

# Introduction

**L**et's start by redefining the term "technical analysis." *Technical analysis is the systematic evaluation of price, volume, breadth, and open interest, for the purpose of price forecasting.* A systematic approach may simply use a bar chart and a ruler, or it may use all the computer power available. Technical analysis may include any quantitative analysis as well as all forms of pattern recognition. Its objective is to decide, in advance, where prices will go over some time period, whether 1 hour or 5 years. Technical analysis must have clear rules.

Technical analysis is no longer just the study of chart patterns or the identification of trends. It encompasses intramarket analysis, complex indicators, mean reversion, and the evaluation of test results. It can use a simple moving average or a neural network to forecast price moves. This book serves as a reference guide for all of these techniques, puts them in some order, and explains the functional similarities and differences for the purpose of trading.

## **THE EXPANDING ROLE OF TECHNICAL ANALYSIS**

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Quantitative methods for evaluating price movement and making trading decisions have become a dominant part of market analysis. Those who do not use methods such as overbought and oversold indicators are most likely to watch them along the bottom of their screen. The major financial networks are always pointing out price trends and double bottoms, and are quick to say that a price move up or down was done on low volume to show that it might be unreliable. These comments show the simplicity and the acceptance of technical analysis.

Events beginning in 2002 cast doubt on the integrity of the research produced by major financial houses that have a conflict between financing/underwriting and retail brokerage. The exposure of Enron also cause us to question the earnings, debt, quality of business, and other company data released to the public by large and small firms. It is not surprising that more quantitative trading methods have been adopted by these firms.

When decisions are made with clear rules and calculations that can be audited, those analysts recommending buys and sells are safe from scrutiny.

Extensive quantitative trading exists around the world. *Interest rate arbitrage* is a major source of revenue for banks. *Location arbitrage* is the process that keeps the price of gold and other precious metals the same all over the globe. *Program trading* keeps the price of individual stocks within a narrow band of the S&P futures and Spyder prices.

If you don't think of arbitrage as technical trading then consider market neutral strategies, where long and short positions are taken in related markets (pairs trading) in order to profit from the relative move, one stock rising or falling faster than the other. You might prefer to take advantage of the seasonality in the airline industry or try your hand trading soybeans. Both have clear seasonal patterns as well as years when other factors (such as the Iraqi War) overwhelm the seasonal factors. Trading seasonal patterns falls under technical analysis.

Technology that allows you to scan and sort thousands of stocks, looking for key attributes—such as high momentum, a recent breakout, or other indicator values—is also technical analysis on a broader scale.

Most impressive is the increase in managed funds that use technical and quantitative analysis. Many billions of investment dollars are trading using trend-following systems, short-term timing, mean reversion, and countless other techniques. Technical analysis allows you to backtest and estimate the expected risk, two great advantages to the fund manager. The use of technical analysis has infiltrated even the most guarded fundamental fortresses.

## **CONVERGENCE OF TRADING STYLES IN STOCKS AND FUTURES**

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The development of technical analysis has taken a different path for stocks and futures. This seems natural because the two markets cater to investors with different time frames. At the same time the markets place very different financial demands on the investor.

The original users of the futures markets were grain elevators and grain processors, representing the supply side and the demand side, respectively. The elevators are the grain wholesalers who bought from the farmers and sold to the processors. The futures markets represented the fair price and grain elevators sold their inventory on the Chicago Board of Trade in order to lock in a price (hopefully a profit). The processor, typically a bread manufacturer or feedlot operator, used the futures markets to lock in a low price for their material cost and as a substitution for the storage of inventory. Both producer (the sell side) and processor (the buy side) only planned to hold the position for a few weeks or a few months, until they either delivered their product to market or purchased physical inventory for production. There was no long-term investment. Futures contracts, just like stock options, expire every two or three months and can be traded for about one year; therefore, it is nearly impossible to “invest” in futures.

One other critical difference between futures and stocks is the leverage available in futures. When a processor buys one contract of wheat, that processor puts up a good faith

deposit of about 5% of the value of the contract. If wheat is selling for \$3.00 a bushel and a standard contract is for 5,000 bushels, the contract value is \$15,000. The processor need only deposit \$750 with the broker. The processor is essentially buying on leverage of 20:1.

Even in the 1970s, the futures trader paid an outrageous round-turn commission of \$50 per contract. This is about .3 of one percent, and was probably one of the highest commission ratios in the futures industry. Now, years after negotiated commissions have become part of the system, the fee is closer to \$8, or .05 of one percent. Commission costs are so low that they are not a consideration when trading futures.

How does the short holding period, high leverage, and low commissions affect trading in futures? Futures traders have short holding periods and tight risk controls. They use fast techniques and try to anticipate price moves. They don't invest—they trade. In the derivatives markets, *fast* is one to three days, and *slow* is anything longer than thirty days.

Although speculation has always had a place in the stock market, the investor, rather than the trader, has been the major force. The stock market is an investment in America. The growth of the economy parallels the growth and efficiency of industry. Of course, commissions and tax regulations played a large part in shaping the long-term view of the investor. With commission costs of 1% for each buy and sell order, it is not possible to be a short-term trader. That role was reserved for the market maker on the floor of the stock exchange. It is difficult to be a trader of any sort when you pare 2% from each of your trades. In addition, favorable tax treatment strongly encouraged holding positions for a long-term capital gain, at least six months. The uptick rule for selling discourages speculation on the decline of stock prices. And even now, short sales are not allowed in most retirement funds. Given the difference in the type of investor caused by commissions and regulation, the type of trading in stocks and futures was very different.

The change in stock trading has been in direct response to lower commission and is partly due to electronic trading. Where once you would have paid 25¢ to buy or sell Microsoft at \$25 (50¢ total for a trade), anyone can now pay \$10 per order—1¢ per share on a 1,000 share order—or slightly higher for smaller lots. That is a commission rate of .04%, four hundredths of one percent—right in line with futures.

Low commissions in stocks open up the possibility of fast trading. Low commissions do not resolve the issue of being able to execute a short sale as quickly as a buy, and they do not provide the leverage of the futures markets, but they do expand the opportunities. In index markets, which have exceptionally high volatility, short-term trading has become popular. Stock traders now look to the methods used by futures traders to identify trends faster and use tighter risk control.

## **A LINE IN THE SAND BETWEEN FUNDAMENTALS AND TECHNICALS**

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The market is driven by fundamentals. It is also driven by consumer confidence, supply and demand, geopolitical factors, and expectations of price movement. It is just too difficult to trade using those facts. There is no timely indication that the value of a company

has changed, that supply has increased, that the world has resolved its differences, or that expectations have changed. Recently we have had the disturbing realization that the data we use to make fundamental decisions may not be reliable.

Technical analysis, when used to determine the long-term direction of prices, attempts to objectively evaluate these complex fundamentals. It is no different from the economists who use regression, seasonal, and cyclic analysis to forecast the economy. The technical trader can use those tools as well as chart trendlines, pattern recognition, and probability distributions. Perhaps the economists are doing the same thing.

It is well known that the Federal Reserve monitors trading and prices in order to decide how to time their rate changes and, when necessary, their currency intervention. Even the Fed knows that, when the dollar is falling like a rock, you don't try to catch it. If the public wants to sell the dollar, the Fed doesn't have enough clout to stop it. It must use its resources carefully, and it uses market know-how and price analysis to time its actions.

The primary advantages of a technical approach are that it is objective and completely self-contained. The accuracy of the data is certain. One of the first great advocates of price analysis, Charles Dow, said:

*The market reflects all the jobber knows about the condition of the textile trade; all the banker knows about the money market; all that the best-informed president knows of his own business, together with his knowledge of all other businesses; it sees the general condition of transportation in a way that the president of no single railroad can ever see; it is better informed on crops than the farmer or even the Department of Agriculture. In fact, the market reduces to a bloodless verdict all knowledge bearing on finance, both domestic and foreign.*

Much of the price movement reflected in any market is anticipatory; it results from the expectations of the effects of macroeconomic developments or the outcome of good corporate management and new products. Markets, however, are subject to change without notice. For example, the government may block the merger of two companies, or approve or reject a new drug. A hurricane bound for the Philippines may send sugar prices higher, but if the storm turns off course, prices may reverse. Anticipation of employment reports, housing starts, or corn production reports causes highly publicized professional estimates, which may correctly or incorrectly move prices before the actual report is released. Markets then react to the accuracy of the estimates rather than to the economic data itself. By the time the public is ready to act, the news is already reflected in the price.

## **PROFESSIONAL AND AMATEUR**

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Beginning technical traders may find a system or technique that seems extremely simple and convenient to follow, one that seems to have been overlooked by the professionals. Most often there is a simple reason why that method isn't used. As you learn more about

trading, you'll find that you may not be able to get good execution with a given system, or the risk is much higher than you originally expected, or that the system has too many losses in a row. Trading is a business, not one to be taken casually. As Richard Wyckoff said, "Most men make money in their own business and lose it in some other fellow's." Plan to invest your time before your money, so that when you begin trading, you have more realistic expectations.

To compete with a professional speculator you must be more accurate in anticipating the next move or in predicting prices from current news—not the article printed in today's newspaper ("Government Approves New AIDS Drug"), which was discounted weeks ago, and not the one on the wire service ("15% Fewer Soybeans and 10% More Fishmeal"), which went into the market two days ago. You must act on news that has not yet been printed. In order to anticipate changes, you must draw a single conclusion for the many contingencies possible from fundamental data, or

- Recognize recurring patterns in price movement and determine the most likely results of such patterns.
- Determine the "trend" of the market by isolating the basic direction of prices over a selected time interval.

The bar chart, discussed in Chapter 3, is the simplest representation of the market. These patterns are the same as those recognized by Jesse Livermore on the ticker tape. Because they are interpretive, more precise methods such as point-and-figure charting are also used, which add a level of exactness to charting. Point-and-figure charts are popular because they offer specific trading rules and show formations similar to both bar charting and ticker-tape trading.

Mathematical modeling, using traditional regression or discrete analysis, has become a popular technique for anticipating price direction. Most modeling methods are modifications of developments in econometrics and basic probability and statistical theory. They are precise because they are based entirely on numerical data.

The proper assessment of the price trend is critical to most trading systems. Countertrend trading, which takes a position opposite to the trend direction, is just as dependent on knowing the trend as a trend-following technique. Large sections of this book are devoted to the various ways to isolate the trend, although it would be an injustice to leave the reader with the idea that a "price trend" is a universally accepted concept. There have been many studies published claiming that price trends do not exist. The most authoritative papers on this topic are collected in Cootner, *The Random Character of Stock Market Prices* (MIT Press, 1964); more recent and readable discussions can often be found in the *Financial Analysts Journal*, an excellent resource.

Personal money management has gained an enormous number of tools during this period of computerized expansion. The major spreadsheet providers include linear regression and correlation analysis; there is also inexpensive software to perform spectral analysis and apply advanced statistical techniques. There is an Excel add-in, Solver, that can easily be adapted to portfolio allocation. Development software such as TradeStation and

MetaStock have provided trading platforms and greatly reduced the effort needed to program your ideas. Professionals maintain the advantage of having all of their time to concentrate on the investment problems; however, nonprofessionals are no longer at a disadvantage.

## **RANDOM WALK**

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It has been the position of many fundamental and economic analysis advocates that there is no sequential correlation in the direction of price movement from one day to the next. That is, prices have no memory of what has come before—this has been named the “random walk” theory. Prices will seek a level that will balance the supply-demand factors, but that this level will be reached either instantaneously, or in an unpredictable manner as prices move in an irregular response to the latest available information or news release.

If the random walk theory is correct, the many well-defined trading methods based on mathematics and pattern recognition will fail. The problem is not a simple one, but one that should be resolved by each system developer because it will influence the type of systematic approaches studied in this book. There are two arguments against random movement in prices.

The first argument is simply the success of many fully technical trading strategies. There is definitive documentation of performance for systematized arbitrage programs, hedge funds, and derivatives funds, showing success for many years. This is not to say that all technical programs are successful—far from it. But neither are fundamental methods. You still need a sound strategy, whether discretionary or automatic, in order to be profitable. Not everyone can create and implement such a strategy.

The second argument against the random walk is that prices move on anticipation. One can argue academically that all participants (the market) know exactly where prices should move following the release of news. However practical or unlikely this is, it is not as important as market movement based on anticipation of further movement. For example, if the Fed lowered rates twice this year and the economy has not yet responded, would you expect it to lower rates again? Of course you would. Therefore, as soon as the Fed announces a rate cut you can speculate on the next rate cut. When most traders hold the same expectations, prices move quickly to that level. Prices then react to further news relative to expectations. Is this price movement that conforms to the random walk theory? No. But price movement can appear, theoretically, similar to random movement.

Excluding anticipation, the apparent random movement of prices is dependent on both the time interval and the frequency of data observed. When a long time span is used, from 1 to 20 years, and the data averaged to enhance the smoothing process, the trending characteristics appear more clearly, along with seasonal and cyclic variations. Technical methods, such as moving averages, are often used to isolate these price characteristics. Averaging daily or weekly data to create monthly or quarterly prices smoothes out irregular short-term movements, resulting in higher correlations between successive prices.

With less frequent data it is easier to see a trend. In general, the use of daily data shows more noise (random movement) than data of less frequency.

In the long run, prices seek a level of equilibrium. For stocks, equilibrium is where the return on investment (appreciation of share value plus dividends), balanced with the risk of the investment, puts it on an equal footing with the returns of a risk-free investment, such as Treasury notes. In futures, equilibrium is the balance between supply and demand.

Prices do not move in a symmetric pattern and they do not have a normal distribution, two additional facts that argue against random walk. The asymmetry of the index markets, in particular those built on traditional stocks, are easy to understand because the public consists overwhelmingly of buyers. But it is also the nature of price movement to show unique patterns when prices move farther from their normal value during periods of exceptional supply and demand imbalance. When looking at price movement in terms of “runs”—hours or days when prices continue in the same direction for an unusually long sequence—we find that price data has a *fat tail*, representing much longer runs than can be explained by a normal distribution. The existence of a fat tail also means that some other part of the distribution must differ from the norm because the extra data in the tail must come from somewhere else. Throughout this book we refer to these differences in price patterns as the reason why certain trading methods work.

Price movement is driven by people, and people can buy and sell for nonrandom reasons, even when viewed in large numbers. People create price distribution opportunities that allow traders to profit. The long-term trends that reflect economic policy, normally identified by quarterly data, can be of great interest to longer-term *position traders*. It is the short-term price movements caused by anticipation (rather than actual events), extreme volatility, prices that are seen as far from value, countertrend systems that rely on mean reversion, and those that attempt to capture trends of less duration that are the primary focus of this book.

It is always worthwhile to understand the theoretical aspects of price movement, because it paints a picture of the way prices move. Many traders have been challenged by trying to identify the differences between an actual daily price chart and a synthetic one, created using random numbers. There are differences, but they will seem more subtle than you would expect. The ability to identify these differences is the same as finding a way to profit from actual price movements. A trading program seeks to find ways to operate within the theoretical framework, looking for exceptions, selecting a different time frame and capturing profits—and all without ignoring the fact that most of the price movements is very close to random.

## BACKGROUND MATERIAL

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The contents of this book assume an understanding of the stock market and related futures market, such as the S&P 500 and Treasury notes. These futures markets have a great impact on stock patterns and trade 24 hours a day. The workings of those markets

are not explained although they are simple to understand. Ideally the reader should have read one or more of the available trading guides and should understand the workings of a buy or sell order and the specifications of contracts in futures. Experience in actual trading would be helpful. A professional trader, a broker, or a purchasing agent will already possess all the qualifications necessary, as will any businessperson who understands how prices reflect earnings and the need to accumulate inventory at the lowest price. Individuals who manage their own stock portfolio or watch one of the financial news networks are also qualified. It also helps if you enjoy playing any competitive game including board games and crossword puzzles. You like to win.

There are excellent books available to both the beginning and advanced trader. The ones that stand out as excellent sources of general information are Jack Schwager's two-volume set, *Schwager on Futures* (Wiley, 1995), which includes one volume on fundamental analysis and one on technical analysis. John Murphy's *Technical Analysis of the Futures Markets*, 2nd Edition (New York Institute of Finance, 2001) and *Intermarket Technical Analysis* (Wiley, 1991) are highly recommended. There are excellent books on more specific topics. Of these you should consider reading John Bollinger's *Bollinger on Bollinger Bands* (McGraw-Hill, 2002) and Martin Pring's *Pring on Market Momentum* (International Institute for Economic Research, 1993). Two other more comprehensive books worth considering are Peter Bernstein's *The Portable MBA in Investment* (Wiley, 1995) and *The Encyclopedia of Technical Market Indicators* by Robert W. Colby and Thomas A. Meyers (Dow Jones Irwin, 2002); the latter offers an intelligent description of the calculation and trading performance of many market indicators that could be used by traders. Comparing the results of different indicators side by side can give you valuable insight into the practical differences in these techniques.

The basic reference book for general contract information has always been the *Commodity Trading Manual* (Chicago Board of Trade), but each year *Futures* magazine publishes a *Reference Guide* which gives the trading hours, contract size, and other specifications of the primary futures and options markets traded around the world. All of this information is also available on the Internet. For reviewing the basics there is Little and Rhodes, *Understanding Wall Street*, 3rd Edition (McGraw-Hill, 1991), and Todd Lofton's, *Getting Started in Futures*, 4th Edition (Wiley, 2001). The introductory material is not repeated here.

A good understanding of the most popular charting method requires reading the classic by Edwards and Magee (and now Bassetti), *Technical Analysis of Stock Trends*, 8th Edition (originally published by John Magee), a comprehensive study of bar charting. For a constant flow of both classic and new techniques, the magazines *Technical Analysis of Stocks & Commodities*, *Futures*, and *Active Trader* have numerous articles on trading systems and methods. A basic understanding of market phenomena and relationships, often requiring some math skill, can be found in the *Financial Analysts Journal*.

On general market lore and to provide motivation when trading is not going as well as expected, the one book that stands out is Lefèvre, *Reminiscences of a Stock Operator* (originally published by Doran, reprinted by Wiley in 1994). Wyckoff mixes humor and philosophy in most of his books, but *Wall Street Ventures and Adventures through Forty*

*Years* (Harper & Brothers) may be of general interest. More recently, Jack Schwager's *Market Wizards* (New York Institute of Finance, 1989) has been very popular.

There are a number of associations and user groups that can be very helpful to traders at all levels. The Market Technician's Association (MTA), found at [www.MTA.org](http://www.MTA.org), offers a Certified Market Technician credential, and the Association for Investment Management Research (AIMR) offers the Charter Financial Analyst (CFA) credential. For those with higher math skills, the International Association of Financial Engineers (IAFE) offers excellent resources, and the TradeStation users groups, found in larger cities and on the Internet, can be a means for solving a difficult problem.

As for this book, a reader with a good background in high school mathematics can follow everything but the more complex parts. An elementary course in statistics is ideal, but a knowledge of the type of probability found in Edward Thorp's *Beat the Dealer* (Vintage, 1966) is adequate. Fortunately, computer spreadsheet programs, such as Excel and Quattro allow anyone to use statistical techniques immediately, and most of the formulas in this book are presented in such a way that they can be easily adapted to spreadsheets. Even better, if you have a computer with trading software, such as TradeStation Technologies' TradeStation Platform, MetaStock, or any number of other products, you are well equipped to continue. If you have a live data feed, such as CQG, you will also have access to technical studies that you will also find very helpful.

## RESEARCH SKILLS

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Before starting, there are nine guidelines that may help make the task of developing a trading system easier.

- 1. Know what you want to do before you start.** Base your trading on a sound premise. It could be an observation of how prices move in response to Government policy, a theory about how prices react to economic reports, or simply a pattern that shows up at the same time each day or each month. This is the *underlying premise* of your method. It cannot be discovered by testing everything on a computer. You need to know it in advance.
- 2. State your idea or question in its simplest form.** The more complex it is, the more difficult it will be to evaluate the answer. More complex methods do not usually work as well as simple ones.
- 3. Do not assume anything.** Many projects fail on basic assumptions that were incorrect. It takes practice to avoid making assumptions and to be critical of certain elements that you believe to be true. Prove everything to your own satisfaction.
- 4. Try the simplest and most important parts first.** Some of the rules in your trading program will be more important than others. Try those first. It's best to understand how each rule or technique contributes to the final system. Then build slowly and carefully to prove the value of each element of the system.

5. **Build one step at a time.** Go on to the next step only after the previous ones have been tested successfully. If you start with too many complex steps and fail, you will have to simplify to find out what went wrong. The ability to readily understand the operation of each part of your system is called a *transparent solution*, rather than a *fully integrated* or *complex* one. Transparent solutions are very desirable.
6. **Watch for errors of omission.** It may seem odd to look for items that are not there, but you must continually review your work, asking yourself if you have included all the necessary costs and accounted for all the risk. Simply because all the questions were answered correctly does not mean that all the right questions were asked. Important questions may be missing.
7. **Question the good results.** There is a tendency to look for errors when results are extremely bad, but to accept the results that are very good. Exceptionally good results are just as likely to be caused by errors in rules, formulas, or data. They need to be checked as carefully as extremely bad results.
8. **Do not take shortcuts.** It is sometimes convenient to use the work of others to speed up the research. Check their work carefully; do not use it if it cannot be verified. Check your spreadsheet calculations manually. One error can ruin all of your hard work.
9. **Start at the end.** Define your goal and work backwards to find the required input. In this way, you only work with information relevant to the results; otherwise, you may expend a lot of unnecessary effort.

## OBJECTIVES OF THIS BOOK

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This book is intended to give you a complete understanding of the tools and techniques needed to develop or choose a trading program that has a good chance of being successful. Execution skill and market psychology are not considered—only the strategies, the methods for testing those strategies, and the means for controlling the risk. This is a goal of significant magnitude.

Not everything can be covered in a single book; therefore, some guidelines were needed to control the material included here. Every technique in this book qualifies as systematic; that is, each has clear rules. Most of them can be automated. We begin with basic concepts, including definitions, how much data to use, how to create an index, some statistics and probability, and other tools that are used throughout the book. The next several chapters cover the techniques that are most important to trading, such as identifying the trend, followed by momentum. Other chapters are organized by common grouping so that you can compare the different ways that similar problems have been solved. Although charting is an extremely popular technique, it is included only to the degree that it can be compared with other systematic methods, or when various patterns can be used in a computerized program (such as identifying support and resistance) or channels. There has been no attempt to provide a comprehensive text on charting; how-

ever, various formations may offer very realistic profit objectives or provide reliable entry filters.

Neither stock options nor options on futures are included in this book. Although there are strategies that combine outright trading of stocks or futures with options, the subject is too large and too specialized to be included here. There are already many good books on options strategies.

This book does not attempt to prove that one system is better than another, because it is not possible to know what will happen in the future or how each reader will cleverly apply these techniques. Instead the book evaluates the conditions under which certain methods are likely to do better and situations which will be harmful to specific approaches. By grouping similar systems and techniques together, you should be able to compare the differences and study the results. Seeing how analysts have modified existing ideas can help you decide how to proceed and give you an understanding of why you might choose one path over another. By seeing a more complete picture, common sense should prevail over computing power.

## **PROFILE OF A TRADING SYSTEM**

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There are quite a few steps to be considered when developing a trading program. Some of these are simply choices in style, while others are essential to the success of the results. They have been listed here and are discussed briefly as items to bear in mind as you continue the process of creating a trading system.

### **Changing Markets and System Longevity**

Markets are not static. They evolve as does everything else. During the past ten years, changes in the markets have continued at an astounding rate. These changes fall into the categories of technology, participation, globalization, and the cost of doing business.

Technology includes communications, trading equipment (primarily computers and handheld devices), and electronic exchanges and order entry. These innovations have accelerated the trading process, provided faster access to quotes, and created instantaneous order entry based on computerized strategies. Electronic markets have changed the nature of the order flow and made information about buyers and sellers more accessible. It has accelerated the process and changed the way prices react to news.

Increased participation is the result of the historic bull market of the 1990s, financial news networks, better communications, computers, and computer software that is user-friendly and readily installed in anyone's home. More participation has changed the level of noise in individual stocks and futures, but it is most obvious in the index markets. Noise results from a large, constant flow of orders placed for unrelated reasons.

Globalization is mostly the result of the reliability of advances in communications. Not only can we see the same news at the same time everywhere in the world, but we can pass information quickly via the Internet or telephone. Equally important, we do not

think about the reliability of this communication. We expect our televisions, telephones, and Internet connections to work without question. When we trade, we are willing to bet on it.

The dramatic reduction in commission cost has been a major influence on trading, opening up opportunities for the fast trader. Negotiated commissions have served the God of Competition. For institutions, stock transactions can be done at far less than 1¢ per share, and for the general public, anyone can get \$10 per order. This not only facilitates fast trading but encourages greater participation. Everyone wins.

The challenge for the trader is to find a system that will adapt to future changes, whatever they are. Most changes are not sudden, but are gradually reflected in price patterns. The steady change in the percentage of institutional volume compared to individual trader orders will slowly alter price patterns. The increase in overall participation affects the level of market noise and may also affect volatility and risk. Index arbitrage and the trading of indices force the component stocks to move in the same direction regardless of their individual fundamentals. The creation of your own successful trading program may require the utmost simplicity or the inclusion of features that adapt to an uncertain future. It is both challenging and rewarding to create a program with longevity.

## **The Choice of Data**

System decisions are limited by the data used in the analysis. Although price and volume for the specific stock or futures market may be the definitive criteria, there is a multitude of other valid statistical information that might also be used. Some of this data is easily included, such as price data from companies in the same sector or industrial group, or the current yield curve relationship. Other statistical data, including the wide range of U.S. economic reports and weekly energy inventories, may add a level of robustness to the results but are less convenient to obtain and less timely.

## **Diversification**

Not all traders are interested in diversification, which tends to reduce returns at the same time it limits risk. Concentrating all of your resources on a single market that you understand may produce a specialized approach and much better results than using a more generalized technique over more markets. Diversification may be gained by trading two or more unique strategies applied to the same market, instead of one strategy used on a broad set of markets.

## **Time Frame**

The time frame of the data impacts both the type of system and the characteristics of the results. Using five-minute bars introduces considerable noise into your program, making it difficult to find the trend, while using only weekly data puts the greatest emphasis on the trend to the exclusion of other techniques. A shorter time may guarantee faster response to price changes, but does not assure better results. Using more frequent data

usually results in a shorter holding period for the trade and greater sensitivity to execution. There is no universal trading system that works in all time frames. You will need to learn whether you are best trading fast or slow, then concentrate in that area.

### **Choosing a Method of Analysis**

Some methods of analyzing the market are more complex than others. This has no bearing on the final success. All good trading methods begin with a sound premise. You must first know what you are trying to extract from the market before you select a technique. If you want to capitalize on long interest rate trends or the result of government policy, then a weekly moving average or trend system is the place to start. If you see false breakouts whenever the price penetrates the high of the day in the second half of the trading session, you should look at a momentum indicator based on 5-, 10-, or 15-minute data. First isolate the idea, then choose the tool.

### **Trade Selection**

Although a trading system produces signals regularly, it is not necessary to enter all of them. Selecting one over another can be done by a method of filtering. This can be a confirmation of another technique or system, a limitation on the amount of risk that can be accepted on any one trade, the use of outside information, or the current volume. Many of these additional rules add a touch of reality to an automated process. You may find, however, that too many filters result in no trading.

### **Testing**

There is a lot of emphasis in this book on testing and the way to evaluate test results. A mistake in testing may cause you to trade a losing strategy or discard a profitable one. Back-testing is the only option available to confirm or validate your ideas. Testing is misguided when it is used to “discover” a successful trading method by massive scanning of combinations of techniques. The purpose of testing is to validate an idea and show robustness—that the method works over a wide range of situations in a similar manner. It can also provide a good indication of expectations, both returns and risk. A robust solution, one that works on many stocks or across similar markets, is not as good as the optimized results of a single stock. But using the same system for all stocks in the same sector will give you a more realistic assessment of expectations and a much better chance of success.

### **Risk Control**

Trading survival is based on risk control. Most analysts believe that nearly any system can be profitable with proper risk management. This also means that any system can lead to ruin without risk controls. Risk must be addressed at the individual trade level by using a strategy with entry and exit signals that minimize losses, such as a simple but fast trend method. Trade risk can also be controlled using a stop-loss. Risk must also be managed

at the portfolio level by diversification and correct allocation of size to each asset. Futures traders must also pay attention to leverage. Risk management does not need to be complex, but it has many tiers.

## Order Entry

A system that performs well on paper may be dismal when actually traded. Part of a trading program is knowing how to enter and exit the market, as well as having realistic expectations about the transaction costs, both commissions and slippage. Short-term, fast trading systems are most sensitive to transaction costs because the expected profit on each trade is small. Directional trading strategies, those that buy as prices are rising and sell when they are falling, have larger slippage than mean reversion techniques.

There is equal damage in overestimating costs as there is in underestimating them. By burdening a system with unrealistic fees, tests may show a loss instead of a profit, causing you to reject a successful trading method.

## Performance Monitoring and Feedback

A system is not done when you begin trading; it is only entering into a new phase. Actual trading results must be carefully monitored and compared with expectations in order to know if it is performing properly. It is very likely that slippage will result in some changes to the system rules or to the size of the position traded. Performance monitoring provides the essential feedback needed to be successful. Even a well-designed and well-tested program may start out badly, but proper monitoring can put it on track.

## A WORD ABOUT THE NOTATION USED IN THIS BOOK

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In order to make the contents of this book more useful for trading, many of the traditional mathematical formulas are also shown as a single line in Microsoft's Excel notation, as well as TradeStation's EasyLanguage. EasyLanguage can be understood by anyone who knows the programming language BASIC or FORTRAN.

There are also more complex systems and indicators that appear in both Excel and EasyLanguage, but mostly in the latter. Although these programs have been entered and tested on TradeStation, there are occasional errors introduced during final editing and in transferring the code into this book. Recent market activity may also produce combinations of price movement that did not occur during testing. Readers are advised to check over the code and test it thoroughly before using it.

Computer software used to develop trading strategies may vary in the notation they use to express the simplest statistical functions. For the standard deviation, Excel uses *stdev* while Easy Language uses *stddev*. One program expects the mean to be *avg* while another requires *average*. Please check each formula and solution for notation consistent with your needs.