders are selling and absorbing any new buyers, suggesting that the trend may soon reverse direction. In a correction within an upward trend, declining open interest and volume suggest that the major trend is still healthy. In this sense, open interest is used similarly to volume.

Larry Williams believes that open interest reflects the commercials because they account for such a substantial percentage of volume activity. Commercials are generally short futures contracts used to hedge against inventory. Thus, a decline in open interest, he reasons, is a sign that commercials are covering shorts and that the price will likely rise. He warns that this strategy should only be used in a trading range, and that a 30% change in open interest is necessary before action is contemplated. Colby argues that Williams' strategy does not work in the stock index futures, but he did not test the requirement for a range only.

As we know from Chapter 7, "Sentiment," the Commodity Futures Trading Commission's Commitment of Traders Reports provide breakdowns in open interest by category of trader. Some analysts have compared this data with the data reported daily by the commodity

exchanges and used the resulting ratios and changes as indicators of professional and amateur trading action (Greco, 2001). These relations and calculations are complicated and go beyond our present scope.

#### Herrick Payoff Index (Oscillator)

John Herrick (1989) developed a complex oscillator based on price, volume, and open interest. As in many oscillators, interpretation is based on whether the index is above or below zero and whether divergences exist between volume and open interest and price velocity. Thomas Aspray (*Stocks & Commodities Magazine*, V.6:3, 115-118) has also found that in the Herrick Payoff Index, trend lines are often informative for warnings of a change in price direction, as are the penetration of support and resistance levels.

Figure 18.11 of corn futures displays the Herrick Payoff Index (HPI) and its 21-week EMA. Corn has some erratic moves over the period, but it often shows a divergence between price and the HPI (marked with a solid line) at its peaks and troughs. Unfortunately, divergences also occur during an advance or decline and must be confirmed by other evidence. Generally, when the HPI is above zero, prices are in an upward trend. This has not always been the case with

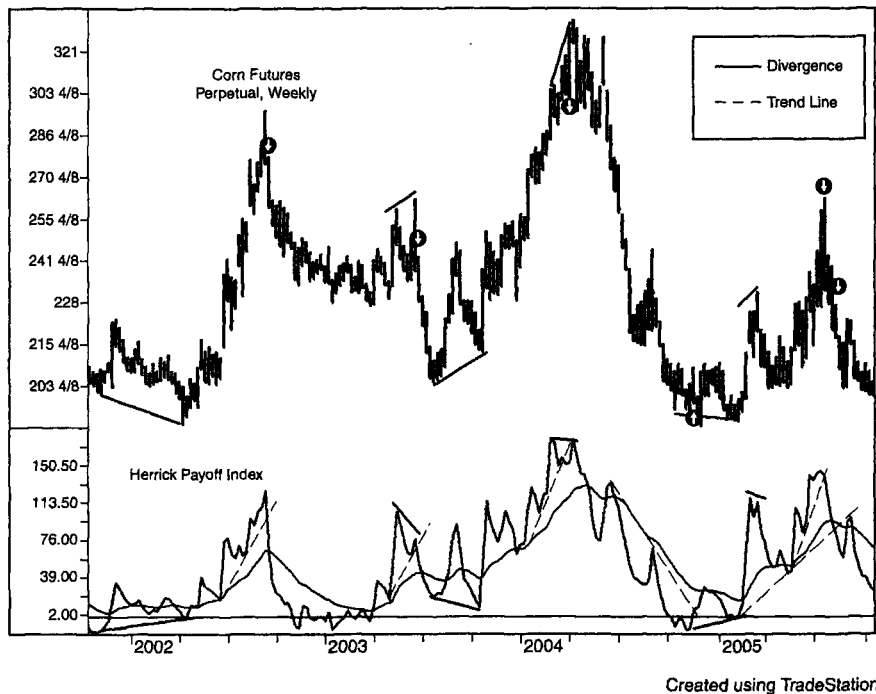


FIGURE 18.11 Herrick Payoff Index—corn, perpetual contract, weekly

com and is one reason for "being skeptical about breaks above and below the zero line. Trend lines are also shown in HPI (with dashed lines), as well as action price (arrow) at which they were broken. The combination of trend line breaks and divergences seems to be favorable.

#### Other Open Interest Indicators

A number of combinations of open interest, price, and volume have been proposed. Most demonstrate what the Herrick Payoff Index displays, and the methods of analysis are the same as for other oscillators. One example is the On Balance Open Interest Indicator. William Painter proposed this indicator, which uses open interest instead of volume in an OBV calculation in the Winter 1995 *Journal of Technical Analysis*. Another suggestion is the Price and Open Interest Index (POI), proposed by R. Earle Hadady (1989). This index is calculated similarly to the Price and Volume Indicator using the change in price times the change in open interest.

## PRICE CONFIRMATION

### What Is Momentum?

Momentum deals with the rate at which prices are changing. For example, in an uptrend, prices are rising and the trend line slopes upward. Momentum measures how quickly the prices are rising, or how steeply the trend line is sloping. In high school calculus, you probably learned that the slope of a line is called the first derivative, and that the change in that slope is called the second derivative. Momentum is thus the second derivative of price action over some period.

Momentum is similar to acceleration and deceleration. For example, let us assume that a car is initially traveling at a constant speed of 30 miles per hour; at this point, the car has a constant travel slope of 30. When the car starts accelerating, it is gaining momentum, and its travel slope is increasing. At some point, the car cannot maintain the level of acceleration, and the rate of increase in speed begins to decline. The car is then said to be decelerating, even though it is still traveling at an increasing rate of speed. The speed itself is not increasing as fast as earlier, so momentum is falling.

The same principle applies to markets. Speed is equivalent to the slope of the price trend—the number of points gained per day, for instance. Momentum is equivalent to the car's acceleration and deceleration and is the measure of the price trend's changing slope. Trend can be thought of as direction and momentum can be thought of as the rate of speed of the price change. For example, suppose that a stock is originally selling for \$25 a share. If the same stock is selling for \$30 a share five days later, then the stock price has increased by \$5 in five days. The momentum would be \$5 in five days (or \$1 per day). If over the next five days, the price continues to increase to \$34, the trend is still upward. However, the rate of change (or momentum) has slowed to \$4 in five days.

Technical analysts have developed many indicators to measure momentum, and these measures have become leading signal generators or confirmation gauges, telling us whether the trend slope is changing or not. When momentum is confirming the price trend, a "convergence" or "confirmation" occurs; when momentum is failing to confirm the price trend slope by giving



a warning signal, a "divergence" occurs. As a sign of price trend change then, the technical analyst often looks for a divergence.

Confirmation also is used to identify "overbought" and "oversold" conditions. Remember that prices never follow a trend in an absolute straight line. Prices oscillate about a central trend, deviating above and below the trend. When prices are considerably above the trend, the expectation is that prices will return down to the central trend and perhaps even fall below the trend line. When prices are noticeably above the central trend, an "overbought" condition exists. When prices are considerably below the trend, they are to be "oversold" and are likely to return up to the central trend and, perhaps, above.

Analysts have developed many types of oscillators to measure what is overbought and oversold. These oscillators usually are based on price but can also be based on volume or other data. Mathematically, these oscillators eliminate the trend and look only at the oscillations about the trend.

Suppose that you are watching a particular stock and notice a breakout occurring. An oscillator can be useful in determining the validity of the breakout. If an oscillator is oversold, this breakout is more likely to be valid than if the oscillator were overbought. However, in some instances, buy signals are generated from an overbought oscillator accompanied by other indicators (as we will see with the popsteckle later in this chapter).

A word of warning about using oscillators, however, is warranted. Traders often incorrectly use oscillators to generate signals without respect for the underlying trend direction. This will result in many false signals. Remember, profits are made from anticipating and riding the trend. Indicators and oscillators should only be used as secondary evidence to confirm the trend; otherwise, the analyst is likely in for trouble.

To combat the tendency to focus on overbought/oversold signals while ignoring the underlying trend, analysts have developed a number of adjustments and filters to account for trend more mechanically. Adjustments include altering the oscillator parameters, such as the period over which the oscillator is calculated and the signal levels. Other adjustments are even more sophisticated, using digital filters or other mathematical means of filtering and smoothing. The bottom line, however, is that by-and-large the results are the same. In fact, some analysts argue that increasing the complexity of the calculations only produces a false confidence. They also argue that complexity breeds an increase in the possibility for error when one of the parameters changes and does not allow the analyst the opportunity to gain practical experience. The indicator or oscillator becomes too mechanical. Whatever the arguments, however, even in their simplest forms, indicators and oscillators are useful as confirmation of price behavior, once the quirks are understood and the dependence upon them is secondary.

## **How Successful Are Momentum Indicators?**

Momentum indicators are based on price information. Most academic studies of technical indicators attempt to demonstrate whether price action is random and, if not, whether this apparent nonrandomness violates some of the principles of the Efficient Markets Hypothesis. As such,

these studies are usually of little use to practicing technical analysts who introduce many more variables into trading or investment decisions.

It is difficult for academics to construct tests that take into account all of the intricacies of real trading. When studying moving averages, for example, how would the requirement for protective stops around support and resistance be integrated? What kind of exit strategy should be used?

The trader must account for risk, as well as return, when considering the usefulness of an indicator. The academic concept of risk is considerably different from that which the practical investor must consider. Therefore, as we will see in Chapter 22, "System Design and Testing," when we look at testing methods, the measurements of risk provided in academic studies are not the same measures that a practitioner would use.

Finally, we will note that any method tested by academia has very likely already been discarded by the technical analysis world as outdated. By its nature, academia will always be behind the advances made in the more practical world. Nevertheless, academic studies are useful in determining the direction in which to look for means of profiting from technical analysis. For example, if a particular indicator shows no advantage over the random hypothesis, it should be treated with considerably more skepticism than one that does show some statistically relevant results.

Most academic studies of price indicators, so far, have focused exclusively on moving averages. Interestingly, there have been very few studies of standard technical indicators. The two most recent studies of indicators are Bauer and Dahlquist (1999a, 1999b) and Thomas (2003). The Bauer and Dahlquist study covered 60 technical signals, including popular oscillators, for 878 stocks over the period from 1985 through 1996, a period of generally rising stock prices. The Thomas study included price and volume oscillators for 1,750 stocks over the five-year period from 1995 through July 2001, a time during which the stock market had a significant advance and decline.

## Specific Indexes and Oscillators

Remember that because momentum indexes and oscillators are based on price data, they do not add new information to the analysis. They are simply manipulations of the same data. This means that they are less informative than other indicators, such as volume, that provide new and different information. The analyst therefore must be careful when using price indicators, as confirmation may be more redundant than informative. This is not to say that a different manipulation of the data cannot be helpful, only that the base data itself is the same. For example, watching several different price oscillators calculated over the same period is silly because by their nature, they will be providing roughly the same results. Watching several price oscillators over different periods or including volume or some other different information would be more productive.

We describe the most common price momentum oscillators next. There are many ways of calculating momentum, but because all of them arrive at essentially the same result, we describe only the most common and most popular.

### Moving Average Convergence-Divergence (MACD)

Gerald Appel, publisher of *Systems and Forecasts*, developed the Moving Average Convergence-Divergence (MACD) oscillator. A variation of the moving average crossover, the MACD is calculated using the difference between two exponential moving averages. Traditionally, a 26-period EMA is subtracted from a 12-period EMA, but these times are adjustable for shorter and longer period analysis. This calculation results in a value that oscillates above and below zero. A positive MACD indicates that the average price during the past 12 periods exceeds the average price over the past 26 periods.

The MACD line is plotted at the bottom of a price chart along with another line—the signal line. The signal line is an exponential moving average of the MACD; a nine-period EMA is the most common. A histogram of the difference between the MACD and the signal line often appears at the bottom of the chart. You can see this type of plot in Figure 18.12. The chart displays the MACD (thin black line), the signal line (thick gray line), and the histogram of the difference between the MACD and its signal line for Apple Computer over the same period as the other charts in this chapter.

The MACD is useful in a trending market. When the MACD is above zero, it signals that the faster (shorter-term) moving average is above the slower (longer-term) moving average. The converse is true when the MACD is below the zero line. Crude signals occur when the MACD crosses the zero line, but these are just the same signals as would be generated from a moving average crossover.

Other information can be gleaned from the MACD, however. For example, when the MACD is above zero, suggesting an upward trend, buy signals occur when the MACD crosses from below to above the signal line. Downward crossings are not at all reliable while the trend is upward. Through experimentation to determine overbought and oversold levels, analysts can use these levels as places to generate signals for price reversion to the central trend. These extremes showed good performance results in the Thomas study of oscillators.

Additionally, some analysts compare the peaks and valleys in the MACD to the price line in a divergence analysis. Bauer and Dahlquist suggest that divergences can be useful, especially in a downward trending market. The peaks and valleys in the histogram provide two useful sets of information. They can be used for divergence analysis, and because they are sensitive to price directional change over short periods, they can also be used to signal shorter price trend changes within the longer trend.

Let us look a little more closely at Figure 18.12. The MACD is above zero for the entire period. This suggests that the underlying trend is upward and that only buy signals should be followed. Buy signals occur with upward crossovers of the MACD above its signal line; these are marked with arrows in a circle. Notice that downward crossovers are not profitable when the trend in prices is up.

Small arrows mark the valleys of the histogram and thus potential trading signals that precede the crossover signals. The peaks in both the MACD and the histogram show periods when momentum diverges from price, and the light horizontal line shows a hypothetical overbought line that suggests when the MACD has reached an upper extreme and prices are due to correct.

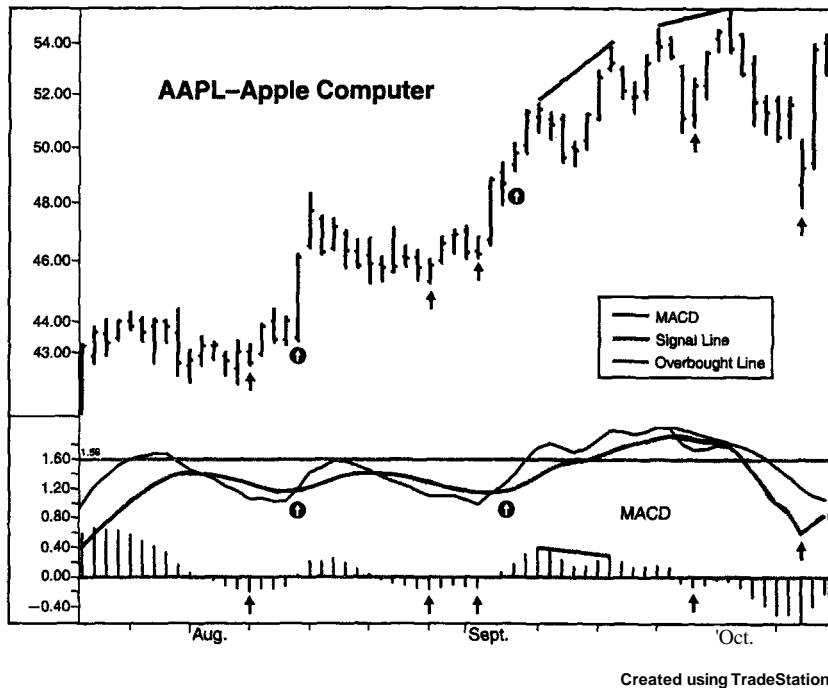


FIGURE 18.12 Moving Average Convergence-Divergence (daily: August-October 2005)

### Rate of Change (ROC)

Rate of change (ROC) is likely the simplest oscillator. It is a measure of the amount a stock's price has changed over a given number (N) of past periods. The formula for calculating ROC is as follows:

$$\text{ROC} = \left\{ \frac{P_{\text{today}} - P_{N \text{ periods ago}}}{P_{N \text{ periods ago}}} \right\} \times 100$$

With this calculation, ROC is zero if the price today is the same as it was N periods ago. It shows on a continuous basis how the current price relates to the past price.

Even though it is very simple to calculate, the ROC has many problems as an indicator. Although economists often calculate ROC using macroeconomic data, usually on an annual basis to minimize seasonality, it suffers from the drop-off effect. Only two prices,  $P_{\text{today}}$  and  $P_{N \text{ periods ago}}$  appear in the calculation, and these two prices are equally weighted. Therefore,

the older price that occurred  $N$  periods ago has the same effect as the current, and probably more relevant, price on the oscillator. The ROC can thus have a current rise or fall based solely on what number drops off in the past. Some analysts will smooth the ROC with a moving average to dampen this effect.

Analysts use the ROC in the standard four ways. Its position relative to zero can indicate the underlying trend; it can be a divergence oscillator showing when the momentum relative to the past is changing; it can be an overbought/oversold indicator; and it can generate a signal when it crosses over its zero line. In none of the instances is the signal reliable, however.

Figure 18.13 shows a graphical representation of a 14-day ROC for Apple Computer. As in most oscillators, the analyst must determine the trend in prices before using the ROC. Looking at the price bar chart, AAPL is clearly in an uptrend. The fact that the ROC is consistently above zero is consistent with this upper trend. (As long as the price today is higher than the price 14 days ago, the ROC will be positive; a negative ROC suggests that today's price is lower than the price 14 days ago.)

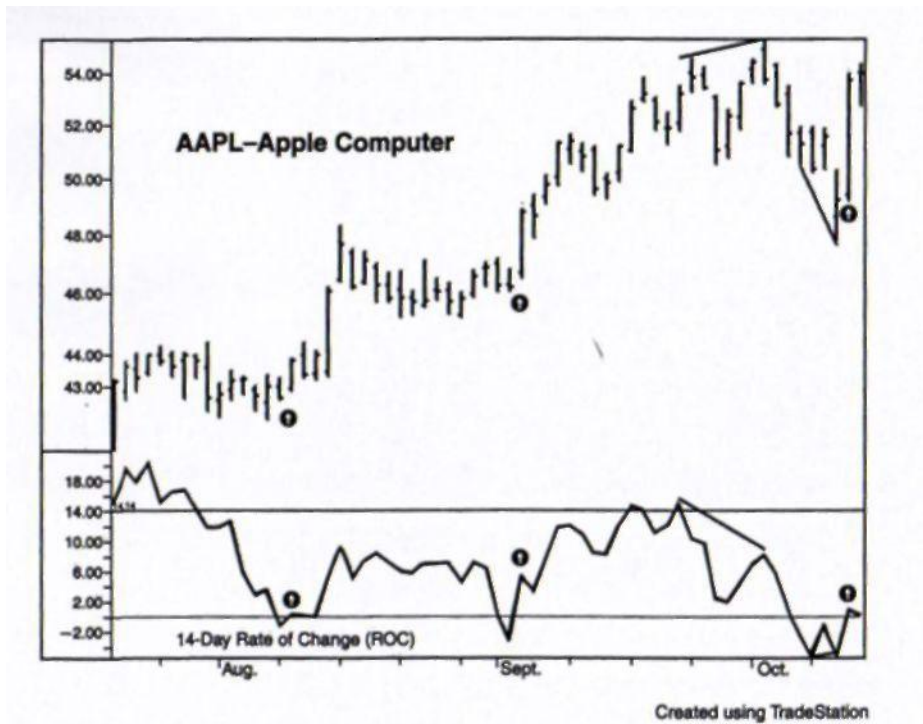


FIGURE 18.13 Role of change (daily: August-October 2005)

With an upward trend, one way to use the ROC is for the crossover of the ROC upward through the zero line to trigger a buy signal. Another way to use the ROC is to look for divergences. The divergences shown first give a negative warning of a peak in prices in late September; higher prices are occurring on lower momentum. Then a positive divergence occurs in mid-October, suggesting the possibility of a price rally. Finally, the hypothetical overbought line at 14 shows when the ROC has reached an extreme and prices are due for a correction.

#### Relative Strength Index (RSI)

In June 1978, J. Welles Wilder introduced the relative strength index (RSI) in an article in *Commodities* (now known as *Futures*) magazine. The RSI measures the strength of an issue against its history of price change by comparing "up" days to "down" days. Wilder based his index on the assumption that overbought levels generally occur after the market has advanced for a disproportionate number of days, and that oversold levels generally follow a significant number of declining days.

Be careful to understand that the RSI measures a security's strength relative to its own price history, not to that of the market in general. Because of its name, a common misconception is that this indicator compares one security to other securities.

To construct the RSI, several calculations must be made, as follows:

$$\begin{aligned} \text{UPS} &= (\text{Sum of gains over } N \text{ periods}) / N \\ \text{DOWNS} &= (\text{Sum of losses over } N \text{ periods}) / N \\ \text{RS} &= \text{UPS/DOWNS} \\ \text{RSI} &= 100 - [100 / (1 + \text{RS})] \end{aligned}$$

The RSI can range from a low of 0 (indicating no up days) to a high of 100.<sup>2</sup> In his original calculations, Wilder used 14 days as the relevant period. Although some analysts have attempted to use a time-weighted period, these methods have not been well accepted, and the 14-day period remains the most commonly used.

After calculating the RSI for the first 14 days, Wilder used a smoothing method to calculate RSI for future days. This process dampens the oscillations. For day 15 and after

$$\begin{aligned} \text{UPSd}^*_{i,j} &= [( \text{UPSd}_{i-1,j} \times 13 ) + \text{Gain}_{i,j} ] / 14 \\ \text{DOWNS}^*_{i,j} &= [( \text{DOWNS}_{i-1,j} \times 13 ) + \text{Loss}_{i,j} ] / 14 \end{aligned}$$

These measures for UPS and DOWNS are used to calculate RS and RSI. This method of smoothing the averages is now called the "Wilder exponential moving average" and is used in many other indicator formulas. We saw, for example, in the section on volume oscillators earlier in this chapter that the money flow oscillator uses the RSI formula.

2. DOWNS is the sum of losses. In the calculation, the absolute values of the losses are added together. In other words, if a stock closes at \$36 one day and \$34 the next day, the loss is \$2 (not a -\$2 loss).

The RSI has many characteristics that can generate signals. For example, when the RSI is above 50, the midpoint of the bounded range, the underlying trend in prices is usually upward. Conversely, it is downward when the RSI is below 50.

Overbought and oversold warnings are the same as with many other indicators. Wilder considered, for example, an RSI above 70 to indicate an overbought situation and an RSI below 30 to indicate an oversold condition. Analysts will often adjust these levels based on the underlying trend. Chuck LeBeau, for example, uses 75 and 25 as the overbought and oversold extremes.

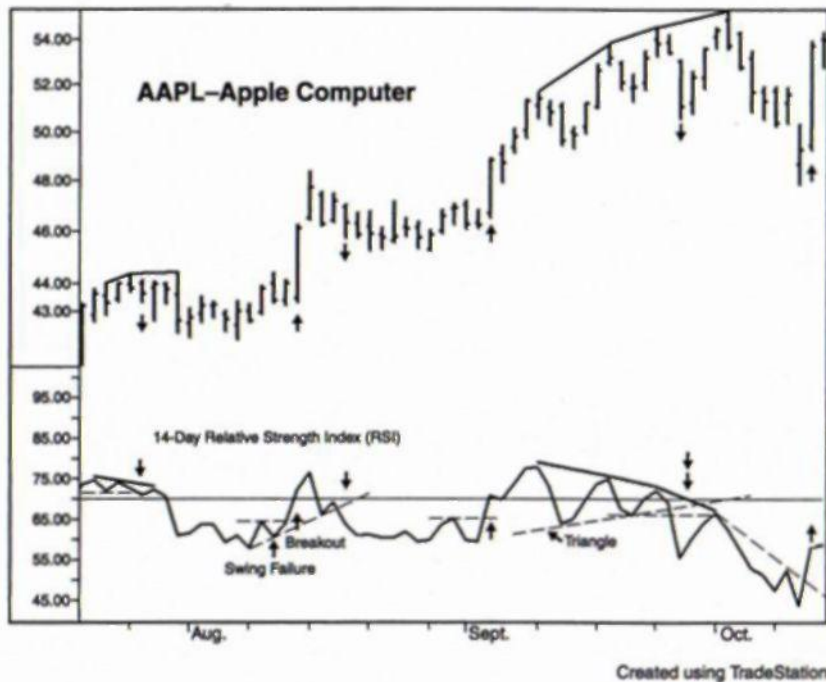
Similar to other oscillators, RSI divergences with price often give warning of trend reversal. The RSI also appears to have patterns similar to price charts. Triangles, pennants, flags, and even head and shoulders patterns occur, and support and resistance levels become signal levels. The rules for breakouts from these formations are used for signals from the RSI.

Another method of signaling is failure swings. A failure swing occurs when the oscillator exceeds a previous extreme, top or bottom, corrects, and then heads for the old top or bottom but fails to exceed it. If prices did exceed their previous extreme after this failure in the RSI, we would have a divergence, but a swing failure does not require a divergence. If the second run fails to exceed the peak (or valley) of the first run and then breaks through the retracement high (or low), it gives a swing failure signal. This type of signal occurs in Figure 18.14. Although swing failure signals can occur in other oscillators, they seem to be more common in the RSI.

A short-term trading method using the RSI is to place a buy stop above the daily high when the RSI declines 10 points from a recent peak above 70. This should only be used when the trend is upward and never when a downward swing failure develops. The buy stop can be adjusted each day until either it is triggered for a day or two trade or the RSI continues to decline, suggesting that the trend is reversing downward.

There is also the method called the "RSI is wrong." In Figure 18.14, the RSI remains above or near the overbought level for a substantial period, during which the AAPL price continued to rise. This method suggests that rather than looking for a top when the overbought level is penetrated, buy the issue and use a sell stop. *Active Trader Magazine* (August 2004, p 64-65) tested an "RSI is wrong" system, not optimized, on 19 futures from 1994 through 2003 with the following rules: Buy when 14-day RSI penetrates above 75; sell when RSI penetrates 25 or after 20 days. The opposite rules apply for sells using a break below the RSI 25 level as the initial short sale. The results showed a steady, straight equity curve especially for long positions.

Thomas (2003), in his testing of the RSI, found that none of the conventional signals had value except the positioning opposite from the conventional overbought/oversold levels of 70 and 30. His testing showed promise for the "RSI is wrong" thesis. Bauer and Dahlquist found that the conventional use, called a "crossover" system, of selling on a break below the overbought 70 and buying on a break above the oversold 30 had marginal returns during the period tested. They also found that using peaks above 70 and below 30 had marginal returns, and that the opposite buying at peaks outperformed all signals. Their testing method, however, judged against the percentage of time in a position and did not account for the reduction in risk when in cash. Nevertheless, the results were "disappointing."



RGU1E1L14 RSI (daily: August-October 2005)

Let us look a little closer at Figure 18.14 to see how an analyst might use the RSI. Because the underlying trend in AAPL during our sample period is upward, the RSI hangs around the overbought level of 70. Signals generated by breaking below the overbought level are not profitable and suggest that the level should be increased. However, other signals appear to have some merit over this timeframe. Look at the negative divergences that formed in July; these warned of the stagnant period that occurred in early August. The negative divergences formed in September warned of the correction that occurred in October. The RSI produced many swing failure signals (shown with small arrows) and even formed a symmetrical triangle in late September. Trend lines appear frequently, as do support and resistance levels.

As the many warnings and signals that occur in Figure 18.14 suggest, the RSI cannot be interpreted mechanically and is, perhaps, why it does not test well. However, the action is informative and useful to many traders. In a survey of traders taken in 2005 (Earle), the most popular indicator was the RSI. In short, traders have developed many methods. If you wish to use the RSI as a confirming indicator, you must learn these methods, experiment with them, and always be sure of the underlying price trend.



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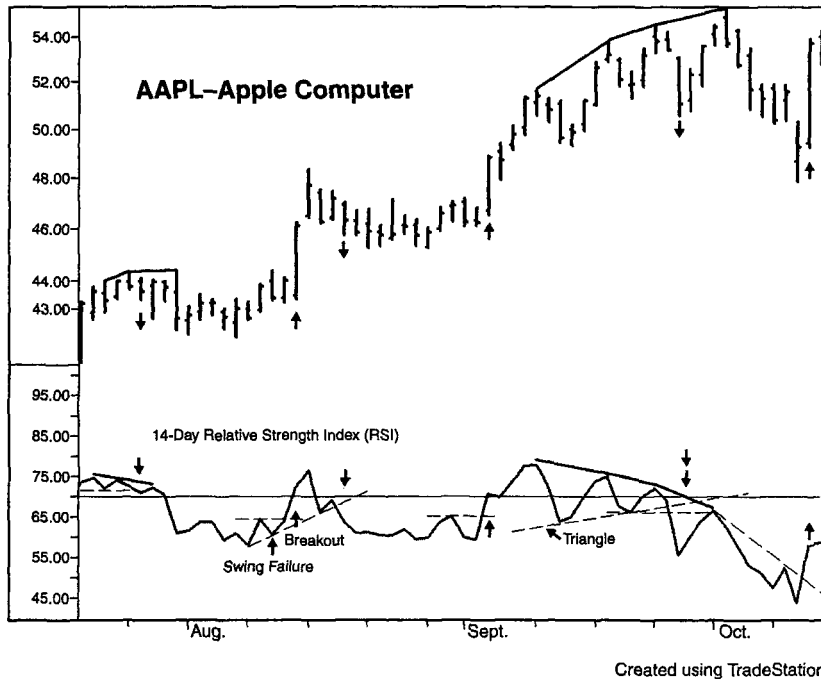
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Created using TradeStation

FIGURE 18.14 RSI [daily: August-October 2005)

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### Stochastic Oscillator

All oscillators use a specific time over which they are calculated. The traditional periods for the MACD are 26 and 12 bars; the RSI traditionally uses 14 bars for its calculation. These oscillators depend on smoothing techniques that tend to dampen the most recent price action. The stochastic takes another tack. It looks at the most recent close price as a percentage of the price range (high to low) over a specified past "window" of time. This makes it very sensitive to recent action. Analysts use the stochastic for trading or investing when the most recent close is the most important price.

It is not absolutely clear who was the inventor of stochastics. George Lane is known for promoting the concept since 1954 (Lane, 1985), and it is sometimes referred to as Lane's Stochastic (Colby, 2003), but others apparently preceded him. Two names mentioned are "Ralph Dystant and a dentist friend of his" and Richard Redmont (Larry Williams, 2004). Dystant introduced the indicator as part of an Elliott wave course through his Investment Educators, and Lane, who lectured for that firm, took it over on Dystant's death in 1978.

Not only is the inventor of stochastics unknown, the origin of the term "stochastics" is not clear. The name of this oscillator has nothing to do with the scientific term "stochastic," which means random or nondeterministic. Of course, traders would hope that this indicator did not produce random results. So, how did the name stochastic become associated with this indicator? According to Gibbons Burke (<http://www.io.com/gibbonsb/trading/stochastic.html>), Tim Slater, founder and president of CompuTrac Inc., included this indicator in the company's software analysis program in 1978. He needed a name to attach to the indicator other than the %K and %D we will see in the indicator calculation. Slater saw a notation of "stochastic process" handwritten on the original Investment Educators literature he was using. The name stuck. Regardless of who the actual inventor might be or how it got its name, the stochastic oscillator is one of the most popular, both for long- and short-term momentum signals.

The formula for the stochastic is as follows:

$$\%K - ((C - L) / (H - L)) \times 100$$

last %D - 3-bar SMA of %K

slow %D - 3-bar SMA of %D

Where: W Is the time window (that is, 14 bars)

H is the high (or the window period (w))

L is the low for the window period (w)

C is the most recent bar close (w)

The "fast" stochastic, as seen in most trading software, refers to the raw stochastic number (%K) compared to a three-period simple moving average of that number (fast %D). This number is extremely sensitive to price changes. Because of the erratic volatility of the fast %D, many false signals occur with rapidly fluctuating prices. To combat this problem, analysts have created the

"slow" stochastic. The slow stochastic is designed to smooth the original %D again with a three-period simple moving average. In other words, the slow stochastic is a doubly smoothed moving average, or a moving average of the moving average of %K.

Analysts often create their own variations of the stochastics formula. Lane, for example, smoothed the numerator separately from the denominator in the %K formula, and then divided each rather than smoothing the %K itself (Merrill, 1986). He also used only five days in the time window.

The question of how many periods to use in the window is problematic. The volatility and cyclical nature of the issue traded, as well as the tendency for these factors to vary, are integral to choosing a window period. Larry Williams uses a composite of different time window periods and the true range rather than the high and low for his "Ultimate Oscillator." Others adjust the window period, as well as the number of bars used in smoothing the %K based on their interpretation of the dominant cycle in prices. Many analysts just test the results of signals over different windows to see which works best.

As in most oscillators, the stochastic works better in a trading range market but can still give valuable information in a trending market. In a trending market, divergences, trend line breaks, and swing-failures generate signals. During trading ranges, crossovers and swing-failures generate signals when the stochastic reaches overbought or oversold, traditionally 80 and 20. Crossovers occur when the fast stochastic crosses over the slow stochastic. Following crossovers without other confirming evidence, however, can cause whipsaws.

As in the RSI and many other oscillators, chart patterns, such as triangles and pennants, can also evolve in the stochastic oscillator. Support and resistance levels, even without swing failures, can be useful signals or warnings, and trend lines often appear to warn of potential changes in momentum. All standard technical rules apply to oscillators. However, oscillators by themselves should never be used strictly for signals. The analyst must confirm any oscillator signal with price action—a breakout or a pattern.

Academic testing of standard stochastic signals has had the same mediocre results as with other oscillators. This is not surprising, of course, because the determination of trend or trading range is rarely included in academic studies. Indeed, the fact that some positive results have occurred is encouraging, considering the primitive definitions of signals and circumstances used. Thomas (2003) found that extreme levels of overbought and oversold were somewhat predictive of future price direction but that most standard overbought/oversold interpretations failed. Bauer and Dahlquist (1999) found that acting at peaks and troughs above and below overbought and oversold respectively had better results on the long side than the short side. Unfortunately, trend was not a consideration in the testing, and the period tested (1985-1996) was one of a historically large upward trend when short signals would be expected to fail. Thus, the positive results for long signals were encouraging, considering that the signals had to keep up with the values in a generally rising market.

Figure 18.15 shows a 14-3-3 slow stochastic. This means that a 14-day time window was used; %D was smoothed once using a three-day SMA and again using another three-day SMA.

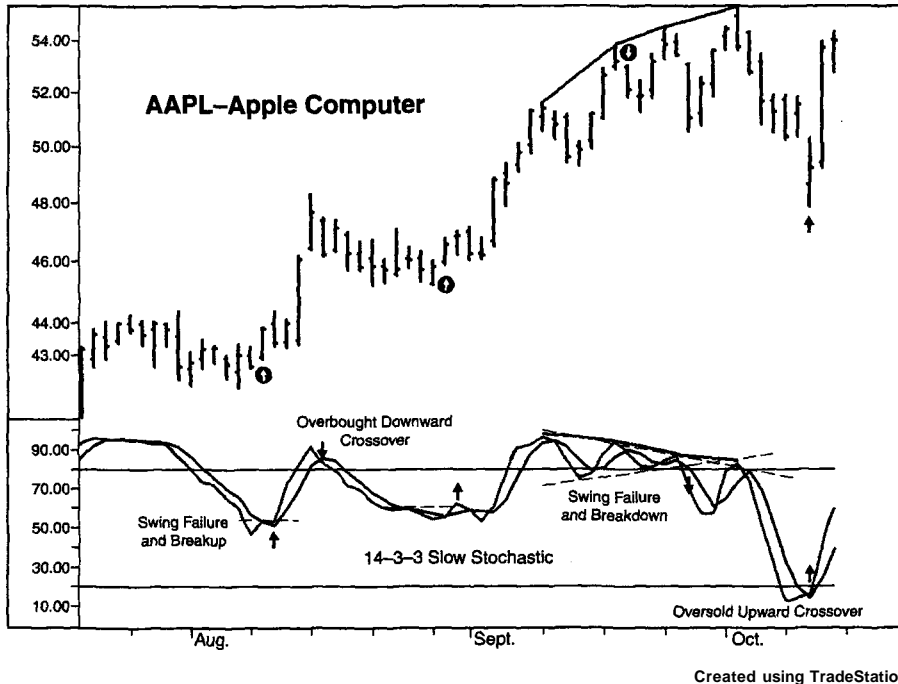


FIGURE 18.15 Stochastic (daily, August-October 2005)

AAPL is in a trending mode during the period considered. As such, trading using overbought and oversold signals is dangerous because the stochastic often will not reach one or the other extreme. For example, during the corrections in early and late August, the stochastic crossed below the 80 overbought level but never reached the oversold level. Thus, breakdown sell signals in a rising trend must be suspect. They can signal the time to get out of a long trade, but they do not necessarily signal the time to enter a short trade. Conversely, several swing failure signals did occur at opportune moments. The upward signal in early August was timely, as was the downward swing failure signal in September. Indeed, the September signal resulted in the stochastic becoming oversold, an indication that the longer trend was consolidating and that a trading range market was likely beginning.

Remember that in a trading range market, overbought and oversold crossovers are more useful. Crossovers within the overbought/oversold bounds are often whipsaw signals as those that occurred in late August and late September. Notice also that as the early October price

decline approached, several negative divergences occurred between price and the stochastic. These were warnings that the upward momentum was waning. In addition, a symmetrical triangle formed in the stochastic that was broken on the downward swing failure.

#### Other Oscillators, Similar to the Stochastics

##### *Williams %R*

The Williams %R oscillator is almost identical to the stochastic. It can be thought of as an inverted stochastic. Instead of comparing the current close to the low that occurred during the time window, the Williams %R compares the current close to the high that occurred during the time window. Thus, the formula for the Williams %R is as follows:

$$\%R = [(H-C)/(H-L)] \times 100$$

The Williams %R tells whether a stock is at a relatively high point in its trading range, while the stochastic indicates whether a stock is at a relatively low point in its trading range.

##### *Commodity Channel Index (CCI)*

The Commodity Channel Index (CCI) is also very similar to the stochastic. Donald Lambert developed this indicator, describing it in the October 1980 issue of *Commodities* (now known as *Futures*) magazine. Do not be fooled by the name of the indicator; it can be used in any market, not just commodity markets. The CCI measures the deviations of a security's price from a moving average. This gives a slightly different picture than the stochastic, and in some cases, the signals are more reliable. However, the difference between the CCI and the stochastic is so miniscule that using both would be a duplication of effort and liable to create false confidence. Figure 18.16 shows how similar the CCI and the stochastic are.

The CCI is not bounded—that is, it can rise above +100 and fall below -100—as is the stochastic, and this bothers some analysts. To avoid this problem, some analysts use a stochastic calculation on the CCI, bounding the CCI to 0 to 100 and smoothing the CCI at the same time. Barbara Star reports in *Active Trader Magazine* (2004) that in trending markets, this bounded, smoothed CCI is often useful for entries in the trend direction, but not in a counter-trend direction, and in trading markets, it often gives overbought and oversold signals.

#### Similarities Between Oscillators

Figure 18.17 shows a standard 14-day RSI compared to a three-day to ten-day MACD. See how the two lines follow almost identical paths. It is thus redundant and nonproductive to use many oscillators that essentially tell the same story. This is why most analysts prefer to use just one, or perhaps two, oscillators and learn their complexities and intricacies well rather than depend on mechanical signals from many.

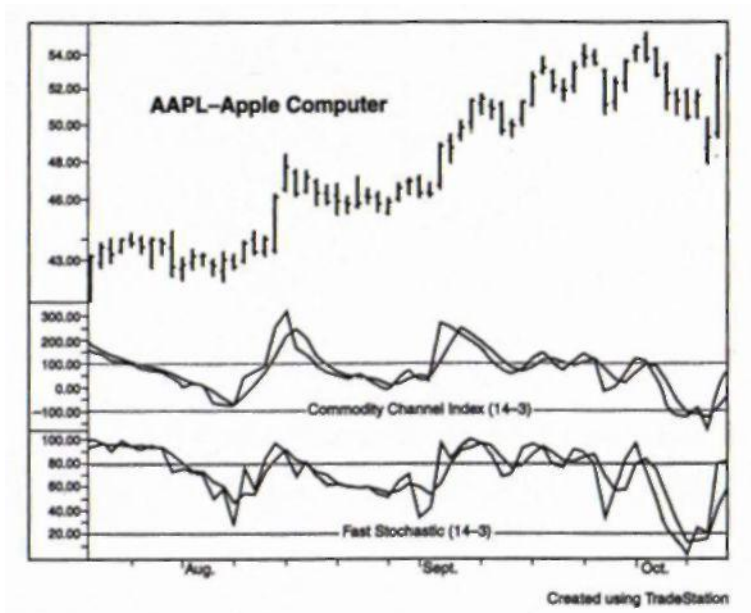


FIGURE 11.16 CCI (daily: August-October 2005)

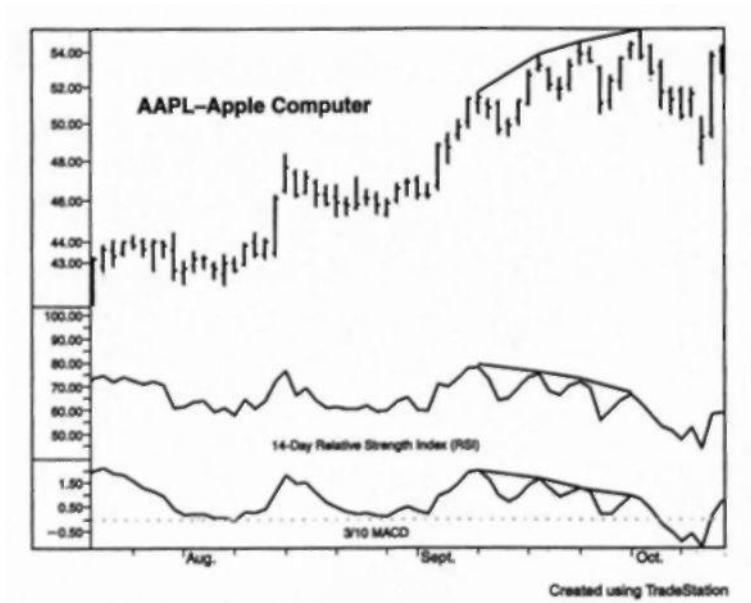


FIGURE 18.17 AMCD and RSI (daily: August-October 2005)

### Combinations—Determining Trend and Trading Range

In Chapter 14, we discussed trends, moving averages, and especially the use of the ADX and its component parts, the DMI+ and DMI-. We found that moving averages were only profitable in trending markets, just as we have found in this chapter that oscillators are more profitable in trading markets. The problem, then, is to be able to determine whether a particular market is trending or trading. Usually markets rotate from one to the other, but the signals generated by moving averages and indicators are not always quick to decipher the change. Because most profits come from trending markets, analysts focus on moving averages and oscillators to determine when a trend is beginning, and the sooner they recognize the trend, the better.

The most common solution is the use of Wilder's ADX in combination with an oscillator and a moving average. Because it is smoothed through averaging, the ADX is a lagging indicator and should not be used for signals except from very low levels when a trend may be beginning. Its value is in demonstrating the degree to which prices are already trending and, by implication, suggesting what kinds of analysis—trend or trading range—should be used. It is equally adept at trend determination from very short-term intraday trading to month-to-month investing.

The use of the ADX is based on its level and its trend. The level determines the amount by which prices are trending, and the direction shows the change in that trending. Low readings (<20) suggest a trading range and low volatility in which oscillators and patterns should be used. A moderately high reading (30) indicates strong trending in which moving average crossovers and patterns should be used. A very high reading (>45) indicates a potential trend reversal in which patterns, trends, support and resistance, divergences in oscillators and volume, and oscillator failures should be used. Generally, a rising ADX reflects an increased trending, up or down, and a declining ADX reflects an approaching reversal or consolidation.

#### BOX 18.1 General Rules for Using ADX

In an article appearing in *Futures Magazine*, Ashwani Gujral provided general rules for using ADX. His guidelines include the following:

When ADX is rising and at a level

Between 15 and 25	Beginning of trending; use trending indicators.
Between 25 and 45	Definite trending; use trending indicators.
Of 45 or above	Overextended; watch for trend turning point; use price or indicator patterns.

When ADX is declining and at a level

Below 20	Low volatility; very short swings; no trend; use oscillators
Between 20 and 30	Consolidation; use oscillators.
Between 30 and 45	Correction from extreme likely; use patterns; trending indicators.



Analysts have developed numerous methods of utilizing the ADX with oscillators and moving averages. Let us look at two of them: David Steckler's popsteckle and Linda Raschke's holy grail.

#### *Popsteckle*

In a 2000 article, appearing in *Stocks and Commodities*, David Steckler described a method of identifying stocks that are ready to "pop" upward using all three indicators. The name "popsteckle" is a contraction of "pop" and "Steckler," but Jake Bernstein (1993) is the originator of the method. Steckler's setup rules are as follows:

1. Recent low volatility in price action (dull action).
2. 14-day ADX below 20 (no trend).
3. Eight-day stochastic %K is greater than the day before and above 70 (upward trend beginning).
4. Eight-week stochastic %K is greater than the week before and above 50 (upward longer trend beginning).
5. Bullish market conditions (could be determined by market price above long-term moving average).
6. Stock breaks upward out of congestion on volume 50% above its 50-day simple moving average.

The popsteckle method monitors a low-volatility stock in a horizontal trading range for signs of positive trending action as displayed by changes in the various stochastics. No history of back testing this method is available, but the logic of the variables and indicators is consistent.

#### *Holy Grail*

Unlike the popsteckle, which looks for the beginning of a new trend, Linda Raschke's Holy Grail method takes advantage of an existing trend and uses the ADX in combination with a moving average. First, a 14-day ADX must be above 30 to indicate an existing trend. The primary trend is displayed by a 20-period EMA. An initial downturn in the ADX suggests a correction to the primary trend. When this occurs, enter in the direction of the trend when the price touches or comes close to that EMA. On the long side, the entry trigger would be a break above the high of the most recent declining bar, and it would be the opposite on the short side. The initial target that Raschke uses is the old price extreme, high or low, at which point the analyst must make a decision as to whether the price will continue in the primary trend direction or not.

## **CONCLUSION**

To increase the odds that a technical price signal is correct, the technical analyst uses many other indicators as confirmation. The primary corification indicator is volume because it is a series of data independent of price. Unfortunately, volume indicators and volume itself do not always

confirm a price pattern. Nevertheless, high volume at the appropriate moments does add value to the entry decision. Other means of calculating volume for comparative purposes with past volume and price action have limited value in confirming signals, but they can provide warnings when not confirming price action. These divergences cannot be used as signals by themselves but do help the analyst by suggesting that trend change is soon likely.

The other major area of confirmation comes from momentum, or rate of price change, calculations. Strong momentum suggests a trending market, and weak momentum suggests a consolidating market. Naturally, the analyst principally looks for the beginning of a trending market, and because momentum indicators tend to lead price direction, they are often useful in warning of such a change. However, the reliability of these indicators is highly dependent upon whether the security is trading in a trend or in a trading range. By and large, these oscillators are more useful in trading ranges as overbought/oversold indications. In trending markets, they are more useful as warnings of trend change. In strong trends, they tend to be skewed in the direction of the trend and thus fail to provide reliable entry signals.

Some of the problems with interpreting price and volume indicators can be ameliorated with the use of the ADX or other indicator of trend strength. Combining the ADX, a moving average, and an oscillator, for example, can improve timing results considerably.

## REVIEW QUESTIONS

1. General rules for interpreting volume data date back to the mid-1930s. According to these general rules, how should volume statistics be used?
2. What is meant by the term "momentum"? Looking at the prices for a hypothetical stock, XYZ, explain what is happening as far as the price trend and momentum over time. Sketch a graph of this stock's price and comment on how the curve's shape is impacted by momentum.

Day	Price of XYZ
	28
2	28
3	29
4	30
5	32
6	35
7	39
8	43
9	47
10	51
11	54
12	57

(continued)

Day	Price of XYZ
13	59
14	60
15	61
16	61
17	60
'9	55
19	50
20	45
21	42
22	40
23	39
24	40
25	41
20	43

3. Gather trading information for Valero (VLO) from August 1-October 31, 2005.
  - a. Using this information, calculate the following:
    - i. On-Balance-Volume
    - ii. Price-volume trend
    - iii. Williams Variable Accumulation Distribution
    - iv. Accumulation Distribution
    - v. Chaikin Money Flow
    - vi. Money Flow Index (using a seven-day period)
  - b. Looking at the calculations you have made, what observations can you make about Valero over the three-month period observed?
4. Look at the volume data for Valero in Question 3. Do you see any spikes or dips in volume? If so, how might these volume patterns enter into your analysis of the stock?
  - a. Use the data you collect in Question 3 to calculate the following:
    - i. MACD (using 12- and 26-day EMA)
    - ii. 14-day rate of change (ROC)
    - iii. 14-day relative strength index (RSI)
    - iv. 14-3-3 stochastic
    - v. Williams %R
  - b. What information do you gain about Valero from these calculations? Do you see many similarities among the results of the five different calculations?

5. Most analysts will choose one oscillator to use in their analysis. Explain why using one oscillator is preferable to using the information from multiple oscillators.
6. Explain how moving averages and oscillators can be used in conjunction with each other for trading in trending and trading markets.
7. Explain what is meant by the term "confirmation." What are some general concepts the analyst should consider when looking for confirmation?

# **PART VI**

## **OTHER TECHNICAL METHODS AND RULES**

**CHAPTER 19 CYCLES**

**CHAPTER 20 ELLIOTT, FIBONACCI, AND GANN**

# CYCLES

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The controversy about whether cycles exist in financial market data
- How cycles are defined by their amplitude, period, and phase
- Detrending data and plotting centered moving averages
- The major methods of determining cycles in market data
- The major methods of using cycles to project future price highs and lows

Throughout this book, we have seen how prices trend, but the trend does not occur in a straight line. Prices oscillate up and down around a trend. These oscillations form the trading ranges, patterns, and channels we have discussed. Could it be that these oscillations have some sort of regularity? Believing that they do, cycle analysts look at prices as a form of complex harmonics or waves. (In physics, a harmonic is a wave whose frequency is a whole-number multiple of that of another.) Most standard patterns can be broken down into cycle layers. For example, the head-and-shoulders pattern is a combination of a long cycle peaking with several smaller cycles forming the shoulders and head. Triangles are periods within an uptrend when the amplitude of smaller cycles declines and then expands. By breaking down known patterns into harmonics, these analysts believe that the inherent oscillations are somewhat regular cycles and are, therefore, predictable.

Not surprisingly, the concept of prices oscillating in cycles is controversial. There are two basic reasons some oppose the cycle concept. First, if prices behaved in pure cycles, like radio waves or tuning forks, the numbers would easily fit into mathematical formulas that would give us precise predictions similar to what we know about ocean tides and sunrises. This has not happened. The inability to use present mathematical methods to identify specifically and precisely

any existing cycles is evidence to some that there are no such cycles. These objectors claim that any cycles that traders think they see are merely imaginary. As we saw in Chapter 4, "The Technical Analysis Controversy," when they discuss patterns in trading market prices, the human mind often "sees" patterns in data that do not truly exist.

Another set of objections comes from the inability to identify causes of specific cycles that many agree do exist in prices. There may be correlations between Super Bowl scores or rainfall in New York City and stock prices. However, their relationships are merely curious correlations rather than causation. There is no logical reason why these events would be causal or explanatory.

However, we do see that human behavior does strange things during different phases of the moon. For example, Al Lieber (1978) discusses changes in emotional behavior at regularly scheduled intervals correlated with phases of the moon in the *Journal of Clinical Psychology*. Yuan, Zheng, and Zhu (2006) demonstrate the correlation between lunar phases and stock prices in 48 countries. The moon rotates around the earth each 29.53 days. Thus, using a normal trading week of 4.85 days (to account for occasional holidays), we should, if there is a lunar cycle in markets, expect a cycle of approximately 20 days in stock market behavior. Does this cycle exist? Yes, it appears to. See Figure 19.1 for a demonstration of a 20-day cycle in the Standard & Poor's 500. Is this cycle related to the phases of the moon? We do not know.

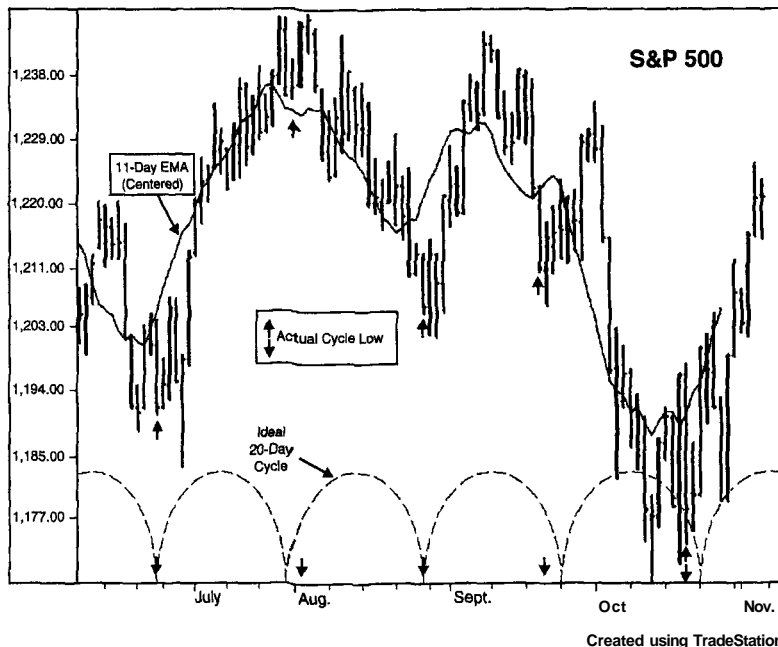


FIGURE 19.1 20-day cycle in Standard & Poor's 500 (daily: June 10, 2005–November 4, 2005]

The astro-physical connection between market cycles and the collective human psyche is a common argument for cycle causes and has been investigated thoroughly for correlation. Some claim such correlations exist, and others say they do not. Nevertheless, this connection has led to the false accusation that technical analysts are "star-gazers." Extremely few analysts have seriously made any causal connections between the planets, the moon, and the sun and market prices, and even fewer use that knowledge or presumption to act in the markets. Nevertheless, there are certain obvious planetary cycles that definitely affect prices if only by affecting supply and demand in agricultural markets.

The earth circles the sun every 365 days. Do we have an annual or seasonal cycle in market prices? Yes, of course, a very well-defined annual cycle exists in agricultural commodity prices (now being dampened by importation of agricultural products from the southern hemisphere). We also see a seasonal cycle in the stock market.<sup>1</sup> Obvious causes for these cycles include change in seasons and weather. Psychologists are also learning about how "sun deprivation" affects human behavior, not only at different latitudes but also at different seasons of the year, and about electromagnetic effects on the brain. In addition to individual behavior, psychologists are studying crowd mood changes that might influence the markets.

There are many observed cycles in market prices. Some of them can be explained, or rationalized, and others cannot. Some, like the "presidential cycle" of four years, are thought to be man-made; others are products of nature; and most are unexplained. There are very long-term cycles like the Kondratieff and Kuznets cycles, and very short-term ones lasting only a few minutes.

In terms of the markets, the "business cycle" is not truly a market cycle in the sense that it does not have a periodic element. However, the business cycle obviously does affect market prices, and it does have a rough periodicity of four to five years, which in turn can be affected by market prices in a feedback loop.

The important point in market cycles is that they are not truly harmonics, the mathematical description of cycles. Instead, they tend to be periodic events or extremes that can be measured in time but not necessarily in amplitude. Amplitude is a measure of the "strength" of a cycle. In markets, amplitude can change and lie dormant for a while. Amplitude is related to volatility, which we know also fluctuates over time. Harmonic mathematics has not developed to the point that it can account for this conduct (it assumes a constant amplitude), and we must often rely more on observation of periodicity alone to gain insight into the timing of future market events.

Other curious aspects of market cycles are as follows: (1) they often tend to "nest" together—especially at turning points, more often at price lows—and when they do, larger events seem to occur; and (2) they tend to be fractions of larger or multiples of smaller cycles, usually by a factor of two or three. The latter is termed "harmonic" action, similar to that in music. These aspects are useful sometimes in projecting market events ahead in time. Finally, the aspect of "proportionality" suggests that longer cycles tend to have larger amplitudes. This is not always the case and can often be deceiving. Because amplitude is consistently a projection problem, the most reliable projections are made strictly on periodicity and phase.

**1. For more information about seasonal cycles in the stock market, read *Research Driven Investor* by Timothy Hayes (McGraw-Hill, New York, 2000).**



In this chapter, we will consider the description and mathematics of cycles, the ways in which analysts detect cycles, and some methods of profiting from them.

## WHAT ARE CYCLES?

In mathematical terms, the cosine (and sine) function describes a cycle. Figure 19.2 shows an acute triangle (one with a 90-degree angle). The side across from the 90-degree angle is the hypotenuse, labeled (H). A cosine of an angle is the ratio of the adjacent side to the hypotenuse. For example, in Figure 19.2, the cosine for angle  $\theta$  is  $A/H$ . Thus, for every angle, there is a specific cosine value.

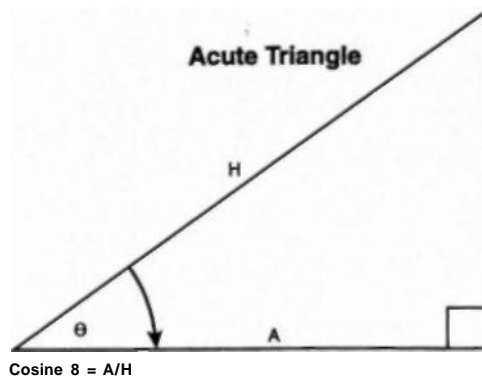


FIGURE 19.2 Triangle and cosine ratio

Within a circle (the unit circle), we can create a triangle from each point along the circle perimeter. As demonstrated in Figure 19.3, using the radius length of the circle as the hypotenuse and the length along the horizontal axis to an intersection perpendicular to the perimeter point, we can calculate the cosine of the angle between each hypotenuse and the axis line for each point along the perimeter. The cosine value is the ratio of the length along the x-axis ( $X'$ ) divided by the radius of the circle. The cosine value will always be one or less because  $X'$  can never be larger than the radius. As the point works its way around the circle counterclockwise, we can plot the series of cosine values in another chart with the angle (in radians) along the x-axis and the cosine value along the y-axis, as shown in Figure 19.4. As you can see in the figure, this results in a curve with values oscillating between -1 and 1. This curve is known as a cosine wave and is the basis for calculating the existence of cycles or waves in time series data.

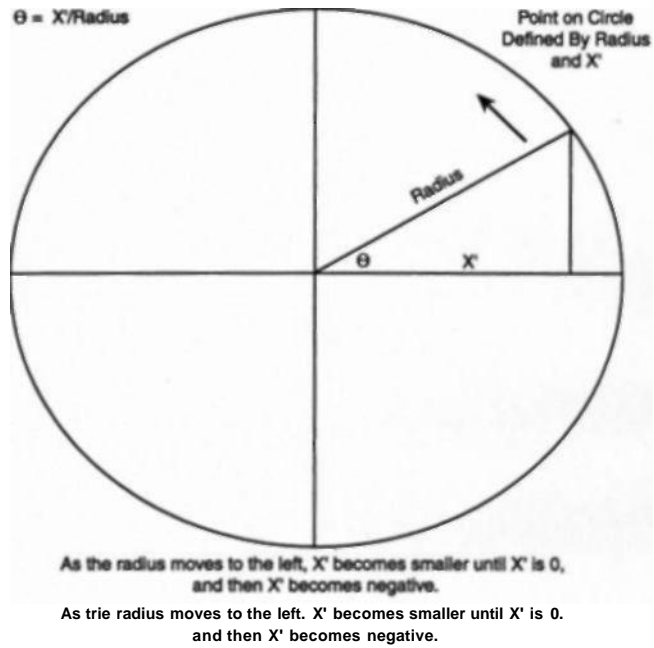


FIGURE 19 J Unit circle

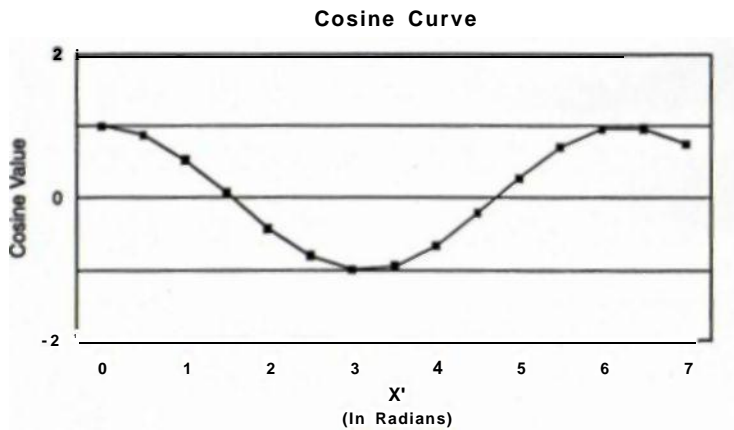


FIGURE 19.4 Plot of cosine curve

Of course, cycles can have different parameters. They can be long from bottom to bottom, high and short, and begin from different locations. The location along the cycle of each point can be defined by the following formula:

$$f(x) = a \times \cos(bx + c) + d$$

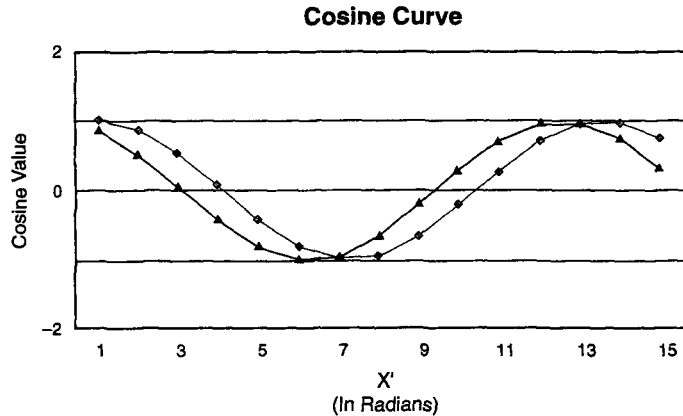
Where:  $a$  is the amplitude

$bx$  is the period (constant  $b$  times  $x$  time in radians)

$c$  is the phase (in radians)

$d$  is the error factor

Rather than fully understanding the derivation of cosine waves, it is important to know the specific variables that determine the waveform. *Amplitude* is the distance from the horizontal axis to the extreme peak or trough. In Figure 19.4, it is 1. An amplitude of 2 would result in a cosine wave twice the height of the cosine waves with an amplitude of 1. *Period* is the distance between consecutive lows or consecutive highs. In our usage, the period is the time along the horizontal axis that it takes for the cycle to return to its original position. Figure 19.5 shows two cosine waves with different phases. Phase determines how far from the  $y$ -axis the particular cycle begins. It thus determines the offset between two cycles of different phases.



**FIGURE 19.5** Cosine waves with different phases

If we know the parameter constants for each variable, we can plot any cosine wave. If there are multiple cosine waves, we can calculate each and add them together in what is called "summation." James Hurst more thoroughly developed this idea in his book, *The Profit Magic of Stock Transaction Timing* (1970). The presumption in markets is that there is no one specific cycle but many cycles that, when summed, form the plot of prices. The forecasting problem then is to reverse the process and go from the price plot to the cosine formula to determine how many

cosine waves and their parameters exist in the data. From this knowledge, presumably the direction of prices can be foretold by extrapolating the waves into the future.

Like all theories related to the markets, the theory of cycles is logical but impossible to quantify, at least with the present level of mathematics. Many methods have been invented to recognize waves in time series data, but none has been able to duplicate market prices sequences with reliable accuracy. There are many reasons for this, the primary one being that the parameters in the cosine functions of market prices are not constants. Hurst calls this the principle of "variation." Amplitude and period, for example, vary over time. Most mathematical means of determining cosines from time series data assume that the parameters are constants. This does not mean that the standard methods of analysis of time series are useless, however. The changes in parameters appear to take place slowly rather than suddenly. By analyzing prices through conventional cosine analysis over specific but different periods, we can see how the parameters change. Amplitude appears to change quickly at times, but period appears to change more slowly. Thus, if we can at least estimate the period with some degree of accuracy, as analysts, we have a useful indicator. We cannot predict future price levels, but with an estimate of period, we can potentially predict the timing of future highs and lows.

## Other Aspects of Cycle Analysis

### Accuracy

Just because the analysis of financial time series data may suggest cycles exist does not imply that the cycles are precise. As mentioned earlier, all three aspects of a wave vary over time, and as wave is added to wave, the errors become large. Because market cycles tend to synchronize at lows, the estimate of the phase is relatively easy. The analysis just begins at a major price low where presumably most cycle lows coincide. The estimate of amplitude varies too much for projection purposes. Amplitude is often called the "power" of the cycle in electronic analysis circles, where it tends to be a constant in those applications. In the financial world, power can be influenced greatly by exogenous, unpredictable events. The study of amplitude becomes non-productive. The third aspect of the cosine wave, the period, often remains relatively constant but can sometime have a large error factor. It is an estimate based on immediate past price history. As an example, a 20-day cycle low can occur several days before or after the expected 20 days from the last low, which itself may have been several days before or after its ideal location. The 20-day cycle, from spectral or other analysis, may only be 19.2 days, or it may be 20.4 days. Cycle periods therefore are indefinite and have error. This means that for investment purposes, all cycles should be used only as a guide. Even the seasonal cycle, which is well established, has actual high and low dates that vary considerably from year to year.

### Harmonics

One of the interesting aspects of cycles first observed by Hurst in market data is that cycles tend to have period lengths a multiple of two or three longer or shorter than the next series of cycles. In other words, a cycle of 20 days will indicate that another longer cycle of either 40- or 60-days length exists and that another shorter cycle of 7 or 10 days exists. The longer is either two times

or three times the observed cycle, and the shorter is either 1/3 or 1/2 the observed cycle. This observation is useful when one specific cycle is determined because it leads the analyst to what intervals to look for in longer and shorter cycles. Hurst believes that the ratio of two is more common. Others, such as Tony Plummer (2003), have hypothesized that three is the correct multiple.

In the April 1987 issue of *Technical Analysis of Stocks and Commodities Magazine*, Frank Tarkany compares his analysis of weekly market cycles with that of three other well-known analysts. Table 19.1 provides a summary of Tarkany's comparisons. All four of the analysts found 26-week cycles; this 26-week cycle is the base cycle. These analysts also noticed multiples of 26 weeks, suggesting that an auto-correlation exists between cycle periods. These cycle periods are called nominal periods because they occur regularly in most financial time series data.

TABLE 19.1 Harmonics of the 26-Week Cycle in the Stock Market

Weeks in Cycle	Gann	Garrett	Hunt	Tarkany	26-Week Harmonic	Potential Cause
234		221	234	234, 237	9	business cycle
208		214			8	presidential cycle
182	182	178		178	7	
156	156		156	156	6	
130				134	5	
104					4	
78		78	78	78	3	18-month cycle
52	52		52		2	seasonal cycle
26	25, 26	25	26	22, 23	1	base cycle
13	12, 13	10	13	12	1/2	quarterly reports
6.5	6, 7, 9		6.5	6-7	1/4	
3.25	3	2	3.25	3	1/8	14-day cycle
1.625			1.625		1/16	7-day cycle

Source: Tarkany (1987)

Notice that several of the cycles appearing in Table 19.1 are stock market cycles we have mentioned in previous chapters. The well-known presidential cycle is very dependable, as is the seasonal cycle. They are both multiples of the 26-week base cycle—the seasonal cycle by two, and the presidential cycle by eight (or  $2 \times 2 \times 2$ ). Thus, the Hurst hypothesis that cycles tend to occur in multiples of two or three seems to make sense.

### Inversions

One of the most difficult observations for the analyst to face is the Inversion. Occasionally, where a cycle low is expected, a peak occurs instead. For example, look at Figure 19.1. Where we

would be expecting to see the second 20-day low, we actually see a high in this chart. This is an example of an inversion. No satisfactory explanation has been given for its existence, but several observations have been noted.

First, inversions most often occur at peaks in harmonic cycles when the next longer cycle is at a peak. This makes sense only if the next higher order cycle is a multiple of two. For example, a cycle of 20 days should make a low every 20 days. If the next higher order cycle is 40 days and synchronous with the 20-day cycle, a 40-day peak ideally should occur just as a 20-day cycle is making a low. In Figure 19.1, this is the case. A more dominant cycle causing more recognizable lows occurs at the first, third, and fifth 20-day cycle low. The period between these larger lows is 40 days. Thus, the second 20-day low occurs at the halfway point and peak of the 40-day cycle and is drowned out by the larger cycle strength. It so happens, although it is not shown on the chart, that this second 20-day cycle peak is also a peak in the 26-week cycle, which is composed of three 40-day cycles. It is, thus, the peak in two cycles of higher order than the 20-day and is important. In a multiple of three, the middle cycle peak is the most dominant. Often the lowest cycle magnitude, the 20-day cycle in the example, is overcome by the strength of the next two higher cycles.

Second, the inverted cycle low often has just a small very short-term low within the peak of the higher order cycle. This forms into an "M" where the small low between the two small peaks is the actual cycle low that is being overcome by the longer cycle. Figure 19.1 shows this small "M" pattern on the second inverted low.

Third, inversions do not always occur at larger cycle peaks. In Figure 19.1, the fourth 20-day cycle low is well defined and occurs at its expected interval from the earlier low.

Previously we noted that cycles are not strict harmonics but specific time-separated events. The habit of producing lows at constant intervals can be interspersed with highs at the same intervals because both are important market events. Thus, a long string of events occurring at specific intervals that is primarily dominated by low events but interspersed with occasional high events can look like a harmonic wave for the period that the lows are occurring. However, the progression is only a time sequence of events. Analysts assume that the progression is a cycle and that the inversion is an anomaly in a harmonic-type wave. This analysis method is used only because the inversion is rare and because the mathematics of cyclical events is relatively simple.

#### Translation

The reason that we study lows in cycle analysis is because longer and shorter cycles tend to synchronize at lows. Peaks, on the other hand, almost never synchronize. Peaks, ideally, should occur at the halfway period of the cycle. A 20-day cycle, for example, should have a peak ten days from its last low. This rarely occurs. Peaks can occur earlier or later than the halfway point. Their location away from the center point is called translation. A right translation in a cycle is when the peak is beyond the halfway point, and a left translation is when the cycle peak occurs before the halfway point. Usually, the underlying trend from a longer cycle determines the amount of translation in the shorter cycle. In Chapter 12, "Trends—The Basics," we noticed that trend directions determined the shape of the corrective trends. In an uptrend, for example, the

upward trends were long and the corrections were short. These were translating right because the peaks were beyond the halfway point between the lows. If the peak had occurred at the halfway point, we would be suspicious about the continuation of the upward trend. Because cycles are nested and synchronous, the shorter cycle is dominated by the trend of the next longer cycle.

Again, let us look at Figure 19.1. The first marked low (at the end of June) is both a 20- and 40-day cycle low. The first full 20-day cycle pictured is also the first half of a 40-day cycle. The 40-day cycle is more powerful than the 20-day cycle, and the peak for the first 20-day cycle is far to the right as the underlying higher order cycle trend is upward. It is right translated. Indeed, the correction into the 20-day low is only one day because of the inversion.

The second 20-day cycle is just the opposite. The 40-day cycle is now declining into its low, and the underlying trend is downward. The peak in the 20-day cycle occurs early in the cycle. This cycle is left translated. In the third 20-day cycle, the peak occurs only slightly after the midpoint, making it right translated. This suggests that the next higher order cycle, the 40-day cycle, is trending upward, as is the case. Notice, however, that the right translation of the 20-day cycle is not as extreme as it was in the earlier 40-day cycle. The diminution of "lightness" suggests that some even higher order cycle is also peaking, as is the case with the 26-week cycle. The fourth 20-day cycle has left translation, as the underlying trend is now downward in both the 40-day and the 26-week cycles.

Translation is thus useful in checking where the overlying longer-term cycle trend direction is headed or if it is changing.

## **How CAN CYCLES BE FOUND IN MARKET DATA?**

Conventional wave-filtering mathematics has gone through tremendous growth and development in the past 50 years. Data transmission, voice and image transmission, electronic signaling, and other developments in the electronic age necessitated more sophisticated mathematics to recognize and understand waveforms. Now we have bandpass filters, digital signal processing (DSP), wavelet modeling, nonlinear spectral analysis, higher order spectral analysis (HOSA), and derivatives of each. For our purposes, however, this sophistication is unnecessary. Because waveforms in prices, if they exist, are not based on constant parameters, we need only to make initial estimates of a cycle period to satisfy our requirements. Once we have an estimate of period, we have information that is useful for projection and useful for determining the "window" or moving average length in indicators that best represents the trading period of interest.

### **Fourier Analysis (Spectral Analysis)**

The most common and simplest method of wave analysis in a time series data is Fourier analysis. Fourier analysis, available in most mathematics software programs, has many variations. It has specific problems, however, in that it requires a large amount of data. For market forecasting, the more data that is involved, the more the waves can change and neutralize the calculations of

parameters. Thus, Fourier analysis should be used only as a basic method of analyzing cycles in market time series data. A faster method, called Fast Fourier Transforms (FFTs), reduces the computation time of the analysis. A second problem with Fourier analysis is that it does not maintain the phase relationships between cycles. In other words, if one cycle crosses the horizontal axis after or before another, the difference in these phases is not recorded. This makes projection of the combination of the cycles very difficult. Figure 19.6 displays an example of spectral analysis.

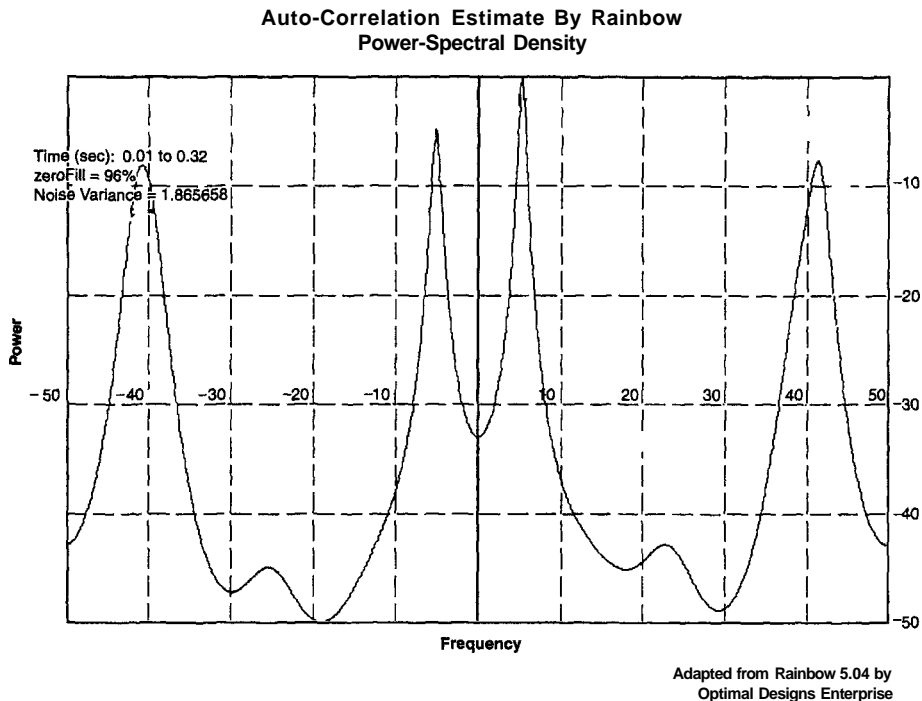


FIGURE 19.6 Display of spectral analysis of time series data for cycles

### Maximum Entropy Spectral Analysis

In the early 1980s, John Ehlers (2002) developed a method that attempts to solve the problems of Fourier analysis without compromising the accuracy of the results. His method, Maximum Entropy Spectral Analysis (MESA), is available through his software company, MESA Software. The method requires only a short time series to determine the inherent cycles in the data. It determines the most recent and most relevant waves for projection and records the different phases of each cycle recognized.



## Simpler (and More Practical) Methods

### Observation

In many cases, the low points of dominant cycles in market data are obvious to the eye. The exact cyclical low can often be difficult to determine, but the general oscillation of the cycle is plain. In his book, *The Profit Magic of Stock Transaction Timing*, Hurst, the father of cycle analysis in the stock market, used a method of envelopes that he traced along the major highs and lows in a price chart. These envelopes were not predetermined like a filter but were drawn freehand on the chart. When prices touched the upper and lower edges of the band, Hurst drew an arrow at the bottom of the price chart for later inspection. When he was done with the freehand estimates, he looked at the arrows drawn and determined if any obvious stable period separated the arrows. Figure 19.7 shows what this hand-drawn method might look like.

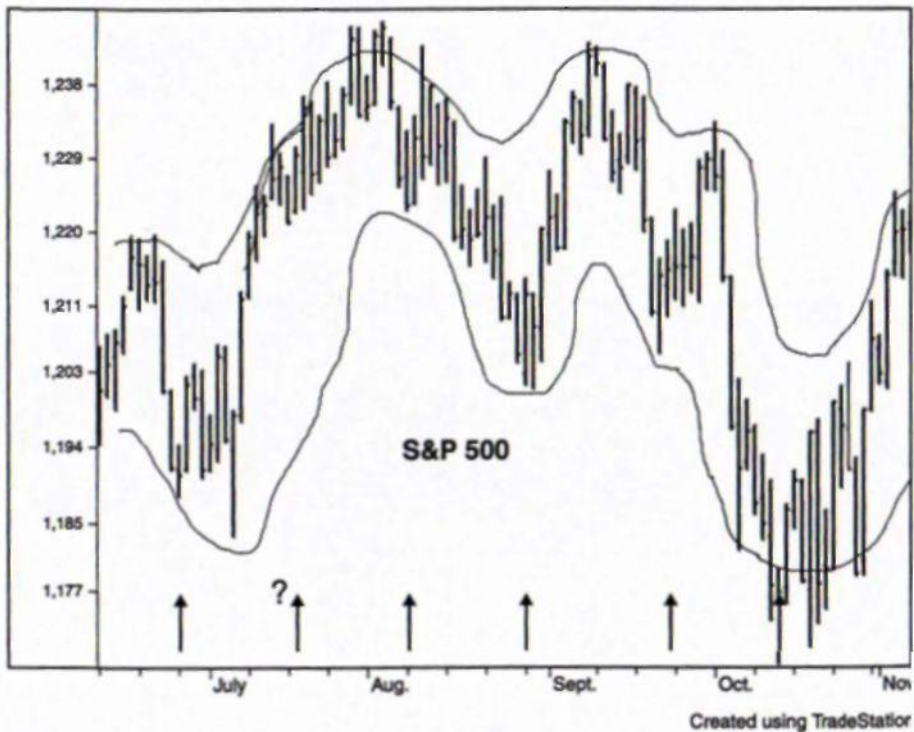


FIGURE 19.7 Envelopes-Hurst hand-drawn method (dairy: June 10, 2005-November 4, 2005)

Of course, such methods are fraught with danger. The human mind often imagines cycles where they do not exist or invents turning points to fit a preconceived notion of an existing cycle. Hurst's method was just the beginning observation of the potential for cycles in financial data. If it appeared reasonable that cycles existed in the data, he would then use more sophisticated methods, such as Fourier analysis and moving averages, to find the specifics.

Oscillators are another method of determining with the eye if cycles exist in financial data. Many of the indicators in Chapter 18, "Confirmation," show oscillations about a central horizontal line. By observing the lows especially, because cycles tend to synchronize at lows, one can observe if the times separating each low are at regular intervals. If so, a cycle is suspected to exist in the data.

If a cycle is suspected, one way of quantifying it more accurately is to mark a dot on the bottom of the chart page just below each low. Then, using a blank piece of paper, mark a line on the edge of the paper, move the paper such that the line is placed on the first dot on the chart, and draw another line on the paper at the point where the next dot lies. This gives a measured distance between the two dots on the paper. Then move the first paper line to the second dot and draw a line on the paper where the third dot occurs on the chart. This second line should be near the earlier line for the second dot but is rarely exactly on it. Now two cycle lengths have been measured, and the difference in period can be seen immediately. Continue to move the paper across the dots, making lines to mark the length between each subsequent cycle bottom. When you're done, the paper will show the range of periods between dots and thus give an estimate of the cycle period. By placing the first line on the last dot, the range of lines from previous cycles will give an estimate of the range in which to expect the next cyclical bottom.

The eyeball measurement of cycle lengths can also be done with a ruler or a drafting divider. In this case, the distance between the first and second dot is measured and recorded; then the distance between the second and third dot is measured and recorded; and so on. Once imported into a spreadsheet, the mean, standard deviation, and other statistical measures can be determined for all the intervals.

### Detrending

Because specific cycle behavior is highly dependent on the direction of the next higher order cycle, the first step in recognizing if a cycle exists in the data is to "detrend" it. Detrending is done merely by dividing the current prices by a moving average of those prices. The resulting plot will oscillate above and below a zero line, and the lows of the plot will correspond to the lows in the cycle being analyzed.

Figure 19.8 shows an example of this detrending method. The chart contains the same S&P 500 data as in other figures in this chapter. The detrended line is constructed by dividing the current price by an 11-day SMA. The cycle, which is about 38 days (slightly shorter than the ideal 40 days), shows up clearly in the plot.

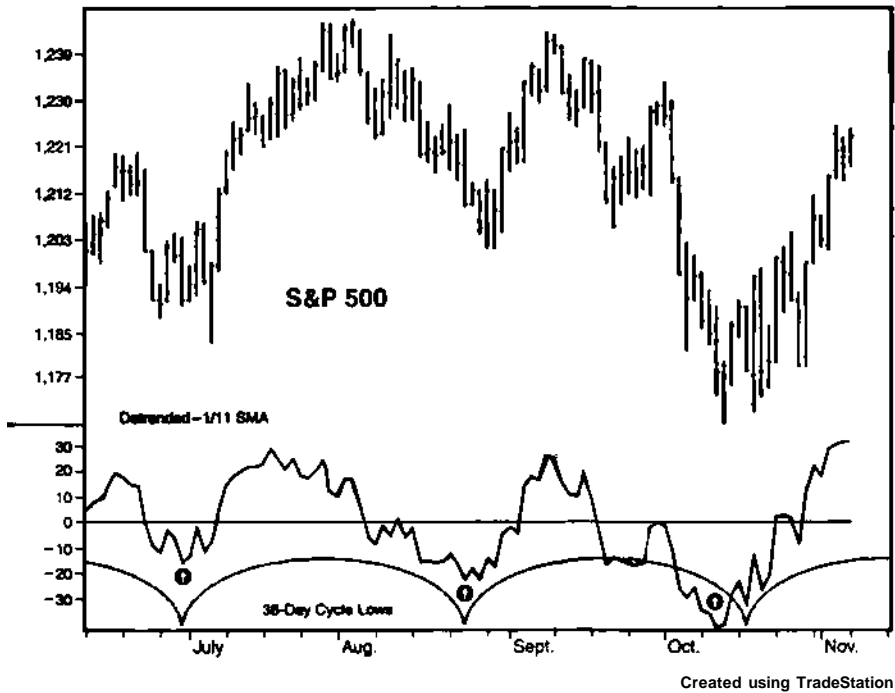


FIGURE 19.8 Detrended  $1/11$  SMA showing 38-day cycle lows [daily: June 10, 2005 - November 4, 2005]

As a further example, Figure 19.9 shows detrending using a five-day SMA, roughly half the length of the SMA used in Figure 19.8. The plot in Figure 19.9 shows more clearly the cycle lows 19-days apart, the half cycle of the 38-days shown in Figure 19.8.

When prices are detrended using the daily closing price as the numerator, especially as we lengthen the denominator, the plot becomes very erratic and difficult to interpret. The solution is to use a moving average in the numerator as well, but this presents some problems that must first be addressed.

#### Centered Moving Averages

"... the time relationship between the moving average and the data it smoothes is not the one that is always shown on stock price charts. In fact, the moving average data point plotted in association with the last price datum should be associated with price datum one-half the time span of the average in the past." —Hurst (p. 65)

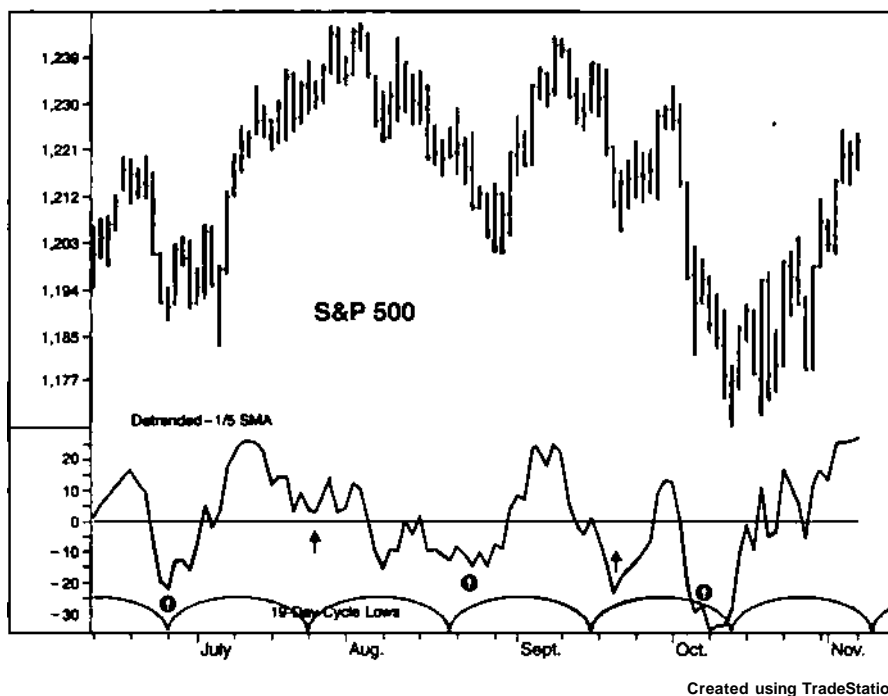


FIGURE 19.9 Detrending one- to five-day SAM showing 19-day cycle lows (daily: June 10, 2005 - November 4, 2005)

What Hurst is saying is that a moving average is an average of both price and time. Most plots take into account the average in price but incorrectly plot that average at the time the last price of the average occurs. For example, an 11-day moving average of prices of Days 1-11 is frequently plotted at Day 11. Instead, because the moving average is also an average of the time over which the average price occurred, it should be plotted at the mean point or center of the time span of the average. In other words, the moving average of Days 1-11 should be plotted at Day 6. The price average today is not the average today but the average over the period used in calculating the moving average. Otherwise, the moving average plot is skewed to the right of the actual price action and is an inaccurate representation of the average price.

This plot is called a "centered moving average." Figure 19.10 shows an 11-day centered moving average versus an 11-day moving average plotted the usual way. We will use a centered moving average for the remainder of our discussion on cycles.

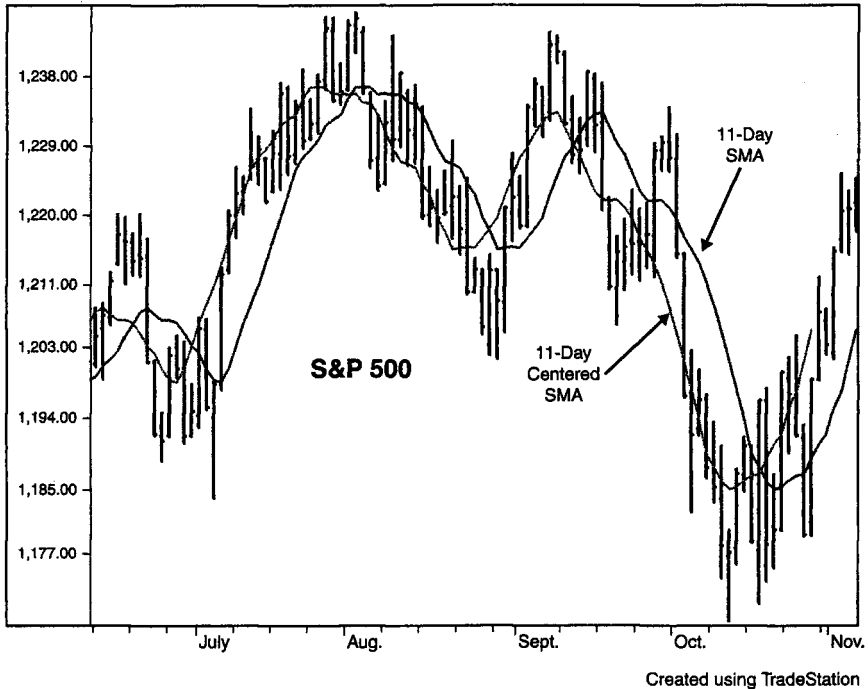


FIGURE 19.10 11-day centered moving average plot versus the standard moving average plot (daily: June 10, 2005-November 4, 2005)

Notice in Figure 19.10 that the centered moving average better reflects the price action than the conventional plot. It runs through the center of all the price oscillations and is not skewed to the right of prices, as is the conventional method. The problem of skewing to the right becomes even more noticeable as the moving average span increases. The centered moving average plot is a better representation of prices but, of course, lags behind prices and by itself cannot be used as a signaling method. It is used to identify cycles but not to predict them.

#### Envelopes

As we saw in Figure 19.7, Hurst used a hand-drawn envelope about prices to get a rough estimate of the potential cycle period in the price data. Once that period could be estimated, he used moving averages to quantify the cycle more definitively.

Moving averages dampen or smooth data. In terms of cycles, a moving average represents price oscillations greater than the period of the moving average and effectively cancels out price action or oscillations less than the moving average period. Figure 19.11 includes a centered 41-day moving average overlay. The large price deviations below and above the moving average appear roughly 40 days apart. To quantify the range of price movement about this moving average, we

draw an envelope parallel with the moving average. Notice that prices touch the lower envelope band about every 40 days.

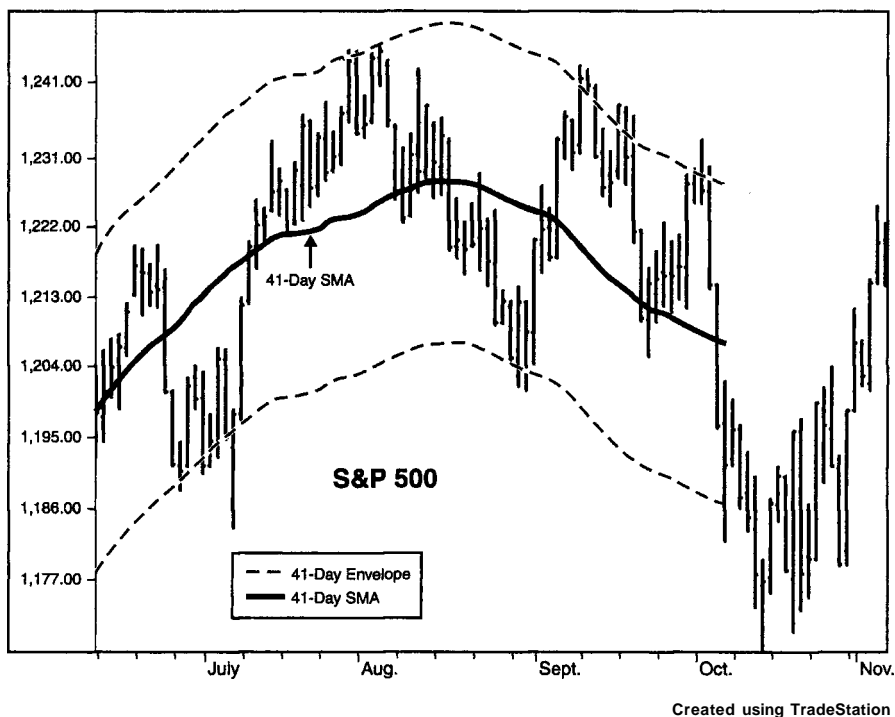


FIGURE 19.11 41-day centered moving average with a parallel envelope (daily: June 10, 2005 - November 4, 2005)

The next step is to draw a half-cycle centered moving average with an envelope, as shown in Figure 19.12. A half-cycle moving average in this example is 21 days. This moving average smooths out all waves shorter than 21 days and includes waves 21 days or longer. When subtracted from the 41-day moving average, it reflects the waves that exist between 21 and 41 days, or the 40-day cycle we are investigating.

The points at which the 21-day envelope touches, or comes close to, the 41-day envelope and turns upward are the low points of the 40-day cycle. It is pure chance that the analysis results in exactly 41 days. Normally it would be close but not exact. To be more confident of the cyclicity, we should use a minimum of seven examples. We now have a well-defined 41-day cycle, and we know the days on which it bottomed and turned upward. When we later discuss the projection of cycles, we will use this data to predict when the next 41-day cycle should occur in the future.

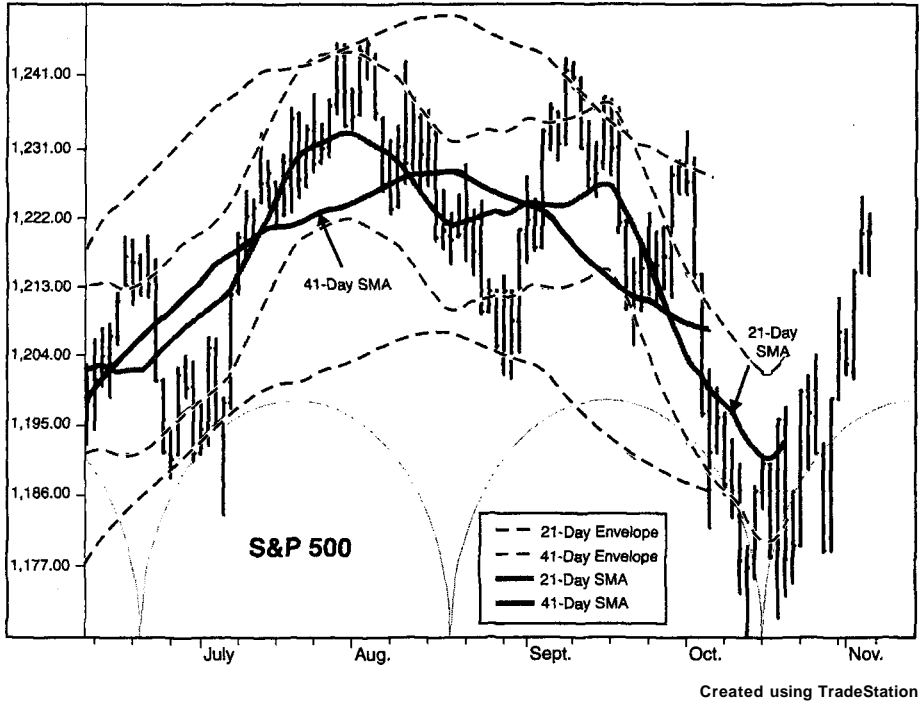
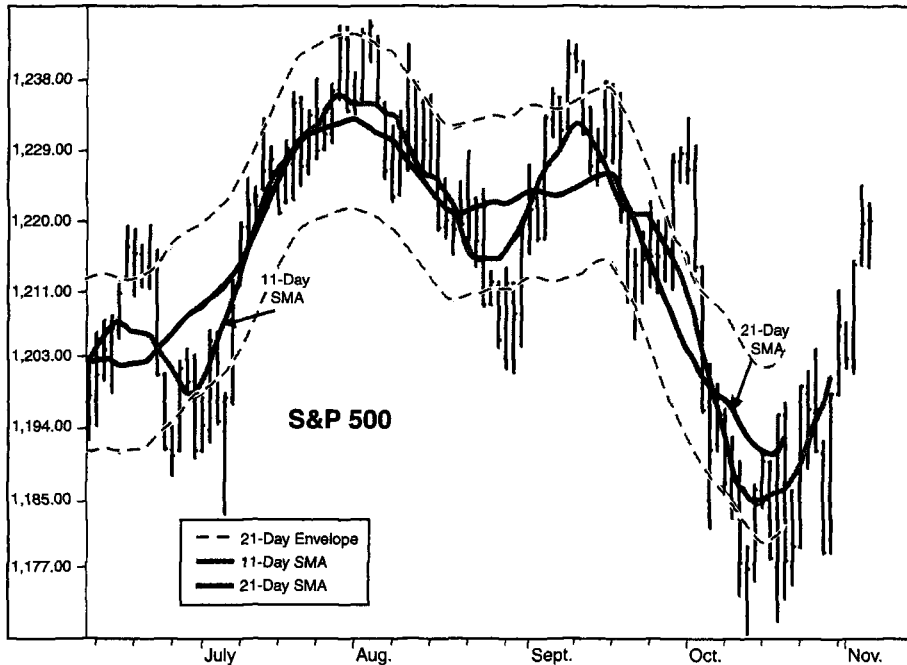


FIGURE 19.12 Combined full-cycle period (41-day) and half-cycle (21-day) moving averages and envelopes (daily: June 10, 2005-November 4, 2005)

The next step is to look for shorter cycles. We would expect, from Hurst's hypothesis, that cycles come in multiples of two or three, and that a cycle of roughly 20 days or 14 days would appear next, one-half or one-third the 41-day cycle span. In the price points that touch or come close to touching the lower envelope of the 21-day average, no clear, consistent 20-day interval occurs in our example chart. If there is a 20-day cycle somewhere in this data, its half-cycle SMA of 11 days should display its lows at upward turning points. We thus draw an 11-day moving average and look for turns, as is done in Figure 19.13.

In Figure 19.13, notice that the turning points of the 11-day moving average occur at the same time as the turning points for the 21-day moving average, but not at 20-day intervals. This is strong evidence that any cycle around 20 days is dormant. It may come back in the future, but for now, it is not strong enough to justify a trade.



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FIGURE 19.13 Combined 21-day and 11-day moving averages and envelopes (daily: June 10, 2005 - November 4, 2005]

Let us go down one more period and see if any cycle appears less than 20 days. Because the smoothing effect of moving averages with short periods will dampen most short-term cycles, generally we do not want to use SMAs less than ten periods. Therefore, we need to turn to another method that uses prices versus the half-cycle average. In this case, we will use an oscillator that is the ratio of the closing price to the centered 11-day moving average. This is shown in Figure 19.14.

Visual inspection of Figure 19.14 shows that although the oscillations about the detrended 11-day average are not as regular as perhaps we would like, there is certainly a rhythm of peaks and troughs above and below the horizontal line. If we average the intervals between these peaks or troughs, we get a wave period of 13.85 days. This is an interesting result. It is almost exactly one-third of the longer 41-day cycle (exact would have been 13.667 days). It also explains why many analysts, through trial and error, found 14 days as the best default period for momentum oscillators such as the RSI, the ADX, and others. Fourteen days is an important cycle in stock market price behavior.



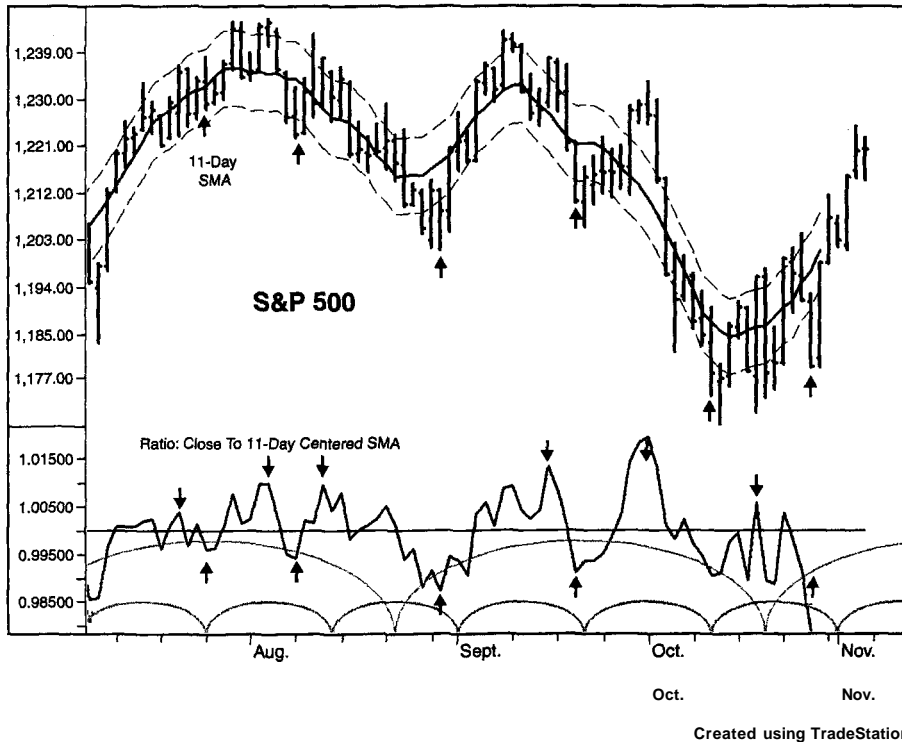


FIGURE 19.14 Ratio: Close to 1 1-day SMA showing short-term 14-day cycle highs and lows (daily: June 10, 2005-November 4, 2005)

We also notice that the phase of the short cycle is out of synchronization with the 41-day cycle. This is why the actual lows in the 41-day cycles are rounded rather than sharp. If the two cycles synchronized at the lows, they would bottom at the same time and create a "V" type bottom pattern. We also note that the original eyeball envelope that suggested a 20-day cycle is only partially correct. Instead, the dominant cycles in this data example appear to be the 41-day and the 14-day cycles.

The process we just went through of deducing the cycles shorter than a known dominant cycle is called "nesting downward." We could equally as well have nested upward by again taking the dominant cycle of 41 days and deducing cycles with longer periods. This would have taken considerably more data, but it is an exercise that should be done before any trading or investing is initiated using cyclical data. When investors decide upon the period of investment, they should understand at least the next longer and shorter cycle period because these cycles will affect the behavior of the cycle of interest. In addition, the analysis should be repeated every time a cycle has completed just to be sure that the original assumptions as to cycle periods are still correct.

The preceding analysis, and all of the analysis in this chapter, can be used in any time series data regardless of the bar interval—daily, weekly, monthly, or minute-by-minute. However, as explained in Chapter 14, "Moving Averages," analysis of cycles shorter than a day must be limited to securities that trade over the complete 24 hours because the data that is shorter than daily does not account for the time between the close of one day and the open of the next day.

## PROJECTIONS

### Projecting Period

We now look at how we can use the knowledge about cycles in the data to project the next low and perhaps the next high. To project the time for the next low, we need three facts: the period length of the cycle of interest, the standard error of that cycle, and the ideal starting point from which to measure it into the future. In the example, we have found periods 41 days and 14 days. From Figure 19.14, we can see that a larger error exists in the 14-day cycle in the number of days between each 14-day projection low. Lows almost never occur exactly where they should. We need an error factor for our projection of the 14-day cycle. Because we only have two cycles of the 41-day period, we cannot determine the error, but for demonstration purposes, we will assume there is none.

The first and most simple method is to use a ruler or the paper trick mentioned previously to draw points on the chart that match the periods determined from measurement. This is subject to interpretive error; in our example, the process suggested a 20-day cycle that was not borne out by further analysis.

Second, we could use the cycle half-moons shown on the charts and project into the future. This method is accurate once we know the precise cycle periods from our analysis and the beginning point. However, it does not estimate an error range of when to expect the next turning point.

Third, we could use a linear regression model of the periods to estimate the period, the error, and the exact location for the starting point (Kirkpatrick, 1990). To begin this process, we identify the lows given by the ratio in Figure 19.4, beginning numbering with 1. Thus, the first low, which occurred on June 10, would be 1; the second low, occurring on July 6, would be 2; and so forth. Table 19.2 displays this numbering of lows under the column heading "Number."

In addition, each time interval is converted to a sequence of whole numbers to eliminate the problem of weekends and to make calculation easier. In our example, for instance, the first 14-day low occurred on June 10. We record that as low Number 1 at time interval 0 because it is the beginning of our period. The next low occurred on July 6. Because this low occurred 17 trading days after low Number 1, we would label it low Number 2 and as occurring 17 days after low Number 1. The third low occurred on July 25. We would label it low Number 3 with an interval of 23 days from low Number 1. The time interval for all lows is measured from the first low. Successive lows are entered into the spreadsheet in a similar manner until the end of the period is reached, as shown in Table 19.2.

This process creates two columns in the spreadsheet. The first, the low's specific number, is the independent variable. The second, the low's corresponding time number, is the dependent variable.

**TABU 19.2** Kirkpatrick Linear (Method of Determining the Optimal Location and Error of Cycle Periods)

Date	Number	Time	Projection	Actual	Projected	Regression Output:
	=	=		Period	Period	
	FQ	(Y)				
Jun 10	1	0	1.2		-1.2	Constanl 12.67
Jul 6	2	17	15.0	17	2.0	Std Er of Y Est 1.77
Jl 25	3	30	28.9	13	1.1	R Squared 0.997
Aug 8	4	40	42.7	10	-2.7	No. of Observations 8
Aug 30	5	56	56.5	16	-0.5	Degrees of Freedom 6
Sep 21	6	71	70.4	15	0.6	
Oct 12	7	86	84.2	15	1.8	X Coefficient s  13.84
Oct 27	8	07	98.1	11	-1.1	StdErrorofCoef. 0.27
[Nov 18]	9		111.9			
(Dec 8]	10		125.8			

We then use linear regression to determine a best fit between the cycle number and the time interval on which it occurred. The results of the linear regression suggest that the cycle period is 13.84 days (given by the X coefficient), has a standard error of 0.27 days, and will project within a standard deviation (66% of the time) of 1.77 days. 90% of projections presumably would come within twice that or within 3.5 days of the ideal projected low.

Using these numbers, we can project future lows. The best projection into the future is for the next 14-day low (Number 9) to occur 13.84 days after the model's estimate of the eighth low. This suggests a Number 9 projected low will occur at time interval 111.9, or on November 18, and the Number 10 projected low will occur on December 8 with a 3+ day error on either side. As it turns out, the longer 41-day cycle is also due for a low around December 8. We can expect, from this analysis, early December to include a downward trending market but right translated because of the strong longer upward trend, with a low point sometime in the first week or two. (Note: The actual lows occurred on November 15, within the estimated error, and exactly on December 8.)

## Projecting Amplitude

Figure 19.14 also shows how amplitude can vary enormously. Indeed, the variation is so large that prediction is almost impossible. What can help in amplitude projection, however, is the concept of nesting. Cycles tend to oscillate within cycles. Thus, their outer boundaries, as defined by envelopes, can give us a rough estimate of what to expect for amplitude. Again, let us look at our same data example, this time shown in Figure 19.15 with 21-day and 41-day SMAs and envelopes.

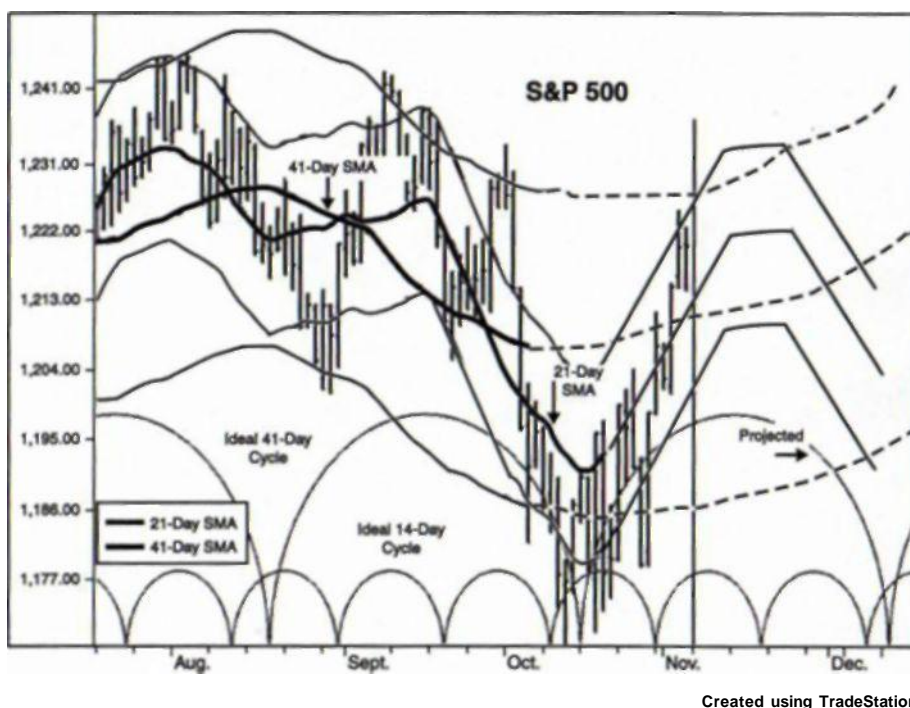


FIGURE 19.15 Projected envelopes and periods (dairy: June 10, 2005–November 4, 2005)

We project the next cycle lows using the linear regression method outlined previously. This gives us an idea as to when to expect cycle lows and, by inference, cycle highs. We know that the low around mid-October is a 41-day low, and from earlier discussions, we know that it is likely a 26-week low. It is, therefore, a powerful low, and we can expect the immediately following cycles to translate right. Right translation has already occurred in the first 14-day cycle and will likely occur in the first 41-day cycle. Because of the right translation, the peak in the 41-day cycle will likely occur during the third 14-day cycle, sometime between mid- and late-November. Because the longer cycle is rising, the 41-day SMA, which represents that longer cycle, will soon begin to rise. The 21-day cycle SMA has already made the upward turn, confirming that the October low was the 41-day cycle low.

We must now draw, freehand, the expected curve of the moving averages and their envelopes. This is a dangerous exercise because we are acting without a rudder. Nevertheless, it is about the only method available, considering the lack of reliable data. Once the projected cycle envelopes have been drawn, we have a "model" of what we should expect from cycle analysis alone over the next several months.

### Half-Cycle Reversal

We mentioned earlier that the half-cycle moving average represents the full cycle under investigation, as well as all other higher order cycles. When the half-cycle SMA reverses, it signals that the low in the cycle of interest has occurred. In our example, a half-cycle SMA of the 41-day cycle has a span of 21 days. The span is the same as the number of days in the average. This 21-day SMA is then centered by placing it 11 days prior to current prices.

When the 21-day centered SMA turns upward, as in Figure 19.15, it occurs at the first quarter of the cycle of interest. In other words, it occurs roughly ten days into the cycle that should ideally run for 20 days upward and 20 days downward. Not only does the upward turn signal that the cycle of interest has turned upward, but it also indicates that the cycle is roughly halfway through its advance. Being halfway through its advance suggests that the other half of the advance will follow in the next ten days. The vertical distance from the low of the 41-day cycle to the price on the date at which the half-cycle turned upward is a halfway point and can be projected upward by an equal distance.

In Figure 19.15, the half-cycle SMA turned up two days prior to the last price shown in the chart. That last price close was 1,215. The bottom of the 41-day cycle was a closing price of 1,177. This gives us a difference of 38 points, which we add to the last close to get 1,253 as a projection for the peak of the 41-day cycle. (Note: The projection was reached on November 21, roughly where it was expected to occur.)

### The FLD and Centered Moving Average Crossovers (The "Forward Line")

Hurst describes another interesting method of projecting prices in a cycle called the FLD line. FLD stands for Future Line of Demarcation. It is the closing prices projected a half-cycle period forward. In Figure 19.15, for example, the cycle of interest is the 41-day cycle. Projecting closing prices a half-cycle forward, or 21 days, produces the FLD line. Several observations can be made.

First, because the projection is a half-cycle forward, its peak should appear when a low is expected and vice versa. This is because prices should rise during the first half into a cycle measured from the cycle low and should decline during the second half. Thus, a high should occur at the halfway point in the cycle. If the cycle is projected forward by a half-cycle distance, the projection high should occur when the real cycle low is occurring, and vice versa.

In Figure 19.16, the peak in the FLD line in late August occurs at the same time as the low in prices, and again the peak in the FLD line in early October coincides with the low in the 41-day cycle. Looking forward from the last close on the chart, the series of lows in the FLD occurring in November suggests that a peak in the cycle will occur then.

Second, by representing a half-cycle, the FLD line is declining when the cycle prices are advancing. The crossover of current prices through the FLD should occur at roughly the midpoint of the advance or decline. In Figure 19.16, the downward crossover of prices through the FLD projected a decline to the 41-day low of approximately 1,211, just about where the cycle bottomed. In early September, the rise in prices only barely crossed the FLD, suggesting that the longer-term cycle, the 26-week, was declining, as it was. The price crossover below the FLD in early October projected a decline to the 1,186 area, just about where the cycle bottomed.

Currently, the crossover of the 41-day FLD projects around 1,144 and the crossover of the 41-day FLD, representing the 26-week cycle, projects to 1,274. (Note: The 1,144 was reached on November 18, and the 1,274 was reached on December 14.)

Thus, the FLD can be a useful projection device. Even when the price fails to reach an FLD projection, the FLD can provide the analyst with valuable information. For example, its failure to reach an intended projection informs the analyst that the next higher order cycle is likely in the process of reversing. Conversely, a considerable overshoot of the projected price indicates the next higher order cycle is strengthening in the direction of the overshoot

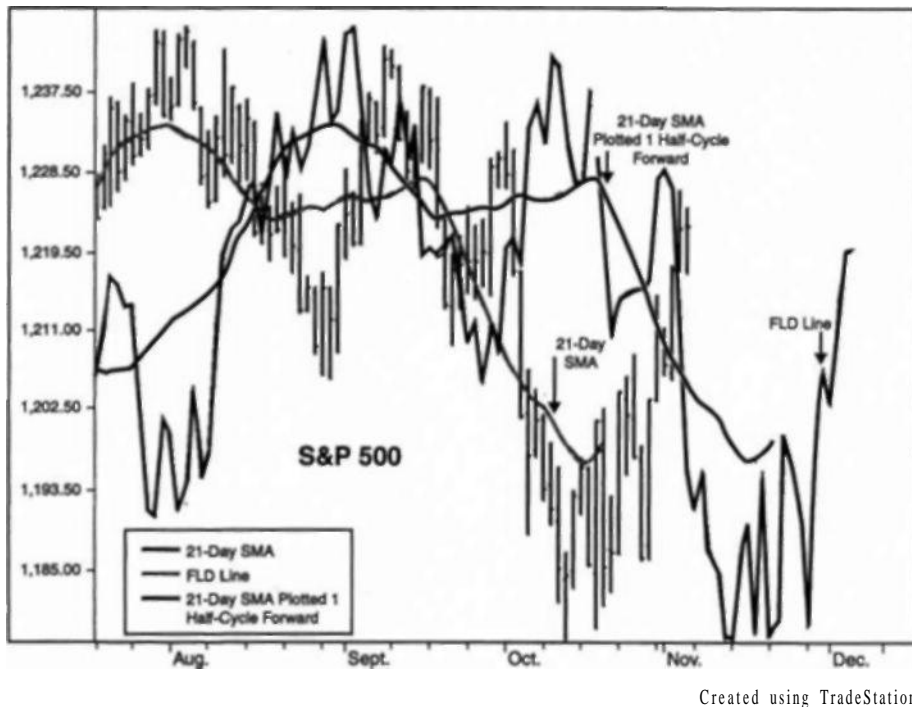


FIGURE 19.16 FLD line and forward line (daily: June 10, 2005-November 4, 2005)

As Figure 19.16 shows, the FLD line can be erratic, and the crossover can be due to the change in prices a half-cycle earlier. To combat this, a smoothed line equivalent to the FLD can be used instead. To smooth the FLD, we use a half-cycle SMA projected a half-cycle forward from current prices. This line is often called a "forward line" because it is an SMA plotted forward of prices. In Figure 19.16, the forward line closely follows the FLD, as it should, but it is less erratic and can be used for crossover signals instead.

### The Tillman Method

Jim Tillman (1990) of Cycletrend Inc. has developed a number of methods for cycle projections. He uses centered moving averages of half-cycles after having determined the dominant cycle periods.

Tillman's analysis concentrates on what he calls "focal points." Focal points occur when three or more half-cycle moving averages cross at roughly the same location. In Figure 19.17, only crossovers of two half-cycle moving averages (11-day and 21 -day) are shown, but Tillman's observations can still be made.

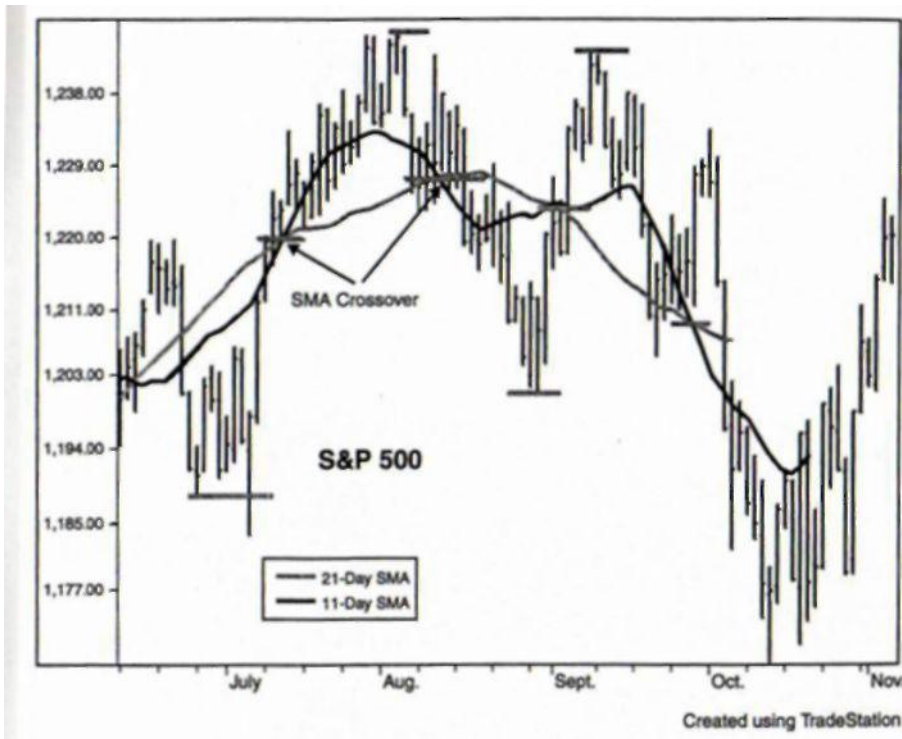
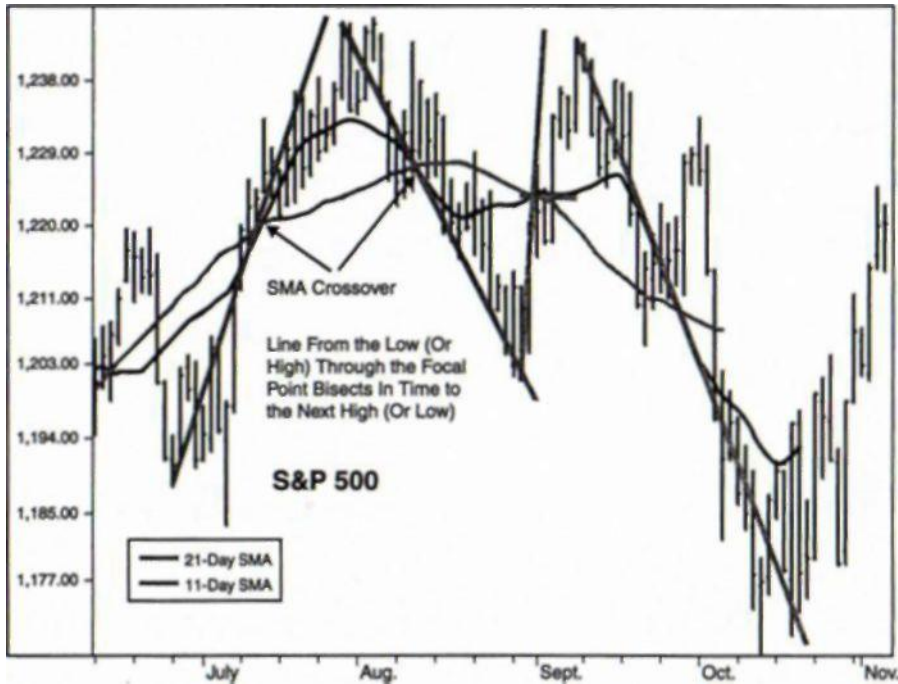


FIGURE 19.17 SMA crossovers-focal points (daily: June 10, 2005-November 4, 2005)

One observation is that focal points occur at roughly the halfway point of cycle advances or declines. Notice the horizontal lines at the 41-day cycle peaks, troughs, and crossovers in Figure 19.17. The crossovers occur roughly halfway between the peak and trough in points. The practical problem from this observation is that by the time the lagging half-cycle moving averages have crossed, prices have usually already reached their projection. The crossover thus occurs when the cycle is ending its run up or down. When you see a crossover in an upward leg of a cycle, you know that the upward leg is about to peak or already has.

In Figure 19.18, lines are drawn through the high or low of a cycle through the focal point. The upward sloping lines will continue through to the high of the cycle, and the downward sloping lines will continue through to the low of the cycle. The time from the low (high) to the focal point will equal, approximately, the time to that high (low). In our example in Figure 19.18, the time from the first low close to the focal point was 11 days, and 11 days later, the high was reached. The crossover is the center of the cosine wave. It is the center in time as well as distance.



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**FIGURE 19.18** line through focal point bisecting line from **low** to high or high to **low** (daily: June 10, 2005-November 4, 2005)

If we then draw a trend line between two successive focal points, we have an estimate of the direction of the next higher order cycle. Lines drawn parallel to that trend line to the immediate highs and lows will show that the trend is roughly midway between the parallel lines and that they represent the boundaries of the cycle, just as the earlier lines parallel to the moving averages showed. The advantage of using these parallel lines formed from the trend between focal points is that they can be projected into the future, whereas the moving average parallel lines had to be drawn freehand as a guess.



When the parallel lines are decisively broken, we know that the next higher order cycle has changed direction. This makes sense because the parallel lines define the boundaries of the lower order cycle. If they are broken, it must be due to the change in direction of the next higher order cycle.

For example, look at early October in Figure 19.19. The lower parallel trend line of the next cycle larger than the 41-day was broken downward. This indicated that the next higher order cycle, say the 81-day or longer, was reversing downward. When we draw the trend line between the two focal points on the way down, we can estimate that the crossover occurred when the 41-day low was being formed, and we can draw the two parallel lines to that trend, which tell us the approximate bounds of the next rally. By placing a buy order then in the vicinity of 1,185, with appropriate exit stops, we estimate that the 41-day rally will at least run up to the upper parallel line in the vicinity of 1,210.

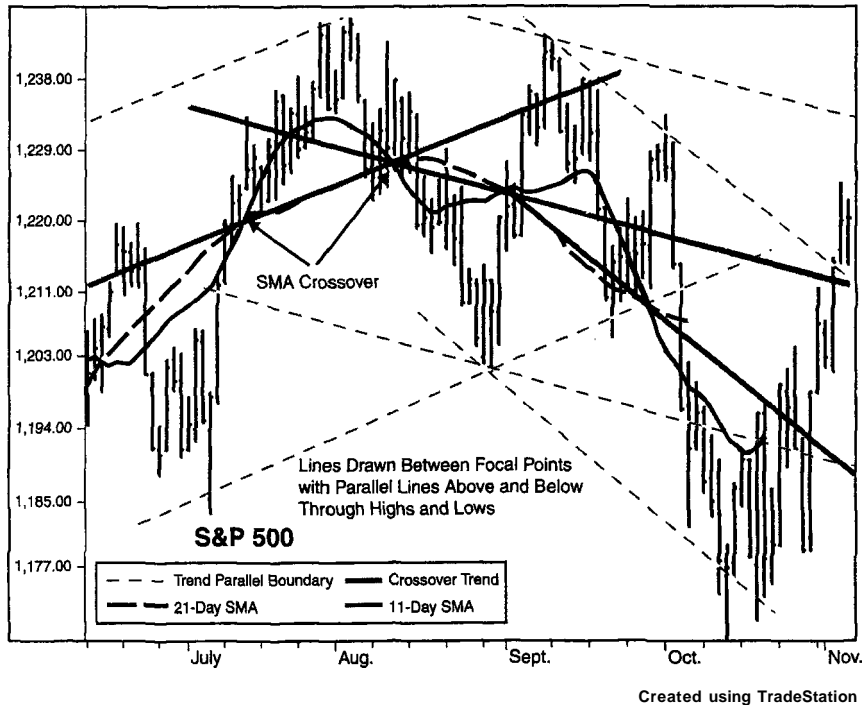


FIGURE 19.19 Trends between focal points and their parallel boundaries (daily: June 10, 2005 - November 4, 2005]

As it turns out, the upper parallel line was broken, indicating that the hypothetical 81-day or longer cycle turned upward again, and that the low in October was a higher order low. To see where that longer cycle is likely to go, we need to analyze the next higher order 81+ day cycles

using weekly data. Tillman's method, therefore, is much more precise in measuring not only the cycles, but also their estimated projections.

#### Concept of Commonality

Another of Hurst's principles, that of commonality, suggests that issues of the same nature tend to have the same cycles but with different amplitudes. In the stock market, this principle implies that individual stocks will have generally the same cycles as the stock market averages. The study of cycles requires the analyst's close attention and analysis. Few analysts pursue it because the conversion of the analysis to computers is difficult and requires some knowledge of applied mathematics and trigonometry. Much of the analysis must be done by hand. Because cycle analysis is intensive and very subjective, the analyst must select stocks with sufficient volatility such that the cycles of interest will have enough amplitude to become profitable if correctly timed. The same can be said of commodities in that innate volatility is a factor that should be considered when selecting an issue to trade using cycle analysis.

## CONCLUSION

The possible existence of cycles or waves in financial time series data is a controversial subject that remains unresolved. The results of standard spectral methods have been unsuccessful, so far, in isolating reliable waveforms in this data. This has led many skeptics to argue that the pursuit of cycles in financial data is futile. On the other hand, cycle analysts argue that the reason cycles have not been definitively isolated is that they change their characteristics too frequently and that standard mathematics cannot adjust quickly enough. However, a simple observation of price data shows that prices oscillate. If prices oscillate in a regular manner, the preceding analysis should be sufficient to identify this regularity and to make it useful for the projection of price action in the future. The concepts of Hurst, Ehlers, Tillman, and others—mostly professional engineers—are intriguing, and even if the ideas are difficult to apply, they provide interesting insights into the workings of the financial markets.

## REVIEW QUESTIONS

1. A great deal of controversy surrounds cycle theory. What are the reasons why some oppose cycle theory? How do the supporters of cycle theory respond to these criticisms?
2. Explain what each of the following terms means as it refers to cycles:
  - a. Amplitude
  - b. Period
  - c. Phase
  - d. Summation
  - e. Inversion
  - f. Harmonics

3. What do "left translation" and "right translation" mean? When would you expect to see each of these occurring in a cycle?
4. What is the argument for plotting a centered moving average centered over the time period in the calculation rather than plotting it at the end of the time period?
5. Download daily data for the S&P 500 for the period July 1, 2004 through July 1, 2005. (This historical data is available at <http://finance.yahoo.com>.)
  - a. Plot this data in a chart. Are any cycles apparent in your chart?
  - b. Detrend the data by creating an oscillator that is constructed using a ratio of the current close to the 11-day SMA.
  - c. Does the plot of this oscillator reveal any cycle in your data?
6. Using the S&P 500 data you collected in Question 5, plot a 41-day centered SMA and a 21-day centered SMA. Explain ways in which this information might be used to determine and project cycles.
7. What is a focal point? How is it used to project cycles?

# ELLIOTT, FIBONACCI, AND GANN

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The basic tenets of and vocabulary used with the Elliott Wave Theory
- The rules and guidelines of the Elliott Wave Theory
- The construction of the Fibonacci sequence
- The derivation and characteristics of the golden ratio
- The reasons why Elliott Wave Theory can be difficult for the average analyst to apply

Perhaps there is a natural structure in markets. Structure is seen in many phenomena in nature. Although markets appear to be completely manmade, perhaps their existence, flowing from human emotion and reason, is a product of evolution and follows a natural order. After all, nature includes humans among its species. Humans like structure. Unfortunately, however, we have seen that humans tend to presume structure when perhaps it is not present. This chapter discusses those theories of market structure that assume some sort of natural order. Many technical analysts have come to accept these theories at some level, but they are not necessarily practiced.

The most widely followed theory of market structure today is the Elliott Wave Theory. We will look at this theory and some of its interpretations. We will also look at the mathematical basis for this theory derived from a sequence of whole numbers called the Fibonacci sequence. In addition, we will consider briefly another theory of market structure by W. D. Gann.

## ELLIOTT WAVE THEORY (EWT)

Devised by Ralph Nelson Elliott, the Elliott Wave Theory (EWT) is an attempt to define a structure to the stock market, and by implication, other trading markets. EWT is based upon the notion that the market behaves in an irregular cyclic manner. Proponents of EWT believe that this cyclic

structure is classifiable and predictable. Defining the market structure allows the analyst to recognize where the market is within the structure and, from that, where it is proceeding next.

Because Elliott's theory defies any strict, mathematical description, except through anecdotal evidence, its existence is difficult to prove conclusively. Thus, even amongst practitioners of the Elliott Wave Theory, there is much disagreement about the "where are we" aspect of the theory. The basic rules are generally agreed upon, but because of the vagaries of interpretation, no agreement or consensus seems to arise as to present conditions.

In this chapter, we outline the basics of the theory, as espoused by Robert Prechter (1990), the principal proponent of the EWT. We also provide some alternate rules, when known, from some of the other leaders in the field and include some results from computer screening. However, we leave the interpretation and much detail to further study by the student. EWT is a complex subject and deserves some thought, even if a practical application can be elusive.

## Ralph Nelson Elliott

Born in 1871, Ralph Nelson Elliott spent most of his business career as a railroad accountant and reorganizer in Central America. After 25 years in the railroad business, he contracted a severe illness and was forced into retirement to recover. During his recovery, Elliott decided to study the stock market, having earlier subscribed to several market letters, one by Charles Collins and the other by Robert Rhea of Dow Theory fame. At the age of 63, he began his career as a stock market technical analyst, studying the Dow Jones Averages over periods from half-hours to months.

His initial discovery of the wave principle took place in early 1934. Becoming destitute, Elliott wrote to Collins asking for an arrangement by which he could be paid for market forecasts. Collins allowed him to write to him of his opinions on the market at that time, and Elliott was amazingly correct, calling several major market turns within the hour. In 1938, Collins published the first book on the Elliott wave called *The Wave Principle*.

In the late 1930s, Elliott moved to New York, and with Collins's financial assistance and investor referrals, began his business of newsletters, consulting, and money management. By now, Elliott was familiar with the Fibonacci sequence and had integrated it into his wave theory. Later in life, he wrote about all his discoveries in *Nature's Law—the Secret of the Universe*, but his advancing age affected his writing, and the book became disjointed and rambling. Elliott died in New York in 1948. Richard Martin, a former student of Collins, Hamilton Bolton, the publisher of *The Bank Credit Analyst*, and Bolton's business associate A. J. Frost were well-known for applying Elliott's theory after his death. Robert Prechter, a notable scholar of Elliott's theory, has published all his works, including magazine articles, in *The Major Works of R. N. Elliott* (1980).

## Basic Elliott Wave Theory

Elliott's theory describes the market structure as a nested series of waves of various length and size. A wave is a sustained price move in one direction as determined by the reversal points that initiated and terminated the move. A wave cycle is composed of two waves—an impulse wave and a corrective wave. The impulse wave is in the direction of the current trend; the corrective wave moves against the trend's direction. During a bull market, the overall trend is called a

"motive impulse wave" (upward price movement) and ends when a downtrend begins, signaling a major change in market direction.

The wave concept that a market has positive price movement followed by a correction is simple. The benefit of EWT is that it provides the analyst with more detail about these waves. Both the impulse wave and corrective waves include special subwaves. The impulse wave is always made up of five subwaves and determines the strength and trend of the wave cycle. Analysts traditionally label these waves with numbers (1, 2, 3, or I, II, III, or i, ii, iii, etc.) based on their degree relative to longer and shorter wave cycles. See waves 1 through 5, for example, in Figure 20.1. Waves 1, 3, and 5 are smaller waves that contribute to the larger wave's upward trend. Waves 2 and 4 are corrective subwaves; these corrective waves break the sustained upward movement.

The corrective wave is broken into three subwaves, rather than five. These subwaves are labeled with letters, such as A, B, and C, as shown in Figure 20.1. Waves A and C are associated with downward price movement. Wave B breaks this downward movement with an uptrend.

In describing the specific subwaves, analysts assume an upward underlying trend at the next higher degree and thus a rising five-wave impulse wave and a declining three-wave corrective wave. We will use the same convention, but the student must be aware that in an underlying downward trend, the same relationship between impulse wave and corrective wave holds, just in the opposite direction. In other words, the downward impulse wave would include five subwaves and three subwaves in its corrective wave upward.

Look at Figure 20.1. See how the upward motive impulse wave consists of three rising impulse subwaves, coinciding with the primary trend, and the corrective wave consists of two corrective subwaves, contrary to the primary trend. This pattern can be thought of as three steps forward and two steps backward, with each step followed by a small correction.

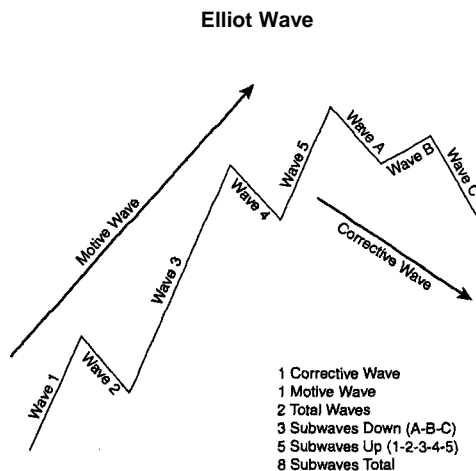


FIGURE 20.1 The structure of ideal Elliott waves within an upward motive impulse wave

Figure 20.1 demonstrates how the two waves of the cycle, the impulse and corrective waves, can be broken down into smaller subwaves. Each of these subwaves can be broken into separate patterns. Interestingly, the patterns of each subwave will form the same general impulse and corrective Elliott pattern with and against their trend. In other words, the patterns generated from the waves are fractal, a term we used earlier in describing how chart patterns of a specific type can exist in identical shapes in very short- as well as long-term charts. The patterns remain the same regardless of time or scale. Each series of waves will define a partem within a pattern both up and down the scale.

Unfortunately, the patterns do not have definitive time limits. One of the major problems of the interpretation of Elliott waves is in deciding at what degree level a particular pattern exists. Often the shape of the wave can be interpreted as being part of one degree of magnitude of waves, when it really is part of a larger or smaller degree of waves. These different interpretations may have different implied consequences, making projections even more difficult.

To establish the order of the waves being analyzed, analysts generally begin with a long-term interpretation and reduce the inspection of waves through lower and lower degrees until the trading horizon is reached. Misinterpreting any of the waves between the long-term pattern and the trading horizon pattern, of course, can alter the interpretation of future prospects as well.

Each of the subwaves within either the impulse or the corrective waves can have its own peculiarities and alternative patterns. First, let us look a little more closely at the characteristics of impulse waves. Then we will turn our attention to corrective waves.

## Impulse Waves

### Basic Rules

There are several rules regarding the characteristics of waves. These rules are inviolate. To violate a rule is to disregard the Elliott Theory and, almost certainly, to arrive at an incorrect conclusion and projection. Although there are not many rules, it is important to remember that they are strict rules that cannot be violated.

The six rules for impulse waves are as follows:

- Impulse waves move in the same direction as the trend of the next higher degree wave.
- Impulse waves divide into five subwaves.
- Within an impulse wave, subwaves 1, 3, and 5 are themselves impulse waves of a lesser degree, and subwaves 2 and 4 are corrective waves.
- Within an impulse wave, subwave 1 and 5 may be either an impulse or diagonal pattern.
- Within an impulse wave, subwave 3 is always an impulse pattern.
- In cash markets, within an impulse pattern, subwave 4 never overlaps any portion of subwave 1. This is not always true for futures markets.

In addition to the inviolate rules, Elliott observed other wave characteristics that routinely occurred. Elliott's observations were made without the advantage of computer power to sift through large amounts of data, and he used only the Dow Jones Industrial Average. The observations we include in this chapter are observations from computer screens of price action in many different trading markets and over many different periods (Swannell, 2003). Most of these observations agree with Elliott's assessments, but some differ slightly. Nevertheless, the computer screens display that his observations were mostly accurate.

### Impulse

Impulse patterns define the trend direction and strength. They include five subwaves, three of which move in the direction of the trend and two of which move in the direction opposite to the trend. A rising market generally has two strong subwaves: 3 and 5. In a declining market, subwave 3 is generally the strongest, and subwaves 1 and 5 are approximately equal.

Elliott Theory describes the character of each subwave in more detail. The details of these subwaves are as follows:

- Wave 1 is an impulse or a leading diagonal.
- Wave 2 can be any corrective pattern but a triangle.
- Wave 2 does not retrace more than 100% of wave 1.
- Wave 3 is always an impulse.
- Wave 3 is larger than wave 2.
- Wave 3 is never shorter than waves 1 and 5.
- Wave 4 can be any corrective pattern.
- Waves 2 and 4 do not overlap in price.
- Wave 5 is an impulse or ending diagonal.
- Wave 5 retraces at least 70% of wave 4.
- In the fifth wave, a diagonal, extension, or truncation indicates that a major reversal is to occur soon.

### Diagonals

A diagonal (see Figure 20.2) is the same as the classic wedge pattern seen in classic technical patterns. It is simply a triangle formation with both bounds headed in the same direction but at different angles so that they will meet at some point in the future.

Diagonal patterns can appear in wave 1 or wave 5. If a diagonal appears in wave 1, it is called a "leading diagonal." A diagonal appearing in wave 5 is called an "ending diagonal." A diagonal never occurs in wave 3. The direction of the diagonal bounds is the same direction as the trend of the higher degree impulse wave.



A leading diagonal usually consists of five subwaves of three wavelets, each a 3-3-3-3-3 configuration converging toward an apex. Occasionally, however, the configuration is 5-3-5-3-5, just as in an impulse but with the overlapping of waves 2 and 4 (Frost and Prechter, 2000).

An ending diagonal also includes five subwaves, each of which is in turn subdivided into three smaller waves. Often, the fifth subwave will break out of the diagonal's bounds for a short period before reversing. This is called a "throw-over" (Frost and Prechter, 2000).

A throw-over is an "elongated impulse with exaggerated subdivisions." Usually an extension will occur in only one of the subwaves in an impulse pattern. Thus, if waves 1 and 5 are approximately the same length, wave 3 likely will be extended. In fact, the third wave extension is the most common extended wave pattern in the stock market. In commodities, however, the extended wave is usually the fifth wave. When extended, a wave often appears to have nine subwaves rather than the usual five. This is because the extended wavelets are large enough to appear the same size as the subwaves themselves.

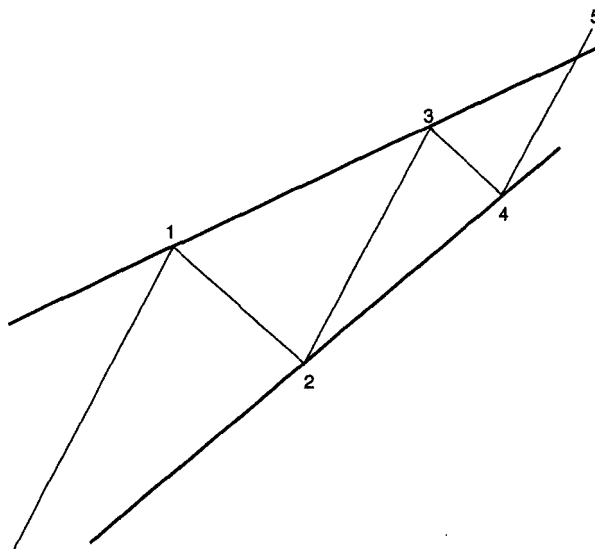


FIGURE 20.2 Diagonal leading or ending [in upward trend]

#### Truncation

Occasionally, the fifth wave fails to exceed the end of the third wave. This phenomenon is shown in Figure 20.3. Elliott referred to this as a "failure." Nevertheless, a truncated fifth wave will still have five subwaves.

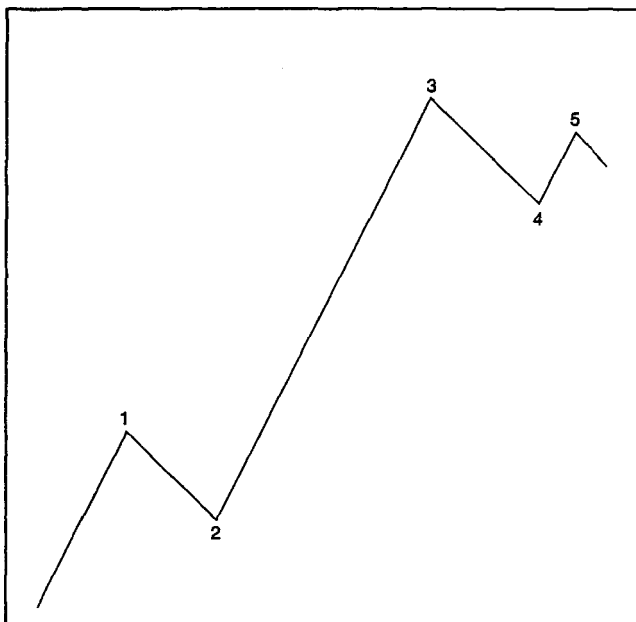


FIGURE 20.3 Truncated fifth in an uptrend

## Corrective Waves

Corrective waves are unquestionably the most difficult to interpret. They can appear in many different configurations and pattern combinations. Richard Swannell and Robert Prechter have both contributed to our current understanding of corrective waves. Swannell has tested price data, searching for waves, and Prechter has interpreted Elliott's original work with some modifications. The following information about corrective waves comes from the work of these two analysts.

Corrective waves commonly occur in three subwaves (A-B-C). The direction of corrective waves is either sideways, as in a trading range, or sharply opposite to the prevailing trend of the impulse wave. Corrective waves are generalized into three categories for descriptive purposes: zigzags, flats, and triangles.

### Zigzags

The single A-B-C correction in Figure 20.4 is an example of a zigzag correction. Generally, in a simple zigzag, wave A is an impulse, leading diagonal, or zigzag; wave B is any corrective pattern; and wave C is an impulse, ending diagonal, or zigzag. If wave A is a diagonal, wave C is not an ending diagonal.

In addition to this simple, single A-B-C correction, a zigzag correction can occur as a more complex double or triple zigzag pattern. The second correction pictured in Figure 20.4 shows the more complex double zigzag. Double and triple zigzags use different nomenclature for their descriptions. The double zigzag, for example, is two simple zigzags joined by a wave X. As shown in Figure 20.4, W and Y are often used to designate each simple zigzag within the double zigzag. When another simple zigzag is added to a double zigzag, a triple zigzag forms. The added simple zigzag is referred to as wave Z; the intervening wave is labeled XX. Fortunately, for interpretive purposes, triple zigzags are rare.

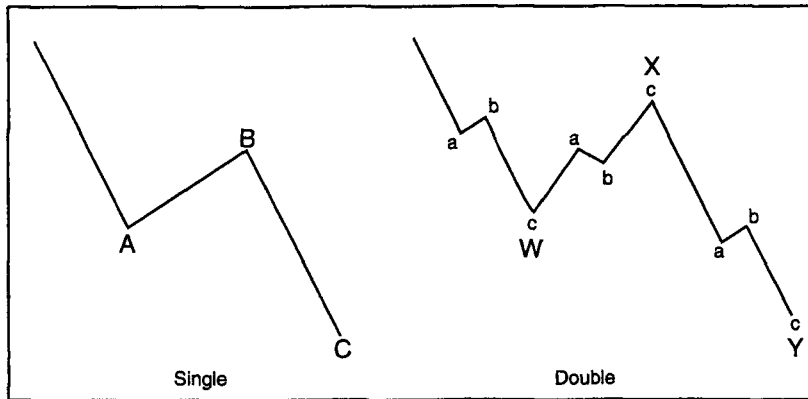


FIGURE 20.4 Single and double zigzag corrective pattern

Swannell (2003) provides the following characteristics for actual double zigzags:

- Wave W is a zigzag.
- Wave X is any corrective pattern other than an expanding triangle.
- Wave X is smaller than wave W.
- Wave Y is a zigzag.
- Wave Y is equal to or larger than wave X.

Triple zigzags continue with the same pattern as double zigzags; thus, wave XX is smaller than both wave Y and Z. Prechter points out that zigzags characteristically have a 5-3-5 combination of subwaves.

## Flats

Sideways patterns are called flats. Flats behave very similarly to zigzags except that rather than sharp upward or downward corrections to the prevailing trend, they move sideways, and their subwaves generally overlap. The characteristics for flats are the same as for zigzags except that

- Wave B is not a triangle, retraces wave A by at least 50%, and is less than twice the length of wave A.
- Wave C overlaps wave A at some point.

The A-B-C pattern in Figure 20.5 shows a simple flat pattern. In addition to this single A-B-C pattern, flats can occur as a double or a triple. Double and triple sideways have the same nomenclature as double and triple zigzags. Just like triple zigzags, triple sideways are rare. The characteristics of the double and triple flats are similar to their zigzag counterparts except for the necessary adjustments needed to produce a sideways pattern. Thus, common characteristics of these multiple flat patterns are as follows:

- Waves W, X, and XX can be any corrective pattern except a triangle, a double, or a triple.
- Waves Y and Z can be any corrective pattern except a double or triple.
- Wave X retraces at least 50% of wave W.
- Wave Y is greater than wave X unless it is a triangle.
- Wave XX retraces at least 50% of wave Y.
- Wave Z is not a zigzag if wave Y is a zigzag.
- Wave Z is greater than wave XX.

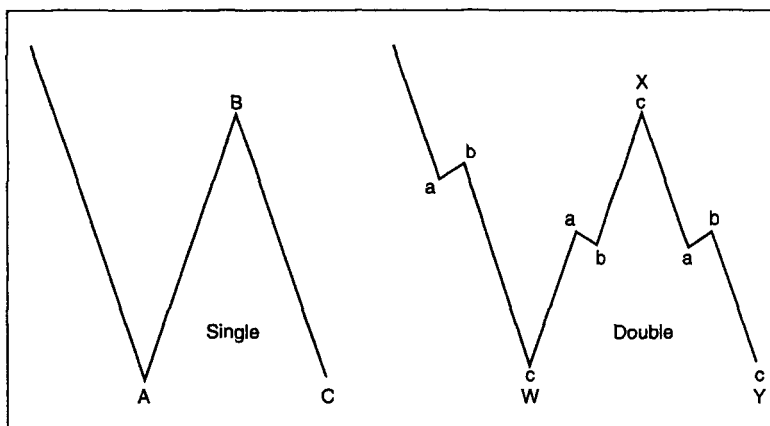


FIGURE 20.5 Single and double flat corrective patterns

Prechter points out that flats characteristically have a 3-3-5 combination of subwaves. Elliott, he argues, considered the sideways patterns as possibly including a combination of zigzag and flat, one followed by the other in a complex corrective wave. These were called doubles and triple threes. The method of designating each pattern is the same as the method used previously for double and triple sideways patterns.

### Triangles

The Elliott wave triangle is identical to the standard triangle pattern we discussed in Chapter 15, "Bar Chart Patterns," with the exception that it is limited to five waves (A-B-C-D-E). Prechter points out that triangles have a 3-3-3-3 combination of minor waves. The Elliott wave triangle can be either a converging or a diverging triangle.

The rules for a converging triangle are as follows:

- Wave A is a zigzag or a flat.
- Wave B is only a zigzag.
- Waves C and D can be any corrective pattern except a triangle.
- Waves A, B, C, and D move within the bounds of the channel lines between A to C and B to D.
- Bounds converge (one may be horizontal), and the intersection of the bounds occurs beyond the end of wave E.
- Wave E can be a zigzag or a converging triangle.
- Either wave A or B is the longest wave.
- Wave E ends in the range of wave A.
- Wave E moves within or closes within the bounds.

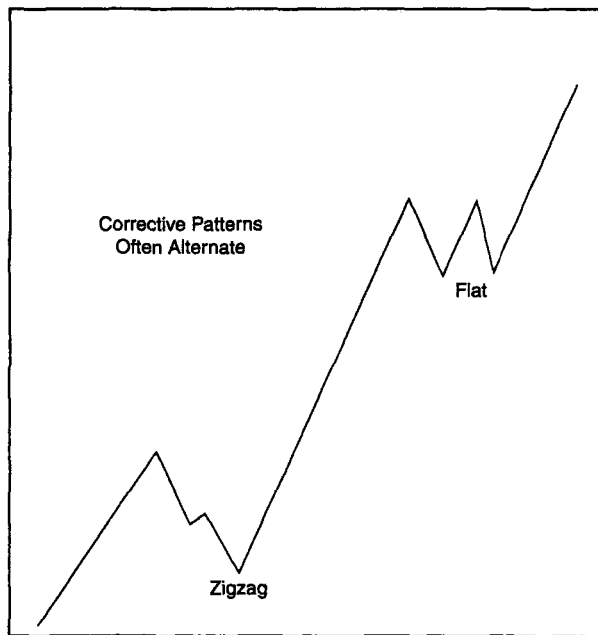
Expanding triangles, although relatively rare, have generally the same rules. The exceptions are that for the expanding triangle:

- Wave B is smaller than wave C but more than 40% of wave C.
- Wave C is smaller than wave D but more than 40% of wave D.
- The intersection of the bounds occurs before the formation of the triangle.
- Wave E is longer than wave D.
- Wave E ends outside the territory of wave A.
- Either wave A or B is the shortest wave.

## Guidelines and General Characteristics in EWT

### Alternation

Within EWT, a rule is inviolate. A guideline, as opposed to a rule, however, is less definite, and its instance is not to be expected at all times. Alternation is such a guideline. Alternation refers to the common occurrence of one type of corrective wave occurring in wave 2 and a different type of correction occurring in wave 4. In other words, the types of corrective waves tend to alternate. If wave 2 is a flat, for example, wave 4 will likely be some other type of corrective wave, such as a zigzag or a triangle. The guideline of alternation can also occur in a corrective wave when, for example, the first part of a double is a zigzag and the second part is a flat, as shown in Figure 20.6.



**FIGURE 20.6** Example of two corrective patterns alternating in an uptrend

### Equality

At least two of the three impulse subwaves in a five-wave sequence are often equal in length. Usually equality exists between wave 1 and wave 5, especially when wave 3 is extended. However, if wave 1 or wave 5 is extended, the remaining two will tend toward equality.

### Channeling

Channels, similar to those we discussed in Chapter 14, "Moving Averages," are used in conjunction with EWT. To construct a channel for a five-wave impulse, draw a line between the end of wave 1 and wave 3; then draw a parallel line through the end of wave 2. Price will tend to oscillate within this channel.

Sometimes wave 4 falls short of the lower channel line, as shown in Figure 20.7. When this occurs, draw a new line from the end of wave 2 to the end of wave 4. This line will be steeper than the original lower channel line. Then draw another parallel line running through the end of wave 3. This will give a rough approximation of where wave 5 should end. A "throw-over" occurs when wave 5 exceeds this second channel line and usually denotes excessive emotion in the market and possibly an extended fifth wave.

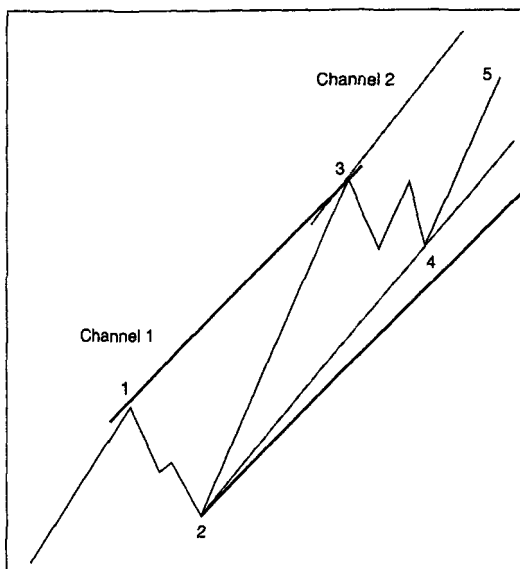


FIGURE 20.7 Channeling drawn between wave ends in an uptrend

### Projected Targets and Retracements

How can EWT be used to project prices? In the next section, we will discuss Fibonacci ratios and their use in projection. Because of the importance of Fibonacci numbers, we will devote an entire section to their use. Right now, we will mention a few other methods.

Some analysts use the channeling method for projections. These channels are useful because all price movement should lie within the channel. Prechter, however, mentions that two guidelines for target projections are available in addition to the channeling method. The first

occurs in wave 4. The extent of the larger wave 4 correction should be no further than the end of wave 4 of lesser degree. In other words, the larger wave 4 should not break through the end of the minor wave 4 in the larger wave 3 preceding the larger wave 4. The fourth wave target is shown in Figure 20.8.

Figure 20.9 illustrates a projection that occurs at the end of wave 5 extensions. When wave 5 extends, the corrective wave that follows is steep and often ends either at the minor wave 2 of the extended wave 5 or at the end of wave 4. In other words, the corrective wave following an extended wave 5 often corrects all or most of the extended wave 5 move.

From his screening of actual patterns, Swannell (2003) reports that the most accurate patterns for predicted results are the triangle and ending diagonal. Their consistent behavior after their completion gives results accurate enough to be almost 90% dependable.

Other means of estimating target prices have been proposed. Hill, Pruitt, and Hill (2000), for example, estimate that in impulses, the target for wave 3 is 50% of wave 1 added to wave 1, and the target for wave 5 is 100% of wave 1 added to wave 1. Their estimates of retracements are based on the length of wave A, the first correction wave. If wave A corrects 25-35% of the prior impulse wave, it will likely be only a single wave correction. If wave A corrects 35-50%, the correction will likely be a three-wave correction, and if wave A corrects 50-75%, it will likely be a five-wave correction. Any reaction more than 75% suggests a possible trend change.

The most common methods of determining targets and replacements use multiples of the Fibonacci ratios. We will now turn our attention to the derivation of these numbers.

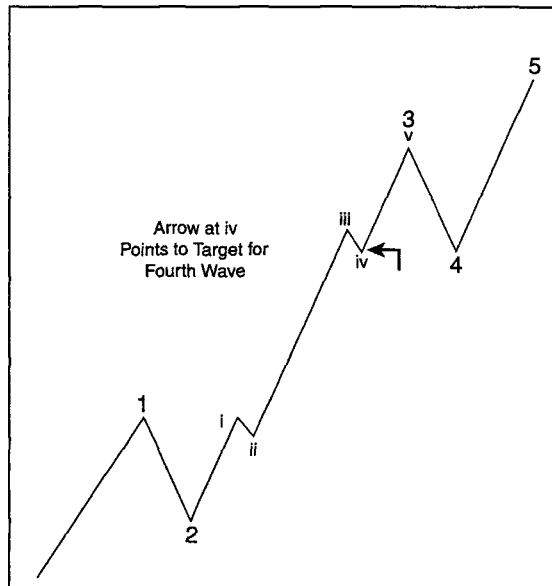


FIGURE 20.8 Fourth wave target estimate in an uptrend



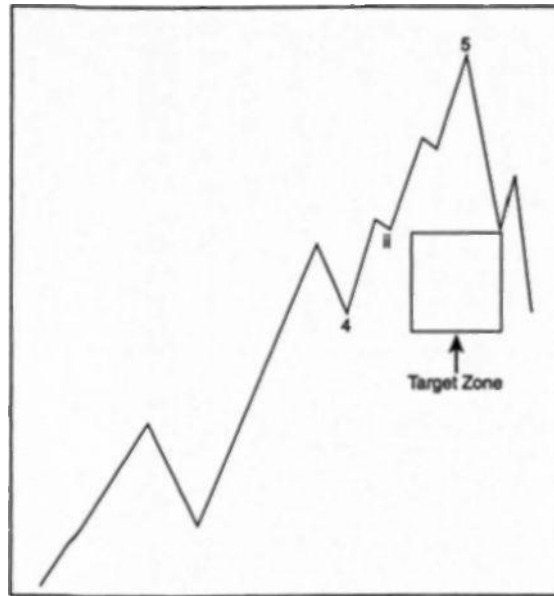


FIGURE 20.9 Extended fifth wave estimated target in an uptrend

### Alternatives to EWT

As would be expected with a theory that is so difficult to apply, many analysts have differing opinions about Elliott rules and guidelines. Most of these analysts stick with the general principles of impulse waves and corrective waves and their five-wave and three-wave subdivisions, but the application of other observations in the specific waves and interpretations of Elliott can sometimes cause quite differing results.

In his book *Mastering Elliott Wave*, Glenn Neely (1990) takes the reader from the most simple wave construction through an extremely lengthy set of rules that encompass his theory of how waves unfold. In doing so, the reader learns by practice how to set up an Elliott wave chart using the Neely method of dots rather than bar charts, how to determine monowaves and their larger patterns, and other nomenclature and idiosyncrasies of Elliott analysis.

Zoran Gayer, a student of the Neely school of Elliott analysis, has developed a sophisticated approach called bifurcation. This method is an offshoot of Chaos theory, where motion goes from erratic to organized, just as prices go from consolidation to trending. In Elliott terms, this would equate to going from corrective waves to impulse waves. Zoran, as he is known, calls them directional and nondirectional moves. Directional moves are those that do not correct more than 61.8%. The bifurcation points are not necessarily the extreme high or low of a wave but can occur when the price action changes tone and direction, such as at the end of wave 3 in conventional Elliott

labeling. The method becomes complicated and requires close study. Past Zoran commentaries can be seen at [www.safehaven.com/archive-1.htm](http://www.safehaven.com/archive-1.htm).

As with all the preceding methods, the assumptions underlying the market structure are that prices are determined by patterns of human nature and sentiment. Elliott believed that sentiment rose and fell in fits and starts that could be identified and labeled with his wave structure. That these fits and starts followed a mathematical sequence such as the Fibonacci sequence came as no surprise to Elliott.

However, Elliott's hypothetical structure has been analyzed by others who have used different growth structure models, even assuming that the controlling mathematics are still the Fibonacci ratios. Tony Plummer (2003), for example, hypothesizes that the growth curve of nature as well as sentiment in markets is a three-wave process influenced by shock. Shock need not be exogenous. It can be just the sudden realization that the markets have changed direction. Thus, the three-wave sequence consists of the first wave changed by natural causes and its natural completion in a normal growth curve, then a flat period as the new circumstances are evaluated, and finally the realization that the trend has changed and a second directional move. The entire cycle is composed of a zigzag up of three legs and a zigzag down, three separate cycles within the longer cycle, as illustrated in Figure 20.10. Using this method, Plummer maintains that he has been able to integrate Fibonacci, cycle analysis, and EWT into a simpler and more easily understood method of recognizing structure in the markets.

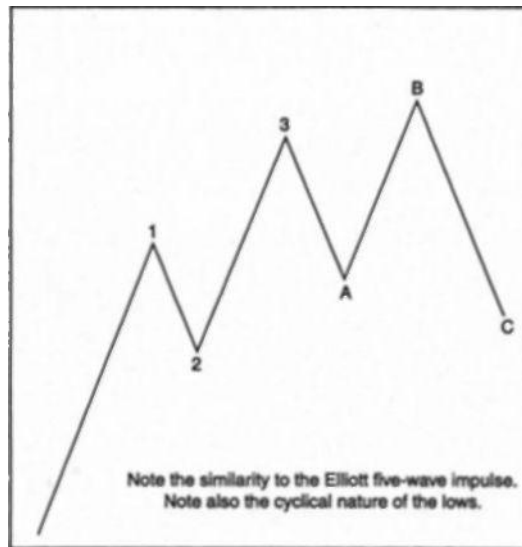


FIGURE 20.10 Plummer cycle three waves x three waves

## Using EWT

Although the theory of market structure is interesting, the point in technical analysis is to use these theories to make profits. With Elliott analysis, this is difficult. The application of the rules always seems to have exceptions, the description of waves often can only be determined after the fact, and the means of projecting into the future are suspect. This is not to say that the theories do not have value. They do, and at certain instances they can be profitably utilized. To do this, the analyst must be fully trained in Elliott analysis and be patient enough to wait for an opportunity that is clearly within the realm of the implied Elliott structure. Because Elliott analysis is not easily computerized, its practical interpretation needs other technical tools before any profitable signals can be derived.

Steven Poser (2003) is correct in stating that too many Elliott analysts attempt to pick the top and bottom of moves rather than take a piece out of the middle. They overanalyze the waves and generally become overwhelmed by minutia. He suggests that at least two other technical methods must confirm any Elliott wave expectation. Other suggestions are to determine the period in which the analyst is most interested and analyze the next higher and lower degree waves to establish the context within which trading or investing will occur. Establish key price levels, he says, such as targets, retracement levels, and important reversal points based on the Elliott analysis, and use other indicators such as moving averages and oscillators to confirm action signals. For example, he looks for momentum confirmation in wave 3 and divergences in wave 5. More importantly, he argues, the analyst must be aware of the behavior of the market especially at certain juncture points. The Elliott Wave Theory is a model of behavior, a useful means of understanding the position of the market within itself, not a mechanical system of forecasting.

Connie Brown (1994, 1999), who worked for Prechter for a few years and is now a professional trader and adviser, has devised oscillators to confirm waves within an Elliott context. She simplifies Elliott's basic rules into a five-wave pattern, where waves 1, 3, and 5 are impulses:

- Wave 2 may not break below the origin of wave 1.
- Wave 3 cannot be the shortest wave, but it does not necessarily have to be the longest.
- Wave 4 cannot overlap the termination of wave 1.

Rather than becoming obsessed with the smaller threes and fives and other patterns. Brown claims that getting a feel for the rhythm in the market is more important. By compressing the scale in a chart, the smaller, less important details become obscure, and attention then focuses on the market rhythm. Professional expertise is not needed to make money from this pattern. To determine the Elliott five-wave pattern. Brown begins at the middle of a pattern where the largest price move occurred and looks forward and backward (uncovering price action by widening the distance between her thumbnails that are covering price action before and after the large price move). She then uses Fibonacci ratios, Gann time, and price projections combined with oscillators based on the RSI and her composite index to estimate price projections and give action signals.

## THE FIBONACCI SEQUENCE

### Fibonacci

Leonardo Pisano, better known by his nickname Fibonacci, was born in 1170 in Pisa, Italy. Fibonacci's father, Guilielmo Bonacci, was a public notary, working for the interests of the merchants of the Republic of Pisa. Because of Guilielmo's work, Fibonacci traveled with his family extensively through Northern Africa and the Mediterranean as a child. At a young age, Fibonacci was exposed to the mathematical and accounting systems of the various merchants with which his father worked. In his writings, Fibonacci recalls learning the mathematical and accounting systems of India, Egypt, Syria, Greece, Sicily, and Provence.

Around the age of 30, Fibonacci ended his travels and returned to Pisa. There he wrote a number of important texts that played an important role in reviving ancient mathematical skills. Copies of his books *Liber abaci* (1202), *Practica geometriae* (1220), *Flos* (1225), and *Liber quadratorum* (1225) still exist today. Other books written by Fibonacci, such as his book on commercial arithmetic, *Di minor guisa*, have been lost.

The writings of Fibonacci are credited with bringing the Hindu-Arabic decimal place mathematical symbols that we use today to Western Europe. Many of his works dealt with pricing issues faced by merchants. He is thought to have invented present value analysis of cash flows in contracts and a method for expressing investment returns. In addition, he solved a number of complex interest rate problems (Goetzmann, 2003). Fibonacci was likely the world's greatest mathematician in his time. Although his work formed the basis of our decimal system, and he laid the groundwork for financial mathematics, he is unfortunately remembered today almost exclusively for a small portion of his life's work—his numerical sequence.

### The Fibonacci Sequence

Fibonacci derived the sequence by answering the question of how many rabbits can be produced over a year from an original pair, in an enclosed space, when all pairs give birth each month to a new pair that in turn can breed in two months. The sequence of pairs occurs in the following manner by month: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, and 144. These are called Fibonacci numbers. Fibonacci numbers are simply a sequence in which the last number is added to the previous number to arrive at the next number. For example, 5 plus 3, the previous number, produces 8, the next number; next, 8 plus 5 produces 13, the next number. This sequence can continue to infinity.

### The Golden Ratio

There are a number of reasons why this sequence is of interest to mathematicians and scientists. One reason is the relationship that the sequence has to the "golden ratio." Except in the very low

numbers, the ratio of any number in the sequence to the next lower number is 1.618 (e.g.,  $144/89 = 1.61798$ ); the ratio of any number in the sequence to the next highest number approaches 0.618 (e.g.,  $55/89 = 0.61798$ ). The number 1.618, known as the "golden ratio," and its reciprocal of 0.618, possess many interesting properties. For example, it is the only number that when added to 1 is the same as 1 divided by itself. Another fascinating fact is that 1.618 multiplied times 0.618 = 1. There are many more strange relationships between .618 and whole numbers; see Box 20.1 for a demonstration of the "mystery" of this number. Mathematicians use the Greek letter *phi* to refer to this ratio.

The golden ratio has been of interest at least since the pyramids were built and likely long before. Buildings built in proportion to the golden ratio were thought to be most pleasing to the eye. The Parthenon and the Washington Monument, for example, have dimensions based on the golden ratio. Not until relatively recently, in terms of the history of civilization was the golden ratio derived mathematically through the Fibonacci sequence.

**BOX 20.1** Golden Ratio (1.618) from Arbitrary Whole Numbers

Pick any two whole numbers. For this example, we picked 14 and 285, but it will work for any two numbers. Add the two numbers together. In the following example,  $14 + 285$  equals 299. Calculate the ratio of the sum and the second addend; in our example, this is  $299/285 = 1.049$ . Repeat the process adding the second addend (e.g., 285) to the resulting sum (e.g., 299). As you progress through the iterations, notice how the ratio approaches 1.618.

Iteration	Result	Ratio
1. Add the two numbers together. $14 + 285$	299	1.049
2. Add the result to the highest previous: $285 + 299$	584	1.953
3. Add the result to the highest previous: $299 + 584$	883	1.512
4. Add the result to the highest previous: $584 + 883$	1467	1.661
5. Add the result to the highest previous: $883 + 1467$	2350	1.602
6. Add the result to the highest previous: $1467 + 2350$	3817	1.624
7. Add the result to the highest previous: $2350 + 3817$	6167	1.616
8. Add the result to the highest previous: $3817 + 6167$	9984	1.619
9. Add the result to the highest previous: $6167 + 9984$	16151	1.618

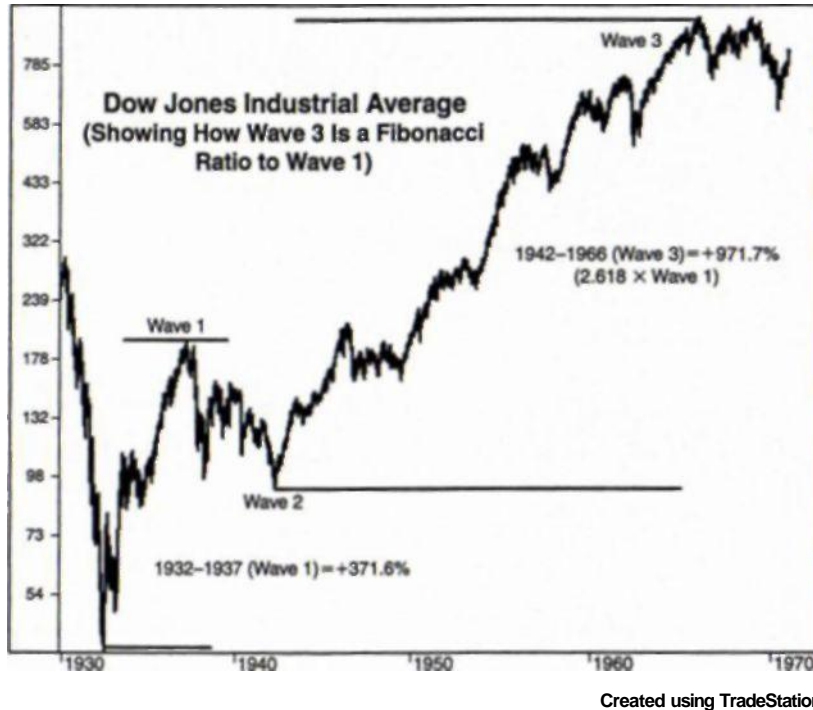
Plato considered the golden ratio to be the "most binding of all mathematical relations, and considered it the key to the physics of the cosmos" (Frost and Prechter, 2000). German-born, seventeenth-century mathematician, astronomer, and astrologer, Johannes Kepler likened the golden ratio to a fine jewel and claimed that it described all creation. The reason for this adoration is that the ratio appears in innumerable natural phenomena. For example, consider a spiral that has its arc length to its diameter at a ratio of 1.618; this spiral occurs in nature in comet tails, galaxy spirals, spider webs, pine cones, snail shells, ocean waves, and even the human finger when curled. It is universal. It is a growth pattern in nature, and Elliott hypothesized that it occurred in the stock market as well.

Look back at Figure 20.1; see how the number of waves, as the partem becomes more complex, follows a Fibonacci sequence. The first waves are corrective and impulse, one and one, totaling to two. Then there are three corrective waves and five impulse waves, totaling eight waves. Each of these numbers is part of the Fibonacci sequence. If we take the progression further and include smaller and smaller waves, the number of waves continues in a Fibonacci sequence. Although this relation to Fibonacci numbers is interesting, it is portraying the ideal. But remember if you take any two whole numbers and add them together, then add to the sum the previous highest number, eventually you will arrive at *phi*, the Fibonacci ratio (1.618), between the highest number and the previous highest number. (See the example in Box 20.1.) Thus, the ratio is the universal relation rather than the numbers themselves. It is the ratio and derivatives of it that are applied to stock markets.

## Price and Time Targets

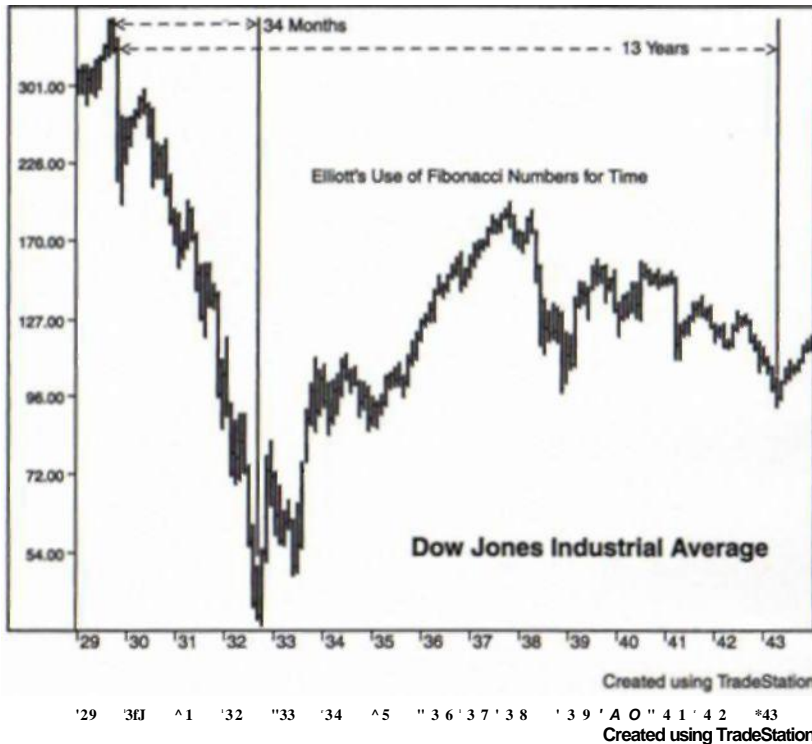
Elliott wave enthusiasts, to predict retracements and price targets, as we have already seen, and to project the timing of the next series of waves, use Fibonacci ratios. For example, Prechter notes that corrective waves tend to correct approximately 61.8%, or its complement 38.2% (100%-61.8%), of their corresponding impulse waves. Prechter is quick to point out, however, that this is a tendency, not even a guideline, and is not dependable. He found that more reliable relations exist in projecting target prices for alternating waves. For example, in percentage terms, impulse waves tend to be related in some manner by 2.618, 1.618, 0.618, or 0.382. As an example, he noted that the rise in the Dow Jones Industrial from the low in 1932 to 1937, wave 1, gained 371.6%, while wave 3 from 1942 to 1966 gained 971.7%, 2.618 times as much. This relationship is pictured in Figure 20.11.

Numerous other examples of relations between waves can be cited. One common occurrence is when wave 1 and wave 5 are the same length, wave 3 is often either 1.618 or 2.681 times wave 1. In addition, in a fifth wave extension, the length of the fifth wave is frequently 1.618 times the length from the beginning to the end of wave 3. Many times in an extended wave 1, the remaining four waves end at 0.618 the length of the extended first wave. In corrective waves, wave C is often related to wave A in some Fibonacci ratio, and the wave 4 length is often related by a Fibonacci ratio or by equality to the length of wave 2.



**FIGURE 20.11** Prechter interpretation of Fibonacci ratio between wave 1 and wave 3 in period 1932-1966 [monthly: 1930-1970]

In addition to the extent of price movements in waves being related by Fibonacci numbers, times in stock market data have also been related to the Fibonacci ratio. However, this exercise is spurious at best. Tables are often used to show the time differences between important peaks and valleys in market prices that occurred in a Fibonacci number of years, months, or days. Elliott himself used the example of the 34 months between the peak in September 1929 and the bottom in July 1932 and the 13 years between the peak in 1929 and the low in 1942 (see Figure 20.12). Although others also have seen a relation between Fibonacci time counts and important events, Hamilton Bolton, a contemporary of and correspondent with Elliott, and publisher of the *Bank Credit Analyst*, stated, "Permutations tend to become infinite" (Frost and Prechter, 2000). One of the tenets of any technical theory is that the principles must make sense. In the case of time, which is determined somewhat arbitrarily by humans and differently over the ages, the likelihood of there being a consistent series of time intervals that follow Fibonacci sequence numbers is a little far fetched. Indeed, a comprehensive study by Herbert Riedel, PhD (1989) on 182 days of the Dow Jones Industrial Average in 1985 demonstrated that no evidence of Fibonacci ratios was present either in retracements or in timing.



**FIGURE 20.12** Elliott's example of Fibonacci numbers in time (monthly: January 1929-December 1942)

Although there is perhaps a far-too-often coincidence of waves being related to other waves by some variations of the Fibonacci ratio, the practical problem is that the relations, even if valid, are not usually known until after the fact. Thus, the relations are interesting but generally unproductive. To some extent, the same can be said about wave structure. One of the great problems with Elliott wave analysis is that the proper sequence of impulse and corrective waves is not often recognized until after the price action has completed. Even then, analysts—even those with considerable experience—will argue over whether the configuration is one type or another. For the technical analyst, especially one starting out, the concept of the Elliott Wave Theory must be understood in general terms, but the likelihood of being a seasoned practitioner is remote without considerable study, analysis, memorization of the rules and guidelines, and inspection of many long- and short-term price charts.

### W. D. Gann

William Delbert Gann, born in Texas in 1878, roughly at the same time as Elliott, left his formal schooling at the age of 16 to begin his career as an itinerant salesman. Legend suggests that he made several fortunes in the commodities markets, married a number of younger women, and



spent huge sums on planes, yachts, real estate, and gambling in Cuba (Costa, 2000). Some believe he was a scoundrel, that his courses on trading were full of generalities and astrology, and that he sold his advisory service several times (Williams, [www.ireallytrade.com/asiseeit.htm](http://www.ireallytrade.com/asiseeit.htm)). We do know that he died with very few assets. Nevertheless, Gann was a prolific writer, both of novels and advisory books. He published articles and sold courses on trading. Richard Wyckoff wrote an article on his trading, and Gann received considerable notoriety in his time for trading, especially in cotton. He was a superb trader, as witnessed by several independent observers. Whether or not he used the methods he proposed is uncertain.

Gann's published concept of market structure, specifically in commodity markets, encompassed time as well as price. He is known for such things as circles, squares, and triangles, all having to do with the angles of a circle. For example, he strongly believed in the seasonal cycle of approximately 360 days, the same as the number of degrees in a circle, the circle of the earth traveling around the sun. Thus, portions of a circle were important, such as 90, for 90 degrees, a quarter year, and 180, a half year; he expected that low to highs or highs to lows would generally occur within those time periods or divisions of them. He preached that the range between tops and bottoms could be divided into zones that would project retracement levels, and he used angles drawn from tops and bottoms that when crossed, especially at the same level as his support and resistance zones, were important predictors of time and price for retracements. His concept of squares and rectangular shapes, not mathematical formulas, denoted where in time and price future price motion should occur. Gann also discovered the strength of the fifth year of each decade, which since 1905 has been an up year. He claimed incorrectly to have invented swing charts, but he did successfully promote them as a method of trend following. His square of 52 is based on the 52 weeks in a year, or in a circle. His square of 144 is  $12 \times 12$ , or the number of months in a circle. He devised spiral calculators such as the square of nine, the square of four, the 360-degree circle chart, and the hexagon chart. Gann also published a summary of 28 trading rules, all of which are still valid today.

There is no question that Gann was an inventive person. Whether his discoveries are hocus-pocus to sell his courses and books we do not know, because his methods are too vague to properly test, but even today a few analysts follow his numerological methods and claim success.

## CONCLUSION

In this chapter, we have discussed the resemblance of stock market cycles to cycles seen occurring in nature. The basis for much of this theory goes back to the work of Ralph Elliott in the late 1930s. Elliott's work focuses on the waves in the stock market, especially how these waves are related to Fibonacci numbers and the golden ratio. His work has been thoroughly studied by subsequent analysts, especially by Robert Prechter.

The mathematical relationships and tie to nature found by these analysts can be fascinating. A basic knowledge of wave theory is a great aid to the technical analyst. However, making profitable trading decisions based primarily on wave theory is difficult. The theory is complex, requiring a great deal of study. Often waves can be found, in retrospect, which amazingly adhere to some variation of the Fibonacci sequence. However, it is often impossible to recognize these patterns and waves as they are occurring, making it difficult to use them for trading decisions.

## REVIEW QUESTIONS

1. Explain the following Elliott Wave Theory terms:
  - a. Motive wave
  - b. Corrective wave
  - c. Impulse wave
  - d. Subwave
  - e. Truncation
  - f. Equality
  - g. Alternation
  - h. Rule
2. The EWT partem is often said to be like "three steps forward and two steps back." Explain this phrase as it relates to EWT.
3. Explain what a Fibonacci number is.
4. Explain the difference between a zigzag and a flat in EWT.
5. Choose any two numbers, and go through the method shown in Box 20.1 to demonstrate how you will arrive at the golden ratio.
6. Explain why using EWT can be difficult for the average analyst.

# **PART VII**

## **SELECTION**

### **CHAPTER 21 SELECTION OF MARKETS AND ISSUES: TRADING AND INVESTING**

# SELECTION OF MARKETS AND ISSUES: TRADING AND INVESTING

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The major factors to consider when choosing a security to trade
- The major factors to consider when choosing an investment security
- The relationship between hard asset and soft asset markets
- The basics of intermarket analysis
- The concept of relative strength among different investment vehicles and its implications for investors
- The basic methods of determining an individual stock's relative strength

We have now reached the stage in technical analysis where we become more practical. After learning how to analyze the long-term stock market and how to use various technical tools to determine the best entry and exit points in individual issues, we now focus on exactly what issues to consider for trading or investment goals. Those interested in using technical methods in markets must determine whether they have the time, inclination, and facilities to trade issues, or whether they wish to consume less time and utilize technical methods for investing over longer periods.

## WHICH ISSUES SHOULD I SELECT FOR TRADING?

Trading requires a complete commitment to the markets. It requires time every day and night, even if swing trading from day to day. Intraday trading requires constant attention, excellent execution abilities, and high-speed price reporting. It is not for everyone, and it is not advisable for people who have other jobs and limited time to commit. Trading can be accomplished through mechanical

systems that are developed for that purpose, but even then, a heavy time commitment is necessary to perform the executions, to monitor the system, and perhaps to develop new systems.

The wise trader will select more than one issue to trade. In the stock market and the futures market, diversification is a necessity for many reasons. First, when a single issue becomes dormant in a small trading range and is difficult to trade, other issues with which the trader is already familiar can take its place. Second, following more than one issue increases the odds that a profitable trend will not be missed. Third, diversification, especially in issues that are not correlated, reduces risk. Thus, when screening markets with the criteria discussed next, anywhere from three to ten issues should be selected, watched, and traded. In Chapter 23, "Money and Risk Management," we will see that only a minimum commitment should be made to any one issue. Trading only one issue, and using more than the suggested initial capital in that one issue, substantially increases risk of failure.

Some traders, rather than concentrating on just a few issues, would prefer to screen through the entire marketplace for issues showing signs of an impending trend change. They program their computers to search for new highs and lows, gaps, one- and two-day reversal patterns, range and volatility changes, volume changes, moving average crossovers, and any number of other short-term indicators of possible trend change in individual stocks and contracts. From this information, they glean issues to trade over short periods and then go on to the next selected issues.

## Choosing Between Futures Markets and Stock Markets

A trader must also make a choice about whether to trade in the stock market or the futures market. This choice is a personal one. The trader must consider a number of factors when making this decision. These factors include costs, personal risk preferences, preferred time horizon for trading, familiarity with each market, access to the proper equipment, and execution capability. Let us look at these factors in a little more detail.

### Costs

Trading is a grueling, time-consuming process. It is not as glamorous as some recent movies make it out to be. Aside from the emotional strain of having to make instant decisions and instant executions, trading has many hidden costs that add up because of the many transactions necessary to profit. These transaction costs go beyond the commissions paid to the executing broker. The first cost is the initial setup of equipment. To trade, you must have not only a high-speed computer, excellent data feeds, and reliable, quick execution capability, but you must also have a backup. You cannot afford to have your system go down during a short-term, especially intraday, trade. Other costs are commissions, slippage, missing the intended price during a fast market, limit days, and unexpected events, seemingly always occurring at a critical juncture. (The dog pulls the wires out of the computer, the cat walks across the keyboard and executes several orders, and so on.)

### Risk

Each trader must determine his or her own level of risk tolerance. Futures are considerably more risky than stocks because they are usually traded with high leverage. Leverage is the amount of

capital that can be borrowed to initiate and carry a position. Because futures can be entered into with a relatively small amount of personal capital, a trade can lose all its capital with a small adverse move. With futures, the danger always exists that an adverse move will eliminate the trader's protective margin, requiring the trader to come up with more funds or be "stopped out."

We investigate this leverage risk more thoroughly in Chapter 23. Stocks can also be leveraged, but usually not to the degree that futures can, and are, thus, not as risky to capital. This is not to say, however, that a stock trader cannot go broke as quickly as a futures trader can. Capital risk depends on many other factors than just leverage.

#### Suitability

Your experience in the markets determines the issues with which you are most comfortable. For beginners in technical trading, the slowest and least risky markets are the best. Once your trading experience provides enough confidence, you can enter other faster and more risky issues. Suitability also encompasses time available, how much should be invested in fancy quote and execution equipment, and so on. It is based on personal choice and preference.

#### Time Horizon

Three types of trading are done by nonmarket makers—scalping, day trading, and swing trading. Scalping is taking very small profits between the bid and ask prices of a stock. It requires very close attention, excellent execution, fast-feed charting equipment, and communications, in addition to considerable experience. The competition is fierce between the scalper and the market makers, specialists, floor traders, and those others very closely connected with the issues being traded. This type of trading is not for amateurs.

Day trading is trading an issue and closing all positions by the end of the day. It has an advantage in that there is no overnight risk because no positions are held overnight. A variation of day trading is called screen trading. Screen trading uses technical analysis intraday shown on a computer screen to give signals. The bar lengths are determined by the trader's ability to react quickly and accurately. Most commercial intraday technical analysis software divides trading into anywhere from single tick-by-tick, to 5-, 10-, 15-, and 60-minute bar lengths. From this data and software, almost any indicator or pattern can be programmed and used to identify opportunities. Again, however, it requires the time to watch positions all day and the equipment necessary to execute and watch entries and exits. Nevertheless, day trading has become very popular. The new automated electronic exchanges where trades are executed immediately against the trading book have revolutionized day trading and made markets more accessible to nonprofessionals. The advent of the e-mini S&P 500 futures at the Chicago Mercantile Exchange is an excellent example of a new futures contract that is executed almost instantly and has a margin requirement considerably less than its earlier, larger version.

Swing trading, the third type of trading, is more easily accomplished by amateurs. It is the holding of positions over several days or weeks, attempting to catch the small trends accompanying or counter to a longer trend. The swing trader can determine entry and exit prices during non-trading hours and can judiciously place orders for the next trading day to enter or exit positions. Many swing traders watch the market throughout the day, but it is often not necessary.

Of course, professional traders are active in all the preceding trading methods because they are intimately in tune with the markets.

### Volatility

As we saw in some of the short-term trading patterns, low volatility is a difficult world in which to make profits. The breakout from low volatility to high volatility is where most of the profit is derived. Therefore, futures or stocks with low volatility are generally not good choices for trading. The transaction costs of exit and entry, the possible mistakes in execution, and other costs demand that the issue traded has enough price change to make a profit despite these problems.

### Liquidity

Volatility, however, must be accompanied by liquidity. Price changes may be large (high volatility), but if no size is available for trading, this volatility is of no use to the trader. Liquidity is the ability to transact a meaningful number of shares or contracts easily and without bringing about a large price change. Even volatility with heavy volume may be deceiving if the volume only occurs sporadically within the trading horizon. For stocks, volatility can be measured using the **ATR14**. A more complicated formula is necessary for futures because of the different dollar value of point moves and the different margin requirements for each market contract.

Volatility usually is related to the size of the bid and ask and the spread between bid and ask. A narrow spread does not guarantee liquidity because the bid and ask may be small. For easy entry and exit, high liquidity is a requirement. Trading is difficult enough without having to worry about whether an order will be executed close to the desired price. Each month, a section of *Technical Analysis of Stocks & Commodities* called "Futures Liquidity" shows a list of the most popular futures markets with their respective relative liquidity. These figures are based on the number of contract expirations that are traded, the total open interest, and volume. The list also displays the margin and effective margin for each contract series.

### Volume

Issues with constant heavy volume are usually issues that have liquidity, but they may not have sufficient volatility to profit. Volume is therefore a requirement for a trading issue, but it is not the final determinant. Liquidity and volatility are also required.

## **WHICH ISSUES SHOULD I SELECT FOR INVESTING?**

When investing, the universe of potential investments is enormous. This means that some method must be used to cull out the investments, determining those most likely to outperform the markets. Usually, the investor only goes long investments or in cash, rarely short, though in the commodities markets, long one currency, for example, may be equivalent to being short the other. Let us look at some of the items you need to consider when choosing investment securities.

In the futures markets, selection is usually based on a ratio analysis of each future versus a basket of futures or against another investment vehicle. In the stock market, selection uses two different methods. The first method is the "top-down" method whereby the prospects for the

market are first determined, then the prospects for groups (such as industry groups or countries) are determined, and finally—after the decision is made that the market is favorable and certain groups are favorable for investment, specific stocks are selected from within the groups. This method is more common in fundamental analysis and in professional management where there may be little choice as to whether to be in the stock market or not. It is often called asset allocation, and the first step is the group selection.

The second method is the bottom-up method, whereby stocks are selected, usually based on their price behavior. This method is more technically oriented because it uses relative price strength as one of its primary selection criteria. By selecting stocks first, regardless of their group affiliations, the portfolio manager can assess what groups are performing well and whether the entire market is favorable or not. If few stocks come through the screens for performance, it is clear that the market is in difficulty, for example, and if many stocks meet the investment criteria, the market is favorable.

## TOP-DOWN ANALYSIS

Top-down analysis begins with a study of the major markets such as interest rates, currencies, and stock market to determine which market has the highest possibility of profit in the future. Once a market has been selected, the next level of decision making is the groupings of issues in that market, and finally the individual issues within those groupings. In the currency markets, the breakdown for U.S. investors is basically whether to invest in the dollar or in a foreign currency. If it is to be a foreign currency, the selection is large and can be broken into further groups—for example, the resource-producing countries and the emerging countries. If the bond market is chosen, the groupings can be on length to maturity, country and currency, and level of default risk. In the stock market, of course, industry groups are the standard sectors, but others are used such as capitalization, foreign origin, investment style, and interest-rate related. The investor must decide the long-term, secular trend in the various markets. As in trading, the trend is the most important aspect of any price change and the major determinant of whether the investor will profit from investing. Bucking the trend in investing is just as dangerous as it is in trading.

The technical method used to determine markets' relative attractiveness is called "ratio analysis." It compares different markets to each other to see which is performing most favorably. After a market has been selected that fits the investor's objectives, further comparisons are made with components of that market, such as by industry group, capitalization, or quality.

## Secular Emphasis

John Murphy, in his book *Intermarket Technical Analysis* (1991), discusses the concept of alternating emphasis in the markets on hard assets and soft assets over long secular periods. "Secular" is a term used for any period longer than the business cycle. Hard assets are solid commodities such as gold and silver; these assets traditionally are considered an inflation hedge. Soft assets are financial assets, called paper assets, that primarily include stocks and bonds.

Generally, when hard assets rise in value, soft assets decline. However, since 1998, this relationship has not always held. The reason for the inverse relationship between the value of



hard assets and of soft assets is that a close correlation exists between material prices and interest rates. Inflation, or higher material prices, is generally associated with higher interest rates. When inflation becomes a threat, paper assets, which decrease in value as interest rates rise, are undesirable as investments. Likewise, when hard asset prices decline, interest rates usually decline, and soft assets increase in value.

The theory that one or the other of these kinds of assets becomes popular for substantial periods is not a new one. The principal problem with proving this theory is the lack of hard asset prices going back before the free market in gold in the late 1960s. Nevertheless, the concept likely has some validity because since then, markets have generally alternated between these two basic types. One thought is that a 16-year hard/soft asset cycle exists. If so, as of 2002, it appears that the markets have returned from a soft asset market to a hard asset market.

Gold is traditionally the measure of hard asset prices because of its universal appeal as an inflation hedge. Figure 21.1 shows the history of gold prices and the Dow Jones Industrial Average since 1973. Mostly, these two markets head in opposite directions. Gold is the hard asset; U.S. stocks are the soft assets. Notice that when gold prices rise, the stock market declines, and vice versa. This behavior led to the theory of alternating hard and soft asset markets.

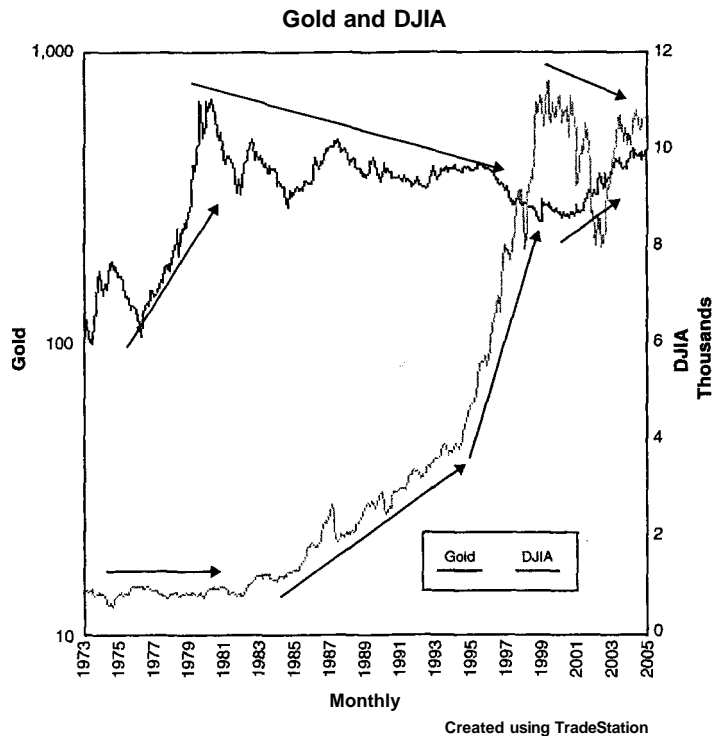


FIGURE 21.1 Gold price and the Dow Jones Industrial Average

Looking at a ratio chart of gold to the stock market, we see that clear trends develop in the relationship between these two types of assets. Figure 21.2 shows both a line for the ratio of gold to the stock market and a line for the stock market itself. A decline in the gold/stock market ratio indicates that gold is underperforming the stock market and, in relationship to the stock market, is not a wise investment.

The broad signal as to when to switch from one asset class to another is given when the ratio crosses its 48-month EMA. As seen in Figure 21.2, the last signal to switch from hard assets to soft assets occurred in June 1981, just three months after the peak in the gold price at a time when the DJIA was at 998.

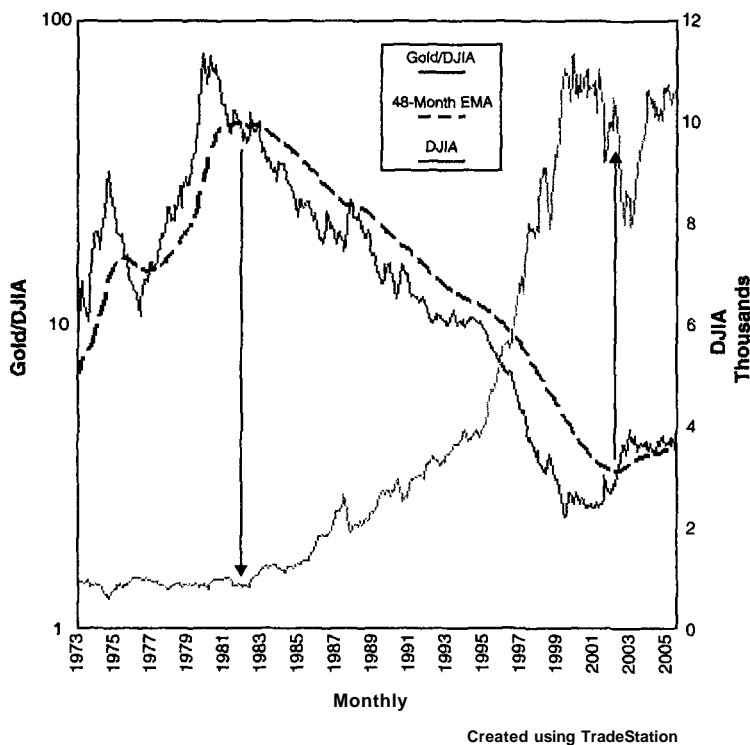


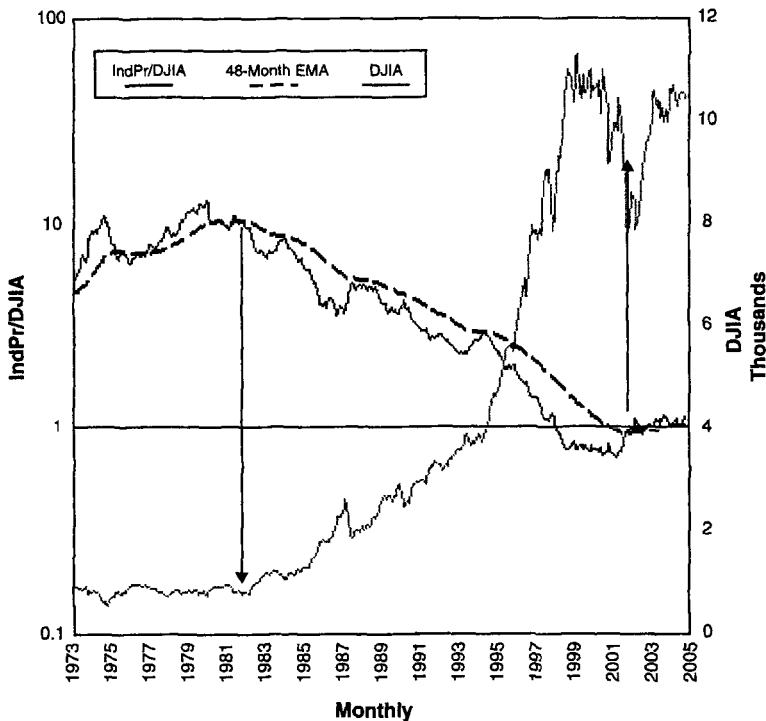
FIGURE 21.2 Ratio line of gold to the DJIA versus the DJIA line

The next switch signal came in June 2002 when the ratio crossed above its 48-month EMA, signaling a move into hard assets. Between the 1981 signal to soft assets and the 2002 signal to hard assets, gold had declined to \$320 and the DJIA had advanced to 10,000. In the relatively short period since the hard asset buy signal, gold has risen to \$700 and the DJIA has remained relatively flat. Although these signals are not precise by any means, they do indicate

over long periods in what asset type the investor should be invested. Once a definite trend toward one or the other asset type is clear, it usually remains in place for many years.

Although we have used gold as an example of a hard asset thus far, gold is not necessarily the best hard asset. Others exist such as silver, oil, copper, and aluminum. These are called "industrial raw materials" and are normally associated with the business cycle. Along with gold, these industrial prices have a long-term component that follows the gold price and gives more options for investment during a period of hard assets types.

Figure 21.3 shows the relationship between industrial raw material prices and the stock market since 1973. As you can see, the moving average crossovers in the ratio occur at approximately the same time as those for the gold market alone did in Figure 21.2. Thus, when we see the ratio of gold or industrial raw material prices to the stock market cross its 48-month EMA, we know that a long-term shift is occurring in the investment emphasis from hard assets to soft assets or vice versa.



Created using TradeStation

FIGURE 21.3 Ratio of industrial raw material prices to the DJIA versus the DJIA line

What does this mean for investment selection? Being in the time period following the 2002 signal for the switch to hard assets suggests that analysis should be concentrated on those investments concerned with hard asset prices. Those investments could be in futures or spot markets of the hard assets themselves; however, this group also includes stocks of mining, oil- or forest product-producing companies, or currencies in countries like Australia or Canada that are involved in exporting raw materials. There are many choices, but the emphasis should be placed on those investments that will gain from increases in industrial materials and gold prices. When the tide turns the other way, and soft assets appear more promising, emphasis should be placed on commodity users, not producers, consumer staples, anything related to interest rates, bonds and stocks, or currencies of consuming nations.

## Cyclical Emphasis

Within the longer secular economic trend are a number of business cycles. These business cycles are of varying length but usually average around four to five years. These business cycles are the normal horizon for most economists, business managers, and investors. It is well recognized that leadership in the trading markets often switches within the business cycle. There appears to be a standard pattern that is worth watching. Murphy maintains that although the markets may appear independent, they are interrelated and follow certain patterns. For that reason, he suggests that investors should be aware of all these markets and their interactions. The activity in all of these markets might offer suggestions about investment prospects.

Martin Pring (2002) classifies investment markets into three categories: commodities, bonds, and stocks. Murphy adds currencies and, to some extent, foreign stock markets, to this list. The business cycle affects each of these markets but in different ways. Let us look at the normal sequence of leadership among these investments and see how to recognize when a change in leadership has occurred.

### U.S. Dollar and Industrial Raw Material Prices

Murphy maintains that currency rates influence industrial prices but sometimes with a considerable lead. The dollar is important in that it is the pricing currency for many of the world's raw materials such as oil, gold, and other precious metals. When the dollar declines, it makes these commodities cheap in foreign currencies but expensive in dollar terms. Thus, there is a leading inverse relationship between the U.S. dollar and raw materials prices in the U.S. Figure 21.4 shows the ratio of the dollar to industrial prices and industrial prices themselves. When the ratio is rising, or the dollar is stronger than materials prices, materials prices tend to decline, and vice versa.

In the business cycle, we use the 52-week EMA as the signal line. In Figure 21.4, this signal line was crossed on the week of March 11, 2002. At that time, the signal line suggested investment in industrial raw materials including gold, raw materials, energy, and any other inflation-affected securities. As of December 2005, it had not reversed its signal. When it does, it will suggest that investments be switched to materials users, such as interest related, consumer staples, and drugs.



FIGURE 21.4 Ratio of U.S. dollar to industrial raw material prices versus industrial raw materials, weekly

#### Industrial Raw Material Prices and Long-Term Interest Rates

The next sequence is typically for industrial prices to lead long-term U.S. interest rates. Again, by taking a ratio of industrial prices to the U.S. Treasury ten-year note, we see that at certain times, a signal is given by the ratio as to when to enter or exit the long-term bond market. The ratio is shown in Figure 21.5. The oscillations around the EMA require a filter before specific signals can be given, but the general picture from 2000 to mid-2003 was a period of favorable trending for the long-term bond market. A definite upward crossover occurred in June-July 2003, suggesting a switch from long-term bonds to the raw materials market. At that time, gold was trading at \$359 and oil at \$31.66. They subsequently climbed to \$500 (+39%) and \$65 (+105%), respectively. Over the same period, the U.S. ten-year note declined from \$140 to \$127 (-9.3%), and stocks (S&P 500) rose from 998 to 1260 (+26.3%). Because the ratio as of December 2005 has not suggested switching into long-term bonds, investments should still be concentrated in the inflation-related markets (through either futures or stocks).

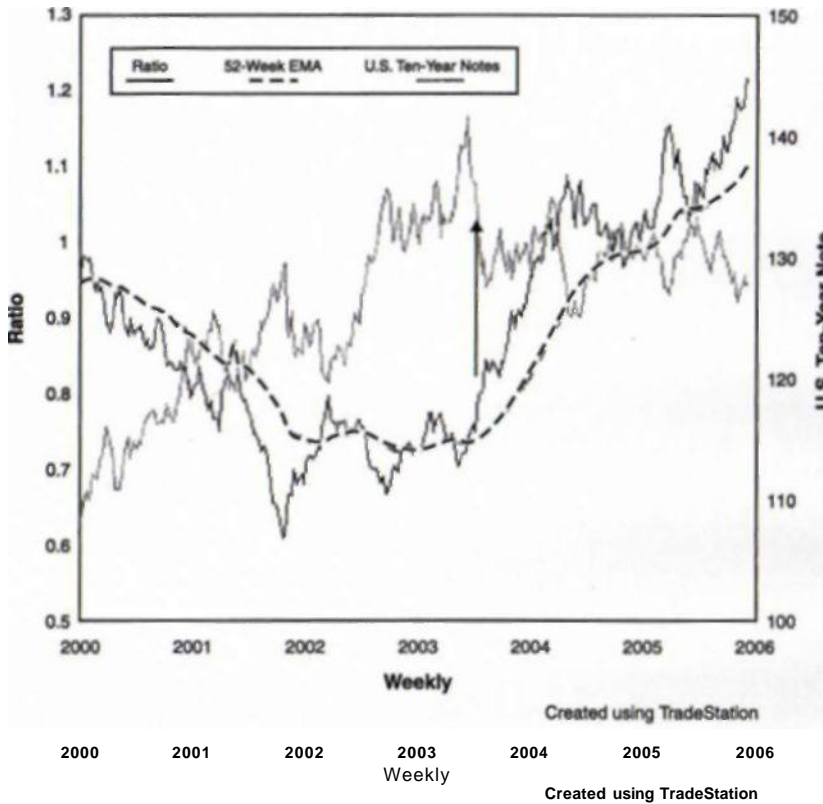


FIGURE 1M Ratio of industrial raw material prices to the U.S. ten-year note versus the U.S. ten-year note

### Bond Market and Stock Market

Ideally, the next switch in markets is from the bond market to the stock market. As Chapter 10, "Flow of Funds," demonstrated, the lead-lag relationship has not been a successful one since 1998. Murphy argues that this is because for the first time since the 1930s, actual deflation has become a threat and has upset the previous balance between interest rates and the stock market. Nevertheless, a plot of the ratio of bonds to stocks, as shown in Figure 21.6, shows very definite times when one or the other has the advantage.

This chart shows that even if we had owned bonds, despite what the commodity markets were suggesting, they should have been switched to the stock market around May 2003. From that point to December 2005, the U.S. ten-year note declined from 139 to 127 (-8.6%), and the S&P 500 rose from 964 to 1265 (+31.2%).

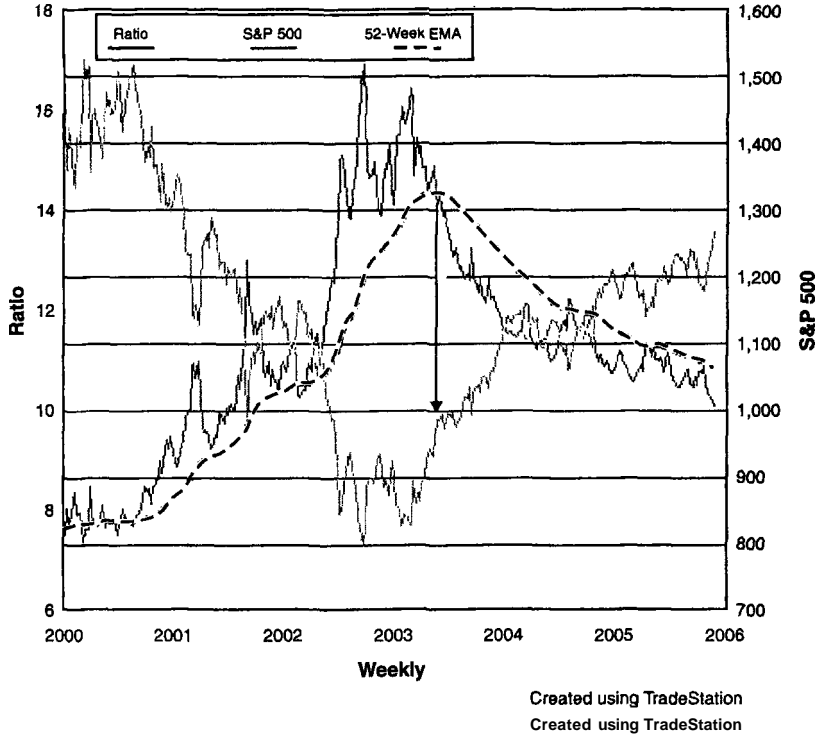


FIGURE 21.6 Ratio of U.S. ten-year note to the S&P 500 versus the S&P 500, weekly

#### Stock Market and the U.S. Dollar

The final analysis is to return to the beginning and see how the dollar and the stock market are interacting. Generally, the two markets are so out of sync that a ratio analysis will lag beyond the investment period desired. The dollar usually leads the industrial raw material market, which in turn generally leads the bond market, which in turn leads the stock market. By connecting the loop, nothing is accomplished because there seems to be only a slight relationship between the stock market and the dollar. This is born out in Figure 21.7, which compares the S&P 500 to the U.S. dollar. The signal to buy the S&P in preference to the dollar is late. The percentage returns since are still favorable for the investor in the stock market but only partially favorable for the earlier investment in the dollar. This is a good example of why the analyst must always be aware of the absolute prices as well as the relative ones.

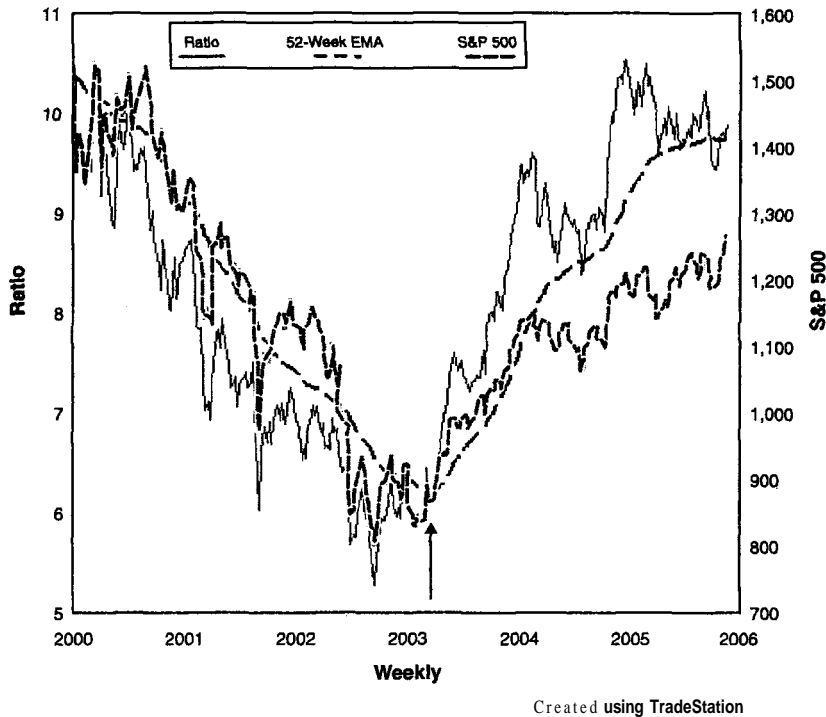


FIGURE 21.7 Ratio of S&amp;P 500 to the U.S. dollar versus the S&amp;P 500

#### Implications of Intermarket Analysis

From the previous analysis, it appears that around 2003, the investor should have been looking at the raw materials markets and the stock market. Because both markets appeared favorable, the raw material market stocks would likely have been the best investments. As of December 2005, there is no change in this allocation. The signals given by the various ratios are usually long-term signals, in the sense that they are operating within the business cycle. They are neither trading signals nor mechanical signals. Their purpose is to inform the investor in which markets to invest solely from how the marketplaces are behaving. When certain sectors become strong, they tend to remain strong, just as when a trend begins, it tends to remain. Eventually these ratios will suggest changes in the investment mix, but only rarely do they err, and often that miscalculation comes from the investor impatience and greed, treating the signals as mechanical rather than waiting to be sure they are real.



One important caveat is that the signals come from ratios, not raw figures. Raw figures should always be used as a backup. It is possible that sometime in the future all markets will decline. In that case, the investor may find the "best" market but still lose money—perhaps not as quickly as in other markets, but still lose. For this reason, the absolute value of markets must never be overlooked. Many investors are happy with a relative return rather than an absolute return even in a declining market. This is a major mistake, because the law of percentages suggests that to make back any actual loss is considerably more difficult than to make back a relative loss. A relative loss of 20% can be made back with a relative gain of 20%, but an absolute 20% loss requires a 25% gain to break even.<sup>1</sup> All absolute losses must be kept to a minimum. As the old adage goes, "You can't spend a relative return."

Finally, this analysis is not intended to forecast the economy. It is useful primarily in determining where the best market for investment might be at any time and for enough time for investment. Because most indicators lead the economy, forecasting the economy is unfruitful. From this information, certain aspects of the economy are obvious, but investment is best left to the analysis of price than to the analysis of the lagging economy.

## Stock Market Industry Sectors

Some analysts have proposed theories of industry group and sector rotation during the stock market cycle. These rule definitions, however, are too strict, and often the markets do not accommodate them. For example, some models suggest that utilities, generally considered interest-related stocks, should be bought at certain stages of the market cycle when interest rates are expected to decline. However, as we have seen previously, when an inflationary environment exists, anything to do with interest rates will generally underperform. In other words, any system of following specific models of business cycles is not flexible enough to account for changes in the major market segments.

For some individuals, like a stock mutual fund manager, investment in the stock market is a requirement. In these instances, the best manner of screening out the most likely sectors to outperform is the use of ratio analysis between the sector performance and the stock market as a whole. For example, Figure 21.8 shows a weekly plot of the utility iShares (based on the Dow Jones utility sector) to the DJIA, and Figure 21.9 shows a weekly plot of the energy iShares (based on the Dow Jones energy sector) to the DJIA. Each uses a three-box, point-and-figure chart.

1. For example, if you have \$100 in capital and sustain a 20% loss, you are left with \$80. You must earn a 25% return on the \$80 to return to the breakeven level of \$100. For any particular loss amount, the percentage amount that must be gained to break even is calculated using the formula  $\% \text{ gain necessary} = \% \text{ loss} / (1 - \% \text{ loss})$ .

**ISHR DJ U.S. Utilities Sector (IDU)**  
**Plotted Relative to DJ Industrials ( X 10,000)**

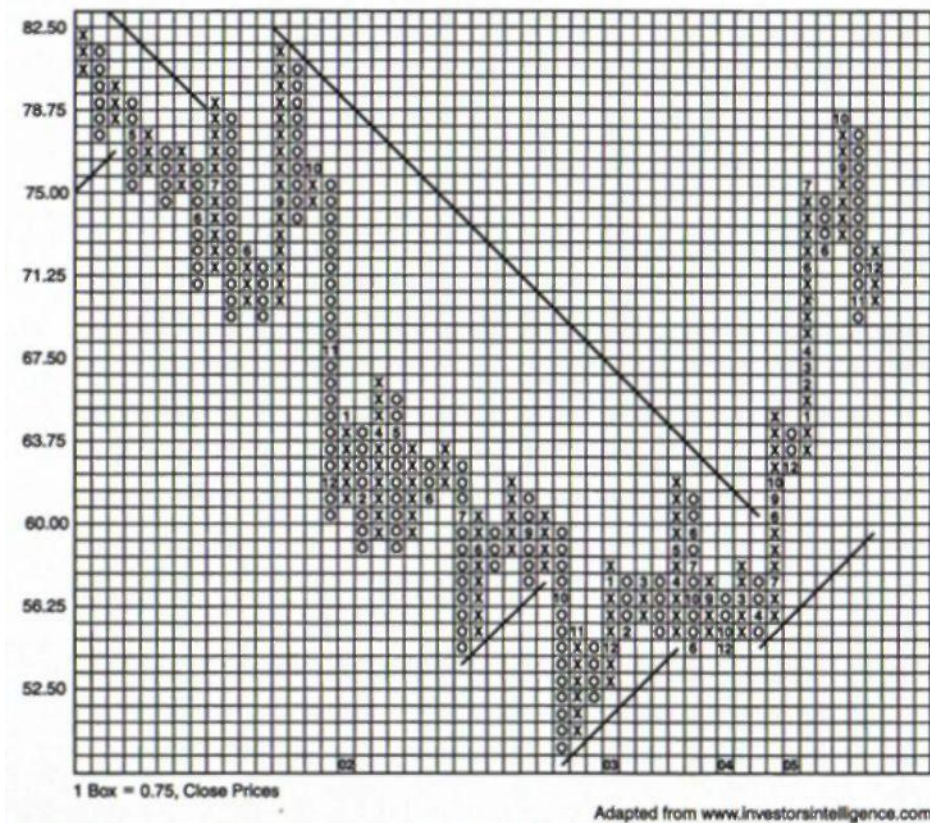


FIGURE 21.t Ratio of the DJ utility sector to the Dow Jones Industrial Average

Plotting the relative strength ratio of an industry and often a stock to some underlying average, we often see an irregular line that is difficult to interpret. By plotting these ratios on a point-and-figure chart, the minor, less significant oscillations are eliminated, and the overall relationship of the two indices becomes more obvious. In Figure 21.8, for example, it is clear that underperformance of utility stocks began as early as 2002. The weakness in the utilities, however, has apparently reversed, as the relative strength of the sector improved after March 2003 and especially after late 2004. In Figure 21.9, it is clear that the relative rise in energy stocks began in early 2004 and is ongoing. These charts are much more informative than a line chart. Remember, however, when deciding whether to act on any of the ratio analyses, the absolute price action of the stock in the numerator always must be analyzed as well. When both charts demonstrate a trend, one can act with more confidence.

ISHS Dow Jones Energy Sector Index (IYE)—2.12  
 Plotted Relative to DJ Industrials ( × 10,000)

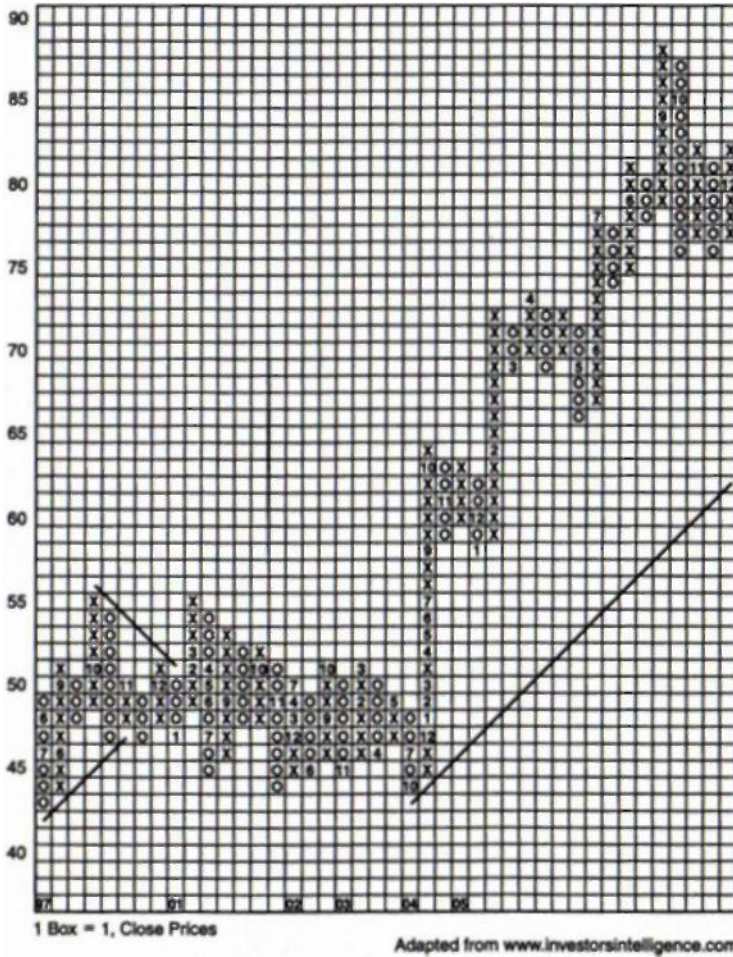


FIGURE 21.9 Ratio of the DJ energy sector to the Dow Jones Industrial Average

**BOTTOM UP—SPECIFIC STOCK SELECTION AND RETENTIVE STRENGTH**

At present, almost 8,000 stocks trade in the active stock markets in the U.S. This number is too large for an analyst to screen at frequent intervals. Some technical analysts briefly inspect the chart of every stock in their universe, using either a bar, candlestick, or point-and-figure chart.

This is a laborious process and far from objective. Others screen through relative strength ratio charts. The least time-consuming and most objective method is to screen all stocks on a periodic basis for relative price strength using one of the methods described next. Relative strength will provide evidence that a particular stock is outperforming the market and is very likely in a trend. These methods have also been used successfully in mutual fund, ETF, and industry group selection.

## Relative Strength

Most technical screening methods use a concept called relative strength to judge which securities have the most promise. Relative strength is a reliable concept that has been demonstrated academically to have value. The presumption behind the concept of relative strength is that strength will continue, similar to how a trend will continue, and that by recognizing the strongest investments, an edge can be obtained by investing in them until their strength abates. It is the basis for one of the arguments against the random walk hypothesis. If strong investments tend to remain strong, the market cannot be random.

The most common means of establishing relative strength is called the ratio method. It is merely the ratio between two investments, sectors, industry groups, averages, commodities, and so on to see which is outperforming the other. Usually a line chart is drawn that shows the item of interest, say a steel stock, and a ratio of the item to an average, say a steel industry average. If the **line** of the ratio is rising, it is simply showing that the particular stock is stronger than its industry average. Interpretations of behavior are similar to those used in price and other oscillators. Divergence analysis, trend lines, and even patterns appear in the ratio lines.

The item can also be plotted in a point-and-figure chart along with a point-and-figure chart of the ratio. We will look more closely at this method when we look at selecting sectors and groups later. We will also cover other methods of screening large numbers of potential investments for likely portfolio choice when we look at individual stocks.

## Academic Studies of Relative Strength

In 1967, Robert Levy, Ph.D., published a paper in the *Journal of Finance* in which he argued that relative price strength tended to remain for a long-enough period that it could be profitable and that the concept of random walk was therefore dead. His paper received considerable opposition at that time when the Efficient Markets Hypothesis and the Random Walk Hypothesis were relatively new and highly favored among academics.

Not until 1993 was another major paper published on the subject of relative price strength, or momentum as it is commonly called. This paper, "Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency," was also published in the *Journal of Finance*. The authors, Professors Narishimhan Jegadeesh and Sheridan Titman, demonstrated how stocks with high returns over a 3- to 12-month period earned excess profits of about 1% per month for the following year. However, they also found that these stocks on average had losses 13 to 60 months later, thus matching the theory that relative price strength was not permanent but more likely a temporary phenomenon. They clearly stated that the *t* statistic test forced them "to conclude that

the hypothesis of market efficiency can be rejected at even the most conservative levels of significance."

In a study of 150 momentum (relative strength) and contrarian strategies, Conrad and Kaul (1998) also found that the optimum profit occurred during the 3- to 12-month horizon. In addition, they found that a contrarian strategy (buying the lows) only had statistically significant profits during the period 1926 through 1947.

Of course, other academics immediately criticized the study for any number of possible reasons, but by the time of Conrad and Kaul's paper, other doubts about market efficiency had also been demonstrated, and the evidence was not rejected immediately as it had been with Levy in the 1960s. Since then, the basis of their paper has been proven correct not only in foreign countries but also in the period following the original paper in the U.S., as reported in a subsequent paper by Jegadeesh and Titman in 2001 in the *Journal of Finance*.

Various reasons have been proposed for the existence of relative strength, none of which has been proven. The most logical has to do with behavioral tendencies of investors and the flow of information. An excellent discussion of the behavioral model describing investor under reaction and over reaction is Barberis, Shleiger, and Vishny (1997). However, we are not concerned with why relative strength is valid. Our only concern is that over a period of six months to a year, using relative strength is a viable strategy and is, thus, a reliable means of selecting stocks.

## Measuring Relative Strength

### Percentage Change Method

In their study, Jegadeesh and Titman used a six-month price change as their basic calculation. The stocks then were sorted based on these rates of change. They found that the higher decile stocks continued to be strong for the next three to ten months. Their sample included both large capitalized and thinly capitalized and both high-priced and low-priced stocks. All performed similarly both in the original experiment and in the subsequent out-of-sample tests.

#### **BOX 21.1** (oblation of Alpha for MPL)

The graph in Figure 21.10 shows the scatter plot of weekly changes in AAPL (Apple Computer stock) and the S&P 500 index. The linear regression line through the scatter plot can be defined by its beta (1.60) and its alpha (1.55). Beta represents how volatile AAPL is relative to the S&P. AAPL's beta of 1.6 implies that AAPL stock will oscillate on a weekly basis 60% more than the S&P. The alpha of 1.55 indicates that AAPL has been outperforming the S&P by 1.55% on average over the 52 weeks in the plot. It thus has a positive alpha and is a strong stock. Comparing AAPL's alpha to that of other stocks is a way to determine which are the strongest and best candidates for investment.<sup>1</sup>

2. For a more thorough explanation of linear regression, see Appendix A. "Basic Statistics."

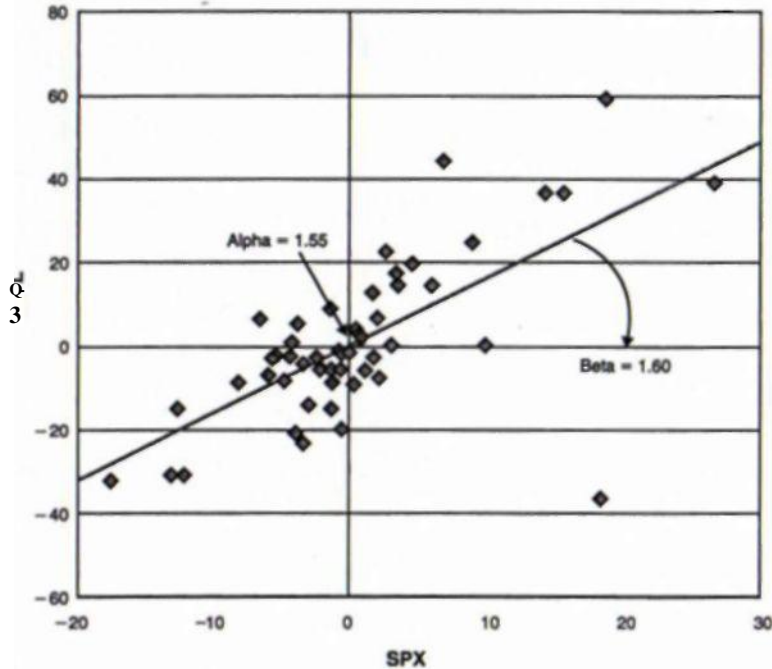


FIGURE 21.10 Alpha and beta of AAPI versus Standard & Poor's 500, weekly

#### Alpha Method

A number of different methods of calculating relative strength have been developed. One is the alpha method. In the beta theory of Modern Portfolio Theory (MPT), stock prices are compared to an average, usually the S&P 500, weekly over a year (and sometimes with different time intervals and period). The weekly percentage change in the stock price is plotted versus the weekly percentage change in S&P 500, and a linear regression line is drawn through these plots on a best-fit basis. The line so defined is expressed using the slope of the line, called the beta, and the intercept with the vertical axis, called the alpha. Thus, each stock over a specified period has an alpha and a beta. Traditionally, beta has been used as a measure of volatility relative to the S&P 500 and considered a definition of risk. Stocks that oscillated widely have a high beta representing a steep slope in their regression line and thus demonstrated a proclivity to swing widely about the S&P. The alpha describes the value when the regression line crosses the 0% change in the S&P and is thus a measure of the trend relative to the S&P 500. MPT suggested that high beta stocks would be more profitable but would also be more risky. What they missed is that high beta stocks could also have negative alphas, suggesting that, while more volatile, their trends relative to the S&P could be downward. In MPT, the alpha must always either approach or be close to zero because, in theory, no systemic gain can come from the market (the S&P 500) itself. In other

words, a stock's price motion is determined by beta, not alpha. Alpha is not considered of any importance. However, in actual markets, alpha does not remain at the zero level and has thus become a measure of how much better or worse the stock is performing relative to the S&P. When alpha is compared among stocks, it provides a relative strength measure, and stock lists can be ranked by alpha to show which issues are the strongest. Alpha will change more frequently and more widely than beta, but beta is somewhat irrelevant to the relative price strength and has been largely discarded, even as a measure of volatility.

#### Trend Slope Method

Rather than go through the more complicated calculation of alpha and beta, another method of screening for relative price strength is to calculate the slope of the price curve in percentage terms over a specified period through a linear regression formula for each stock. The stocks can then be ranked by the slopes of their price curves. This method is similar to the alpha method and to the Jegadeesh and Titman method. It is easier to calculate than the alpha method and does not suffer from the drop-off effect of a rate of change calculation beginning at an arbitrary price.

#### Levy Method

Robert Levy introduced a method of calculating relative strength in his 1965 paper. Levy first calculated the ratio of the stock's current price to its 131 trading day moving average. He then ranked this ratio against the same ratio for all other stocks.

Levy found, as did Jegadeesh and Titman, that the screen for relative strength should be calculated on performance of the stock over six months. Anything shorter tends to give multiple whipsaws in post-calculation performance, and anything longer tends to be too close to when the performance begins to regress back to the mean. Levy also found that when the overall stock market headed downward into a lengthy bear market, relative strength continued to be reliable but gradually lost its ability to pick winning stocks, and when the final decline, the washout, occurred, those stocks having been relatively the strongest usually declined the most. Relative strength is thus a bull market selection process and should not be used when the stock market declines.

One of the authors has tested the method live over 20 years (Kirkpatrick, 2001) and found it still provides a consistent list of winning stocks. In addition, 26 weeks is close enough to Levy's original 131 days and can be substituted in the ratio to make the calculation easier.

## **EXAMPLES OF HOW SELECTED PROFESSIONALS SCREEN FOR FAVORABLE STOCKS**

### **The William O'Neil CANSLIM Method**

CANSLIM is an acronym for a method of picking stocks to buy, devised by William O'Neil (2002), publisher of *Investors Business Daily*. The data and ratings for each stock are included in a subscription to that newspaper. The breakdown of CANSLIM is as follows:

C—Current quarterly earnings per share versus a year earlier

A—Annual earnings increases



- N—New products, management, and stock price highs
- S—Supply and demand of stock
- L—Leader or laggard
- I—Institutional sponsorship
- M—Market direction

We, as technical analysts, are only concerned with L and M. The other selection criteria are useful but not in the domain of this book. To determine L, leader or laggard, O'Neil calculates the 12-month percentage price change of every stock, weighted more heavily over the most recent three months, and ranks each stock in percentiles from 99 to 0, with 99 being the strongest. He has not divulged the exact formula, but as we know from academic studies and others, the exact calculation is less important than the time over which price change is measured. This method is on the long side at 12 months, about the time when a strong stock begins to revert to its moving average. The weighting over the past three months reduces the overall time for comparison and therefore improves the prospects of price strength continuing. O'Neil found that the average relative strength percentile, by his calculation, was 87 before large upward moves.

For M, market direction, O'Neil refuses to listen to newsletters and "gurus" and refuses to use economic data because it lags behind the market. He has a number of specific indicators and patterns he watches for signs that a market is bottoming. He believes that the buy-and-hold method is faulty because the widely held belief that all stocks will recover after a bear market is a myth.

### **James P. O'Shaughnessy Method**

Not surprisingly, James O'Shaughnessy, the president of O'Shaughnessy Capital Management in Greenwich, Connecticut, found in studying fundamental and price data for 43 years that most investment strategies are mediocre at best and that traditional investment management does not work. He studied market capitalization, price-to-earnings ratios, price-to-book ratios, price-to-cash flow ratios, price-to-sales ratios, dividend yields, earnings changes, profit margins, and return on equity. He found that relative price strength, out of all the possible variables, fundamental and technical, was the only "growth variable that consistently beats the market" (1997).

O'Shaughnessy's calculation of relative strength is similar to O'Neil's in that it takes a ratio of the year-end price to the price one year prior. It is thus a 12-month relative price strength measure, a slightly longer-term calculation considering the history of relatively strong stocks remaining strong. O'Shaughnessy developed from his testing of data from December 31, 1954 through December 31, 1995 a multifactor investment strategy model called the Cornerstone Growth Strategy. It include a primary screen for stocks with a price-to-sales ratio below 1.5, earnings greater than the previous year, and of those selected so far, the top 50 stocks in relative price strength.

### **Charles D. Kirkpatrick Method**

Charles Kirkpatrick (2002), coauthor of this book, has long had a model similar to that of O'Shaughnessy. The principal differences are three-fold. First, in working with Robert Levy in



the late 1960s, he discovered the importance of relating all ratios to each other. Thus, in using the price-to-sales ratio, he calculates the relative price-to-sales ratio of all stocks. Second, he calculates the relative earnings per share growth for each stock from four quarters to four quarters to reduce seasonality in earnings. Third, Kirkpatrick uses the Levy calculation of relative price strength over six months in line with Levy's original work and that of later studies showing the importance of that period for post-calculation continuation of price strength. A multifactor investment strategy is developed using the relative rankings of each of the preceding factors. This method has outperformed the S&P 500 over the past 20 years in live weekly reporting by better than four to one. A weekly list of stocks meeting the specific criteria is available for a small fee.

### **Value Line Method**

The Value Line Ranking System ([www.valueline.com](http://www.valueline.com)) has an extraordinary history of outperforming the stock market. Value Line claims that its Timeliness Ranking system has outperformed the Standard & Poor's 500 by 16 to 1 since 1965. Although the company will not divulge its method of calculation, it does admit that a significant portion of it includes a calculation of relative price strength. Other factors include earnings trends, recent earnings, and earnings surprises. Value Line charges a fee for its stock services.

### **Richard D. Wyckoff Method**

A method of profiting from the stock market using technical analysis and relative price strength that has stood the test of over 80 years is the method taught by Richard DeMille Wyckoff beginning in 1931.

Richard Wyckoff, now considered a legend and one of the most important proponents of technical analysis, began his long career in Wall Street as a runner in 1888 when he was only 15 years old. He organized his own brokerage firm by the time he was 25. From his brokerage firm, he published a daily newsletter that evolved into a magazine called the *Magazine of Wall Street*. Motivated by seeing "appalling losses in securities suffered annually by millions of people who do not realize what they are risking and have an amazingly small knowledge of the market" (Hutson, 1986), in 1910, under the pen name "Rollo Tape," Wyckoff described many important aspects of the stock market in a book entitled *Studies in Tape Reading*. His observations then are still valid today. Before retiring for health reasons in 1928, his subscriber list exceeded 200,000 names, and later, when he returned to Wall Street in the early 1930s, he wrote many books on the subject of profiting from the stock market and developed a correspondence course.

Wyckoff believed most strongly that stock prices were determined solely by "supply and demand." He had little use for "tips, rumors, news items, earnings analyses, financial reports, dividend rates, and the myriad of other sources of information" or the "half-baked trading theories expounded in boardrooms and popular books on the stock market" (Wyckoff in Hutson, 1986). He was a true technical analyst, and a very successful one. He believed that the markets were influenced mostly by wealthy individuals and informed insiders. Substituting "institutions" today for these players, we find that the situation has not changed. By understanding what these

capital pools were doing in the markets, one could profit by following them. Their capital moved the markets, right or wrong, and the small investor could take advantage of this movement by understanding how to gauge it.

Wyckoff's tools were many of the methods described in this book. He used bar charts (called vertical charts) and point-and-figure charts (called figure charts). He measured relative strength for both long and short positions, used volume as a means of testing the best time to consider acting, required stop orders be entered with any action order, used trend lines to determine direction, used composite indexes, used group indexes, and believed that timing of entry and exit was the most important variable in success. Support and resistance, reversal points (called danger points), and horizontal counts from figure charts were important to his method. In short, he used about everything you have learned so far. He believed that attempting to fit the market into a formula or specific pattern was futile because no two markets are the same. The market, he believed, traveled in waves—small ones evolving into larger ones in either direction—and that these waves could be detected and even anticipated, but they followed no certain, mathematical path. Consequently, although his method had some organization, it required judgment and experience.

Wyckoff's progression of selecting stocks was as follows:

1. To determine the direction of the entire market, Wyckoff devised an index called the Wyckoff Wave that was a composite of the most widely held and active stocks. This was his proxy for the market. Preferably, the stocks in the index were the ones that the investor or trader was interested in trading. His concept of trend was to watch trend lines drawn on the Wave chart and on charts of the composite market.
2. To select the stocks in harmony with the market, Wyckoff selected stocks that were strong in upward trends and weak in downward trends. He believed that it was futile to act against the trend. His calculation of relative price strength used the percentage changes from wave highs to lows and lows to highs of each stock versus those of the Wyckoff Waves. Those stocks that consistently outperformed in each Wave in the direction of the longer Wave trend were the ones to analyze further.
3. To determine the potential of those selected so far, Wyckoff used the point-and-figure horizontal count. At the same time, a stop level was established, and for the stock to be considered further, a three-to-one ratio of potential gain to potential stop loss was necessary.
4. To determine if the stock is ready to move, shorter-term considerations were needed to analyze the nature of its price action. To do this, Wyckoff relied on volume, range, and to some extent, short-term momentum. This portion of his method relied heavily on experience and judgment.
5. To time the entry, Wyckoff based his decision on the turning in the overall market. His basis for this principle was that most stocks move with the market direction, and to time with the market change just reduces the risk of error.

## CONCLUSION

Trading is often focused on very few issues because each must be watched very closely and intently. Selecting the issues most suitable for a trader depends on many factors having to do with the trader's time horizon, liquidity, volatility, preferred market, technical methods, operating costs, and risk tolerance. Those traders who look for special opportunities in the market rather than concentrate on a small number of issues are often swing traders who hold their positions for a few days or weeks. They use screens based principally on technical action such as patterns, gaps, breakouts from prior highs and lows, and changes in volume or volatility to select issues. Their equipment is able to scan through large numbers of issues looking for such indications of trend change. As might be expected, these methods are not often used by amateurs because they must be followed each day all day, though swing trading setups can often be recognized at night and orders placed for the next day while the trader is otherwise occupied.

In investment selection, as in fundamental screening for issues in which to invest, technical screening can begin with the overall picture, the top-down approach, or it can begin right with the individual issues in the markets that the investor is most interested in, the bottom-up approach. Of course, rather than analyze economics and company financial data, the technical analyst regards the price action of the areas of interest. In the top-down approach, the analyst begins with the long, secular period of economic activity and studies the relative action of the four basic investment segments—currencies, materials prices, interest rates, and stock markets. From the results of that analysis, the analyst can then further analyze the sectors of those markets showing the most promise. At all times, focus is placed on the best-acting areas for investment because they have consistently been shown to continue with such strength, similar to the behavior of trends on an absolute basis. The bottom-up approach is most often accomplished specifically for the stock markets because they have so many different issues from which to choose. This analysis is likewise centered around what is called relative strength to determine the best acting issues over a specified past period, usually around six months, with anticipation that those selected issues will continue to outperform over the following year. Relative strength has been widely tested both in academia and in practice and has shown consistent reliability in flat and rising markets.

## REVIEW QUESTIONS

1. Explain the differences among scalping, day trading, and swing trading.
2. A trader should consider a particular instrument's volatility, liquidity, and volume when choosing instruments to trade. Explain why each of these three characteristics is an important component of the trader's decision.
3. Explain the difference between a hard asset market and a soft asset market.
4. Explain the basic premise of secular analysis and its importance to the investor.
5. Explain the basic principle behind cyclical analysis and its importance to the investor.

6. Lauren inherited \$10,000 and immediately invested the money in the stock market. Unfortunately, she lost 30% of her investment. Explain why she will have to have a return greater than 30% to get back to her initial capital level of \$10,000.
7. Explain what is meant by the term "relative strength" in this chapter and the implications of a stock's relative strength for the investor.
8. Andrew has been following the performance of the stock of his favorite company, Back Country Driving Equipment (BCDE). He has plotted the ratio of BCDE to the S&P 500 for the past year, and he has found a strongly upward-sloping line. He thought that this meant that BCDE was a relatively strong stock; however, he noticed that investors in BCDE have lost money over the past year. He is confused as to how investing in a relatively strong stock could result in a loss. Explain how this could happen.

# **PART VIII**

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## **SYSTEM TESTING AND MANAGEMENT**

**CHAPTER 22 SYSTEM DESIGN AND TESTING**

**CHAPTER 23 MONEY AND RISK MANAGEMENT**

# SYSTEM DESIGN AND TESTING

## CHAPTER OBJECTIVES

By the end of this chapter, you should be familiar with

- The importance of using a system for trading or investing
- The difference between a discretionary and a nondiscretionary system
- The mindset and discipline required to develop and trade with a system
- The basic procedures for designing a system
- The role that risk management plays in system design
- How to test a system
- Standard measures of system profitability and risk

We have covered most of the methods used by technical analysts to analyze the trading markets. We now enter into the field of how to utilize this knowledge to produce profits and reduce risk. Any constant and consistent management of assets requires money management, which we cover in the next chapter, and some type of system. Haphazardly investing or trading on intuition, rumor, or untested theories is a road to disaster. It is why most amateur traders and investors lose money.

A fundamental investor may use price-to-earnings, debt ratios, and so forth, whereas a technical investor will likely use relative strength, price trend, or volatility, and both investors will believe they are doing the correct analysis. They are not. In both cases, the methods may be correct, but making money requires a tested system. There are many myths in investing, and most investors succumb to them without further analysis. To trade or invest successfully, we need to know not only how profitable a method has been, but also what the risks of capital loss were. Not having an understanding of tested methods is flying blind in the financial markets. How do we test these methods? We create a system. The system must include not only the method for

profit but also the means of controlling risk of loss. Both aspects of investing are extremely important. Some would argue that controlling loss is even more important than the profit method, that by buying and selling at the flip of a coin, one could make a decent return just by controlling risk of loss.

Let us begin this chapter by looking a little more closely at what a system is. Then we will focus on what risk is and how to control losses. Once we have these foundations, we can focus on the mechanics of developing a system and testing investment strategies.

## WHY ARE SYSTEMS NECESSARY?

No stock market goes up forever. Indeed, most world stock markets have declined to zero at one time or another. The buy-and-hold strategy so popular in the U.S. today is based on a statistical anomaly. It is a strategy based on a survival bias in the U.S. and the U.K. markets, the only countries in history, so far, whose markets have not completely disappeared at some time (Burnham, 2005). This has caused a misleading assumption that U.S. stocks and stocks in general will necessarily continue to rise. "It would be naive to expect the future of U.S. stocks to be as bright as the past" (Burnham).

We certainly know that individual stocks can go to zero. How about buggy whips in 1910, or canals in 1830, or bowling in 1950, or junk bonds and REITs in 1980? Thus, a long-term plan that excludes a means of controlling risk is eventually doomed.

On the other hand, most technical and fundamental methods, by themselves, are not profitable over time either. Some of the exceptions have been covered earlier in this book, but these methods primarily depend upon the market circumstances at the time, on the method used, and on controlling risk. Traders' and investors' greatest misconception is that the market has order and that by finding and acting on that order, profits will be consistent and large. It presumes that a magic formula exists somewhere that can predict markets. This belief is not true. In looking at the previous studies in this book, there is no magic order to the markets beyond the fact that they sometimes trend and, more often, remain in trading ranges. The money made is based on the use of well-controlled entries and exits, especially those that limit the amount of loss that can occur and that will react to changing conditions in the market. A system will aid the investor or trader in timing these market entries and exits.

## Discretionary Versus Nondiscretionary Systems

Systems are the next step in the development of an investment plan after understanding the methods of either technical or fundamental investing. Systems can be discretionary, nondiscretionary, or a combination of both. In discretionary systems, entries and exits are determined by intuition; in other words, the trader or investor exercises some discretion in making trades. Nondiscretionary systems are those in which entries and exits are determined mechanically by a computer.

Think for a minute of the stereotypical discretionary trader. Imagine the ultimate discretionary trader behaving like the man in the antacid advertisement with two or three phones

yelling, "buy" in one, "sell" in another, with computer screens showing prices and charts of securities all over the world, with ringing phones, with news broadcasts from financial TV stations, and with a large contact list of people in different specialties. This type of trader is generally looking for the home run. It is a great image, one that has in it a bit of the swashbuckler, the gunslinger, and so on. In fact, many truly exceptional traders are like this. They have the gifted intuition to be able to do this consistently and profitably.

Most people, however, do not have the time, the knowledge, the contacts, the equipment, the quickness of thought, or the stomach to do this. In fact, most people who attempt to trade like this either bum out or go broke. They have no way of evaluating what they are doing except from the equity in their account at the end of the day. It is as if the excitement is more important than making profits.

The nondiscretionary trader, on the other hand, is usually calm, calculating, and likely bored. The majority of successful traders and investors use nondiscretionary systems (Etzkorn interview of Babcock, 1996). Some have been engineers; others have that type of mind, familiar with statistics and systems. They have studied the markets, the methods of profit making—both fundamental and technical—and have tested the techniques using modern statistical methods. They understand that nothing is perfect and that markets change character over time. However, by testing their methods and strategies, they have derived a mechanical system that minimizes risk of loss and maximizes return.

Rules are the structure of a system. An example of a rule would be "buy when one moving average crosses above another." Variables are the quantities used in the rules—two moving averages, and parameters are the actual values used in the variables—two days and seven days. A system will include all these factors, and their usefulness is determined by testing different rules, variables, and parameters over varied markets and market conditions.

A purely nondiscretionary system is one that runs by itself on market data that is continually fed into it. If our rule is to buy when the two-day moving average crosses above the seven-day moving average, for example, a buy order automatically is placed when this occurs. Once the trader has determined the rule to follow, the system is on autopilot and the trader does not make decisions. A trader or investor can also choose to use a partial discretionary system. The partial discretionary system is one that generates signals that then are acted upon by the investor based on personal confidence in them and experience with them. By having some discretion, however, the system cannot be tested accurately because emotion can enter into the trading decisions and cause unquantifiable errors.

Is it always better to choose a nondiscretionary, mechanical system over a discretionary one? Let us look at some of the advantages and disadvantages of this approach.

#### Benefits of a Nondiscretionary, Mechanical System

A nondiscretionary, mechanical system provides a mathematical edge as determined by testing and adjusting. This is the principle behind the casino and an insurance business, both of which profit from many small profitable trades and occasional losses.

Using a nondiscretionary system avoids emotion. This is an advantage because traders often lose money due to emotional decisions. The nondiscretionary system also reduces other trading pitfalls—overtrading, premature action, no action, and constant decision making.



Trading with a properly designed mechanical system also prevents large losses and risk of ruin, which most traders have never quantified or understood. In fact, risk control can be one of the most important advantages of a mechanical system.

Trading with a nondiscretionary system also provides certainty, develops confidence, and produces less stress. Anxiety comes from uncertainty. Although a nondiscretionary system cannot predict the future, it can structure how to react to possible outcomes. It gives a list of responses to events beyond one's control.

#### Pitfalls to a Nondiscretionary, Mechanical System

Although there are many benefits to a nondiscretionary, mechanical system, pitfalls also exist. For one, extrapolating will not have the same results as tests; history does not repeat itself precisely. The more a system is optimized or curve-fitted, the less reliable it will be in the future. In fact, in their book, *The Ultimate Trading Guide*, Hill, Pruitt, and Hill (2000) suggest that you should generally expect half the profits and twice the drawdowns as shown in tests of past data. Having been tested, the system designer expects results that are often unrealistic. The designer must be careful not to lose confidence when unrealistic expectations are not achieved.

Nondiscretionary systems often will make profits in clumps, especially if it is a trend-following system. The trader then loses small amounts waiting for the next clump and protecting from large losses. In other words, great creativity may have gone into inventing the system, but its operation is boring. In addition, some system designs allow large drawdowns but still eventually produce profits. The emotional problem for the user is the wait for the drawdown to be recovered and meanwhile the possible loss of confidence in the system. A loss of confidence results in fiddling with the rules or giving up just as the system is about to kick in.

Although a good system adjusts to a changing market, it does require periodic updates. This can often be a source of confusion for the designer. Is it time to update an underperforming system because of a changing marketplace? Alternatively, is the lackluster performance period a time for the trader to sit by patiently waiting for the system to kick in? The answers to these questions are not always obvious.

Remember that the system falls apart if it is not followed precisely. This is what the testing was for, and violations of the rules established from the testing negate the value of the system. This requires considerable discipline.

Using a nondiscretionary, mechanical system is not easy—otherwise, everyone would do it. There is a lot of work in coming up with a system, testing it, adjusting it, and trying it correctly and convincingly. The tendency for many people is to "wing it" and see if it works. That method leaves the trader nowhere.

## How Do I DESIGN A SYSTEM?

Now you are convinced that you need to design a system for trading. However, how do you do that? Let us look at some of the requirements and steps involved in creating an effective system.

## Requirements for Designing a System

What is needed to design a successful system? Before even considering the components of a system, we must begin with something even more basic—designing a workable, profitable system begins with some basic personal attitudes. Some of the characteristics of the necessary mindset include the following:

- Understand what a discretionary or nondiscretionary system will do—be realistically knowledgeable, and lean toward a nondiscretionary, mechanical system that can be quantified precisely and for which rules are explicit and constant.
- Do not have an opinion of the market. Profits are made from reacting to the market, not by anticipating it. Without a known structure, the markets cannot be predicted. A mechanical system will react, not predict.
- Realize that losses will occur—keep them small and infrequent.
- Realize that profits will not necessarily occur constantly or consistently.
- Realize that your emotions will tug at your mind and encourage changing or fiddling with the system. Such emotions must be controlled.
- Be organized—winging it will not work.
- Develop a plan consistent with one's time available and investment horizon—daily, weekly, monthly, and yearly.
- Test, test, and test again, without curve-fitting. Most systems fail because they have not been tested or have been over-fitted.
- Follow the final tested plan without exception—discipline, discipline, discipline. No one is smarter than the computer, regardless of how painful losses may be, and how wide spreads between price and stops may affect one's staying power.

## Understanding Risk

When we set out to create a system, we are usually concentrating on profits. Remember our underlying objective is to make profits. However, we must be careful not to focus so much on earning profits that we forget about the critical concept of risk.

The amateur investor or trader usually uses a discretionary system. Testing and analyzing and evolving a workable nondiscretionary system takes too much time, knowledge, experience, and thought. Most people would rather just take the word of others and act spontaneously. Profitable professionals, however, always have a system. Although they may use a discretionary system, professionals know the results of investment action from experience and know the risks. Successful professionals always apply some form of risk control, even if it is just a series of mental stop-loss levels. Considering risk marks the difference between amateurs and professionals. Those who consider profit potential and not risk are mostly amateurs, even if they think they are

professionals, and generally have or manage portfolios that considerably underperform the markets over the long term.

Risk is a vital concept, but what exactly is it? Academics have long characterized risk as equivalent to volatility. As seen in Appendix A, "Basic Statistics," the Capital Asset Pricing Model (CAPM) and options theory consider volatility not only an important variable in markets, but also a measure of risk. These ideas are partially correct, but as anyone who has operated in the markets knows, the real definition of risk is: "How much money am I going to lose?" This is how the technical analyst focuses on risk.

The amount of money lost, or potentially lost, is called "drawdown." It is defined as that amount by which the equity in an account declines from a peak. In other words, a drawdown is how much investors would suffer if they became invested in an account at its peak value. In a specific trade, the drawdown also can be defined as the amount that the trade value declines between the entry and the exit, even if the exit is above the entry and produces a final profit. Drawdown is sometimes referred to as the "pain" of holding a position. Although volatility can contribute to drawdown, as we will see later in looking at the smoothness of equity curves, the major concern for any investor or trader is the amount that can be lost.

Remember how we saw in Chapter 21, "Selection of Markets and Issues: Trading and Investing," that a 50% decline requires a 100% advance to return to even and that a 100% gain can be wiped out with only a 50% loss. We can see a bit more of the mathematics of this phenomenon in Appendix A where we consider the geometric mean, which in this case would be 0%. This law of percentages is against the investor. Thus, a profit and a loss are not equivalent. A minor loss always requires a larger gain to offset it. The purpose in quantifiable systems is to minimize that potential loss.

Risk to the investor or trader in the markets also includes many intangibles. Loss comes not only from asset loss but also from emotional loss. Nothing is more disturbing to the psyche than losing money and at the same time being proven wrong. Both these risks can be reduced by systems. The losing of money can be prevented through proper exit strategies, and the emotional loss can be alleviated through the confidence that although one may make small mistakes, one's equity curve continues upward. A well-devised and well-understood system can produce that confidence, making small losses just an inconvenience rather than a traumatic event.

## Initial Decisions

Once you are committed to the mindset and discipline of creating a system, you must make certain decisions about the characteristics of your system. The actual fundamental or technical method used as the basis for the system is relatively unimportant. What is important is that whatever is used can be defined precisely. Most fundamental and technical methods, by themselves, have a sketchy record of performance. Performance in the system will depend more on filters, adjustments, and the entry and exit strategies than the method itself. This does not mean that any old method will work. Pick one that is familiar, comfortable, sensible, and has a decent record; then concentrate on the process.

Most systems designers argue that the simpler the system, the better. A system can become bogged down with large numbers of conditions and statistically will lose degrees of freedom.

requiring more data and more signals to establish its significance. Some designers such as Richard Dennis argue against simplicity (Collins, 2005), but they have enormous computer power and knowledge behind them. Hill and others argue that even with modern technology and mathematics, the success of systems now is no greater than the classic systems designed with a hand or crank calculator.

The first decision that must be made is that of trading philosophy and premises. In other words, you must decide what kind of input and method is to be used to generate signals. Some investors depend on fundamental information; most traders depend on technical methods. Others use a combination. The important aspect is to have a clear understanding of the system's premises and to know that the rules will be easily quantifiable and precise. Specificity is much easier to use and to test than generality. You must also understand the logic of the system and be sure that it suits your style of trading or investing.

Second, you must decide on which markets to focus. Is the market suitable for the intended system? Are there opportunities for diversification between markets or instruments? How much volatility and liquidity is required, and what specific instruments will be traded?

Third, you must establish the time horizon for the system. For example, most trend-following systems work better over longer periods, but most pattern systems work in hours and days. Does the system intend to scalp trades, swing trade, or long-term invest? In addition, what is the psychologically best-suited time not only for system logic but also for ease of use? Do you have time to spend all day with the system, or can you monitor the system only daily, weekly, or monthly?

Fourth, you must have a risk control plan; otherwise, you will not know what to do when markets change. Understand that losses are inevitable, but be sure to keep them under control. Admitting losses separates the professional from the amateur. Rationalizing or excusing losses never helps. The market is never wrong—get out, the quicker the better. To do this, devise a stop-loss strategy—"no clinging to the mast of the sinking ship." This strategy should include protective and trailing stops, price targets, and adjustments for volatility, type of market, and any other state that the market might be in. Otherwise, the account may suffer a larger loss. Emotions and judgment become adversely affected, causing missed opportunities, selling profitable positions to get even, and other mistakes. Stop-losses free up nonproductive capital and cause less stress once accepted. A good rule of thumb for maximum risk per trade is 2% of capital. This 2% is the difference between the entry price and the stop price.

Fifth, establish a time routine, which should include when to update the system and necessary charts, plan new trades, and update exit points for existing trades. As part of your system administration, maintain a trader's notebook, a trader's diary, and a daily equity chart.

## Types of Technical Systems

### Trend Following

From our knowledge of technical systems, we understand that markets trend at times and trade in a range at other times. The most profitable background is a trending background, because the moves are larger and generate fewer transaction costs. It is no wonder, then, that trend-following

nondiscretionary systems have been the most productive. Most large-scale mechanical system hedge funds and commodity trading advisors use trend-following systems. Rather than attempting to catch the peaks and valleys, the trend-following system acts in the direction of the trend as soon after it has begun as can be reliably detected. Contrary to the buy low and sell high philosophy, the trend-following system will buy high and sell higher. Schwager believes that slower, longer trend systems work better because the gains are larger, though less frequent, and the whipsaws are minimal. Most trend-following systems add a trend indicator such as the ADX to their set of rules to be sure that a trend is in existence. However, as we know from earlier studies on trends, the performance of a trend-following system can suffer during a trading range market.

#### *Moving Average Systems*

The classic trend-following system is composed of two moving averages that generate signals when they cross over each other. In his book, *The Definitive Guide to Futures Trading*, Larry Williams discusses how as early as the 1940s, Donchian demonstrated the validity of this method and showed that it was more successful than the older system of using price versus a single moving average.

If two moving averages are better than one, would three be even better? No, studies have shown that adding more moving averages weakens performance because of the increased number of rules required. Although practitioners frequently report success using moving averages, we must mention that academic studies have shown that moving average crossover systems, even with simple filters, are generally unprofitable. However, academics have not used any kind of risk control in their experiments. Without the use of these important risk-control strategies, the academic studies are not a true measure of the profitability of using a moving average crossover system.

#### *Breakout Systems*

A variation of the trend-following system is the breakout system. These systems generate buy and sell signals when price moves out of a channel or band. The most popular of these systems is based on a variation of the Donchian channel breakout system or some kind of volatility breakout system using Bollinger Bands or other measures of range volatility. The breakout system can be long term and use weekly figures, or short term, such as the open range breakout systems used intraday.

#### *Problems with Trend-Following Systems*

Given their profitability, the moving average and breakout strategies are popular. Because many of these trend-following systems are being traded, many others will receive the same signal at roughly the same time and price you will. Liquidity can become strained, and slippage costs from wider spreads and incomplete fills will increase the transaction costs over what may have been anticipated. The solution to this problem is to devise an original system or to spread out or scale entry orders.

Another problem with trend-following systems is that whipsaws are common, especially during a trading range market, as the system attempts to identify the trend. In fact, trend-following systems often produce less than 50% wins because of the many whipsaws during ranging markets. This problem can be reduced with the use of confirmations, such as special price requirements

(penetration requirement, time delay, and so on), once a signal has been given, or through filters and diversification into uncorrected markets.

Inevitably, to avoid whipsaws, a trend-following system will be late in the trend and will thus miss profit potential at both ends of the trend. Unfortunately, this is the cost of a trend-following system. If an attempt is made to clip more profit at each end of the trend, the number of losses will increase from the ranging nature of the trend at its terminal points. On the exit side of a trend, specific trailing stops or such can be used to receive better prices, but again there is the risk of missing another leg in the trend by exiting prematurely.

Losses occur primarily in the trading range preceding the establishment of a trend, as the system tries to identify the next trend as closely as possible. One strategy to combat this is to use a counter-trend system at the same time, even if it is not as profitable as the trend-following system. The gains from the counter-trend system will offset some of the losses of the trend-following system, and the overall performance results will improve over the trend-following system alone.

Moving-average and breakout systems are usually limited to a one-directional signal only. Part of the advantage in following a trend is to pyramid in the direction of the trend as evidence of its viability becomes stronger. To accomplish this in a trend-following system, other indicators must be used, thus increasing the complexity and decreasing the adaptability of the system.

The greatest fault with trend-following systems is the large percentage of consecutive small losses that produce significant drawdowns. For example, let us say that the system suffers ten small losses in a row while in a trading range. The drawdown to the equity of the account accumulates during this period from the peak of the equity to the subsequent cumulative loss. A series of losses that cause a large drawdown affect not only the pocketbook but also the confidence in the system and often lead to further complications. One strategy to lessen a sequence of losses is the strategy mentioned previously of using a counter-trend system. Another is to initiate only small positions on a signal until the trend is well established. Yet another is to run another trend-following system parallel that has a longer or shorter period.

Because a trend-following system often is characterized by clumps of large profits from the trend and many small losses from the trading range, extreme volatility occurs in equity. We will look at this later when we study equity curve smoothness, but the most often used counter-measure is to diversify into other markets or systems.

As with most mechanical systems, a trend-following system can work well during testing and then bomb in practice. In most cases, this is due to improper testing and adjusting. Sometimes the improper testing is due to unrealistic assumption about transactions costs. Unrealistic assumptions including spreads during fast markets, limit days in the futures market, and other possible anomalies may have given false results during the testing stage of the system under consideration. Remember that the popularity of trend-following systems can affect slippage; this fact often is erroneously ignored in the testing phase.

Occasionally, substantial parameter shifts will occur that the adaptive system will not be able to recognize and accommodate. Again, by diversifying by using more than one system, or using market character adjustments to volatility, such problems can be reduced.

#### Pattern Recognition Systems

"Every ship at the bottom of the sea had plenty of charts" is attributed to noted systems trader Jon Najarian (Patel, 1997). Using patterns requires considerable testing and overcoming the problem

of defining patterns. Larger patterns do not succumb to easy computer recognition because of their variable nature. System traders such as Larry Williams, Larry Connor, and Linda Raschke use short patterns, some of which we discussed in Chapter 17, "Short-Term Patterns," and limit their exposure with specific position stops and price or time targets. Generally, such systems are partially discretionary because they require some interpretation during the trade entry.

#### Counter-Trend Systems

Counter-trend systems are based on the buy-low-sell-high philosophy within a trading range. This type of system requires a certain amount of volatility between the peaks and valleys of ranges; otherwise, transaction costs, missing limits, and being stopped out on false moves chew up any potential profits. Generally, these systems are discretionary. They profit from fading minimum moves against a trend and using oscillator indicators such as the stochastic, RSI, the MACD, or cycles. The largest potential problem in trading with one of these systems is the possibility of a trend developing that creates the risk of unlimited losses. Protective stops are a necessity.

Generally, this type of system does not perform well. A number of publicly available tests, for example, of buying and selling within Bollinger Bands have been conducted, and invariably the best performance comes from buying and selling on breakouts from the bands rather than trading within them. The major use of counter-trend systems is to run coincident with trend-following systems to dampen the series of losses in the trend-following system during a trading range.

#### Exogenous Signal Systems

Some systems generate signals from outside the market being traded. Intermarket systems, such as gold prices for the bond market, would be an example of an exogenous signal system. Other examples are sentiment such as the VIX for S&P futures, volume, or open interest warnings of activity that trigger price systems or act as confirmation of price systems, or fundamental signals such as monetary policy or consumer prices.

#### Which System Is Best?

Which type of system is the best? John R. Hill and George Pruitt, whose business is to test all manner of trading systems ([www.futurestruth.com](http://www.futurestruth.com)), maintain that the best and most reliable systems are trend-following systems. Within trend-following systems, the breakout systems have the best characteristics, specifically the Bollinger Band breakout systems, and the Donchian, or channel, breakout systems. Closely behind are the moving-average crossover systems.

## How Do I TEST A SYSTEM?

### Data

Not surprisingly, for an accurate evaluation of any system, the data must be impeccable. Without the correct data, the system tests are useless. Data should always be the same as what will be

used when the system is running real-time. Not only the data but also the data vendor should be the same source as what will be used in practice. Different vendors receive different data feeds. This is especially a problem in short-term systems, where the sequence of trades is important for execution and for pattern analysis.

The amount of data required depends on the period of the system. A general rule of thumb is that the data must be sufficient to provide at least 30 to 50 signals and cover periods where the market traveled up, down, and sideways. This will ensure that the test has enough history behind it and enough exposure to different market circumstances.

The real-time trader has enough difficulty with "dirty" data on a live feed, and this becomes just as crucial when testing back data. Cleanliness of data is another very necessary requirement. Any anomalies or mispriced quotes will have an effect on the system test and will skew the results in an unrealistic manner. Cleaning of data is not an easy task and often must be relegated to the professional data providers.

#### Special Data Problems for Futures Systems

Although stock data has a few historical adjustments such as dividend payments, splits, offerings, and so on, the futures market has another more serious problem: which contract to test. Most futures contracts have a limited lifespan that is short enough not to be useful in testing most systems. The difficulty comes from the difference in price between the price at expiration and the price of the nearest contract on that date. Those prices are rarely the same and are difficult to splice into something realistic that can be used for longer-term price analysis. To test a daily system, for example, two years or more of daily data is required at the very least, but no contract exists that runs back for two years. Of course, testing can be done on nearest contract series, but it is limited to the contract length. This is satisfactory if the system trades minute by minute but not for daily signals in a longer-term system.

To rectify this problem, two principal methods of splicing contract prices of different expirations together in a continuous stream have been used. These methods are known as perpetual contracts and continuous contracts. Neither is perfect, but these methods are the ones most commonly used in longer-term price studies.

Perpetual contracts, also called constant forward contracts, are an interpolation of the prices of the nearest two contracts. Each is weighted based on the proximity to expiration of the nearest contract to the forward date—say a constant 90 days. As an example, assume that today is early December, only a few days from expiration of the December contract of a commodity future and a little over three months from the expiration of the March contract, the next nearest. The 90-day perpetual would be calculated by proportioning each contract's current price by the distance each is in time from the date 90 days from now. This weighting in early December favors the March contract price, and each day as we approach the December expiration, the December contract receives less weight until expiration when the perpetual is just the March contract price. The following day, however, the March contract price begins to lose weighting as the June contract price begins to increase its weighting. This process gives a smooth but somewhat unrealistic contract price; it eliminates the problem of huge price gaps at rollover points, but you cannot literally trade a constant forward series. As Schwager point out, "the price pattern



of a constant-forward series can easily deviate substantially from the pattern exhibited by the actual traded contracts—a highly undesirable feature" (1996, p. 664).

The continuous, or spread adjusted, contract is more realistic, but it suffers from the fact that at no time is the price of the continuous contract identical to the actual price because it has been adjusted at each expiration or each rollover date. The continuous contract begins at some time in the past with prices of a nearby contract. A rollover date is determined based on the trader's usual rollover date—say ten days before expiration. Finally, a cumulative adjustment factor is determined. As time goes on and different contracts roll over to the next contract, this spread between contracts is accumulated and the continuous contract price adjusted accordingly. With this method, the continuous prices are exactly what would have been the cost to the trader had the system signals been followed when they occurred. There is no distortion of prices. Price trends and formations occur just as they would have at the time. The only difference is that the actual prices are not those in the continuous contract. Percentage changes, for example, are not accurate. Nevertheless, the method demonstrates exactly what would have happened to a system during the period of the continuous contract, precisely what the systems designer wants to know.

As Schwager points out, "a linked futures price series can only accurately reflect either price *levels*, as does the nearest futures, or price *moves* as does continuous futures, but not both . . ." (p. 669). Students interested in trading futures can refer to the book, *Schwager on Futures: Technical Analysis*, to learn more about these techniques.

#### Testing Methods and Tools

Fortunately, the wheel need not be reinvented when it comes to testing software. Many trading software products include a testing section. Some are reliable; however, some are not. Before purchasing any such software, you should understand the testing methods and resulting reports of the software. Almost all such programs leave out crucial analysis data and may often define terms and formulas differently than others. For example, the term "drawdown" has different meanings, depending on intraday data, closing data, trade close data, and so forth. You must understand the meaning of all terms in any software program to correctly interpret tests performed by it. With this in mind, the systems analyst must establish exactly what information is desired, what evaluation criteria would be useful, and how the results should be presented.

#### Test Parameter Ranges

The initial test of a system is run to see if the system has any value and, if so, where the problem areas might lie. When the testing program is run, the parameters selected initially should be tested to see if they fall in a range or are independent spikes that may or may not occur in the future. A parameter range, called the parameter set, that gives roughly the same results bolsters confidence in the appropriateness of the parameter value. If, when the parameter value is changed slightly, the performance results deteriorate rapidly, the parameter will not likely work in the future. It is just an aberration. When the results remain the same, or similar, the parameter set is said to be stable—obviously a desirable characteristic.

**BOX 22.1** Designing a System—The "Apple-a-Doy System"

Let us look at a simple case study of how to develop a trading system. Suppose we decide that we will trade Apple Computer common stock (AAPL). (Remember that we looked at this stock in Chapter 18, "Confirmation," when we were studying indicators.) We also decide that we will start with a simple Donchian channel breakout system on weekly highs and lows data.

Looking at the monthly chart of AAPL (see Figure 22.1) from 1993 through 2006, we see many periods of upward and downward trends and trading ranges. This is an ideal history to analyze and test because it includes the three possible trends in any market: up, down, and sideways. It also covers a period of 13 years, roughly 670 weeks, which should give us plenty of signals.

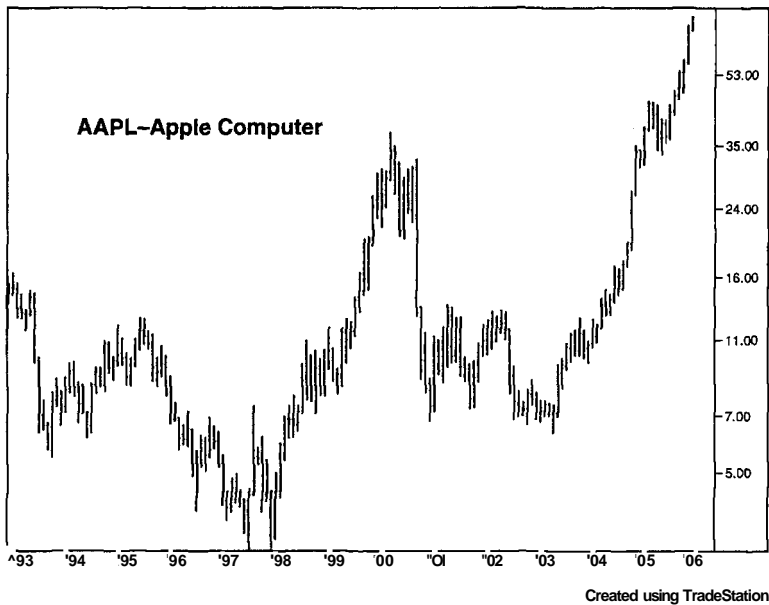


FIGURE 22.1 Apple Computer stock price 1993-2005 (monthly: 1993-2005)

The Donchian channel breakout system gives a buy signal when the closing price breaks above the highest price over the past  $x$  weeks. The sell signal occurs when the closing price breaks below the lowest price over the past  $x$  weeks. We will use 20 weeks as  $x$ , the standard starting point for  $x$  in this system. There will initially be no

(continued)

stops or any other exit criteria other than the opposite signal. This is called a "Stop and Reverse" (SAR) system, and funds are invested at all times, either long or short.

The equity curve for this system is shown in Figure 22.2. An *equity curve* is a chart of the equity in the account (vertical axis) versus time measured either by trade number or by time (horizontal axis). In Figure 22.2, time is along the horizontal axis. Looking at the chart, we can see that until September 1999, the system had lost money, over \$1,200 at one point. Until 2000, this was the maximum drawdown. In March 1998, the system picked up a trend and ran from a loss of \$1,200 to a profit of \$1,900. At that point, in 2000, roughly at the peak of the general market, it was hit again with a large drawdown to a loss of \$700 in September. This drawdown of \$2,600 intraday is the largest drawdown to date. Again, the system picked up a trend, a steep downward trend. Equity then dribbled downward until March 2003 when the system picked up the most recent trend. In short, the system was losing for almost half the period and only truly profited during the past three years. The system is profitable but not pretty. Any user would have to have had considerable staying power and confidence in the system to wait so long and even then not surpass the buy-and-hold strategy (see later in this Box).



FIGURE 22.2 Equity curve for trading AAPL using Donchian channel breakout (December 11, 1992-December 9, 2005)

Some tabulated data from the initial test is as follows:

Trades	All	Long	Short
Net profit	+\$6,195	+\$6,401	-\$206
Gross profit	\$9,974	\$8,228	\$1,746
Gross loss	\$3,779	\$1,827	\$1,952
Profit factor	2.639	4.504	0.894
Number of trades	25	13	12
Percent profitable	40.000%	46.154%	33.333%
Average trade net profit	+\$247.80	+\$492.38	-\$17.17
Largest winner as a % of gross profit	62.64%	75.94%	59.79%
Largest loser as a % of gross loss	25.01%	51.72%	31.56%
Maximum consecutive losing trades	3	3	4
Average weeks in winning position	45.4	48.2	41.3
Average weeks in losing position	12.9	13.4	12.4
Buy-and-hold return	799.9%		
Return on account	396.9%		
Monthly average return	\$64.01		
Standard deviation of monthly return	\$286.89		
Sharpe ratio	-0.862		
Maximum drawdown (intraday)	-\$2,641	-\$2,013	-\$1,615
Net profit as a % of drawdown	248.7%	265.4%	-13.6%

Let's look at some of these statistics and learn what they tell us about the Apple-a-Day system so far:

- *Net profit* is the difference between gross profit and gross loss. It is positive for this system and gives the impression that the system has some merit.
- *Gross profit and gross loss* are the totals under each category for each trade. Gross profit is the total profit from profitable trades; gross loss is the total from all losing trades.
- *The profit factor* is the absolute value of the ratio of gross profit to gross loss. It shows the profitability of the system. In this case, for every dollar of loss, 2.6 dollars of profit are generated. If the profit factor is less than one, the system is losing (and net profit would be negative). Look at the Short column, for example. The gross profit from short trades was \$1,746, but the gross loss from the short trades was \$1,952. This resulted in a profit factor of only 0.894, or a net profit of -\$206.
- *Number of trades.* This system generated 25 trades: 13 long trades and 12 short trades. This is too small of a number of trades for reliable statistics.

*(continued)*

Generally, at least 30 to 50 trades are required to test a system. To address this, we would need to double or triple the data used.

- *Percent profitable* is the percent of all trades that were profitable. In our example, only 40% of the trades were profitable. It is typical for a trend-following system to have less than 50% of the trades profitable. This is one area that should be attacked for improvement. When a low percentage of the trades is profitable, it suggests many small losses and large drawdowns—in other words, high risk. If we can increase the percentage of profitable trades, we can lower the risk profile and reduce the risk of ruin.
- *Average trade net profit* is the average profit received per trade. If this is particularly small, it suggests that the system is vulnerable to transaction costs. In the Short column, the average net loss is \$ 17. It suggests that perhaps we should discard the short side of the system.
- *Largest winner or loser versus gross profit or gross loss*. This figure gives a hint as to whether the gain or loss was accounted for by only one trade. In this case, the largest winning trade accounted for 62% of the total gross profit. Although this is characteristic of trend-following systems, which tend to make profits in large but few clumps, it suggests that the system is highly dependent on finding that one or two hugely profitable trades. Over a period of 13 years, it means that a lot of waiting will be done by the system user.
- *Maximum consecutive losing trades*. A long string of consecutive losses invariably causes a large drawdown and, thus, a high potential risk for the system. In this case, the number of successive losses is three trades in a row. In trend-following systems, the number of successive losses is usually high and is one reason that the systems user must have complete confidence in the system.
- *Average weeks in winning and losing positions*. There is not much question that the Apple-a-Day system has produced many long-term profits (average of 45 weeks) and short-term losses (average of 13 weeks). From a capital gains tax standpoint, this is the ideal combination.
- *Buy-and-hold return*. This is the return gained if the investor bought the stock on the first day and held it for the entire time period through all its gyrations.
- *Return on account*. This is the total return on the minimum account size as determined by the maximum drawdown. It should be compared to the buy-and-hold return to see if the system outperforms a do-nothing approach. In this case, the do-nothing approach outperformed the system, which is not a favorable sign. Of course, such comparisons are not as easy as they look because the concept of risk has not been introduced to either method. The buy-and-hold method has infinite risk because the drawdown can be 100%, while the risk of the system has been limited to a much smaller percentage.
- *Average monthly return and standard deviation of the monthly return* are used to determine the volatility of returns; The average monthly return for this

system is \$64.01, but it is highly volatile. With a standard deviation of \$286.89, two-thirds of the monthly returns will be within a range of -\$223. and \$351. Ideally, a system should have a standard deviation less than five times the monthly return. In this system, it is 4.4 times.

- ? *Sharpe ratio.* The Sharpe ratio is a common measure of the return versus risk of a portfolio or system. As we saw in Chapter 21, it is a ratio of return—in this case, adjusted for the risk-free return of T-bills, to the standard deviation of return, a proxy for risk. As we stated earlier, however, risk is not just variability, but is also the risk of capital loss. The Sharpe ratio fails to account for draw-down and fails to account for skewed deviations of return. An investment that deviates more to the upside, for example, will not be fairly represented by the Sharpe ratio, which assumes a normal distribution. These problems are why system designers shy away from the Sharpe ratio and have designed other ratios of return to risk that are more realistic. In this system, the Sharpe ratio is negative, suggesting that the return does not exceed the risk-free return of T-bills.
- *Maximum drawdown.* This is the maximum amount that the equity curve corrected from a peak. Assuming the future returns remain similar to the period tested, it is the likely maximum risk of capital loss from the system.
- *Net profit as a percentage of maximum intraday drawdown.* Naturally, one wants a system that has no drawdown, but barring that, one wants a system that has profits considerably higher than any drawdown potential. The current case has a percentage of 249%, a particularly favorable ratio considering that this is the first try at the system. The standard is anything above 200%, depending on the length of the period studied. In the current case, the period is particularly long, and a higher net profit to maximum drawdown should be expected. It thus becomes a gauge for comparing systems, and a common ratio for that is the Net Profit as Percentage of Maximum Intraday Drawdown (see Table 22.1).

**TABLE 22.1** ' Robustness of Parameters

**Net Profit as Percentage of Maximum Intraday Drawdown  
Buy and Sell Parameters**

	Sell	17	18	19	20	21	22	23	Average	SD	Ratio
Buy					+			+			
17		292	256	245	345	331	329	341	259.04	110.83	2.34
18		233	208	200	270	258	256	267	241.71	26.35	9.17
19		236	211	203	273	261	259	276	245.57	27.24	9.01
20		214	189	181	249	239	237	256	223.86	27.57	8.12
21		186	163	155	224	213	211	288	197.14	27.21	7.25
22	— •	334	305	293	396	381	379	402	355.71	41.27	8.62
23	— •	325	297	285	388	373	370	393	347.29	41.11	8.45
Average		260.00	232.71	223.14	306.71	293.71	245.04	309.00	267.19		
SD		52.94	50.36	48.62	63.78	62.28	116.60	64.31			
Ratio		4.91	4.62	4.59	4.81	4.72	2.12	4.80			

(continued)

One other important factor is the stability of the parameter set. Table 22.1 demonstrates the net profit as a percentage of maximum drawdown (NPDD) for all combinations of buy and sell parameters two whole numbers above and below the initial parameters of 20 weeks. The purpose in the table is to see if the parameter sets are stable. First, we determine the average NPDD for each parameter horizontally and vertically on the table. Second, we determine the standard deviation of the values horizontally and vertically to see how much they vary. Finally, we calculate a ratio of the average to its standard deviation to include not only the performance of the parameters but also their dispersion.

We can see along the horizontal axis that the ratios are relatively stable\* though low. This suggests that standard deviation of NPDD for short sales is high and is thus less stable. The worst exception is a sell parameter of 22. This is considerably lower than the others are, and we discard it and have questions about parameters 21 and 23 on either side.' r

The vertical axis showing the buy parameter results demonstrates a consistency in the parameters but almost twice the return as the sell parameters. The buy parameters have one exception from the others at 17, where the ratio is particularly low. We discard that exception as a possible parameter and have questions about the validity of 18 because of its immediate proximity. We want adjacent parameters that show similar results. This way, the parameter set can adjust to market changes more easily and will not be dependent on a single set of circumstances that existed during the test. Generally, it is wise to discard any parameter that produces results outside the range of its adjacent parameters.

Now we look at the table again and see that the best-performing parameters are 22 and 23 on the buy side and 20 and 23 on the sell side. Out of the four possible parameters, the two with the highest ratios are buying at 22 and selling at 20. Within their sets, each parameter is stable relative to its neighbors.

Notice that the ratios of NPDDs to their standard deviations for the sell parameters are very low compared to the ratios for the buy parameters. This again brings into question the use of sell criteria in the system. These are the kinds of things to consider when creating a system.

In addition, notice that the ratio for sell parameters increased at 17 beyond all others. This may be indicating that the sell parameter should be considerably lower.

In summary, the system made net profits but under-performed the buy-and-hold strategy. It includes a large drawdown, suggesting large capital risk, and we have identified some problems with the sell rule. So far, we know it works, but is not something we would like to use as it stands.

## OPTIMIZATION

Once you determine that the parameters in your system are valid, you may optimize the system. *Optimizing* is simply changing the parameters of a system to achieve the best results. The most important benefit of optimization is that the designer may find parameters that do not work under any circumstances. If parameters do not work with the past data, it is highly likely they will not work in the future. Thus, optimizing can eliminate useless rules and parameters.

Optimizing is also useful in determining whether certain types of stops are useful. Often the designer finds that there is a limit—for example, to a protective stop—beyond which the stop does not add to the system performance. Often, the distance of trailing stops is too close to the last price, causing premature exits. These determinations can be analyzed more closely with optimization.

Although it can be beneficial, optimization does come with hazards. With modern computers and sophisticated software, we can take any series of prices and find the best parameters for any predefined system. The problem is that by doing such an optimization, we are just fitting the data to a curve of results and have no idea whether the parameters we have derived will perform in the future. Because the future is what we are attempting to control, most optimization is useless and even dangerous, because it gives us a false sense of confidence.

The principal concern with optimization is the tendency to curve fit. Curve-fitting occurs when the optimization program finds the absolute best set of parameters. What the program is really doing is fitting the parameters to the data that is being tested. Thus, it is forming a mathematical model of that data and fitting parameters to that particular time in history. The only way that the parameters will work in the future is if the future exactly duplicates the history that was optimized. Of course, we know this will never happen, and thus the parameters determined by optimization will be useless in the future. Any system could be made to look profitable if optimized; this is a problem that buyers of systems must face when considering purchasing an existing system for investing or trading. The trick is to optimize over a certain period and then test the parameters derived through optimization on a period in which no optimization has been conducted. This is called out-of-sample (OOS) testing. Invariably we will find that the results in the optimization will overstate the results in the out-of-sample period, and thus the optimized parameters should never be used to evaluate the system's usefulness. Optimization should be kept simple. Fine-tuning the system just increases the level of false confidence that eventually will be dashed in real time when the system fails.

There is, thus, some controversy about the use of optimization in arriving at workable mechanical systems. The basic principles of realistic optimization are to keep it simple, test out-of-sample data against in-sample optimization results, preferably use baskets of securities, determine parameter sets instead of single parameters, understand that the best results are high profits with minimal risk, and do not expect to find the Holy Grail. Next we will discuss some optimization methods and some tests for statistical significance to perform after the most realistic parameter sets have been determined.



### Methods of Optimizing

As a general rule, an optimization should be done over a considerable period of price data and include those periods when the prices are in trends and in trading ranges. We do not know ahead of time whether the future will be similar, but we do know that there will be trends and trading ranges. Any system must be able to deal with both of these situations and have developed adjustable parameter sets or rules that will account for them. Parameters determined in this manner should be suitable for future conditions.

#### *Whole Sample*

One method of optimizing is to take the entire price sample and run an optimization of the parameters. This is usually frowned upon because it is the closest to curve-fitting. To avoid this, the optimization is on a basket of securities—either futures or stocks—rather than a market average or single issue and over a long enough period to generate a large number of trades. The diversification of securities reduces the likelihood that any results are solely the result of peculiarities in a particular security, and the large number of signals increases the statistical significance of the results. After determining the optimal parameter sets, those that are consistent and give decent results (but not necessarily the best results), the next step is to divide the optimization period roughly into tenths and run a test on each period using the derived parameter sets. The results from these ten different periods then can be analyzed for consistency to see if the system generated similar results under all conditions. Things to look for are the amount of drawdowns, the number of signals, the number of consecutive losses, the net profit as a percentage of maximum drawdown, and so on. The actual amount of net profit is less important for each stage than are the determinants of risk and the consistency of results (Ruggiero, 2005). If the results are not consistent, the system has a major problem and should be optimized using other means or discarded.

#### *Out-of-Sample Optimization (OOS)*

This is a method most often used in neural network and regression studies. We will not cover these particular methods because they are more useful with other data series. They can be used in market analysis, and some people, such as Lou Mendleson ([www.profitmaker.com](http://www.profitmaker.com)), claim to have successfully been able to correlate different markets using neural network patterns. However, for purposes of this study of optimization, we will ignore neural networks, multiple regressions, and others such as genetic algorithms, expert systems, and artificial intelligence. Instead, we will focus on the most common and productive methods, those used by the majority of systems designers.

One variation of OOS that is commonly used is to take the entire price data series to be optimized and divide it into sections, one of 70-80% of the data to be used to develop the system called the "in-sample" data, and one of 20-30% called the "out-of-sample" data. The out-of-sample data can include the first small portion of the total period and the last, or just the last, most recent data. As with all other test methods, the sample must include bull, bear, and consolidation periods. The total amount of data necessary is large in all optimization processes. This is especially true for daily data since the beginning of the stock market rise in the early 1980s to 2000. The trend then was so strongly upward that systems designed using that data for optimizing often fell apart during the decline from 2000 to 2002. This was because the tested data did not include many examples of declining or trading markets. All must be included so that the system can learn to adjust to any future change in direction or habit.

This method of OOS optimizes the in-sample data and then tests it on the out-of-sample data. The out-of-sample results are theoretically what the system should expect in real time. Invariably the out-of-sample performance will be considerably less than the performance generated in the optimization. If the out-of-sample results are unsatisfactory, the method can be repeated, but the more that the out-of-sample results are used as the determinant of parameter sets, the more that the objectivity of the optimization is compromised and the closer to curve-fitting the process becomes. Eventually, if continued in this manner, the out-of-sample data becomes the same as the sample data, and the optimization is just curve-fitting. One other method of reducing the effect of curve-fitting is to use more than one market as the out-of-sample test. It is difficult to have the same parameter set in different markets and at the same time curve-fit. This appears counterintuitive because most analysts would think that each market is different, has its own personality, and requires different parameters. Indeed, when looking at publicly available systems for sale, one method of eliminating a system from consideration is if it has different parameters for different markets. This usually indicates that the results are from curve-fitting, not real-time performance. A reliable system should work in most markets.

#### *Walk Forward Optimization*

Walk forward optimization is also an OOS method that uses roughly the same kind of price data series as the one described previously. In the walk forward method, the in-sample data is also 70-80% of the entire series but is usually the first portion of the series, and the more recent 20-30% is the out-of-sample data. Although there are many variations of this method, the most common procedure is to optimize the in-sample data and then test it on a small period of the out-of-sample date—for example, in daily data anywhere from one month to one year. The results of this test are recorded, and another window of data is optimized—this time the in-sample data used earlier less the amount of time taken for the test, a month up to a year, plus the data used in the test. Again, the results are recorded, and the window moved forward another period until the test reaches the most recent data and a series of test recordings is available. Each optimization thus has an out-of-sample test. The results from all the recordings are then analyzed for consistency, profit, and risk. If some parameter set during the walk forward process suddenly changes, the system is unlikely to work in the future. The final decision about parameter sets is determined from the list of test results.

### **Optimization and Screening for Parameters**

We will look next at all the different summaries and ratios that a system designer considers in measuring *robustness* (the ability of the system to adjust to changing circumstances), but first we must mention those that are used to screen out the better systems during optimization.

When optimization is conducted on a price series, the results will show a number of different parameter sets and a number of results from each parameter set. We can look at the net profit, the maximum drawdown, and any of the other statistics shown in Box 22.1. Many analysts screen for net profit, return on account, or profit factor as a beginning. They look at the average net profit per trade to see if the system generates trades that will not be adversely affected by transaction costs, and most importantly they look at the net profit as a percentage of the maximum drawdown. The means of profiting from a system, any system of investing, are determined by the amount of risk involved. Remember the law of percentages. Risk of capital loss is the

most important determinant in profiting. The net profit percentage of maximum drawdown describes quickly the bottom-line performance of the system. Unfortunately, the optimizing software of some commercial systems fails to include this factor and it must be calculated from other reported statistics.

## Measuring System Results for Robustness

When analyzing a system, we look at the system components, the profit, the risk, and the smoothness of the equity curve. We want to know how robust our results are. Robustness simply means how strong and healthy our results are; it refers to how well our results will hold up to changing market conditions. It is important that our system continues to perform well when the market changes, because although markets trend and patterns tend to repeat, the future market conditions will not exactly match the past market conditions that were the basis for our system design.

### Components

The most important aspect of the optimization and testing process is to be sure that all calculations are correct. This sounds simple, but it is surprising how often this is overlooked and computer program errors have led to improper calculations. The next aspect is to be sure that the number of trades is large enough to make the results significant. The rule of thumb is between 30 and 50 trades, with 50 or more being the ideal. We have mentioned previously that the comparisons between in-sample and out-of-sample results should differ in performance but should not materially differ in average duration of trades, maximum consecutive winners and losers, the worst losing trade, and the average losing trade. We should also be aware of the average trade result in dollars and the parameter stability. We could apply a student t test to the parameters and their results to see if their differences are statistically significant, and we should test for brittleness, the phenomenon when one or more of the rules are never triggered. Once we are satisfied that the preceding inspection shows no material problems, we can look at the performance statistics more closely.

### Profit Measures

Remember that the point of practicing technical analysis is to make money—or profit. On the surface, it seems as if this is a simple concept: If I end up with more money than I began with, then the system is profitable. Actually, measuring and comparing the profitability of various potential systems is not quite so straightforward. There are several ways in which analysts will measure the profitability of systems. The major ways are as follows:

- Total profit to total loss, called the profit factor, is the most commonly used statistic to screen for systems from optimization. It must be above 1.0, or the system is losing. Although a high number suggests greater profits, we must be wary of overly high numbers; generally, a profit factor greater than ten is a warning that the system has been curve-fitted. As a measure of general performance, the profit factor only includes profits and losses, not drawdowns. It therefore does not represent statistics on risk.

- Outlier-adjusted profit to loss is a profit factor that has been adjusted for the largest profit. Sometimes a system will generate a very large profit or loss that is an anomaly. If the profit factor is reduced by this anomaly and ends up below 1.0, the system is a bust because it depended solely on the one large profit. The largest winning trade should not exceed 40 to 50% of total profit.
- Percentage winning trades is a number we will use in the next chapter on the makeup of risk of ruin. Obviously, the more winning trades there are, the less chance of a run of losses against a position. In trend-following systems, this percentage is often only 30-50%. Most systems should look for a winning trade percentage greater than 60%. Any percentage greater than 70% is suspect.
- Annualized rate of return is used for relating the results of a system against a market benchmark.
- The payoff ratio is a calculation that is also used in the risk of ruin estimate. It is a ratio of the average winning trade to average losing trade. For trend-following systems, it should be greater than 2.0.
- The length of the average winning trade to average losing trade should be greater than 1. Otherwise, the system is holding losers too long and not maximizing the use of capital. Greater than 5 is preferable for trend-following systems.
- The efficiency factor is the net profit divided by the gross profit (Sepiashvili, 2005). It is a combination of win/loss ratio and wins probability. Successful systems usually are in the range of 38 to 69%—the higher the better. This factor is mostly influenced by the win percentage. It suggests that reducing the number of losing trades is more effective for overall performance than reducing the size of the losses, as through stop-loss orders.

For a system to be robust, we should not see a sudden dip in profit measures when parameters are changed slightly. Stability of results is more important than total profits.

### Risk Measures

What happens if you find a system that has extraordinarily high profit measures? Chances are you have a system with a lot of risk. Remember, high profits are good, but we must balance them against any increased risk. Some of the major ways that analysts will measure the risk within their system are as follows:

- The maximum cumulative drawdown of consecutive losing trades from peak equity can also be thought of as the largest single trade paper loss in a trade. The maximum loss from an equity peak is the most common usage. The rule of thumb is that a maximum drawdown of two times that found in optimizing should be expected and used in anticipated risk calculations.

- The net profit to drawdown ratio is the same as net profit as a percentage of maximum drawdown. It is also called the recovery ratio, and it is the best method of initially screening results from optimization. In any system, it should be above 2.0.
- Maximum consecutive losses often affect the maximum drawdown. When this number is large, it suggests multiple losses in the future. It is imperative to find out what occurred in the price history to produce this number if it is large.
- Large losses due to price shocks show how the system reacts to price shocks.
- The longest flat time demonstrates when money is not in use. It is favorable in that it frees capital for other purposes.
- The time to recovery from large drawdowns is a measure of how long it takes to recuperate losses. Ideally, this time should be short and losses recuperated quickly.
- Maximum favorable and adverse excursions from list of trades informs the systems designer of how much dispersion exists in trades. It can be used to measure the smoothness of the equity curve but also give hints as to where and how often losing trades occur. Its primary use is to give hints as to where trailing stops should be placed to take advantage of favorable excursions and reduce adverse excursions.
- The popular Sharpe ratio has severe problems when applied to trading systems. First, it does not include the actual annual return but only the average monthly return. Thus, irregularities in the return are not recognized. Second, it does not distinguish between upside and downside fluctuations. As a result, it penalizes upside fluctuations as much as downside fluctuations. Finally, it does not distinguish between intermittent and consecutive losses. A system with a dangerous tendency toward high drawdowns from consecutive losses would not be awarded as high a risk profile as others with intermittent losses of little consequence.

Individual analysts will choose, and even create, the measure of risk that is most important to their trading objectives. Some of the other measures of risk mentioned in the literature are as follows:

- *Return Retracement ratio*—This is the average annualized compounded return divided by MR (maximum of either decline from prior equity peak [i.e., worst loss from buying at peak] or worst loss at low point from any time prior).
- *Sterling ratio* (over three years)—This is the arithmetic average of annual net profit divided by average annual maximum drawdown; it is similar to the gain-to-pain ratio.
- *Maximum loss*—This is the worst possible loss from the highest point; using this measure by itself is not recommended because it represents a singular event.
- *Sortino ratio*—This is similar to the Sharpe ratio, but considers only downside volatility. It is calculated as the ratio of the monthly expected return minus the risk free rate to the standard deviation of negative returns.

### Smoothness and the Equity Curve

Some analysts prefer to analyze risk in a graphic, visual manner. Two graphs commonly are used as a visual analysis of a system's performance: the equity curve and the underwater curve.

An equity curve chart is shown in Figure 22.2. It shows the level of equity profit in an account over time. Ideally, the line of the equity profits should be straight and run from a low level at the lower-left corner to a high level at the upper-right corner. Dips in the line are losses either taken or created by drawdowns.

The common measure of smoothness is the standard error of equity values about the linear regression trend drawn through those equity values. Smoothness of a system usually is affected more by changes in the entry parameters or adjustments, such as filters. Because the majority of price **.1-1 ion** has occurred by the exit, the exit parameters and stops have little effect on smoothness.

The second type of graph used to look at system performance is the underwater curve chart. An example of this type of chart is shown in Figure 22.3. This displays the drawdown from each successively higher peak in equity. It is calculated in percentages and gives a representation not only of how much drawdown occurred, but also of how much time passed until equity recovered from that drawdown. As Figure 22.3 shows, the percentage drawdown in the initial Apple-a-Day system was a little over 22%. This chart helps us to see that a major problem with the system is not the size of the drawdowns but the time it takes for the system to recover. In Box 22.2, we outline a method for improving the system.

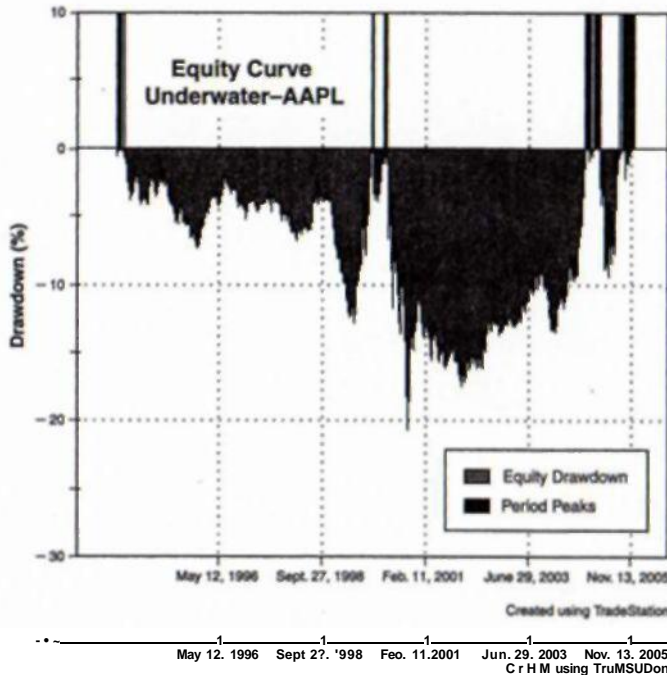


FIGURE 22.3 Weekly underwater curve for Appleo-Day system in Box 22.1 example (weekly: December 1 I, 1992-December9, 2005)

**BOX 22.2** Upgrade in the Apple-a-Day System

Now it is time to upgrade our system, based upon the results of our initial testing. Our early results suggested changing the buy and sell parameters to 22 and 20, respectively. Our previous results also indicated that although the long calls of the system were profitable, the short calls had lost money and suffered considerable drawdowns. Therefore, we also eliminate the short sales, remaining either in a long position or cash; for this trial, we use a 2% protective stop in case the long position begins to get into trouble and a 20-week channel breakout downward as a trailing stop. The following statistics show the results of changing these parameters. •

Trades	Original	22/20 No Shorts 2% Stop
Net profit	• +\$6,195	• +\$7,291
Gross profit	•> \$9,974	" \$8,021
Gross loss	\$3,779	\$730
Profit factor	2.6	11.0
Number of trades	25	• < 31 •
Percent profitable	40.0%	9.7%
Average trade net profit	+\$247.80	+\$235.19
largest winner as a % of gross profit	62.6%	77.9%
largest loser as a % of gross loss	25.0%	14.5%
Maximum consecutive losing trades	3	13
Average weeks in winning position	45.4	81.3
Average weeks in losing position	.129	3.1
Buy-and-hold return	799.9%	799.9%
Return on account	396.9%	1,679%
Sharpe ratio	-0.862	-0.563
Maximum drawdown (intraday)	-\$2,641	-\$2,030
Net profit as a % of drawdown	248.7%	359.2%

Let's look at how the system performs with these changes. In reality, we would change each variable and rule one by one to see the effect on results. Rather than go through each change individually, we show the results after all changes, for demonstration purposes.

The profit factor jumps considerably because the series of stops prevents any large loss. Thus, the gross loss for the system declines to \$730 from its earlier reading in the thousands of dollars. This causes the profit factor to soar to unrealistic

levels. The number of trades has risen, largely because the trailing stop being so tight causes more trade bailouts. The average trade profit, however, remains very close to the original. This indicates that the system is dropping trades that had losses (or only marginal gains) but retaining the most profitable trades. Because the maximum intraday drawdown has lowered the base capital necessary for this system, the return on account is much higher than before and greatly exceeds the buy-and-hold strategy. This is the advantage of lowering risk through stop exits. On the other hand, the percent of profitable trades is extremely low and would likely test a user's patience. It is quite apparent that the profits from this system occurred from several large trades with many small losses in between.

Figure 22.4 shows the equity curve chart of the no-short system; notice how the exit stops have prevented the equity from declining beyond a certain level. The system begins with a loss just as before, but the loss is considerably less, and with each run up when a trend is caught, the subsequent drawdown is recognized early and capital is preserved. The flat periods are when the system is out of the market entirely, waiting for the next entry signal.

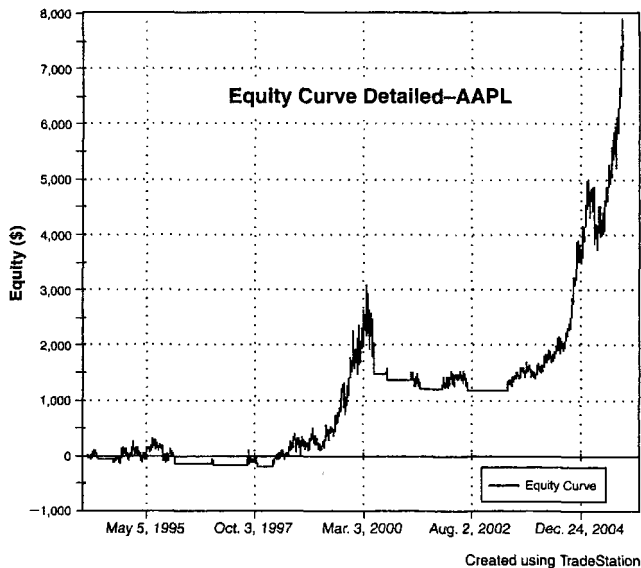


FIGURE 22.4 Equity curve of Applet-Day without short sales and with trailing stops (weekly: December 1, 1992-December 9, 2005)

(continued)



The underwater curve in Figure 22.5 shows the drawdown for the improved Apple-a-Day system in percentage terms. The drawdown in percentage terms has been reduced from greater than 20% in the original version to less than 16% in the version that includes exit stops but does not take short positions.

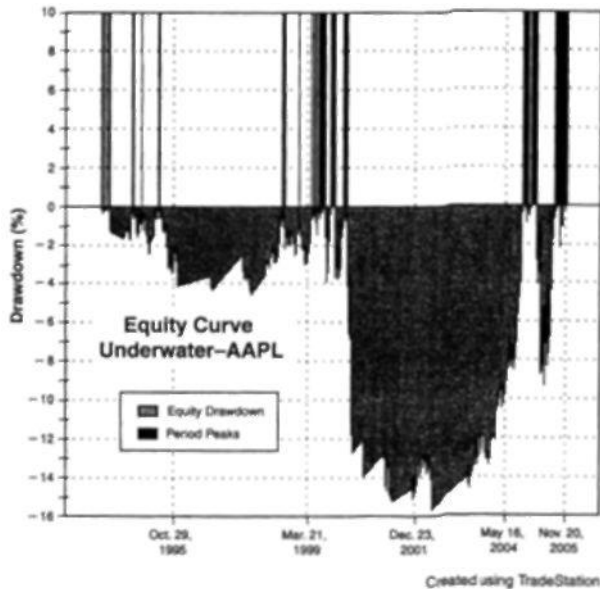


FIGURE 22.5 Underwater curve for Apple-a-Day system with trailing stops (weekly: December 1 1, 1W2-December9, 2005)

There continue to be problems, however. The largest winner as a percentage of gross profit is far too high. It suggests that only one trade accounted for a majority of the profits in the system and that the ending price was considerably above the range of prices earlier in the system. It is dangerous in that regard because in the future, such a large single trade may not occur. It would be a good system for catching a major run in stocks but not such a good system if the runs do not appear. We could continue with several other adjustments. For example, the percentage stop does not adjust for volatility or time in trade. The number of samples is too small, especially profitable trade samples. Other stocks should be tested with the same

parameters to give a broad range of results. A counter-trend system should be run at the same time to take advantage of the small oscillations that triggered the stops. In other words, as it exists, this system is not something to use. It needs considerable improvement and more testing. We tested it with the same parameters on all 30 Dow Jones Industrial stocks and found that it produced losses in nine stocks, profits above maximum intraday drawdown in only four stocks, and maximum drawdowns greater than or equal to net profits in 17 stocks. Thus, we know that we have likely curve-fit the system to Apple Computer alone and that it will not work consistently for other stocks. Do not use this system as it stands in any stock. It is presented only as an example of the process of looking for parameters, variables, and rules in a system development.

However, we hope that you can see the process of developing a reliable and profitable system and some of the types of adjustments that can be applied to systems, especially the use of stops, to improve performance and reduce risk. System development is a very difficult and time-consuming task.

#### **BOX 22.3 What Is a Good Trading System?**

In his book, *Beyond Technical Analysis*, Tushar Chande discusses the characteristics of a good trading system. Chande's Cardinal Rules for a good trading system are the following:

- *Positive expectation*—Greater than 13% annually
- *Small number of robust trading rules*—Less than ten each is best for entry and exit rules
- *Able to trade multiple markets*—Can use baskets for determining parameters, but rules should work across similar markets, different stocks, different commodities futures, and so on
- *Incorporates good risk control*—Minimum risk as defined by drawdown should not be more than 20% and should not last more than nine months
- *Fully mechanical*—No second-guessing during operation of the system

## CONCLUSION

Throughout this book, we have looked at a number of technical indicators to guide our buying and selling of securities in reaction to particular market conditions. In this chapter, we turned our attention to mechanizing these reactions. A system is simply a plan or set of rules of when to buy and sell securities. A system lets us determine *a priori* how we will react to particular market situations. Having a system in place helps us to follow a well thought-out plan and prevents us from haphazardly trading based on emotion.

Of course, our basic objective in creating a system is to make a profit. Although this sounds like a straightforward goal, the goal of making a profit is not as simplistic as it sounds. Of course, we test our system to see how well it performs. But—and this is an important but—just because a system performs well using past, historical data in a trial situation does not guarantee that we will have the same stellar results in future, real-time trading. The most basic reason for this performance differential is that the market never repeats itself exactly; the system is operating in a different market environment than the one in which it was tested. There are also some system design and testing issues of concern. The system designer must be careful about data choice and not to overfit the data in the sample period. As we have seen in this chapter, even a system that has a high net profit in a test period is not necessarily a system that will perform well in the future. The system designer must consider a host of statistics about the system performance to determine whether the system is suitable for future trading. By following the guidelines laid out in this chapter, you should be ready to design systems and test them to determine their appropriateness for your trading situation.

## REVIEW QUESTIONS

1. Explain the difference between a discretionary and nondiscretionary system.
2. What are the advantages and disadvantages of a nondiscretionary system?
3. How would you describe the discipline and mindset necessary to develop and follow a trading or investing system?
4. Your brother is a physician who does not have the time to manage his own money. Knowing that you have an interest in investments and have taken a class in technical analysis, he asks you to develop a trading system for him. Before you agree to take on this job, you want to make sure that he understands the concept of risk. How would you explain risk to him, especially as it is related to using a system for investing?
5. After you explain the concept of risk to your brother, he still wants you to develop a trading system. In fact, he has done some reading and is convinced that a trend-following moving average crossover system is the way to go. He even knows what stock he wants to trade using the system—his favorite pharmaceutical company, High Profit Pharmaceuticals (HPP). You do some initial investigation, and you think that HPP is currently in a trading range. Explain to your brother why you think it would be unwise to attempt to trade HPP using a moving average crossover system at this point. (Be sure to explain the concept of a whipsaw in your explanation.)

6. Your brother, eager to develop the "perfect" system to trade HPP, has developed a system, tested it, and optimized it. His results show that he would have quadrupled his money last year trading his system! He is ready to put the system in place to trade HPP this year, expecting to quadruple his money. What questions would you have about his testing and optimization procedures, and what warnings would you want to give him?
7. Two of your friends, Jennifer and Michael, have developed systems to trade IBM. During the test period, Jennifer's system had a net profit of \$9578, while Michael's system had a net profit of only \$8993. Explain why this information alone is not enough to determine that Jennifer's system is superior to Michael's.

# MONEY AND RISK MANAGEMENT

## CHAPTER OBJECTIVES

After reading this chapter, you should be familiar with

- Definitions and measurements of risk as it relates to money management
- The martingale betting strategy
- Diversifiable versus correlated risk
- Methods for testing money management strategies
- The use of various types of stops to manage risk
- Methods for determining the minimum capital needed for a system
- Methods for determining the percentage of capital to allocate toward one system

"They [great traders] have all been humbled by the market early on in their careers. This creates a definite respect for Mr. Market. Until one has this respect indelibly engraved in their (sic) makeup, the concept of money management and discipline will never be treated seriously." —Jeff Cooper, trader

Money management is the next and final step in portfolio design after having established a reliable system or systems. We have concentrated on the reward side of investment because that is the more interesting and the part that most investors or traders find enjoyable. Unfortunately, the reward side is only half of the portfolio equation. The other half is money management, a much-neglected aspect of portfolio management that should receive as much attention as the reward side. We can refer to money management as the risk side of investment, the means of preventing financial ruin. It is principally concerned with how to measure and manage risk of loss and therefore how to utilize one's capital most efficiently. In most aspects of investing, there is a tradeoff between reward and risk. Neither can be measured precisely, and the amount of risk to reward is a personal decision based on one's tolerance for risk. Everyone is happy

with reward, but different investors have different thoughts on what they can accept as risk. Unfortunately, reward is not guaranteed, but risk is. A system may not return profits, but a system will always have losses. Just how much risk is acceptable, how to measure it, and how to control it is the subject of this chapter.

## RISK AND MONEY MANAGEMENT

"Risk is the amount and probability of an adverse or series of adverse events occurring" (Rotella, 1992). Substituting "losses" for "adverse events" results in the following: *Risk is the amount and probability of a loss or series of losses occurring.* Note that the probability of occurrence is as important as the total amount.

There has never been a system that was 100% profitable, that never took a loss on any trade or investment. Although such a system is the ideal, it has never been achieved despite the brilliant minds, sophisticated mathematics and theories, and super-fast computer abilities that have addressed methods of investment. It likely never will be achieved. The search for such a perfect strategy can become an obsession but is genuinely futile, and losses are therefore inevitable in investing and trading.

Ruin is also very likely. Every day some traders and investors are wiped out, largely because they did not utilize a portfolio method that included an assessment and control of risk. The area between perfection and ruin is a compromise between the gains and losses, known more commonly as rewards and risks, of a system or portfolio strategy. As can be imagined, the possibilities between perfection and ruin are limitless and have much to do with personal preference for risk. The reward side of a strategy we can fairly well quantify, as was shown in the previous chapter on systems, but the risk side is not so easily understood. The tradeoff between the two will affect the ultimate success or failure of a portfolio strategy. That is the essence of money management—to maximize return at minimum risk. No home runs, no Holy Grails, no perpetual money machines—just plain and simple, consistent profits with minimum chance of losing all of one's capital. The extremes, of course, are highly leveraged options or futures contracts in a seat-of-the-pants, untested, untried system, and on the opposite side strictly cash. The cash investment theoretically has no risk, whereas hotshot investments and systems are likely doomed.'

Ironically, a good system can lose money if it is not applied with concern for risk. Money management can turn it into a profitable, reliable system, but money management cannot help a system that does not work. Thus, as we covered in the last chapter, the first step in creating a portfolio strategy is to find a workable system, preferably more than one. It need not be a super system, just one that consistently shows higher profits than losses. It can be based on fundamentals, technicals, or both. If you read interviews with successful traders and investors, you will find every one of them has a different method or system of entering the markets, but they all have in common a money management system to protect against loss. Indeed, most will admit that money

**1. A cash position does not have the risk of losing capital. Economists, however, will consider the inflation risk—the risk of the cash position losing purchasing power during inflationary periods.**

management is more important than any system. The second step is to decide on what markets and in which issues the system will trade or invest. The third step is to combine these systems and issues into a portfolio strategy. At this point, the subject of money management arises.

Because the theories of money management largely concern price and size, the evaluation and control of risk are technical. Fundamental investors cannot assess risk in the marketplace with fundamentals alone. What should be the initial capital? What should be the trade size in contracts, shares, or dollars? What should be the risk strategies applied to these positions? What should be the execution style? Should the strategies be combined into one portfolio system, or should each system be treated separately? All these questions must be answered to manage the portfolio successfully, and all of them rely on technical studies and use of price action and signals. Generally, the systems will take care of themselves if properly tested and will give adequate entry signals, leaving the investor with the problem of how to best position from those signals and what exit strategies to use. The object of money management is to maximize the best situations and avoid or minimize those situations that can cause capital loss.

Because money management has much to do with determining the size of positions, it has also been called "position sizing." However, there is more to it than just sizing. The parameters for risk avoidance, such as stops and exit strategies, are also important, as are diversification and execution methods. We will cover some of the principal money-management strategies you should know and demonstrate methods of testing for and reducing the risk of ruin.

## TESTING MONEY MANAGEMENT STRATEGIES

We covered the standard method of testing a system in Chapter 22, "System Design and Testing," but now we are looking at complete portfolio systems that include, hopefully, many sub-systems and many issues traded using each subsystem with different objectives that satisfy the requirement for diversification. Of course, we should already have tested each subsystem by itself with a diversified number of issues and have confidence in its results alone. By merging it into a portfolio system, however, we now need a method to test the entire model. We will see that the model often will produce better results than any of the separate subsystems do individually. To test the model, we can use the same methodology as used in Chapter 22, or we can use what is called a Monte Carlo simulation.

Because the testing system in Chapter 22 is plagued with the risk of curve-fitting and the inability to determine the success or failure of the system under varying circumstances, we need a testing method that looks at a multiple set of possibilities and tells us how well the rule, variables, and parameters in the combined subsystems handle change. The Monte Carlo simulation is one of the better and more often used testing methods of portfolio risk.

Without discussing the mathematics behind a Monte Carlo simulation (because it can become very complicated), we will instead just outline what it does. A simple simulation can be performed on a spreadsheet, with considerable work, and a more sophisticated software program called Equity Monaco is available from [www.tickquest.com](http://www.tickquest.com) for free. More sophisticated software is available elsewhere for a fee. More information on the mathematics of Monte Carlo simulations can be seen at [www.montecarlosimulations.org](http://www.montecarlosimulations.org).

As we will see with the Martingale betting system, a system may be profitable but the bettor must be able to withstand a long series of losses (a large drawdown). This means that the trading system results, even if spectacular from the optimization tests, could be just the result of chance or luck. In the example system derived in Chapter 22, the profit was generated from only a few highly successful trades in one specific issue. Suppose, as is likely, that these trades were pure luck—the exception rather than the rule. We would not want to use such a system if the results were chancy, for this would increase our odds of failure.

In the martingale betting system, we saw how the system is profitable only as long as the bettor is able to withstand a long series of losses, a large drawdown. To measure whether the system is valuable in all circumstances and what the odds of failure from a series of losses might be, especially because the trader usually has limited capital, the trader (or investor) needs to test for as many different circumstances as possible. The Monte Carlo simulation does not use the rule, variables, or parameters in the original trading system. It uses only the actual trades, entry and exit, and the profit or loss from each. It looks at the sequence of these trades from various angles to see what the probability of a series of losses leading to ruin exists in the system. It thus is a money-management test rather than a system test, though obviously the system determines the trades. If the money management test fails by showing a high probability of ruin, the original system must be discarded, adjusted to improve these results, or other safeguards installed to prevent such a possible disaster.

The simulation takes the original trade data, profits, and losses and scrambles them in a random manner. This is done many times, usually at least 100 times and better if 1,000 or 2,000 times. An equity curve is then created for each scrambled sequence of trades. The results from each equity curve are then assembled to give the results and related to a normal distribution curve. The simulation is testing to see if the system is random and by how much. The less the system is random, the more likely it will be profitable with minimum risk of failure.

## **MONEY MANAGEMENT RISKS**

### **Defining Risk**

We have defined risk in many ways in earlier chapters. Variability of returns, amount of loss per trade, beta, maximum amount of loss per trade, drawdown, maximum drawdown, and volatility of prices have all been used. In Appendix A, "Basic Statistics," we cover some of the statistical principles associated with risk measurement in Modern Portfolio Theory. One of the principal difficulties in the use of standard linear statistics in evaluating markets is that it assumes that each price, each trade, and each profit or loss is independent. In other words, it stands by itself and is not related to any other price, trade, or trade return. When using such statistics, one must therefore be careful not to believe absolutely in what the statistical tests might show.

For our purposes, the important risk consideration is loss of capital. This comes from losses on trades, realized or unrealized, and thus we will use drawdowns as the best definition of risk. Because drawdowns, if not controlled, can lead to ruin, our intention in this chapter is to develop means that will keep us from losing all our capital.



## Concepts

### Drawdown and Maximum Drawdown

When we discussed drawdowns in the previous chapter, we found that more than one drawdown can occur, and it may result from one trade or many trades. If we look at all the drawdowns over a period, the one that has the highest intrapeak equity percentage loss is called the maximum drawdown (MDD). The MDD is the worst case that occurred in the system and often is used as an estimate of the worst case that can occur in the future. Of course, it could have been a fluke and exaggerate potential drawdowns in real trading, or it could underestimate and make drawdowns appear less damaging than they would be in real trading. We will find that we can reduce risk of loss on single trades with stops, but we cannot reduce the risk from a series of losses. All we can do is find a realistic estimate of the odds of a long run of losses against us and then take our chances or change the system. Even assuming a large MDD, we must design the money management strategy such that enough capital is always available to withstand a loss in the magnitude of the known MDD. Otherwise, the system goes broke.

Drawdowns, for statistical purposes, are not independent, especially if the loss occurs in multiple systems at one time based on some adverse news. Uncontrollable loss, called "an act of God" in the insurance industry, cannot be anticipated and thus is never included in any estimate of risk. These events, however, usually only affect a single trade rather than a series of trades.

### Theory of Runs

A drawdown is usually the result of a series of losses. We can estimate the chances of a series of losses using the theory of runs. This theory states that the probability of a series of independent events is the product of the probability of each event occurring. Thus, if a system has a losing percentage of 40%, the odds of a run of five losses in a row are  $(0.40 \times 0.40 \times 0.40 \times 0.40 \times 0.40) = .01$  or 1%. If a system has a losing percentage of 60%, the odds of a run of five losses in a row are 8%. Although this calculation does not account for money lost in each transaction, it does suggest that to avoid a series of losses, the lower the losing percentage of the system, the better. Even so, a large number of losses together may not be harmful to a system specifically—many trend-following systems have long runs of losses—but create an additional risk of loss of confidence in the system and the potential premature abandonment just before it becomes profitable. Psychology is a major component in trading, and confidence is usually fragile when trades are going against the trader.

### Martingale Betting System

A martingale betting system often is used in a situation where the bet size can be changed but the odds are relatively even, such as gambling at a roulette wheel. The basis for the method is the theory of runs and the odds against a long series of losses when probability is about even. The method is to double up on the next bet after a loss, and return to the standard bet after a win. Eventually, a winning bet will cover all the previous losses and return a profit on the original

bet. Unfortunately, the system requires substantial capital to withstand an unexpectedly long series of losses in a row.

For example, assume you make a \$100 standard bet that takes the \$100 bet and either returns the bet plus \$100 on a win or pays nothing on a loss with even odds of winning or losing (50% win percentage). After a run of five successive losses occurs, using a martingale system, the next bet will require \$3,200 above the \$3,100 that has already been lost ( $\$100 + \$200 + \$400 + \$800 + \$1600 = \$3,100$ ). Thus, to bet the sixth time after five successive losses would require \$6,300, hoping for a win that would net \$100 above our previous commitment. It is a tough way to make \$100. Nevertheless, as long as the bettor can ante up the funds for the next bet in a losing series of bets, he or she will profit eventually by the amount of the original bet (\$100) when the final winning bet occurs.

If the payoff ratio is greater than one-for-one and the win percentage is greater than 50%, the martingale approach may be profitable in the trading markets, but that long series of losses is always hanging out in space somewhere waiting to occur. Furthermore, in the trading markets, the profit from each bet is not constant. It could, for example, be larger for losses than for gains. Of course, a maximum loss or stop can be used to get out of the game, but by then so much capital has been lost that the chances of recovery are slim. Needless to say, the martingale approach rarely is used in trading markets.

## Reward to Risk

The objective in all investment is to have a high reward to risk. Return on investment, or ROI, is the standard calculation of reward. ROI is calculated as net profit divided by initial capital at the beginning of the measured period. We have gone into more detail in Appendix A on statistics.

The standard method for analyzing portfolios and systems for reward and risk is to calculate the ratio of ROI to the MDD. This is called the Sterling ratio and is how we initially evaluated the system design parameters in Chapter 22. Some analysts use other ratios. The profit/loss ratio, also called the "profit factor," is commonly used, and the "payoff ratio," which is the average gain per profitable trade to the average loss per unprofitable trade, is often used. Other methods of measuring specific aspects of a system or portfolio reward-to-risk are the Sharpe ratio, mentioned in Chapters 22 and Appendix A, and percent of winning trades.

A recent myth about MDD, derived from the risk-reward relationship in Modern Portfolio Theory, is that a higher MDD suggests a higher return. This is not true. Risk and reward are not proportional. MDD cannot be greater than 100 percent, but returns can theoretically be infinite.

## Normal Risks

### Position Size

The most important aspect of money management, beyond establishing where and what kind of stops to use to protect capital, is the determination of position size for each trade. Too much in a position can incur unwarranted risks in case of failure, including complete ruin, and too little can

reduce profit potential beyond the risk-free rate. Position size is directly related to risk, and it is the aspect of money management that most traders and investors overlook.

Position size has two levels of importance. The first is the determination of the minimum size of account required to trade a system with a minimum level of potential risk of ruin. The second is the determination of the optimal size of each position taken in a system that meets the predetermined risk level of the system owner. Generally, the position size in either determination is based on the maximum drawdown of the system and the margin required for a futures contract or price of a stock.

#### Number of Shares or Contracts

In the stock market, the question of how many shares to use in a system is relatively easy because margin requirements are comparatively small and the number of shares flexible. In the futures markets, however, the number of contracts to use can become a problem. Margin requirements frequently change. The two standard methods of determining the number of contracts are either to use the system on a fixed number of contracts or to determine the risk as a percentage of the trading account and divide that by the margin required for each contract. After a successful series of trades, if the account capital has increased, a decision must be made as to whether to continue with a set number of contracts or continue with the percentage risk proportion on a continuous capital adjustment. Some traders use a capital step process whereby the number of contracts is only adjusted when the account capital reaches certain thresholds.

Evstigneev and Schenk-Hoppe (2001) argue that constant proportion strategies produce wealth more rapidly than other proportional methods. This is an outgrowth of the Kelly formula discussed next and implies that keeping a portfolio equally proportionally invested is the best method of accumulating profits. This concept goes against the grain of some analysts. They maintain that while the system is working, the accumulation of profits is favorable, but at some time, a significant series of losses will occur, when the capital is larger than its initial size, and the losses will be proportionately larger because they depend on the proportion of the capital in the account. For now, we will go with the statistical evidence from Evstigneev and Schenk-Hoppe. They are not alone in their conclusions. As such, we will look for the optimal proportion of capital to invest in a system that will avoid the risk of total loss of capital. This sometimes is referred to as the "fixed fractional" method.

#### Determining Optimal Position Size

There are three methods of determining the position size: 1) Risk of Ruin formula; 2) Theory of Runs formula; and 3) Optimal  $f$  or Kelly formula. To calculate the best position size, all three formulas should be used, and that formula with the smallest percentage of capital to be risked should be the one used in the system or model.

#### *Risk of Ruin Formula*

The Risk of Ruin (ROR) formula uses three pieces of data from the historical or testing data: 1) the probability of success or the percentage of wins; 2) the payoff ratio, or average win trade amount divided by the average loss trade amount; and 3) the fraction exposed to trading.

The risk of ruin formula is

$$\text{ROR} = \{(1 - ta) / (1 + ta)\} \times CU$$

Where: ROR **is** the risk of ruin

ta **is** the trading advantage = percent wins minus percent losses

cu is the number of trading units, shares, or contracts

Because the ratio is always less than one, the greater "cu" is, the less chance of ruin using a fixed dollar amount. In addition, the greater the "ta," the less chance of ruin. The risk of ruin therefore is proportional to the percentage wins. The formula demonstrates that trend-following systems with a high percentage of losses often should end in ruin. This formula, however, fails to account for the amount of each win and loss.

To determine the optimal percentage of capital to use in any system with win and loss amounts, use this formula:

$$\text{PCT} = \{[(A + 1) \times p] - 1\} / A$$

Where: PCT is the percentage of capital to use

A **is** the average payoff ratio

p **is** the percentage of wins

### BOX 23.1 Optimal Percentage of Capital to Avoid Risk of Ruin

Using the figures from the example in Chapter 22, let us calculate the percentage of capital to use from the risk of ruin formula.

#### • Data

Percent profitable trades (profitable trades) = p = 9.7%

Average win trade amount - \$2673.67

Average loss trade amount - \$26.07

Average payoff ratio . = 102.55

#### Formula

Optimal percentage of capital =  $\{[(A + 1) \times p] - 1\} / A$

#### Substituting

Optimal percentage of capital =  $\{[(102.55 + 1) \times .097] - 1\} / 102.55$

= 8.8%

Anything over 8.8% of capital invested in this system has a high chance of ending in ruin.

### *Theory of Runs*

The odds of going broke from a series of losses is the frequency of trading times the percentage of losses to the power of the largest string of losses. Most analysts will assume a minimum run of ten consecutive losses as the baseline. In any case, most calculations end with a maximum suggested percentage investment of around 2% to avoid the risk of going broke.

### *Optimal f and the Kelly Formula*

The Kelly formula was invented by John L. Kelly, Jr. of Bell Labs in the early 1940s to measure long-distance telephone noise and was later adopted by gamblers to determine optimal betting sizes. Its application to the trading markets is somewhat tenuous because it does not account for MDD and, thus, risk of ruin. However, it is used in conjunction with other position-size calculations to determine the optimal size of a position relative to capital. In any profitable system, capital growth increases in proportion to the percentage of capital risked. After a certain threshold in the percentage, however, the rate of growth decreases and eventually reaches zero. The Kelly ratio or optimal f is the threshold of maximum growth. Optimal f is therefore a method of determining the optimal percentage of capital that should be invested in a particular system.

The optimal f percentage = (percentage of wins x (profit factor +1) - 1) / profit factor

Where: Percentage of wins is the percentage of winning trades

Profit factor is the ratio of total gains over total losses

Once f is determined, it is multiplied times capital for the amount to be used in each position. This amount can be divided by the contract margin requirement for each contract to determine the number of contracts. In the stock market, the amount for each position can be divided by the price of the shares to determine the number of shares. Because this method often suffers from extraordinary drawdowns, the percentage of capital is usually limited to 0.8 of optimal f, or a maximum optimal f of 25%.

To account for MDD that is otherwise not in the f formula, another method called the secure f (Zamansky and Stedhahl, 1998) is to divide the MDD by optimal f to determine the amount that can be risked on one contract or convert this amount to a percentage of capital for stock shares. The Larry Williams formula for the number of contracts to trade is to take the amount of money at risk (account balance times risk percent from whatever formula) divided by the largest single loss. A loss in the future can be controlled by stops.

**BOX 23.2 Calculating Optimal f**

Again, using the system developed in Chapter 22, let us calculate the optimal f.

Formula

$$\text{Optimal f} = (\text{percentage of wins} \times (\text{profit factor} + 1) - 1) / \text{profit factor}$$

Data

$$\text{Percentage of wins} \approx 9.7\%$$

$$\text{Profit factor} = 10.988$$

Substituting

$$\text{Optimal f} = (.097 \times (10.988 + 1) - 1) / 10.988$$

$$= 1.46\%$$

This is the maximum percentage to invest any capital account in the Apple-a-Day system developed in Chapter 22.

#### Final Position Size

The smallest percentage of capital suggested by the three formulas is used as the final percentage to use in trading the specified system. Generally, because the theory of runs limits the percentage to around 2%, most professional traders use this figure, or less, as a maximum commitment to any system.

#### Initial Capital

The reason for concern about initial capital requirements is the risk of a series of losses right in the beginning of the system use. The problem at startup is not the problem of individual loss in a trade. That can be controlled with stops. The problem is the risk of complete loss of capital. This problem is related to the possibility of a run of losses that wipes out capital and eliminates the trader from being able to reenter the system. Later, when profits have accrued, the accumulated profit cushion lessens the risk of losing all, but at the start, the risk of being wiped out is the highest.

A general rule of thumb for initial capital is to have at least three times the margin required for a single contract for each contract traded, or at least two times the amount of the MDD plus the initial margin for stocks and contracts. A more precise number can be determined from the Monte Carlo simulation described previously, estimating the odds of complete failure of the system using history. As in any simulation, the levels determined from the test should be doubled or tripled as a precaution against extraordinary initial surprises.

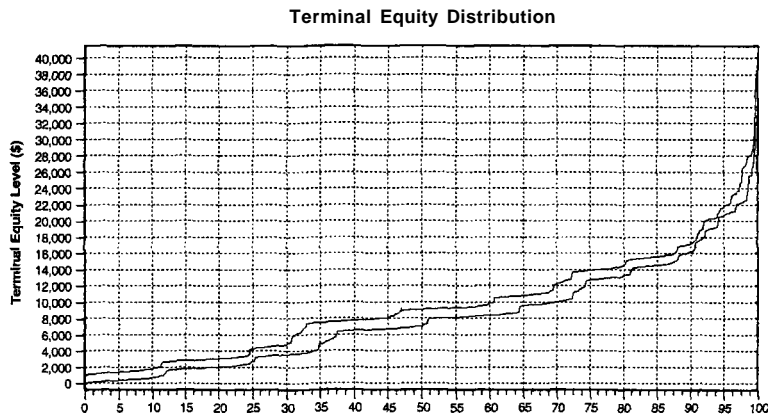
**BOX 23.3 Initial Capital—Monte Carlo Simulation**

In Chapter 22, we developed the Apple-a-Day trading system. Now, using a Monte Carlo simulation of the Apple-a-Day system, let us look at a chart of the distribution of terminal equity for the total number of tests. The test period was five years, nine months, and six days. The initial price of AAPL was \$8.25, and we assume all trades are 100 shares.

The lower line in Figure 23.1 shows the results for an initial capital of \$1,000; the upper line is for initial capital of \$2,000. For example, at the 50% vertical line, the upper line appears at \$9,000. This means that 50% of the upper tests beginning with \$2,000 had ending equity of \$9,000 or less.

When we use \$1,000 as initial capital, we can see that roughly 12% of the tests either lose money over the total period or go broke. Do we take that risk? That is up to the investor.

When we raise the initial capital to \$2,000, we see that at no time does the system go broke, but again it fails to profit roughly 12% of the time. Thus, to avoid complete failure, initial capital should be close to \$2,000 and even then, we have only an 88% chance of profit over the 5+ year period.



Source: Equity Monaco from [www.lickarst.com](http://www.lickarst.com)

FIGURE 23.1 Monte Carlo simulation, projected terminal equity of Apple-a-Day system

### Leverage

Leverage, or the borrowing of capital to increase the potential for gain, of course also increases the risk. Leverage generally increases the volatility of the portfolio or system and thus magnifies all those dangerous possibilities from increased volatility, including larger drawdowns and more potential for complete failure.

Risk is proportional to leverage. If we find that our system or combination of systems produces an MDD that is unacceptably high, we can adjust the portfolio mix to include a risk-free investment, such as Treasury bills, in the proportion necessary to bring down the potential MDD. For example, if the model estimates a 40% MDD, and we will only accept a 20% MDD, we can adjust the model to invest 50% of the capital in risk-free investments and the remainder in the systems. On the other hand, if the systems suggest a 10% MDD, and we are willing to accept a 20% MDD, we can borrow 100% of the model's capital and double our return as well as our risk.

### Pyramiding

Pyramiding is a more complicated method of adding leverage to a position. It consists of adding to a profitable position to gain leverage. Of course, the risks are not as clear because gaining size in the position after it is profitable may result in a larger position just as the inevitable drawdown begins. The best manner of pyramiding is to test it within the system as a set of rules. Specific rules of thumb for pyramiding include the following:

1. Never adding to a position until its profit becomes positive.
2. Placing stops at the breakeven level as size increases.
3. Entering the largest positions first and diminishing the size of subsequent entries.
4. Being sure that the position risk is still within the limits established by the system and by the maximum acceptable position size.

## Unusual Risks

Before we become involved in standard portfolio risks, we must be aware of other risks that we have some control over but that will not usually show up in standard tests of performance. These are outlined next.

### Psychological Risk

As we have mentioned many times earlier, trading and investing are largely psychological. The motion of investment vehicles is due largely to rational and to irrational decisions on the part of buyers and sellers. Taking advantage of this price motion through technical analysis is an emotional exercise for the trader or investor as well. The participant in the markets must be careful not to be swept up in the emotion of the crowd; indeed, in many instances, he or she must act against the crowd and, thus, against human nature. Many inputs can affect the psychological stability of the trader. Lack of sleep, family fight, sickness, or any other nonstandard outside intervention can upset one's attitude and ability to act successfully. Unfortunately, once lack of success begins, lack of confidence also begins, and lack of confidence can cause even more



errors in judgment. The purpose in designing a nondiscretionary system is to reduce those outside emotional effects and let the system operate by itself. However, a losing system or series of losses can cause even the slightest override of the system; simply a change in orders, a wait after a breakout, or any other minor action unknowingly can upset the expected results even more. Many system overrides are not even recognized by the trader—just a little change here and there. Thus, there is a constant battle between the psyche and the markets. A super system will not avoid one's own nature. Only oneself can control one's nature. It is a risk that cannot be eliminated by a computer, only reduced, and the system must be followed religiously. Some writers argue that the psychology of trading accounts for better than 70% of success. This is likely true, but unfortunately, it is perverse and unquantifiable.

#### Knowledge of the Market

"I didn't realize that option expired today" or "I didn't realize that contract traded at night in Singapore." The trader or investor must be fully aware of the markets being traded, their history, their method of execution, their various peculiarities, their people, their structure, and their operation. There is no excuse for losing money from simple ignorance. Most investors learn from experience about the oddities of particular markets, but that experience can be costly.

#### Diversifiable Risk

Diversification is a complex subject. As we saw in Chapter 22, the complexity has to do with the weighting amount of different vehicles or systems in a portfolio, as well as whether their behavior are similar or different from each other. Various mathematical models have been developed; but as we said before, diversification is the common sense approach of "not putting all your eggs in one basket" that is needed. Obviously, if different vehicles or systems are used, they should not act in concert. Otherwise, they are essentially the same system, and risk has not been diversified away.

Risk is both correlated and uncorrelated. Correlated risk cannot be eliminated through diversification. We must use other means. This nondiversifiable, or market, risk is the risk generated by the overall market itself and accounts for a large portion of portfolio risk. Uncorrelated risk, however, can be reduced through diversification. Uncorrelated risk comes from the effects of all sorts of exogenous variables on individual issues and has more to do with the risk of the individual issue than the overall market. Uncorrelated risk can be reduced by diversification into dissimilar or uncorrelated issues or *systems*.<sup>2</sup>

Reduction in uncorrelated risk can reduce MDD and enhance ROI. Indeed, the results of a diversified portfolio are often superior to the results from the best individual system by itself. The Capital Asset Pricing Model suggests that a properly structured nine-stock portfolio reduces the uncorrelated risk to that of one-third the risk of a single stock. A 16-stock portfolio can reduce uncorrelated risk to one-fourth that of a single stock. The relationship is based on the

**2. An example of correlated, nondiversifiable risk would be the risk that the Federal Reserve tightening the money supply will have a widespread impact on security values and impact almost any stock in a portfolio. On the other hand, the risk that a Vioxx lawsuit will decrease the value of Merck stock is uncorrelated, diversifiable risk. The lawsuit would not impact the stocks of other companies.**

inverse square root of the number of stocks in the portfolio. As such, the portfolio can never eliminate uncorrelated risk, but with just a few different issues or systems, it can reduce it enough to make it irrelevant.' The real problem then becomes the effect of correlated risk.

One further complication in the subject of correlations is that often a lead-lag relationship occurs that is invisible to the system tester, and most correlations themselves change over time. Efficient diversification is thus a useful and important subject but not a simple one.

#### Trade Frequency

Ten losing trades in different markets is the same as ten consecutive losses in one market. The drawdown is the same. Thus, diversification can bring problems as well as reduce risk. The frequency of trading in different markets will increase the risk of a series of losses across markets.

#### Temporal

Risk increases with time. The longer a position is held, the more risky it becomes. This is why long-term interest rates are usually higher than short-term rates. On the other hand, in the markets, reward does not increase with time. Thus, to reduce risk, a position should not be held beyond the time that reward ends. Then, only risk remains.

#### Security Quality

If given the choice of trading a high-quality issue (as determined by some financial rating service) that has the same market characteristics as a low-quality issue, including volatility, liquidity, and volume, which would you choose? The high-quality issue, of course. Erroneously, quality is a concept that normally is not addressed and certainly is not a factor in most systems models.

## **MONEY MANAGEMENT RISK STRATEGIES**

### **Exit Strategies**

In addition to determining the optimal position size, optimal initial capital, and leverage, risk strategies include the timing and placement of exits.

Entry strategies carry no risk until executed. An entry can be made at any time, when the situation or setup is right, or not at all. Perhaps you would rather go to the beach. Because you must now watch your investment, you cannot go to the beach. Once entered into a position, however, an exit strategy is necessary because the position is now at risk. It is the most important action decision in any system.

Exit strategies are usually two-fold: prevention of loss of capital or closing at a target profit or price. Prevention of capital loss can come after a loss, as in a protective stop, or after a profit, as in a trailing stop. There is always a tradeoff between potential reward and potential risk. An exit stop placed too tightly to the trading price prevents a single large loss, but many small losses

**3. For more details on the mathematics behind diversification and portfolio theory, refer to Appendix A.**

that are equally devastating can occur instead. An exit stop can also be too loose, resulting in a larger than necessary loss. It must be wide enough to avoid being triggered by random noise and intrinsic volatility of the issue but not sacrifice too many profitable trades. At other times, a profit may have accrued, and rather than a risk of loss, the question of stop placement or target exit is necessary. All these decisions, naturally, should be tested before the situation arises. There are advantages and disadvantages to all of them.

Slippage is a problem with stops. Any stop that suggests an exit in the direction of the short-term trend rarely will be executed at the same price as the system test suggests. A volatility stop, for example, often will occur when price volatility exceeds the estimated volatility, and a technical stop at a specific price, depending on where it is located within a price pattern, may occur along with many others and receive a poor execution. A target exit often receives a better execution and less slippage because the trend is directed into the target limit. However, it may not be executed at all if the price fails to reach the target, or the price may roar through the target and lose profit opportunity. There is no easy answer about slippage except that these potential problems should be addressed in the testing of a system.

#### Protective Stop

All entries must have a protective stop under all circumstances, and that stop must be inviolate. The protective stop is placed at the level of maximum limit of loss from entry, accounting for the maximum loss that the trader can allow on any one position on any one trade. It is often called a "money-management" stop because it prevents the complete loss of capital. It is determined by the level of risk that the trader is willing to take with his capital in any one position on any one trade. There are numerous methods of determining where the protective stop should be placed.

#### *Hard Money or Dollar Stop*

When we decide how much money we are willing to risk in a trade, we can place a protective money stop at a price level that reflects that potential loss and no more. For example, assume that a stock is trading at \$50 and the maximum amount we want to risk is \$500. We can buy 100 shares at \$50 and place a sell stop at \$45, or we can buy 200 shares at \$50 and place a sell stop at \$47.50. The same dollar risk appears to be present in each transaction. This is not accurate, however, because the odds of being triggered at \$47.50 are higher than at \$45. The consideration of where to place the stop therefore should be one based on the best price rather than on how many shares can be bought. Once the price is determined, the amount of shares to purchase can be adjusted accordingly. Let us say there is a large support level at \$46. It would be wiser to use the \$45 stop than the \$47.50 stop, even though fewer shares are originally purchased, because the support level has a better chance of holding the stock from falling through \$45 and triggering the stop. Furthermore, as technical traders, we know that if the support level at \$46 is broken, we do not want to own the stock. At \$47.50, we do not know anything about the stock prospects, and the market does not care.

#### *Maximum Winning Adverse Excursion*

The protective stop is placed to prevent loss if something goes wrong with the system. A method of determining when the system is going wrong is called the maximum adverse excursion method. Taking each winning trade in the system test or from the past real time use of the system,

one plots the frequency of adverse excursions. These are the amounts by which the value of the entered position in each trade goes against the initial value before it is closed at a profit. It is similar to a drawdown except limited to winning trades. If an entry is made and the trade eventually is a profitable one, the adverse excursion is the amount of money that the trade was in the hole before it turned profitable. Some profitable trades immediately profit. These are not a problem. Looking at those winning trades that do have initial problems, you will find that over time, the excursion from entry value reaches a limit. If the system is trouble-free, that price is the level beyond which a profitable trade should not go in the future. A price just beyond that level is where the protective stop should be placed. Losing trade adverse excursions are not considered because they will become a problem and will be stopped out at the protective stop. Once the maximum adverse excursion from winning trades is established, it also determines how many contracts or shares can be entered on the system entry signal. If the maximum adverse excursion for one contract is greater than the maximum limit of loss allowed by the trader, the position should not be taken. Otherwise, the number of shares or contracts can be determined by dividing the maximum adverse excursion by the margin required for the contract or the price of the shares. The maximum winning adverse excursion should be recalculated periodically to maintain consistent with any changes in the market or the system.

#### Trailing Stop

With the protective stop in place and inviolate, the market issue will either trigger that stop or will begin to profit. Once a certain amount of profit in the trade has occurred, the next problem for the system is to maximize the profit without giving up too much of what has been gained. A trailing stop is used most frequently to lock in the gain.

#### *Breakeven Level and Breakeven Stop*

A trailing stop often is not placed until a certain gain level is accumulated. This is called the breakeven level, the profit level at which a stop can be placed at the entry price to lock in a breakeven on the trade but not be triggered by noise. In the preceding example, we bought the stock at \$50, and after a little erratic motion, the stock rose to \$55. The ATR (Average True Range) is \$1.50. If we had earlier set three times the ATR, or \$4.50, as the breakeven level, then when the stock reached \$54.50 ( $\$50 + \$4.50$ ), we would automatically raise the protective stop to a breakeven stop at the entry price of \$50. This eliminates the risk of any loss on the transaction from now on. At the same time as the breakeven stop is placed, a trailing stop strategy is initiated.

Another method of handling the breakeven level is to exit half the position when the profit has reached the breakeven level. The breakeven stop is then raised to the entry price. This method locks in a profit, keeps a portion of the position open, and cannot lose capital once it is entered. The potential for profit is reduced, but a smaller profit has already been stashed, and the risk of loss is zero on the remaining portion. A trailing stop strategy then is applied to the remaining position.

#### *Technical Point Versus Money Point*

The decision about a trailing stop usually centers on whether to use a technical point or a money point. A money point stop is similar to a hard money stop described previously, only in this case it defines the amount that the trade should not lose from its maximum profit level. If \$500 is the

money point stop, the stop-price level changes with the value change in the market issue, such that if a correction of more than \$500 occurs from the maximum unrealized profit, the system will exit the trade. A technical stop is one that is placed at a price that represents a technical level beyond which it is obvious that the trade is reversing direction. It is sometimes called a critical threshold stop (Katz and McCormick, 1998) because breaking the specified stop level is critical to the trade. Technical points often are used more in investment and swing trading trailing stops. Money point stops are used more in short-term trading, where price action is often more erratic. The market itself does not accommodate a money point stop because that level is unrelated to the market price and is a matter of the personal risk decision of the trader, but the market does respect the technical stop if properly placed.

#### *Volatility Stop*

We discussed volatility stops in Chapter 13, "Breakouts, Stops, and Retracements." A trailing stop is placed at a certain level based on the historical volatility of the issue. As such, the stop price will adjust to changes in volatility, and loosen when volatility increases and tighten when volatility decreases. It is commonly used for this reason.

#### Other Trailing Stops

##### *Maximum Winning Favorable*

A maximum winning favorable excursion, as opposed to the adverse used in establishing stops, also can be used to establish a trailing stop. The maximum favorable excursion is the highest amount that a profitable trade reaches before it is exited. It is similar to a target. A fraction of this calculation is added to the entry price, and the fraction is increased over time.

##### *Trend Line*

A trend line stop can be used because a trend line follows the price action. As a technical point stop, it has advantages in that a bunching of orders at a critical level, such as a support or resistance zone, usually is not seen along a trend line, such that when triggered, the execution of the exit will be less influenced by competing orders.

##### *Adaptive*

Special formulas, such as Wilder's parabolic, can be used. These formulas follow the price trend and adjust to market conditions along the way. They and volatility stops also are called adaptive stops, and their details can be complicated.

#### Other Kinds of Stops

##### *Signal*

One obvious stop is the signal stop. This occurs when the system gives a signal to enter a position in the opposite direction from the existing position. It is part of a stop-and-reverse system.

##### *Time*

Because of the multidimensional aspect of time and reward versus risk, a time stop often is used in short-term trading when time, cost of money, and opportunity cost are important. This stop is

placed to exit the position a certain time after the entry. If a profit has not been gained within the time specified, the odds of it not occurring in the future increase and the position is best closed to avoid further risk. A variation of the time stop is to reduce the position size as certain time passes. This reduces the risk but leaves room for some further gain. Time stops are also used in swing trading where the trade horizon is only a few days.

#### Targets

In our look at point-and-figure charts and, in some instances, at bar chart patterns, a price target often is established. Exiting at a target can be an exit strategy. In short-term trading, money targets are often used: "If I make \$500 on this trade, I'm out." Targets can be tested as long as the target calculation method is easily quantified. At a target, especially a longer-term target, position size may be reduced or trailing stops tightened using technical barriers, a money stop, or volatility adjustment. In addition, once a target is reached, the system might have a reentry signal that enters the position again if the target is exceeded by a certain amount or the trend continues. Finally, a combination of target and time stop can adjust the target prices as time moves along. This reduces the possibility of the added risk with time affecting profits. All target limits should be accompanied by a trailing stop to avoid losing any profits already gained in case a target is not reached.

#### Execution

Execution risk strategies are useful in short-term trading where profit margin often is related to executed prices and slippage. Entry execution in most instances is related to when the system gives a signal. A breakout system often has competition at the breakout level, for example. Exit execution, on the other hand, can be controlled through experiment. A short-term system must establish, when the system is not a stop-and-reverse, the time at which a better exit can be obtained. Should the trade exit on the close for the day, the opening of the next day, or at some time between when volatility usually declines? The opening is usually emotional and can be both an advantage or disadvantage. The closing is used in most systems because it is the most rational and eliminates overnight risk.

Another means of executing an entry or exit is scaling. This is done more by institutions, which have large positions they need to accumulate or distribute, but it can equally be useful for the smaller-sized trader or investor, who can accommodate more than one standard position size. Scaling is the entering or exiting a position over time in small pieces. The initial execution accomplishes part of the goal of the system, and over time, entries may be added at more advantageous prices. If they do not, at least a small position has been entered.

## MONITORING SYSTEMS AND PORTFOLIOS

All systems and portfolios must be monitored for changes in behavior. The obvious change is when the system is running a series of losses larger than usual. There are methods of monitoring the system that will warn of changes, however, before any substantial loss is incurred.

Bryant (2001) suggests the following methods. Calculate the average profit factor over a moving number of trades—say the last 20 trades—just as in an oscillator such as the stochastic. Plot this calculation and then run a moving average through the plot and watch the behavior of the profit factor window to its moving average. The profit factor should always be above 1.0, and minor oscillations should be ignored. Any drift lower, however, is a warning of something potentially wrong. The recent calculation of a profit factor window should be compared to the entire history of profit factors with a t-test to see if the deviation from the moving average is significant.

Perform a test run to see if the strings of wins and losses are within a normal distribution—that is, if they are random or not. If no dependency is present, smaller size positions should be traded after a win and larger after a loss. If the test shows a positive dependency, the run streak is significant and positions should be reduced until the last trade is a win, at which point position size can be increased.

The equity curve of the system should be checked periodically. One method is to sum the profits and losses over a specified number of trades—say 30—and plot this figure in time. The sum should remain positive, or equity momentum is declining. Another common method of watching the equity curve is to calculate a moving average of equity. Breaking of the moving average is not necessarily a signal for action but is a warning. If a forward line is calculated or a trend line plotted and broken, action likely should be taken, as the system performance is deteriorating for some reason. Often when these signals of danger arise, the position size in the system is reduced until evidence of recovery is seen or the problem resolved.

The sum or average of the percent of winning trades over a specified number of trades will tell if there is a change in runs. A z-test can test whether the differences in proportions or percentages are significant and worth investigating further.

## **IF EVERYTHING GOES WRONG**

Occasionally a portfolio model breaks down completely. Murphy's Law takes hold, and everything that can go wrong does. At that point, the remedy is to close down the system and exit all positions. A standard for closing the entire portfolio model is a dollar or percentage stop, usually around 20%. No system should sustain that amount of loss without adjustment.

## **CONCLUSION**

It pays to understand that trading and investing are not just a matter of entry into positions. Technical signals are useful for entry, but technical understanding of risk is even more important. Remember the law of percentages and how difficult it is to recover from losses. Investing and trading are a matter of determining and controlling loss of capital. Entry is easy; best exit is difficult. Money management consists of a number of ways to measure and to protect from the risk of loss either in individual trades or in complete systems. Exit strategies and the principles of position size are likely the most important aspects of any portfolio model. Amateur investors and traders do not often utilize these risk control measures, but if they did, considerably fewer disasters to pride and portfolios would result.

**REVIEW QUESTIONS**

1. You have tested a system and find that it has a losing percentage of 25%.
  - a. What is the chance of having a run of three losses?
  - b. What is the chance of having a run of four losses?
  - c. What is the chance of having a run of five losses?
2. Explain what is meant by the "martingale betting system."
3. You have tested a system, and it has an MDD of 30%. You are willing to have a 45% draw-down. How might you use leverage with this system to maximize your return, given the level of risk you are willing to take?
4. You are employed as a money manager and know you will lose your job if your drawdown exceeds 15%. However, you have a system with a 30% MDD that you would like to use. How can you structure your strategy to use the system, but at the same time not exceed a 15% drawdown?
5. A phrase heard frequently in finance is "more risk, more return." If I invest my entire portfolio in one stock, High Growth Energy Corporation (HGEC), I am taking substantial risk because "all my eggs are in one basket." Should I expect a higher return than I would if I had diversified my portfolio because I am taking so much risk? Explain.
6. Explain the difference in correlated (market) risk and uncorrelated (diversifiable) risk.
7. Explain how each of the following items would impact the percentage of capital you would want to allocate to a particular system:
  - a. Average winning trade amount
  - b. Average losing trade amount
  - c. Percent of trades that are profitable
8. In the words of a Kenny Rogers' song, "You've got to know when to hold 'em, know when to fold 'em." How could these words be applied to money management?
9. Explain how stops are an important part of risk management.
10. Explain the meaning of the phrase, "Entry strategies carry no risk until executed."



# **PART IX**

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## **APPENDIXES**

**APPENDIX A BASIC STATISTICS**

**APPENDIX B TYPES OF ORDERS AND OTHER TRADER  
TERMINOLOGY**

# BASIC STATISTICS

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## APPENDIX OBJECTIVES

By the end of this appendix, you should be familiar with

- The difference between descriptive and inferential statistics
- How to calculate common measures of central tendency and dispersion
- The process of regression
- The basic premises and statistics related to MPT

Because financial asset prices are numbers that often change with high frequency, it is not surprising that statistical techniques, which primarily concern the analysis of numerical data, have been applied to investing in a variety of ways. According to Lind, Marchal, and Wathen (2002), statistics is "the science of collecting, organizing, presenting, analyzing, and interpreting data to assist in making more effective decisions." In this appendix, we examine the major statistical and quantitative techniques that have been used in connection to stock analysis, although some of the techniques also apply to other assets. The primary goal of the appendix is to acquaint you with these methods, not present them in detail.

## RETURNS

In finance, we often refer to an investment's return. Let us say that we buy a stock for \$50, hold it for one year while earning a \$2 dividend, and then sell it for \$53. We calculate the stock's return as follows:

$$\frac{(\$53 + \$2 - \$50)}{\$50}$$

More generally, we can express the formula for returns as the following:

$$\frac{(P_1 + D_1 - P_0)}{P_0}$$

This formula can apply to bonds, options, futures, and so on. The only difference is that the term for dividends would be replaced with interest or any other additional inflow over the period.

We usually talk about return, even though the return may not represent a realized gain. Even if we continue to hold a stock, we can still talk about our return over the previous year; essentially, we assume that we did sell it and calculate the return based on that assumption. There are some important reasons for focusing on returns rather than prices. We will learn about them later in this appendix.

## PROBABILITY AND STATISTICS

The foundation behind most of statistics is probability. Probability is concerned with the question: Is it likely that the observed outcome occurred purely by chance? The notion of chance is tricky. It is a topic that can lead to deep philosophical debates. For example, we could ask, "Did life on earth appear purely accidentally (by chance), or was it somehow determined through another mechanism?" If something is not random, then we say it comes about through a deterministic process.

We can think about stock prices in terms of random versus deterministic. Are stock prices random? Alternatively, are stock returns random? On the other hand, are the deviations from an average return random, while the average return is stable? As we saw in Chapter 4, "The Technical Analysis Controversy," researchers have debated these questions and continue to debate these questions. Regardless of your viewpoint, probability concepts and statistical concepts are widely used in the study of investments.

One key concept in statistics is called *independence*. If two events are independent, then whatever outcome there is from the first event does not affect the probability of the outcome for the second event. Suppose you start flipping a coin that is perfectly weighted so that the probability of a tail is  $\frac{1}{2}$  and the probability of a head is  $\frac{1}{2}$ . You flip the coin five times and get five heads in a row. What is the probability of a head on the next flip? It is tempting to say that there is a

greater probability of a tail than a head because flipping six heads in a row happens only rarely; however, heads is just as likely as tails on the next flip. The events of the six flips are all independent; later outcomes are not affected by earlier outcomes. If you are performing statistical tests to analyze investments, you have to consider the concept of independence.' Many statistical tests assume that the events are independent.

Two mathematical/statistical terms that are relevant to investing are *permutations* and *combinations*. Let us assume that we are considering investing in five different stocks: Coca-Cola (KO), Pepsico (PEP), IBM (IBM), Microsoft (MSFT), and McDonald's (MCD).

Permutations deal with rearrangements of items. Instead of listing the five stocks as KO, PEP, IBM, MSFT, MCD, we could list them as IBM, KO, MCD, MSFT, PEP. With five unique items, 120 different sequences could be listed. If we are going to buy some of each of the five stocks, the order should not make a difference; therefore, we are not as interested in permutations.

The concept of combinations has more application in investments. With combinations, the sequence is not important. A portfolio consisting of KO and MSFT is the same as a portfolio consisting of MSFT and KO. With five stocks, there are five different one-stock portfolios we could form, ten different two-stock portfolios, ten different three-stock portfolios, five different four-stock portfolios, and only one five-stock portfolio. It does not take very many stocks to generate many different possible portfolios.

In the previous discussion, we have assumed equally weighted amounts of the stocks. For example, the amount invested in each of two stocks would be 50% of the total dollar amount invested. If we consider unequal weightings, such as 78% of MSFT and 22% of KO, the number of possible portfolios is limitless (assuming we can buy fractional amounts of each stock). You can see how different investors could decide to hold very different portfolios, even if they are choosing stocks from the same set, such as the Dow Jones Industrial stocks.

## DESCRIPTIVE STATISTICS

In statistics, a distinction is made between *descriptive statistics* and *inferential statistics*. Descriptive statistics, as the name suggests, merely tries to describe or characterize data in a shorthand manner. Inferential statistics tries to infer various statements about data based on observed outcomes or assumptions about outcomes. We will first examine descriptive statistics.

How would you describe a set of outcomes? How similar are the items in the set of outcomes? Are the outcomes generally high or low? How are two or more sets of outcomes related to each other? Do they tend to be alike or different? Do the outcomes seem to be linked to time? In other words, are outcomes later generally different from outcomes at earlier times? We try to answer some of these questions with descriptive statistics.

**1. Remember that we discussed the concept of randomness of stock prices in Chapter 4. Adherents to the Random Walk Hypothesis claim that stock prices are independent. Technical analysts reject this claim, arguing that stock prices trend.**

## Measures of Central Tendency

A logical starting point in describing a set of data is to ask: What is the typical outcome? In statistics jargon, typical outcome is called *central tendency*. There are several different measures of central tendency, each one approaching from a slightly different perspective.

To illustrate the different measures, assume that we have the following monthly return data for nine months (January-September 2004) for PepsiCo (PEP): 1.4%, 9.8%, 4.1%, 1.2%, -2.1%, 1.4%, -7.2%, 0.0%, -2.2%.

### Mean

The first measure of central tendency (and the one most frequently used) is the *mean*. This is what we would normally refer to as the average. To calculate the mean, we would total the values for the nine months and divide by 9:

$$\text{Mean} = \frac{(1.4\% + 9.8\% + 4.1\% + 1.2\% + -2.1\% + 1.4\% + -7.2\% + 0.0\% + -2.2\%)}{9}$$

Notice that the average value, 0.7%, is not one of the observed values, even though we are in effect saying that it is average outcome.

### Median

The second measure of central tendency is the *median*. To calculate the median, we must first arrange all the outcomes in rank order (this just means that we list them from lowest to highest). The outcome that divides the list into two equal parts is the median. In this case, the median is 1.2%. Half of the outcomes are above 1.2%, while the other half are below 1.2%. The median often is used when either the distribution of outcomes is *skewed* to more high values or more low values, rather than being *symmetric*.

### Mode

The third measure of central tendency is the *mode*. The mode is the outcome that occurs with the highest frequency. In the preceding list, the mode is 1.4%. If the figures had more decimals, like 1.368%, there would likely not be any outcome that occurred more than once. In that case, the mode would not be meaningful.

### Geometric Mean

The three measures of central tendency just described are standard in statistics textbooks. However, there is another measure of the mean that often is used in finance: the *geometric mean*. The mean described earlier is called the *arithmetic mean*. To illustrate the difference between the arithmetic mean and the geometric mean, consider a four-year investment asset with annual returns of 90%, -40%, 60%, and -50%. The arithmetic mean is calculated by adding the four outcomes and dividing by 4. Doing this, we get a value of 15%, which sounds quite good as an annual return. However, consider someone who had started with \$1,000 and invested in the asset.

After year 1, he/she would have \$1,900. After year 2, the investment would be worth \$1,140. After year 3, it would be worth \$1,824. Finally, at the end of year 4, he/she would have only \$912. What happened to the 15% return of the arithmetic mean? Well, this example illustrates the weakness of arithmetic means, especially when used with percentages.

The geometric mean in this example would be calculated by taking the fourth root (due to four outcomes) of (1.90) (0.60) (1.60) (0.50), subtracting 1, and getting -2.3%. The 1.90 comes from adding 1 to the decimal representation of 90%. By multiplying the initial investment of \$1,000 by (1.90) (0.60) (1.60) (0.50), we get \$912, which was the ending value of the investment, referred to as terminal wealth. When we compute the terminal wealth divided by the initial investment, take the  $n$ th (where  $n$  is the number of outcomes) root of that number, and then subtract 1, we get the geometric mean. If we were using a financial calculator, we could find the geometric mean by putting the terminal value of \$912 into the FV register, 4 into the  $n$  register, \$1,000 into the PV register, and then solving for the %i, or interest rate. Therefore, the geometric mean return is the same as what is called the *compound rate of return*.<sup>1</sup>

It is important to understand the difference between the arithmetic mean, which is the "average" we usually hear quoted, and the geometric mean. The geometric mean has a more direct bearing on how much you will actually earn over the life of an investment. The geometric mean will always be less than the arithmetic mean, with one minor exception: They will be equal if the return is identical in every period. The greater the variability in the returns, the greater the difference will be between the two measures.

You will probably have minimal use for the mode in analyzing stock returns. However, the arithmetic mean, median, and geometric mean all have their uses. The mean, either arithmetic or geometric, is the most common measure.

## Measures of Dispersion

In finance, there are many ways to think about the term "risk." One way is to view risk as uncertainty about outcomes. If there is more variability in outcome set A than in outcome set B, we usually consider A to be the riskier choice. From the previous discussion about geometric mean, we know that it will be harder to reach a certain level of terminal wealth with a highly volatile investment.

The two main measures of volatility are the *variance* and *standard deviation*. These are closely related because the standard deviation is the square root of the variance. The standard deviation is used more frequently because it has the advantage of being in the same units as the mean; the variance (being equal to the squared standard deviation) is in units that are difficult to interpret.

For simplicity, let us assume that we have only four years of annual returns and want to calculate the standard deviation. Assume that the returns are 12%, -5%, 21%, and 12%. We can easily add these four numbers and divide by four to get the mean of 10%. Next, we compute the

**2. Remember in the previous chapter, we saw that if we had a 50% loss, it must be followed by a 100% gain to break even. A return of -50% one period, followed by a return of 100% the following period, results in a 0% geometric mean return.**

squared deviations from the mean and total them. Finally, we divide by 3 and take the square root. This is shown next (where  $\sigma$  is used to denote standard deviation):

$$\begin{aligned}\sigma &= \sqrt{\frac{(12 - 10)^2 + (-5 - 10)^2 + (21 - 10)^2 + (12 - 10)^2}{3}} \\ &= \sqrt{\frac{(4 + 225 + 121 + 4)}{3}} = 10.86\end{aligned}$$

You may be wondering, as most people do, why we divided by 3 instead of 4. We could divide by 4 depending on how we interpret what we are doing. In statistics, we talk about a *sample* versus the *population*. The population is the entire set of possible outcomes or entire set of entities. For example, we can think of the adult population in the United States. A sample is when we examine a few outcomes or a few of the entities in the set and try to make inferences from them about the entire population. For example, we could conduct a survey of 1,000 randomly chosen adults in the U.S. as our sample. Therefore, in our numerical example, we could divide by 4, if we are assuming that these outcomes represent the entire set of outcomes. However, because we are probably interested in what outcomes may occur for many periods in the future, we can interpret the three outcomes as a sample of the population. For some complex reasons, we divide by 3 instead of 4 to get what is called an *unbiased estimate*. The number 3 in this case is referred to as *degrees of freedom*.

Initially, there were 4 degrees of freedom. However, when we calculate the mean, which we need for the standard deviation, we are said to have used up 1 degree of freedom. Because we have  $4 - 1 = 3$  degrees of freedom remaining, we use that in the denominator. In our case of only 4 outcomes, the choice of 3 or 4 makes a significant difference in the answer. However, if we had, say, 101 observations, the choice of dividing by either 101 or 100 would not make much difference. It is probably wise not to worry too much about whether or not you use  $n$  (the number of observations) or  $n - 1$  in the denominator; usually it will not make much difference.

With the concept of standard deviation in hand, we can now see a situation where using returns leads you to a different place than using prices. Suppose we observe the following prices for a given stock: 40.00, 44.00, 48.40, and 53.24. If we compute the mean, we get 46.41 with a standard deviation of 5.70. However, if we ignore any possible dividends and compute returns, they are 10%, 10%, and 10%. Notice that when we compute returns, we end up with one less observation because we use up one observation by focusing on changes in price. We need a beginning price to compute the first period's return. Alternatively, we need an ending period price to calculate the return in the last period. Using returns, we have a mean of 10% and a standard deviation of 0%.

If we think of risk as volatility, we now have a slight dilemma. If we focus on prices, we say that the stock is risky due to the variability, which is measured by the standard deviation of 5.70. However, if we focus on return, we might say there is no risk at all because there is no volatility in the returns, and we have a standard deviation of 0%. Which view is correct? Note that the lack of volatility is due to a strong upward trend in the price. Remember the saying, "The trend is your friend"? We have just illustrated a possible statistical justification for that statement.

There is no one correct view; you just have to be aware of what is happening and the implications of it for returns compared to prices.

## Relationships Between Variables

Up to this point, we have considered statistics for just one variable. It is now time to broaden our perspective and consider more than one variable. As we could expect, things start getting more complicated.

With one variable, we had a measure of variation called *variance*. The two-variable version of variance is *covariance*. It is calculated in a manner similar to variance. Let us use four months of stock returns for PepsiCo (PEP) and Coca-Cola (KO) to illustrate the calculation. PEP's returns for January-April 2004 were 1.4%, 9.8%, 4.1%, and 1.2%. The returns for KO over the same period were -3.0%, 1.5%, 1.2%, and .05%. The mean return for PEP over the period was 4.125% (with standard deviation of 4.008%), while the mean return for KO was 5.0% (with standard deviation of 2.076%). To calculate covariance, we subtract the mean from each PEP observation, subtract the mean from the corresponding KO observation, multiply the results, add them together, and divide by the number of observations minus 1. So, we get (the covariance between  $i$  and  $j$  is denoted as  $\text{cov}_{ij}$ ):

$$\begin{aligned} \text{cov}_{\text{pep/ko}} &= \frac{(1.4 - 4.125)(-3.0 - 0.05) + (9.8 - 4.125)(1.5 - 0.05) + (4.1 - 4.125)(1.2 - 0.05) + (1.2 - 4.125)(0.5 - 0.05)}{3} \\ &= \frac{(8.311 + 8.229 - 0.029 - 11.316)}{3} = \frac{15.195}{3} = 5.065 \end{aligned}$$

We saw that a major problem with variance was that the units of measurement were not meaningful. The same problem exists with covariance; the covariance value is hard to interpret. With variance, we solved the problem by taking the square root of the variance. With covariance, we solve it in a different manner—we divide the covariance by each of the standard deviations. This produces a number that can only range from -1 to +1. We call this number the *correlation coefficient*. Using the example from the previous covariance calculation, we get the following:

$$r = \frac{\sigma_m}{\sigma_i \sigma_m} = \frac{\sigma_{\text{pep/ko}}}{\sigma_{\text{pep}} \sigma_{\text{ko}}} = \frac{5.065}{(4.008)(2.076)} = 0.609$$

This result means that PEP and KO were positively correlated to a reasonably strong degree over the period.

If we have observations of a variable at consecutive time intervals, we refer to the variable as a *time series variable*, *time series data*, or just *time series*. If the correlation coefficient between two variables is +1, the two variables are perfectly correlated. In this case, when variable X goes up, Y goes up. When X is down, Y is down. If the variables are perfectly negatively correlated with a correlation coefficient of -1, the opposite is true—when X is up, Y is down, and vice versa. What does a correlation coefficient of 0 mean? It means that there is no discernable



relationship between the two variables. If X is up, there is nothing meaningful that you can say about the value of Y; it could be up or down, or stay the same.

There are two basic ways to picture time-series correlation relationships between two variables. The first is to graph the two variables against time; the second is to plot one on the x-axis and the other on the y-axis. Figure A.1 shows an example of the first type using monthly returns for Coke (ticker = KO) and PepsiCo (PEP) from January 1995 through December 2004. The second method is shown in Figure A.2.

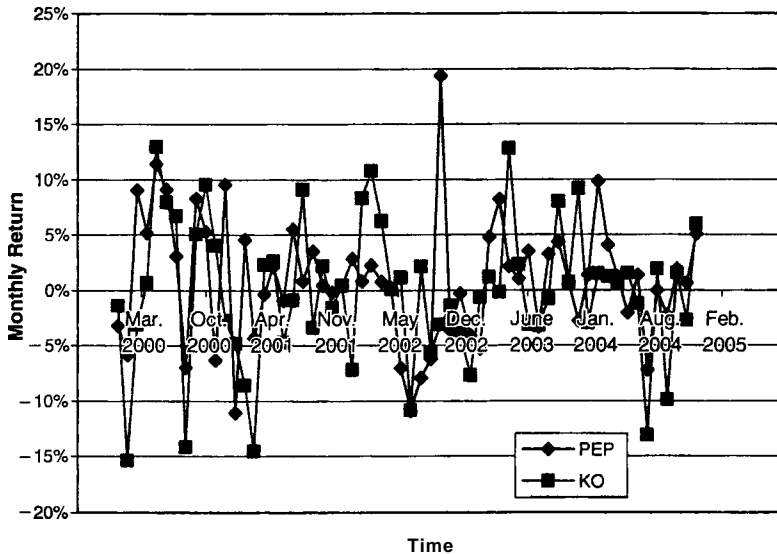


FIGURE A.1 Monthly returns for KO and PEP (January 2000-December 2004)

Look at Figure A.1. Notice that there is a general tendency for KO to be up when PEP is up, and for KO to be down when PEP is down. If the two stocks had been negatively correlated, they would have generally been moving in opposite directions. The actual correlation coefficient for the two stocks during this time was 0.489. If we draw two stocks at random from the S&P 500 and measure the correlation coefficient for their returns, a typical value would be for about 0.2 to 0.5, which we would call weak positive correlation. We would expect a higher value for KO and PEP, compared to two randomly chosen stocks, owing to the fact that they are in the same industry.

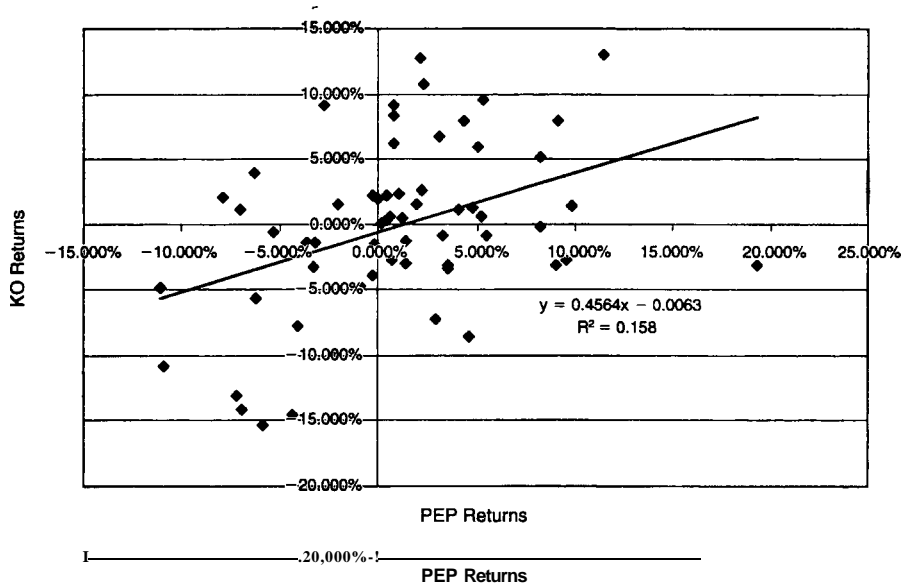


FIGURE A.2 Monthly returns of KO versus PEP (January 2000-December 2004)

Now, consider Figure A.2. In this case, we see the positive correlation from the fact that a line of best fit (to be explained shortly) drawn through the returns slopes from the southwest quadrant to the northeast quadrant. If the stocks were negatively correlated, the line would go from northwest to southeast. What if the correlation was 0? In that case, the scatter of points would look like a shotgun scatter around the center; there would be no discernable relationship, and the best-fitted line would be horizontal.

In the previous discussion about correlation, we spoke of a *line of best fit*. We were intimating about doing a *linear regression least-squares fit* through the points. Suppose we had the same data points as we had in Figure A.2 for two variables, X and Y. If we were to draw a line such that the sum of the squared difference between the actual data points and our line was minimized (in other words, the line in question produced a lower sum than every other conceivable straight line), we would call it the *least-squares regression line*, or *line of best fit*. Statisticians have worked out the equation for such a line, so that you can calculate the intercept and slope of the least-squares regression line without actually having to plot the data and experiment with various lines. The equation for a line is often denoted as  $Y = a + bX$ . Using this notation, the equations for the line are as follows:

$$b = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2}$$

$$a = \bar{y} - b\bar{x}$$

where  $n$  is the number of observations, and  $X_i$  is the  $i$ th observation of the  $X$  variable. The summation symbol,  $\sum$ , simply means to add up all the  $X$  observations. The other summations work in a similar manner.

This can all be done extremely easily in Excel. There are several different ways to have Excel do regression calculations, but one easy method is to have it put the line and equation on a chart of the data, as was done in Figure A.2. Because we are using the KO/PEP data, we would interpret this equation as saying, "KO's returns can be estimated by taking the return for PEP in a given month, multiplying PEP's return by 0.4564 (the slope), and adding -0.0063 (the intercept)."

There is a very nice side benefit to the correlation coefficient. If we square it, we get a value called the *r-squared* or *coefficient of determination*. Because the correlation coefficient can only have values between -1 and +1, the *r-squared* value will be between 0 and 1 (since squaring results in a nonnegative number). Furthermore, this value is a measure of the goodness-of-fit. If we get an *r-squared* of 0.45, we are explaining 45% of the variability in KO's returns through its relationship with PEP's returns. The higher the *r-squared*, the better the fit. In our case, the *r-squared* value is 0.158, saying that we have explained 15.8% of the variation in KO's returns with our equation. This may sound extremely low to you. However, remember that we said typical correlation coefficients between two stocks at random are usually between 0.2 and 0.5? That means that one stock's returns can typically explain about 4-25% (obtained by squaring 0.2 and 0.5) of another stock's returns. In many cases, the correlation coefficient is even less than 0.2, meaning that the *r-squared* may be close to 0.

Before moving on, it is worthwhile to pause and think about what we just said about typical correlations between stock returns. Stocks do generally tend to move up and down together, as evidenced by positive correlation. However, the relationships are not hard and fast, but quite loose. Sometimes people refer to stock prices as being very noisy. By this, they mean that any relationships are subtle and tenuous. In communication theory, people talk about the signal-to-noise ratio. Imagine listening to a radio broadcast of a speech. With no interference and perfect transmission, the words in the speech, which correspond to the signal, are easily identified and understood. If there is heavy interference—because the radio station is far away, there is bad weather, or someone is using a poor hair dryer in the house—there is much noise. The more noise, the lower the signal-to-noise ratio and the harder it is to understand what is being said. Similarly, stock prices are noisy with a low signal-to-noise ratio. Any patterns or relationships that do exist are not easy to discern.

The portion of the unexplained  $Y$  variable in each period is called the *error term* or *residual*. Let us examine a specific case to illustrate this. In May 2000, PEP's return was 11.414%, while KO's was 12.963%. Using the regression line equation in Figure A.2, we would estimate KO's return as 4.579% ( $0.4564 \times 11.414\% - 0.63\%$ ). Note that we changed the intercept value of -0.0063 to percentage notation of -0.63%. The error in our estimate is 8.384% ( $12.963\% - 4.579\%$ ). When we perform regression, we implicitly assume that the error terms are random and have no relationship with each other. However, particularly using time series data, the error terms themselves may be correlated with each other, which is called *autocorrelation* or *serial dependence*. There is a statistical test called the Durbin-Watson test that helps detect autocorrelation. If autocorrelation is present, the fitted regression line may be inaccurate.

In a regression, the variable being explained is called the *dependent variable*. The variable doing the explaining is called the *independent variable*, or *explanatory variable*. We can extend the idea of regression to more than one independent variable. This is called *multiple regression*. Logically, two explanatory variables are better than one, three are better than two, and so on. In fact, virtually any additional explanatory variable we include in a regression will improve the r-squared. For example, we might include monthly average temperature in Paris as an additional series to help explain stock returns. This would not make logical sense, and the temperature in Paris would not have causal relationship to stock returns, but the r-squared would probably increase. When using more than one independent variable, researchers examine what is known as the adjusted r-squared. The adjusted r-squared value penalizes the r-squared value as more independent variables are added to the regression equation. In effect, it helps balance benefit versus cost; is it beneficial to add a particular variable?

One frequently encountered problem in performing multiple regressions is what is called *multicollinearity*. This occurs when there is reasonably strong correlation between two or more of the independent variables. Suppose, for example, that we were trying to understand the factors that affected the stock returns during 2005 of all the S&P 500 stocks. Suppose that for each stock, we had values of changes (2005 values minus 2004 values) in assets, sales, earnings, and shareholder's equity. There would probably be strong links between most of these variables, so that there would be a high degree of multicollinearity. Several problems are caused by multicollinearity, however. One of the main problems is that it clouds the picture concerning which independent variables are statistically significant.

## INFERENCEAL STATISTICS

With inferential statistics, we try to use observed data to infer things about general characteristics of the observed data or characteristics of additional observations. We often test whether or not a certain hypothesis is true or false. A hypothesis might be something like, "The slope of this line is 1." To test hypotheses, we must make some assumptions. The most critical assumptions are the assumptions we make about what is known as the *probability distribution*.

The most well-known of all probability distributions is the *normal distribution*, also referred to as a *Gaussian distribution* because it was first formulated by Karl Gauss, the eighteenth-century German mathematician. It is also known as the *bell curve*, due to its bell shape. It only takes two parameters—the mean and standard deviation—to describe a given normal distribution; there are infinitely many normal distributions due to an infinite number of combinations of values for the mean and standard deviation. The normal distribution has three important characteristics:

- It is bell-shaped, with its peak at the center. The mean, median, and mode are all located at the peak.
- It is symmetric about the mean.
- It approaches the horizontal axis asymptotically at the left and right tails of the bell curve. It extends infinitely in both directions.

The normal distribution also has special importance due to what is called the *central limit theorem*. If we take repeated samples from a population, calculate the mean of each sample, and then plot the distribution of the sample means, they will approximate a normal distribution. As the sample size increases, the approximation will improve. The central limit theorem has important implications for a wide variety of statistical tests.

There are two rule-of-thumb values concerning the normal distribution that are useful to memorize. First, approximately two-thirds of the outcomes will lie (either above or below) within one standard deviation of the mean. Second, approximately 95% of the outcomes will lie within two standard deviations from the mean.

Are stock prices normally distributed? No, you cannot have negative prices, and with any normal distribution, every number is possible, both positive and negative, even though some values are highly improbable as outcomes. Are stock returns normally distributed? No, because we cannot have a return lower than -100%, but we can have returns greater than 100%. However, returns come much closer to being normally distributed than do stock prices. Looking at PEP's monthly returns from January 2000 through December 2004, we see what is displayed in Figure A.3.

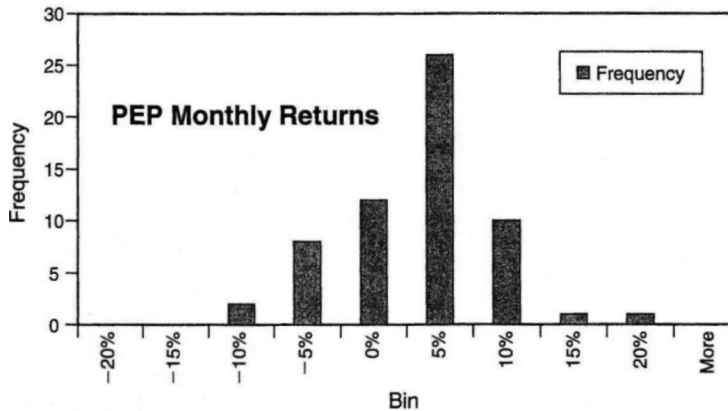


FIGURE A.3 Histogram of PEP monthly returns (January 2000-December 2004)

This graph is a histogram. There are various "buckets" for counting returns. Here, the buckets are in intervals of 5.0%. Over the 60-month period, 26 returns fell in the interval from 0.0% to 5.0%. The size of the buckets will have an impact on the appearance; too few will clump everything together, while too many will produce a very flat histogram. In this example, we can see that PEP's returns do not look like a perfect normal distribution, but they do generally follow a bell shape. There are formal statistical tests designed to assess whether or not a given sample of outcomes can reasonably be said to follow a normal distribution.

Stock returns cannot logically be expected to exactly follow a normal distribution due to the impossibility of returns less than -100%. However, what if we take the change in the log of the prices? These are called log-returns. Do these numbers follow a normal distribution? If they do, we say that the data follow a log-normal distribution. Taking the log produces numbers that range from 0 to  $\infty$ . For stock prices, log-normality is a more reasonable assumption. However, the exact distribution of stock returns has been tough to pin down. Finance researchers are still arguing over the best distribution to use for stock returns, as we saw in our discussion in Chapter 4.

Earlier in this appendix, we used the term "degrees of freedom" when discussing standard deviation. This term also surfaces in descriptions of probability distributions. The easiest way to think of it is just as a parameter needed to specify the distribution. For the normal distribution, we needed two parameters, due to the need to specify the mean and standard deviation.

Three very important distributions are the Chi-Square, t, and F distributions. All of these are based on various manipulations of standard normal variables. A *standard normal variable* is one that follows a normal distribution with a mean of 0 and a standard deviation of 1. We can easily transform most variables into standard normal variables. Suppose that we observe a value of 24 from a sample that has a mean of 20 and a standard deviation of 5. First, we calculate how far the observation is from the mean. We do this by subtracting the mean of 20 from the value of the observation of 24, leaving us a value of 4. Next, we divide the standard deviation into our number, which gives us 0.8 (4/5). This tells us that the observation is 0.8 standard deviations from the mean.

The Chi-Square distribution is based on the sums of standard normal variables. If it is based on the sum of two standard normal variables, we say that it has two degrees of freedom. If it is based on the sum of three, it has three degrees of freedom. As the number of degrees of freedom increases, the distribution begins to approach the shape of a normal distribution. The Chi-squared distribution primarily is used for goodness-of-fit tests. The term "test statistic" refers to a value computed from a sample that is used to test a particular hypothesis. A hypothesis could be something like: "Are all the colors of M&M candies in a bag equally likely to occur?" Many test statistics are known to follow a Chi-Square distribution, so this distribution has many applications.

The t distribution or Student's t (Student was a pen name used by the person who first worked out its applications) is used often in statistics. The t distribution applies when the true standard deviation is unknown (which is most of the time) and is especially important for small samples. The t distribution converges to the normal distribution as the number of degrees of freedom (the sample size minus 1) increases. It closely approximates a normal distribution by 30 degrees of freedom. The t distribution is symmetric, similar in shape to the normal distribution but with wider tails. It commonly is used to test the statistical significance of regression coefficients (such as the intercept and slope). An application of the t statistic will be shown later.

The last major commonly used distribution is the F distribution. The F distribution is based on the ratio of two variables, each of which follows a Chi-Square distribution. It primarily is used to test whether or not samples have the same variance. It is used in regression as an overall measure of goodness-of-fit because it is the ratio of explained variation to unexplained variation.

Now let us see how some of these things come together in looking at some output from a linear regression. Let us use PEP's monthly returns as the Y variable and the S&P 500 monthly returns as the X variable over the 2000-2004 period. We can use Excel to run the regression. Table A.1 displays the output, with the values of primary importance shaded in gray.

**TABLE A.1** Excel Regression Output for PEP Monthly Returns from 2000 to 2004

**Summary Output**

*Regression Statistics*

Multiple R	0.2733
R-Square	0.0747
Adjusted R-Square	0.0588
Standard Error	0.0550
Observations	60

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>			
Regression	1	0.0142	0.0142	4.6828	0.0346			
Residual	58	0.1753	0.0030					
Total	59	0.190						

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-Value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	0.0096	0.0071	1.3540	0.1810	-0.0046	0.0238	-0.0046	0.0238
X Variable 1	0.3321	0.1535	2.1640	0.0346	0.0249	0.6394	0.0249	0.6394

Let us start with the intercept and slope of the regression. The intercept, which is clearly labeled, is 0.0096. The slope is labeled X Variable 1 under Coefficients and has a value of 0.3321. The slope is the beta of the stock, which will be explained later. The beta, a measure of risk, for an average stock is 1. We see that PEP's beta is less than that of an average stock. We also see the r-squared value, which is labeled R-Square of 0.0747. This means that our regression explains 7.47% of the variation in PEP's returns over this period. Below the slope value of 0.3321, we see the t statistic value of 2.1640. As a rule of thumb, t values over 2 are statistically significant, so this exceeds that hurdle. The item labeled P-Value shows the probability that we would observe the given value strictly by chance alone. The P-value of the slope t value is 0.0346, which says that the probability that this t value happened purely by chance was only 3.46%. In most academic research, P-values less than 5% (or sometimes 1%) are considered statistically significant. Analyzing this information is called a t test. Finally, let us consider the F value of 4.6828. This has a significance value of 0.0346, the same as the t value. It essentially tells you the same information as the t in this case. Unless you are performing a multiple

regression, the P-value of the t of the slope and the significance value of the F statistic will be the same. The other numbers on the output have their uses, which you can learn from a standard statistics textbook.

What do the results tell us? The results show that our regression equation does seem to explain part of the variation in PEP's returns. The results are significant from a statistical point of view. However, we are only explaining 7.47% of the variation in PEP's returns. Whether or not this is useful from a practical point of view depends on other factors.

## MODERN PORTFOLIO THEORY

We all learned portfolio theory as children: Don't put all your eggs in one basket! However, MPT began in 1952 with the work of Harry Markowitz. He worked out many mathematical relationships between groups of stocks, or portfolios. Some of the key results are as follows:

- The mean return of a portfolio is a simple weighted average of the mean returns of the individual stocks.
- The standard deviation (of returns) of a portfolio is a quadratic function.
- The standard deviation of a portfolio is almost always less than a simple weighted average of the individual stock standard deviations.
- Even with weak positive correlation, there are significant benefits to diversification.
- If an investor is only concerned with the mean return and standard deviation of a portfolio, it is possible logically to eliminate many portfolios from consideration.
- For large portfolios, the variance of each stock contributes little to the overall portfolio variance. However, the covariance of each stock's returns with the returns of all the other stocks is quite important.

We will flesh out these points as we go along.

Consider combinations (or portfolios) of two stocks, X and Y. Assume that we have estimates of the expected return (mean) and standard deviation of returns for each stock. We can calculate the expected return of a portfolio of X and Y by taking a simple weighted average of the individual expected returns. Thus, denoting the expected return on the portfolio as  $R_p$ , we have the following:

$$R_p = w_X R_X + w_Y R_Y$$

How about the standard deviation of a portfolio of X and Y? That is more complicated. The formula involves a squared term (therefore, it is a quadratic equation) and looks like this:

$$\sigma_p = \sqrt{w_X^2 \sigma_X^2 + w_Y^2 \sigma_Y^2 + 2w_X w_Y \sigma_X \sigma_Y r_{XY}}$$



The  $r_{xy}$  term in this equation is the correlation between stock X and stock Y. If this value was equal to 1 (perfect correlation), this equation would simplify to the following:

$$\sigma_{p,j} = \sqrt{w_i^2 \sigma_i^2 + 2w_i w_j \sigma_i \sigma_j r_{ij} + w_j^2 \sigma_j^2} = \sqrt{(w_i \sigma_i + w_j \sigma_j)^2} = w_i \sigma_i + w_j \sigma_j$$

However, perfect correlation is virtually impossible in the real world. With  $r_{xy} < 1$ , the standard deviation of the portfolio is always less than a simple weighted average of the two individual standard deviations. This means that there are significant benefits to diversification in terms of risk reduction.

We can see how portfolios look in what is called *risk-return space* in Figure A.4. This figure is based on annualized monthly returns for PEP and KO over the 1995-2004 period. Note the curved line, which shows the quadratic nature of the standard deviation relationship. Also, note that a portfolio consisting of 80% KO and 20% PEP is a better choice than KO by itself. Why do we say this? We say it because points that are to the northwest are preferable because they offer more return for less risk. The correlation of returns between the two stocks was 0.489 over this period. Therefore, we see that there are significant benefits to diversification, even if the two stocks have weak positive correlation.

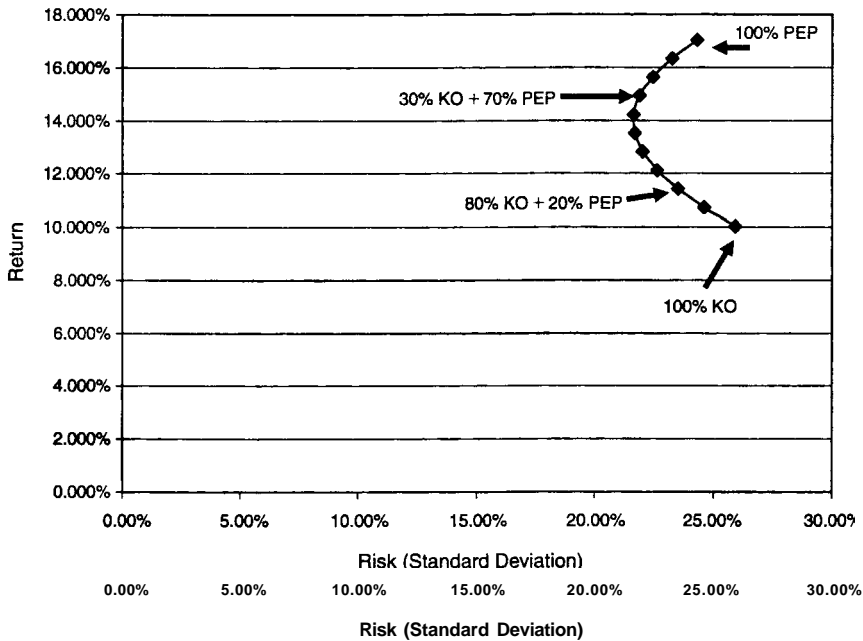
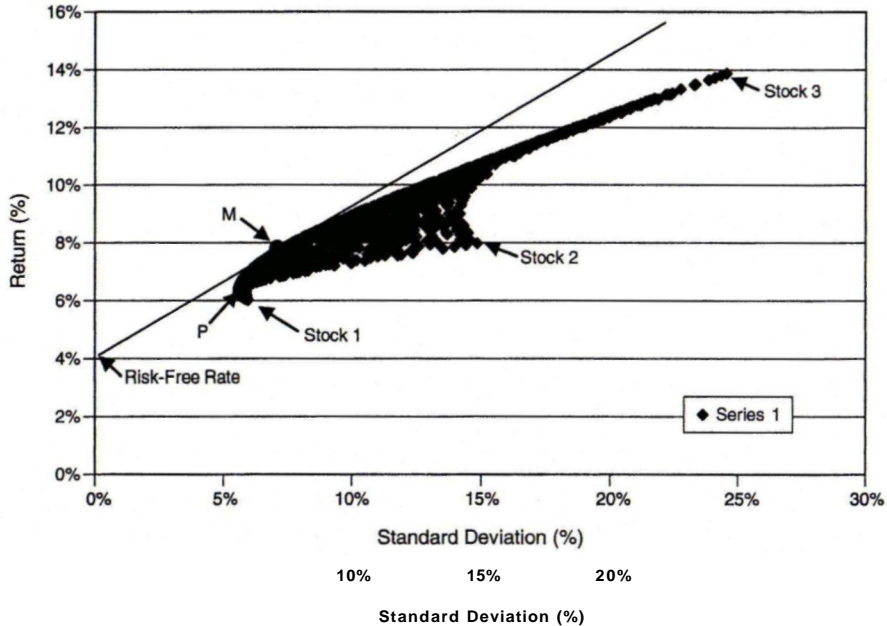


FIGURE A.4 Two-stock portfolio return versus standard deviation

How would the curve change if the correlation was greater? The line between the two ends, representing 100% of one of the stocks, would become straighter. If the correlation was perfect (+1), it would be a completely straight line. How would the curve change if the correlation was smaller? It would bend more toward the vertical axis. In the extreme case of perfect negative correlation (-1), there would actually be one portfolio possibility that would touch the vertical axis with a standard deviation of 0. However, the most common case, as stated earlier, is correlation between 0.2 and 0.5. Therefore, the curve in Figure A.4 is typical in terms of its general shape.

When we extend our calculations to more than two stocks, the expected return is still a simple weighted average of the individual returns, while the standard deviation has terms containing the variance of each stock plus cross-terms (similar to  $2vVjW_{cr,ov,r_{i,j}}$ ). When we graph possible portfolio combinations for three stocks, we get a picture like the one in Figure A.5.



**FIGURE A.5** Three stock portfolios return and standard deviation. Subsequent aspects of Figure A.5 we will discuss later. For now, let us focus on the points of possible portfolios using stocks 1, 2, and 3. This figure was drawn using 1,000 different possible portfolios. If we extended the number of points, the blank spots gradually would be filled in. Therefore, instead of a curved line of possible portfolios, we have a curved region.

If we were to extend our set of possible stocks to four, the variance of the portfolio would be calculated by adding up all the terms in the following matrix and dividing by 3 (see Figure A.6).

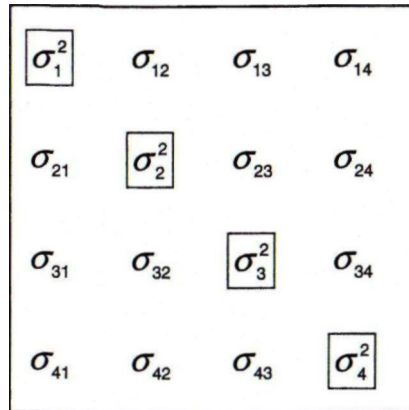


FIGURE A.6 Variances of four stocks

The terms along the diagonal, shown inside the smaller boxes in Figure A.6, are the variances of each of the four stocks. The off-diagonal terms are covariance terms. Because the covariance of stock one with stock two is the same as the covariance between stock two and stock one, the matrix is actually symmetric around the diagonal. Notice that there are four variance terms and 12 covariance terms. The covariances are roughly three times (12 to 4) as important in the portfolio variance calculation. As the number of stocks under consideration grows, the individual variance terms become less and less important. For example, consider adding a fifth stock. The matrix would expand to 25 cells. The variance of stock five would be one of the 25 cells. However, there would be eight additional covariance terms added to the matrix, representing stock five's covariances with the other four stocks. For large portfolios, the variance of each stock is relatively unimportant; what is important is how each stock co-varies with the rest of the stocks in the portfolio. This idea hints at what is called the *Capital Asset Pricing Model (CAPM)*, to be discussed shortly.

Let us return to Figure A.5. Which portfolio would we actually want to hold? Before we answer that question, we need to look at another concept. Consider the diagram in Figure A.7 that shows estimates of the mean and standard deviation for the returns on five stocks. Which investment(s) is/are the most attractive? To begin, we assume that investors will not bear more risk without the likelihood of more return. In investments jargon, we are assuming that investors are risk-averse. With this assumption, it becomes clear that we would prefer points to the northwest on the diagram. Stock A is preferable to Stock B because it has higher return for the same risk. The same argument can be made concerning C and D. We can also argue that A is preferable to C because it has less risk for the same return. In portfolio theory-speak, we say that A dominates B, B dominates C, and A dominates C. That leaves us with A and E. There is no clear way to say which one an investor would prefer. It depends on his/her tolerance for bearing risk.

A more aggressive investor would opt for E, while a less aggressive investor would opt for A. The fact that A and E dominate the others means that they form what is called the *efficient set*.

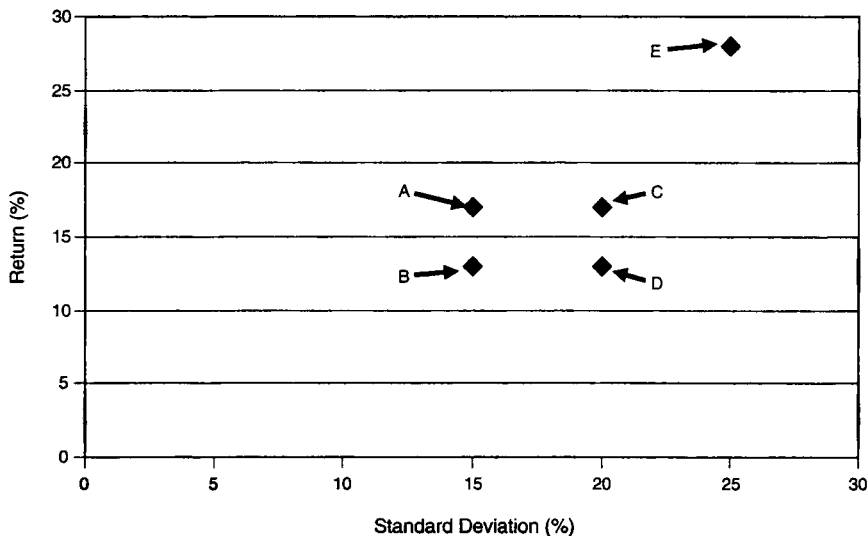


FIGURE A.7 Efficient set

We can extend the efficient set concept to what is called the *efficient frontier*. Let us return to Figure A.5 once again, focusing on some additional aspects of it. Portfolios along the upper edge of the curve from P to Q (which is the point at stock three) represent the efficient frontier. These portfolios have either the highest return for any given value of standard deviation, or the lowest standard deviation for any given level of return. These are the portfolios that would be of most interest to rational investors. The particular portfolio along P-Q that an investor would choose would depend on his/her risk tolerance. We are assuming that investors only care about two things: expected return and standard deviation. This perspective is called a *mean-variance framework*.

Portfolio theory was all fine and good, but there were still two important hurdles in applying the equations. First, Markowitz did not specify how to get the inputs. In other words, he offered no prescribed method for coming up with the estimates of expected return and standard deviation. Of course, one could use historical data to come up with estimates, but how much data would be needed? Sixty months of monthly returns? Fifty-two weeks of daily returns? There was no clear answer. Second, as the portfolio size increased, the number of inputs became exponentially large. For a 100-stock portfolio, an investor would need 100 expected returns, 100 standard

deviations, and 4,950 correlation coefficients. With today's computing power, it would not be difficult to calculate these inputs from a given sample of historical data, but in the early 1960s, this was a formidable computing task.

By 1964, a computationally easier method, with some added theory, had been developed. William Sharpe has received most of the credit for this. The theory became known as the Capital Asset Pricing Model, or CAPM. This theory was based on several simplifying assumptions, such as no transactions costs, no taxes, and other assumptions. However, the most important assumption was that of homogeneous expectations. This means that all investors view the inputs to portfolio theory in the same manner, and that they agree on the expected returns and standard deviations of all stocks and their correlations (or covariances). With this assumption, all investors identify the same efficient frontier. Next, we add the assumption that a risk-free asset (like U.S. Treasury bills) exists.

Returning (for the last time) to Figure A.5, consider the line that starts at the risk-free rate and is just tangent to the efficient frontier. The point of tangency is labeled as portfolio M. The question "which portfolio should I hold?" now becomes "what combination of the risk-free asset and portfolio M do I want to own?" That is true because combinations of the risk-free asset and portfolio M lie along the line from the risk-free rate to portfolio M and beyond. Portfolios on this line dominate (in portfolio theory-speak) all those that lie below. This means that this line has now become the efficient frontier. Portfolio M has now taken on some special significance. Every investor wants to hold the risky portfolio. This means that all investors own a chunk of M, which is a portfolio consisting of all stocks (because every stock must be held by someone, everyone has to hold some of every stock).

From these ideas, it can be shown (we will not go through a tedious derivation) that the expected return  $r_i$  on any stock  $i$  is given by the following equation, which we will call the CAPM equation:

$$r_i = r_f + \beta_i (r_m - r_f)$$

$$\text{where } \beta_i = \frac{\text{COV}_{im}}{(\text{var}_i)(\text{var}_m)} = \frac{\sigma_{im}}{\sigma_i \sigma_m} = r_{im} \frac{\sigma_i}{\sigma_m} \left( \frac{1}{\sigma_i \sigma_m} \right) = r_{im} \frac{\sigma_i}{\sigma_m}$$

This means that  $\beta$  is the product of the correlation coefficient between the stock and the market as a whole times the standard deviation of the stock relative to that of the market. So, if the stock's correlation with the market is 0.4 and its standard deviation is three times that of the market, then its  $\beta$  is 1.2 (0.4 X 3).

For many years, investors had thought about expected return like this:

$$\text{Expected return} = \text{risk-free return} + \text{risk premium}$$

For example, the expected return on a corporate bond would be the yield on a U.S. Treasury bond, a risk-free asset (risk-free in terms of default risk), of the same maturity, plus a premium for default risk, plus possibly a premium for liquidity risk. To calculate the expected return on the stock of that

same company, an extra risk premium would be added for the fact that common stockholders have a residual claim and, thus, common stock has higher risk than the company's bonds.

Therefore, the CAPM equation has the same basic structure that people had been using for many years. The difference is that the risk premium is quantifiable. Note that all of the risk comes about through the relationship between the stock and the market. This is risk that cannot be diversified away, referred to as *nondiversifiable risk*. It is also called *systematic risk*. *Beta* is a measure of systematic or system-wide risk. All companies have some similar risk because they operate under the same laws, the same tax structure, the same political leadership, the same monetary policy, and so on. However, these things will affect different stocks differently. Companies will also have higher systematic risk, or betas, if they have more debt or have a cost structure with higher fixed costs (as opposed to variable costs).

Does the CAPM work? Yes and no. There have been many debates about how to test the CAPM. The evidence in support of the CAPM is mixed. Individual stock betas tend to be highly unstable. For example, remember that we calculated the beta for PEP over the 1995-1999 period using monthly returns. The beta we got was 1.466. When we did the same calculation over the 2000-2004 period, we got 0.332. (Remember that we performed this calculation in the earlier discussion about regression.) It is possible that if we did some in-depth analysis of PEP over this period, we could rationalize the difference. However, sometimes company betas seem to change from one period to another without an obvious reason. However, portfolio betas tend to be more stable. If a particular mutual fund has a beta of 1.18 and the stock market is generally up over a certain period, the return on that mutual fund would most likely exceed that of the S&P 500. If the market were down, the fund's performance would probably be worse than that of the market. In spite of the various problems with betas, they are heavily quoted and used. This is partly because there is no good alternative.

What is the beta for the market as a whole? Because the covariance of an asset with itself is the same as the asset's variance, and the correlation of any asset with itself is 1, the expression for  $\beta_{i-m}$  simplifies to 1. In practice, the S&P 500 is often used to represent the market portfolio. A stock with a beta greater than 1 is an above-average risk stock. If the stock's beta is less than 1, its risk is below average.

## PERFORMANCE MEASUREMENT

In this section, we address the question, "How do we tell whether an investor's investment performance has been good or bad?" This is of particular interest to people who are hiring someone else to manage their money, such as a mutual fund portfolio manager. We want to determine whether the performance is adequate given the risk of the investment strategy.

One simple method of assessing performance is to measure reward per unit of risk. Because we can earn the risk-free return by investing in a risk-free asset, like Treasury bills, it makes sense to focus on the reward in excess of the risk-free return per unit of risk. Therefore, we simply subtract the risk-free return from the average return from the investment and divide by the standard

deviation of the returns over the period of measurement. If fund ABC earned an average return of 12% over the period with a standard deviation of 20%, while the risk-free return was 4%, our performance measure would be 0.4 (calculated as  $(12 - 4) / 20$ ). This measure is called the *Sharpe performance measure* or *Sharpe ratio*, because it was first suggested by William Sharpe.

Putting the same idea in CAPM terms, a logical measure is excess return per unit of beta, which is known as the *Treynor measure of performance*. Suppose that in the previous example, the beta of fund ABC was 1.1. This would lead to a Treynor measure of 7.27. (First subtract 4% from 12%, yielding 8%; then divide 1.1 into 8%.)

Another measure related to beta is what is called *Jensen's alpha*. Let us assume that we are estimating the market risk premium, which is  $R_m - R_f$ , as 6%. Let us use the same numbers for fund ABC that we used before. With these estimates, we would estimate the fund's expected return as 10.6% ( $4\% + 1.1 \times 6\%$ ). We would next subtract the 10.6% from the actual return of 12% to get 1.4%, which would be the fund's alpha. Therefore, alpha is a measure of excess return, return beyond what we expect based upon the CAPM. Fund managers are sometimes said to be "searching for alpha."

Geometrically, we can see the Treynor and Jensen measures in Figure A.8. Suppose that you use the Treynor and Jensen measures to rank two investments, X and Y. It is possible that investment X will have the highest Treynor measure but the lower Jensen alpha. However, in most cases, the ranking will be the same. There is some irony in the fact that the two performance measures based on the CAPM's beta don't bear the name of Sharpe, who developed the CAPM.

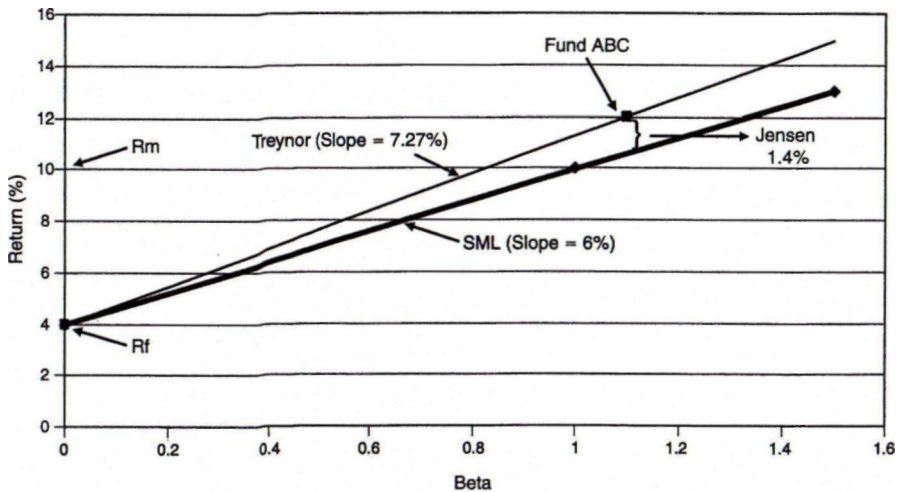


FIGURE A.8 Treynor and Jensen performance measures

Geometrically, the Sharpe measure would look similar to the Treynor measure line drawn in Figure A.8. The difference is that standard deviation would be used in place of beta on the x-axis.

A relatively new (developed in 1994 by J.P. Morgan Co.) measure that is used to summarize risk, especially at the overall firm level, is Value-at-Risk, known as VaR. Banks commonly use this measure, and it is even used for regulatory purposes. VaR tells us in one simple number the maximum loss that will occur (with 95% confidence under normal conditions) over a given period, such as one day. Because no one can foresee the future, the phrase "will occur" is based on certain assumptions. Let us say a certain investment firm is holding various U.S. and foreign stocks. Consider the risk along three dimensions: the risk of holding U.S. equities, the risk of holding foreign stocks, and the exchange rate risk. With VaR, you would analyze the variability in these three components (you could divide it more finely into more components) and the correlations between them. You would then roll all this information into a complex computer program that would perform the VaR calculation and give you one number as the result. For example, the VaR might be \$3.6 million, meaning that there is less than a 5% chance that the firm would suffer a one-day loss greater than \$3.6 million. Due to the complexity of the calculations, this measure would normally only be used by financial institutions.

## ADVANCED STATISTICAL METHODS

Some researchers have applied some very sophisticated statistical techniques to investment analysis. It is beyond the scope of this book to go into detail concerning some of these advanced methods. However, we will try to provide a qualitative understanding of some of the major techniques.

We used the term "time series" earlier in this appendix. It merely refers to data for which we have observations in consecutive periods. *Time series modeling* refers to statistical techniques for analyzing time series data.

When a researcher begins to analyze a given time series, the first question to ask is usually this: Is the series stationary? You can think of stationary as being generally stable, with some degree of structure. Stock prices are usually nonstationary because they are usually trending up or down, or fluctuating with trends.

Earlier in this appendix, we talked about how returns are often used rather than prices. Returns are often stationary. The stationarity of returns is a major advantage. It is not possible to make statements that are very meaningful about a nonstationary series. Stationarity is tested using what is called a *unit root test*. If the series has a unit root, it is not stationary. Therefore, you hope to be able to reject the hypothesis that the series has a unit root.

It is possible for two series to both be nonstationary but for some mathematical (linear) combination of the two series to be stationary. If this occurs, we say that the two series are cointegrated. Cointegration analysis techniques have been applied in several areas of finance, but there is probably great potential for additional applications of this method.

Major buzzwords in the finance academic community over the past 10-15 years are the acronyms ARCH and GARCH. Because ARCH is a subset of GARCH, we will focus just on it.



GARCH stands for *generalized autoregressive conditional heteroscedasticity*. This sounds extremely complicated, and it is to some degree. However, the basic idea behind it is simple—ordinary regression breaks down when you analyze many financial time series because the volatility of the series changes over time.

When the volatility (you can think of this as the standard deviation of stock returns, for example) of a series is not constant (not precisely constant, but at least generally constant or consistent), we say it is heteroscedastic. If we think of periods like that before and soon after the market crash of 1987 or the Internet bubble of the late 1990s, it is easy to imagine that volatility changes over time.

Methods such as ARCH and GARCH are used to estimate volatility. There are three major reasons why volatility estimates have increased in importance, as follows:

- The use of options contracts has increased dramatically in the past few decades. The key input into option pricing models is an estimate of the asset's volatility.
- There have been significant periods of changing volatility over the past few decades. Examples are the stock market crash of 1987, the Asian financial crisis of 1997, the Russian moratorium of government debts, the financial insolvency of Long Term Capital Management (LTCM) in 1998, the World Trade Center attack in 2001, and the accounting manipulations of Enron and other companies in 2002.
- The increased use of VaR, which requires volatility estimates.

One other term you may encounter is maximum likelihood. With maximum likelihood, you work backward from the observed data to make inferences about the probability distribution that produced those outcomes. You try to find the distribution that was most likely to be the source of the outcomes. Maximum likelihood techniques can be applied to many different statistical problems. It can even be an alternative to least squares in performing regression.

## ARTIFICIAL INTELLIGENCE

The term artificial intelligence (AI) refers to using computers to mimic intelligent processes found in the natural world. Researchers in AI have often overestimated their ability to produce intelligent behavior or thought processes with machines. However, AI has definitely had some success and will probably continue to exert greater impact on our society in the future. You only have to look at the latest robotic dogs in a toy store to glimpse some of the potential. We will only briefly describe three of the major developments in AI: expert systems, neural networks, and genetic algorithms.

To build an expert system, you need a cooperating expert. An expert system tries to model the thinking process of someone who is an expert on a particular subject. For example, programmers might interview a doctor at length, trying to build various rules for decision making. For

example, the doctor might say that the first thing to do is take the patient's temperature. If the patient has a fever, you proceed along one set of steps. If the patient does not have a fever, you proceed along another set of steps. As you can imagine, the list of steps would be extremely long to diagnose many different illnesses. Some steps might lead to a dead end, where the system would indicate that a doctor would need to be consulted; the situation would be beyond the capability of the expert system. If you had an expert investor like Warren Buffett, you could potentially build a system that would mimic his stock selection process. However, researchers have found that it is extremely difficult to encode the decision-making process of many experts. Experts often seem to have a sixth sense in many situations that cannot be modeled.

The basic idea behind neural networks is to model, in a computer program, the network of neurons that continually "fire" in our brains, causing us to sense, think, feel, and act. A neural network consists of an input layer, an output layer, and some hidden layers in between. The designer of the neural network decides how many layers should be between the input and output layers and how the layers interact. In an investments application, company financial and stock price data might be inputs, while buy/sell decisions would be outputs. Critics have complained that neural networks are too much like a black box. You put in certain inputs and get out certain outputs, but it is not very clear what is happening in the middle. This criticism does have some validity; building a neural network is done more by trial and error than referring to an architectural or engineering blueprint. Defenders of neural networks counter that it is possible to dissect a neural network and uncover the inner structure.

Genetic algorithms (GAs) derive their name from the fact that they mimic certain genetic processes such as mutation. GAs are optimization algorithms. They try to maximize or minimize what is referred to as "fitness."

Problems are mapped into strings of Is and Os. For example, let us consider stock selection strategies. Positions 1 and 2 in the string might correspond to quartiles of ROE. A value of 00 might mean that you pick stocks that are in the lowest quartile of ROE for a given group of stocks. Similarly, values of 01, 10, and 11 would represent the other three quartiles. If we continued this scheme for other variables, we might be able to say that a certain string (pattern of Is and Os) would mean that we select stocks that are in the highest quartile of ROE, highest quartile of EPS growth, lowest quartile of P/E ratio, highest quartile of relative price strength, and so on.

Genetic algorithms typically start with a randomly generated population of strings. The strings then undergo various genetic operations, such as mutation and crossover (where two strings swap tails), and the population gradually evolves. The evolution is driven toward higher values of fitness. In an investing application, fitness could be the return earned from pursuing a certain strategy.

There are two major hurdles in using GAs: 1) mapping your problem into a string, the process of problem representation, can be difficult; and 2) sometimes, particularly in investing applications, seemingly obvious fitness values (called "fitness functions") can produce poor results because the system evolves toward a solution driven by uncommon quirks in the test data. New refinements to the basic technique, such as genetic programming, may lead to useful applications in the investing world.

**REVIEW QUESTIONS**

1. Explain the difference between descriptive and inferential statistics.
2. The monthly closing prices for VLO and TSO for the year 2005 are given in Table A.2. (The closing prices are adjusted for stock splits and dividends.)

TABLE A.2 Monthly Closing Prices for VLO and TSO

	VLO		TSO	
Date	A d j . Close*	Volume	A d j . Close*	Volume
3-Jan-05	25.89	6,327,590	31.71	1,156,805
1-Feb-05	35.49	11,433,242	36.78	1,283,473
1-Mar-05	36.5	14,312,645	36.87	1,496,781
1-Apr-05	34.14	19,363,771	37.79	1,944,952
2-May-05	34.24	15,281,285	43.48	1,586,209
1-Jun-05	39.47	11,828,418	46.39	1,481,663
1-Jul-05	41.3	11,438,900	48.09	1,213,225
1-Aug-05	53.2	18,753,469	57.69	1,948,447
1-Sep-05	56.48	24,614,095	67.12	3,366,504
3-Oct-05	52.57	23,972,552	61.04	3,137,700
1-Nov-05	48.1	17,303,419	55.07	2,545,585
1-Dec-05	51.6	11,718,461	61.55	1,698,647

Source: <http://finance.yahoo.com>

- a. Calculate the monthly return for each of these stocks.
  - b. Calculate the following for each of these stocks:
    - i. Arithmetic mean of the monthly returns
    - ii. Median monthly return
    - iii. Geometric mean monthly return
  - c. Explain why the mode is not a meaningful statistic for this data set.
3. Calculate the standard deviation of the monthly return for both VLO and TSO using the data provided in Question 2. Explain how the standard deviation relates to risk.
  4. What is the correlation coefficient for VLO and TSO? Explain what the correlation coefficient means.

5. Plot the monthly returns using TSO as the dependent variable and VLO as the independent variable.
  - a. Calculate the least-squares regression line.
  - b. What is the r-squared for the regression line? How is this number interpreted?
  - c. If the monthly return for VLO was 3.4%, given the regression equation, what would be your best estimate of the monthly return for TSO?

## TYPES OF ORDERS AND OTHER TRADER TERMINOLOGY

In the second half of this book, we cover strategies and tactics that can be used with technical analysis systems and patterns. Many of these strategies require knowledge of trading terms and how to tell a broker in trader language what to do. Here are some of the common terms used universally in the markets:

All or None (AON) Execute the entire order or none of it, but not some fraction.

Ask The price at which a seller is willing to sell.

Bid The price at which a buyer is willing to buy.

Day Order An order that, if not executed, expires at the end of the day. Most orders are assumed to be day orders unless otherwise specified.

Downtick A downtick is the opposite of an uptick in that the next previous different price was above the current price.

Fill or Kill (FOK) Execute an order immediately and completely, or cancel it.

Good 'Til Canceled Order (GTC) or Open Order An order that remains in effect until executed or cancelled. It usually has a time limit of several days to up to a month, at which time it must be renewed.

Immediate or Cancel (IOC) An order that must be executed immediately or it becomes void.

Leaves The unexecuted balance of an order.

Limit, Limited Order, or Limited Price Order An order to execute a stated amount at a specific or better price.

Liquidity The ability of the market to absorb a reasonable amount of transactions with a minimum effect on prices.

Long As opposed to short, a position of ownership. "I am long 100 shares of XYZ" means I own 100 shares of XYZ. "I am going long" means I am buying.

Market on Close (MOC) Execute at the close as near to the last sale as possible.

**Market Order** An order to execute a stated amount at the bid or offer price currently available in the marketplace. All orders are assumed to be market orders unless otherwise stated.

**Not Held** The broker is not "held" to the transactions on the tape. He can "work" the order.

**Odd Lot** Usually fewer than 100 shares.

**Offer** The price at which a seller is willing to sell.

**Opening Only or OPG** An order to be executed on the opening only and if not executed to be cancelled. This is valid for market and limit orders.

**Pegged Market** An order is pegged to buy on the best offer and sell on the best bid.

**Pull Back** An order to withdraw a current bid or offer.

**Quote** The highest bid and the lowest offer in a given market at a given time, sometimes including the volume at the bid and offer—usually called a "quote in size."

**Relative** Allows the customer to enter a more aggressive price than the current market price, and have the entered price stay within a fixed interval to the market should prices deteriorate.

**Round Lot** Usually 100 shares.

**Scale** An order to execute in increments—to sell into a rising market or buy into a declining market.

**Scale Order** A specific order to scale a specified amount at specific price variations.

**Seat** A membership in an exchange.

**Short** One has sold the security and owes it to the lender. "I am short 100 shares of XYZ" means I have borrowed and sold 100 shares of XYZ and at some time must buy it back and return it to the lender. "I am going short" means I am selling the security in anticipation of its price declining.

**Short Covering** Buy stock to return stock previously borrowed to make delivery on a short sale.

**Short Sale** A sale of a security that is not owned, usually entered in anticipation of a decline in price. A short sale, because the security is not owned but must be delivered to the buyer, requires that the security be borrowed (usually arranged by the broker) and at some time returned. When the security is "covered" with a "buy to cover" order, the security is returned, and the profit or loss in the position is determined by the difference between the price at which the security was bought and sold. Sometimes, the broker cannot borrow the stock, for a multitude of reasons, and the order to sell short will be denied.

**Stock Ahead** Other orders at the same price were placed on the book earlier and are ahead of the current order. Precedence for orders is based on when they were placed. These earlier orders may be executed without execution of the current order.

**Stop Limit Order** A stop order that becomes a limit order once the stop price is reached.

**Stop Order** An order to execute once a price reaches a certain level away from current price. A stop order becomes a market order once the specified price is reached. It may not be executed at the stop price. An example is "Buy 100 shares XYZ at 52 stop." Presumably, XYZ is trading below 52 currently, and the order states that should the price reach 52, then enter a market order to buy 100 shares. This type of order is principally used as protection against a sudden decline (a sell stop). For example, say you own 100 shares of XYZ at 50 and believe it will rise. To protect yourself from a major loss, you place a "sell 100 shares XYZ at 48 stop" to sell out your position at 48 or below when 48 is reached. Thus, if you are correct and XYZ rises, you profit, but if XYZ declines, you limit your loss to approximately two points. A stop order can also be entered if there is no current position, but if the analyst believes that a certain price is crucial and wants to enter a position once that price is reached. The stop order is the most important order of all orders because it can either enter a potential winning position or limit one's risk.

**Time in Force** The time limit for the order to be entered or cancelled.

**Uptick or Plus Tick** A term used to designate that the last price is above the next earlier price. A Zero Plus Tick is a term that designates the last price that is the same as the next earlier price but still above the last different price. Short sales of stocks usually must be executed on an uptick, though this rule may change soon. ETF short sales do not require an uptick, and neither do any futures markets. A downtick is the opposite of an uptick in that the next previous different price was above the current price.

**VWAP** The Volume Weighted Average Price for a stock. VWAP is calculated by adding the dollars traded for every transaction in that stock and dividing the total shares traded. It is used by institutions to measure the effectiveness of executions and as a target for daily executions.

## **AN ORDER TICKET**

An order ticket, whether on the Internet or on the broker's desk pad, usually includes the following:

Contract Description:

Underlying

Exchange

Security Type: Stock, Option, Future, Future Option, Warrant, Cash, Index, Bond

Currency

Expiration Date

Strike Price

Option Type: Call/Put

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