CHAPTER 1

Introduction

It is not the strongest of the species that survive, nor the most intelligent, but the ones most responsive to change.

—Charles Darwin

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Let'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 calculation 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, 1 day, or 5 years. Technical analysis must have clear and complete 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. It includes some aspects of portfolio construction and multilevel risk control, which are integral parts of successful trading.

THE EXPANDING ROLE OF TECHNICAL ANALYSIS

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. The 200-day moving average seems to be the benchmark for trend direction. 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 collapse of Enron has caused 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 research 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 the overall stock market from diverging from S&P futures and SPY (the SPDR ETF) prices. Recently these fully automated systems have been called *algorithmic trading*.

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 one stock rising or falling faster than the other. If you change your time horizon from hours and days to milliseconds, you have high frequency trading. 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 a disruption in energy supply) overwhelm the seasonal factors. Trading seasonal patterns falls under technical analysis.

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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. High frequency trading, arbitrage that lasts only milliseconds, has become a profit center for large financial institutions, but involves placing computer equipment as close to the source of the exchange price transmission as possible—a contentious issue. High frequency trading is credited for adding liquidity by increasing volume in equities trading, but has also been blamed (perhaps unfairly) for spectacular, highly volatility price moves.

Most impressive is the increase in managed funds that use technical and quantitative analysis. Many billions of investment dollars are traded using trend-following systems, short-term timing, mean reversion, and countless other techniques. It is thought that well over half of all managed money uses algorithmic trading. 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

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

and different commercial interests. 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. 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 processors, typically bread manufacturers or meat packers, used the futures markets to lock in a low price for their material cost and as a substitute for holding 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, simply a hedge against risk. Futures contracts, similar to stock options, expire every two or three months and can be held 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 $10.00 a bushel and a standard contract is for 5,000 bushels, the contract value is $50,000. The processor need only deposit $2500 with the broker. The processor is essentially buying with leverage of 20:1.

In the 1970s, the futures trader paid an outrageous round-turn commission of $50 per contract. This is about 0.3 of 1 percent, far less than the stock market cost of 1%, but 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 0.05 of one percent. Commission costs are so low that they are not a consideration when trading futures. To be fair, the cost of trading equities has also dropped in the same way, but favors those trading larger positions.

How do the high leverage and low commissions affect trading in futures? Low costs allow short holding periods. Floor traders don't invest—they look to scalp the market or capture a fast, volatile price move. In the derivatives markets, *fast* is 1 to 3 days, and *slow* is anything longer than 30 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. When commission costs were 1% for each buy and sell order, it was 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. Even now, some mutual funds charge high fees or penalties for liquidating a position before six months or one year. In addition, favorable tax treatment strongly encouraged holding positions for at least six months to satisfy the long-term capital gain rule. The uptick rule for selling discouraged speculating on the decline of stock prices, and while it is not in effect at this time, politicians are inclined to reinstate it in the belief

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that it will reduce market volatility. Even now, short sales are not allowed in most retirement funds. To get around these rules, exchange-traded funds (ETFs) such as SPY and QQQ allow buying and short selling with no expiration date and low cost. The main differences between trading ETFs and futures is that futures allow leverage, trade in larger size, expire at fixed intervals, and are guaranteed by a major institution, such as the Chicago Mercantile Exchange. Because of the low cost in stocks and the new trading vehicles in the form of ETFs, stock traders now look to the methods used by futures traders to identify trends and mean-reverting opportunities faster and use tighter risk controls.

A LINE IN THE SAND BETWEEN FUNDAMENTALS AND TECHNICAL ANALYSIS

The market is driven by fundamentals. These are often employment, GDP, inflation, consumer confidence, supply and demand, or geopolitical factors—all of which create expectations of price movement. But it is just too difficult to trade using those facts, and economists have never been very accurate. Economic reports are not usually timely, and individual companies are not forthcoming about problems. We have had too many cases where the data we use to make fundamental decisions about individual companies have been unreliable. We can add that to the conflict of interest inherent in the government's calculation of the Consumer Price Index, because an increase in the CPI requires that all those receiving Social Security checks get a cost-of-living increase.

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.

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It is well known that the Federal Reserve monitors trading and prices in order to decide how to time their interest rate changes and, when necessary, their currency intervention. All monetary authorities know that when their currency is rising too fast, you don't try to stop it. If the public wants to buy the Japanese yen, the Central Bank doesn't have enough clout to stop it unless it first waits for the move to be exhausted. 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 well-defined. 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 will send sugar prices higher, but if the storm turns off course, prices 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

Beginning technical traders may find a system or technique that seems extremely simple and convenient to follow, one that appears to have been overlooked by the professionals. Most often there is a simple reason why that method is not used. As you learn more about trading, you find that execution is difficult, or the risk is much higher than 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.

That does not mean that simple systems don't work, but that each has a return and risk profile that is typical of that style and difficult to change. One purpose of this book is to present many different trading methods, each with its own risk and reward profile, so that each trader understands the true cost of trading.

To compete with a professional speculator you must be more accurate in anticipating the next move. This can be done by

- Recognizing recurring patterns in price movement and determining the most likely results of such patterns.
- Identifying 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, in the early 1900s, 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.

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Mathematical modeling, using traditional regression or statistical 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; however, they need trading rules to make them operational.

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 identify 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*; very readable discussions can be found in the *Financial Analysts Journal*, an excellent resource.

Personal money management has an enormous number of tools, many of which can be found in Excel and other spreadsheet software. These 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. Trading systems development software, such as TradeStation and MetaStock, have provided 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.

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RANDOM WALK

It has been the position of many advocates of fundamental and economic analysis 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 came before—this has been named the *random walk* theory. Prices will seek a level that will balance the supply-demand factors, but that level will be reached either instantaneously, or in an unpredictable manner, as prices move in 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 that best suits them. There are two arguments against random movement in prices.

The first argument is simply the success of many algorithmic trading strategies. There is definitive documentation of performance for systematized arbitrage programs, hedge funds, and derivatives funds, showing success for upwards of 20 or 30 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 systematic, 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 would 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 the actual pattern of price movement can appear 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 smooth 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 weekly or monthly data.

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, is 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 stress, or 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. For example, an investment fund will enter the

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market without regard to timing, based on their monthly additions or redemptions. This in turn moves prices and creates 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 prices reversing direction, and those that attempt to capture trends of less duration that are the primary focus of this book.

DECIDING ON A TRADING STYLE

It may seem backwards to talk about a trading style in advance of reading all the material, but many traders have already decided that they want to day trade or hold long-term positions because it suits their disposition, their belief of what moves prices, or their time schedule. With that in mind, short-term and long-term traders will focus on different strategies and markets, while portfolio structure and risk control will be much the same for either approach.

To understand how markets and different trading styles work together, consider a daily chart of any market, an individual stock, a short-term interest rate futures contract, or the S&P 500 index. There are periods of trending and sideways patterns. However, if you change that chart from daily to weekly, or daily to monthly, the long-term trend emerges. It is much easier to see the trend when you use fewer data points over a longer time interval. The presentation of the chart smoothes the appearance of the data (see Figures 1.1 and 1.2).

Now go in the other direction, using 20-minute bars instead of a daily chart. The trend is more difficult to see. What appeared to be a smooth period leading up to the peak

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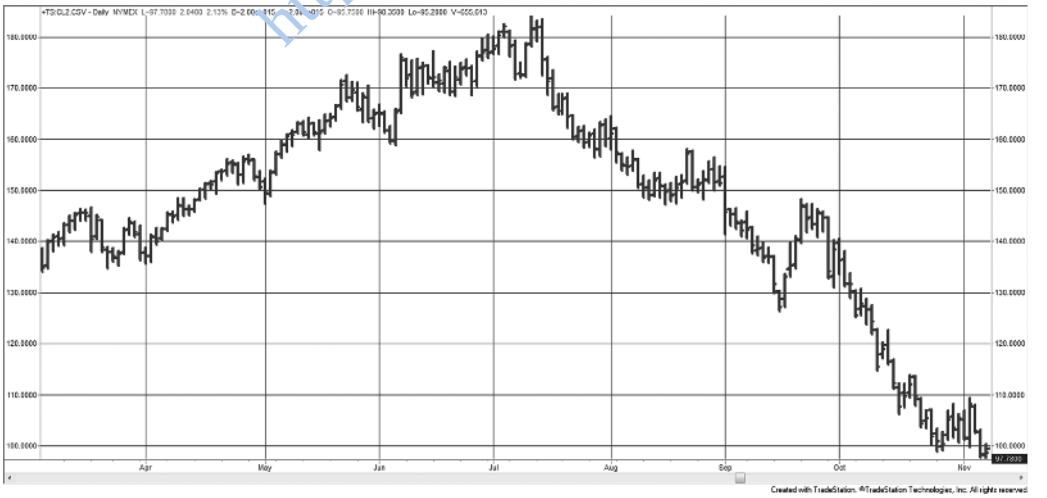

FIGURE 1.1 Crude oil daily chart with July 2008 in the center.

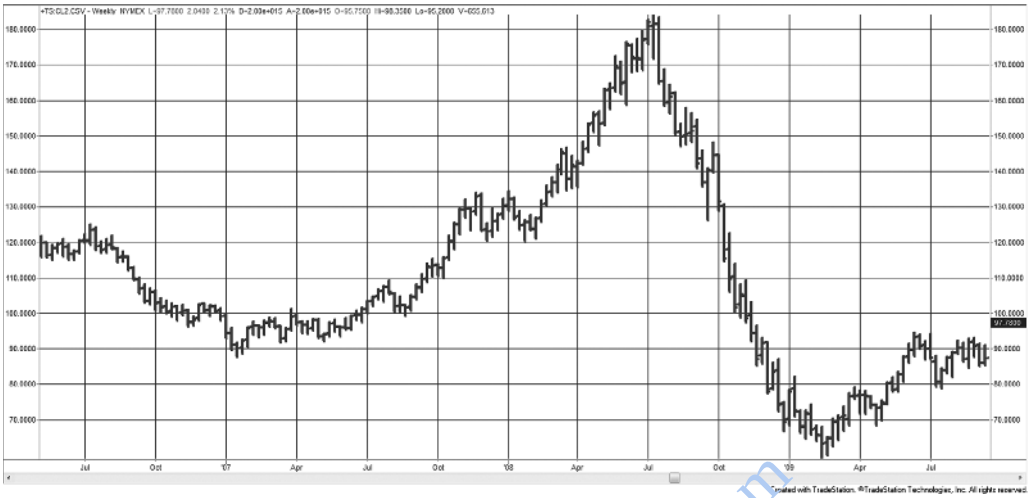

FIGURE 1.2 Crude oil weekly chart with July 2008 to the right of center.

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in July 2008 (Figure 1.3), now looks very erratic. As the bars become shorter, the price noise appears to increase.

Selecting a price frequency that complements your trading strategy is often ignored by traders. If you are a long-term, macrotrend follower, then you want the price series that shows more trends, which are improved by monthly, weekly, or daily charts, although monthly is generally too low frequency for traders. Short-term traders focus on mean reversion or fast directional price moves, and that strategy is enhanced using higher-frequency data, such as hourly or 15-minute bars.

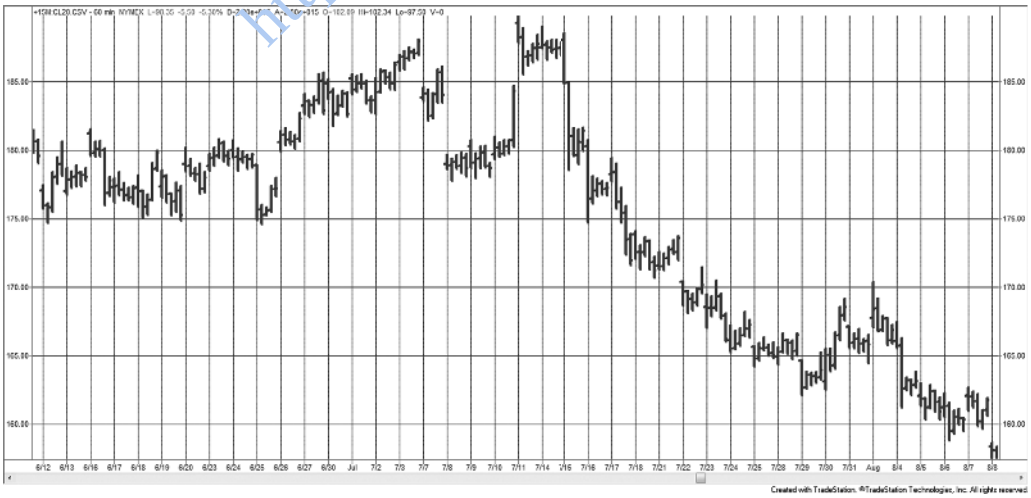

FIGURE 1.3 Crude oil 20-minute chart with July 2008 in the center.

MEASURING NOISE

The need to select the data frequency that best suits the strategy can be verified by measuring price *noise*. Noise is the erratic movement that surrounds the underlying direction of prices at any time. High noise can be compared to a drunken sailor's walk, while low noise is a straight line from the starting to the ending point.

There are a number of ways to measure noise, including *price density*, *efficiency ratio* (also called *fractal efficiency*), and *fractal dimension*. It is important that these measurements remove volatility because noise should not be confused with volatility. In Figure 1.4 a short, hypothetical period of price movement gives an example of noise measured by the efficiency ratio (ER). ER is calculated by dividing the net move (the change for point A to point B) by the sum of the individual moves during that period, each taken as positive numbers.

$$\textit{Efficiency ratio} = \frac{\textit{Net change in price (as a positive number)}}{\textit{Sum of individual price changes (as positive numbers)}}$$

or

$$ER_t = \frac{|P_t - P_{t-n}|}{\sum_{i=t-n}^{i=t} |P_i - P_{i-1}|}$$

where n is the calculation period.

Figure 1.5 illustrates the relative level of noise that might comprise a price move of the same net change. The straight line indicates no noise, the smaller changes that move above and below the straight line would be medium noise, and the large swing are high noise. However, in this example it is not possible to distinguish the level of noise from volatility, yet they are not the same. In Figure 1.6, the net change in price is from 440 to

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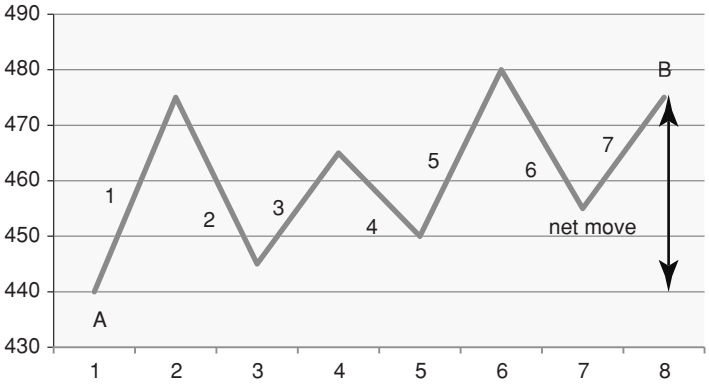

FIGURE 1.4 Basic measurement of noise using the efficiency ratio (also called fractal efficiency).

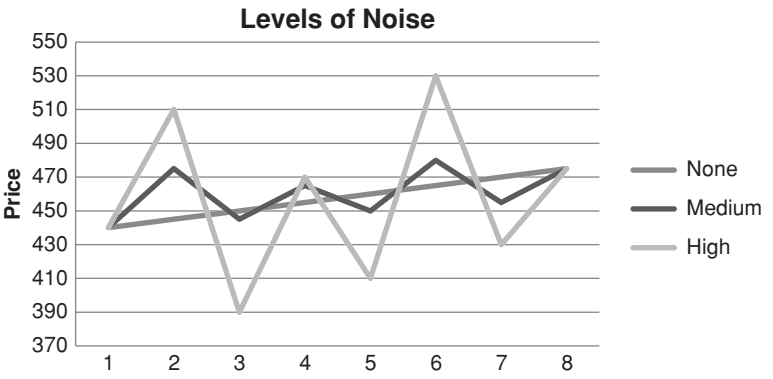

FIGURE 1.5 Three different price patterns all begin and end at the same point. The straight line shows no noise, the smaller variations are medium noise, and the larger swings are high noise.

475 in one case and from 440 to 750 in the other, yet the sum of the individual component changes are similar, 595 and 554. The efficiency ratio is 0.06 for the first and 0.56 for the second, showing that the first is very noisy while the second has relatively low noise (see Table 1.1). Remember that a ratio near 1 shows a strong trend, and a ratio near 0 only noise. If prices are moving up quickly, then even large swings may not be considered a serious interference with the trend.

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Other Measurements of Noise

The previous example of noise used the efficiency ratio; however, price density and fractal dimension may also be used. Intuitively, *price density* can be seen as the extent to

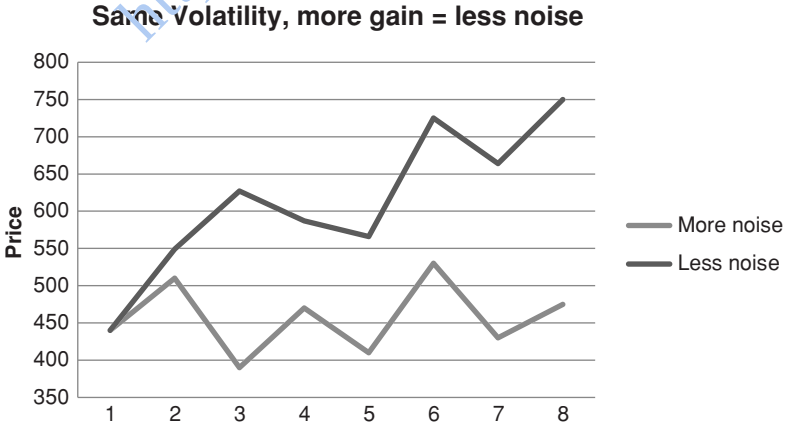

FIGURE 1.6 By changing the net price move, we can distinguish between noise and volatility. If the sum of the individual price changes are the same, but the net move is larger, then the noise is less.

TABLE 1.1 These price changes, reflecting the patterns in Figure 1.6, show that larger individual price changes do not correspond to higher noise if the net change over the entire period is much larger.

Day	High noise	Low noise	Diff high	Diff low
1	440	440		
2	510	549	70	109
3	390	627	120	78
4	470	587	80	40
5	410	566	60	21
6	530	725	120	159
7	430	664	100	61
8	475	750	45	86
Net change	35	310	595	554
Noise			0.06	0.56

which prices fill a box. If we take a 10-day period of price movement charted with highs and lows, and draw a box touching the highest high and lowest low, then the density is how much of that box is filled. This is measured as

$$Price\ Density = \frac{\sum_{i=t-n+1}^{i=t}(High_i - Low_i)}{Max(n\text{-}day\ high) - Min(n\text{-}day\ low)}$$

Fractal dimension cannot be measured exactly but can be estimated over n days using the following steps:

1. Max = highest high over n days
2. Min = lowest low over n days
3. Range = max – min
4. $dx^2 = \left(\frac{1}{n}\right)^2$
5. $L = \sum_{i=t-n+1}^{i=t}\sqrt{dx^2 + \frac{p_i - p_{i-1}}{Range}}$
6. $FD = 1 + \frac{\ln(L) + \ln(2)}{\ln(2 \times n)}$

There is a strong relationship between fractal dimension and the efficiency ratio (fractal efficiency), and there is a similarity in the construction of price density and fractal dimension. In step 5 the term inside the square root sign accumulates the change in price relative to the range over the calculation period. Of the three methods of measuring noise, the efficiency ratio seems to be the clearest, and that will be used in the following analyses.

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Impact on Trading

To determine the significance of the efficiency ratio, a 20-day average noise was calculated for a wide range of futures and world equity index markets for January 2000 through March 2012. A corresponding 40-day moving average trend-following strategy was applied to the same markets (a complete discussion of trend systems can be found in Chapter 8). The trend system used the most basic rules, going long when the trendline turned up and short when it turned down. It was always in the market and there were no costs applied. The results of both the noise and corresponding trend results are scattered in Figure 1.7. Trend results are shown as a *profit factor*, gross profits divided by gross losses. Higher factors relate to better risk-adjusted returns. A simple regression line was drawn through the scatter diagram to emphasize the relationship.

Figure 1.7 shows a pattern from the bottom left to the top right of the chart. Profit factors under 1.0 are net losses, those above 1.0 are gains. The noise is greatest on the left (at 0.204) and lowest on the right (about 0.266). The results can be interpreted as follows: Low noise is good for trend following and high noise is not. That interpretation can be taken further as high noise favors mean-reverting strategies. Tests over different time periods, such as the 1990s, will show much stronger trend than recently, and can shift returns higher, but the relationship of noise to success will remain the same.

A closer look at the results shows that the markets in the top right are short-term interest rates, which are closely tied to Central Bank policy. The next trendiest markets

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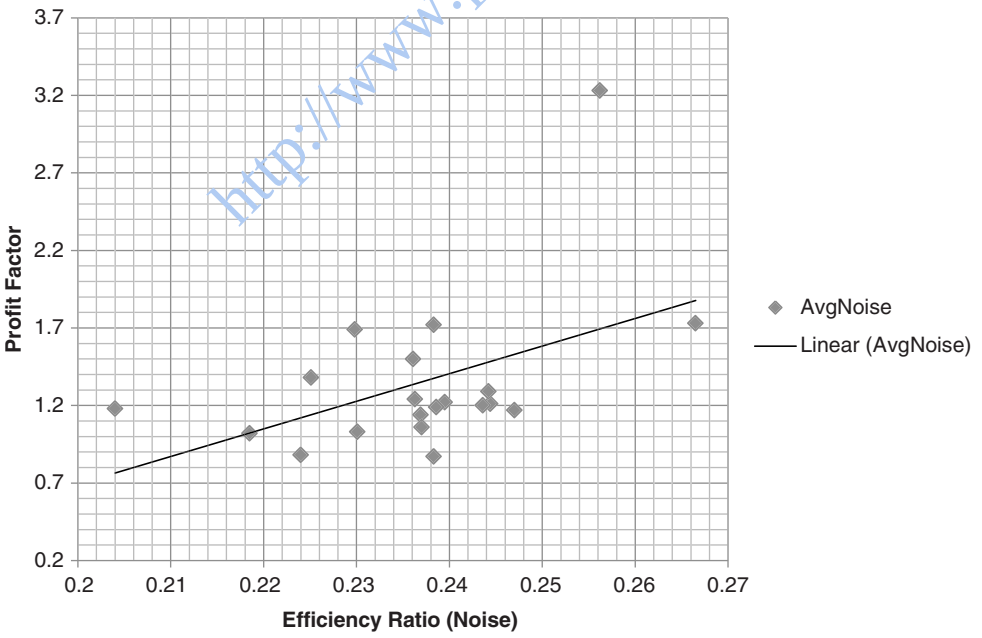

FIGURE 1.7 A scatter of the average 40-day noise and the information ratio based on a simple 40-day trend system, over 12 years from 2000.

are the longer maturity rates, then USD crossrates, energy markets, and metals. At the far lower left on the chart are the equity index markets. Equity index markets have the greatest noise and the worse trend-following performance of all sectors.

This concept will be extremely important when deciding on a trading style. Long-term traders, those interested in macrotrends, should combine low frequency data and long-term trends. Short-term traders should use high frequency data and favor mean-reverting strategies. Of course there are many exceptions to this approach, and opportunities are everywhere. This relationship of price noise, market patterns, and data frequency is intended to put a framework around the most common decisions made when developing trading strategies.

MATURING MARKETS AND GLOBALIZATION

The level of noise in each market can tell us about the maturity of that market and the nature of traders actively using it. The U.S. equity markets are where companies go to finance their operations. Typical U.S. workers participate in the equity markets indirectly through their retirement programs, and many are actively involved in making the decisions in the allocation of those funds. The most conservative choose money markets or guaranteed government debt obligations; others allocate a portion to the overall market using S&P ETFs, and still others choose specific sectors or even individual stocks to allocate part of their resources.

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Other countries are not as involved in their equity markets, even though movement of the equity index in these countries reflects the health of their economy. With less involvement, there is less liquidity and participation is limited to a narrow, less homogeneous group of investors or traders. However, most world markets are becoming more active, even if that liquidity comes from globalization, where traders from one country buy and sell shares in another country. If we look at the history of price noise as reflected in the North American equity index markets, there is a steady increase in noise over the past 20 years (see Figure 1.8). This corresponds to the increase in volume of those markets, reflected in the S&P cash index, SPX, shown in Figure 1.9.

This increase in volume, corresponding to the maturity of the market, is not restricted to the United States or Europe, but a general phenomenon affecting all markets. Figure 1.10 shows the pattern in 5-year intervals grouped by geographic region: greater Asia, Australia and New Zealand, Eastern Europe, Europe (including the U.K.), Latin America, North America, and South America. The left scale is the average noise of all markets in that group. The overall picture is that the markets in all regions are maturing and that this maturity can come swiftly, as shown in Eastern Europe. There is an interesting exception in Latin America (represented only by Mexico) where the noise value has increased, representing less liquidity. This would not happen if the group was diversified and is the result of decreasing confidence in the economy, hence less liquidity. The European region shows a move up in the past five years. Unlike in the United States, European

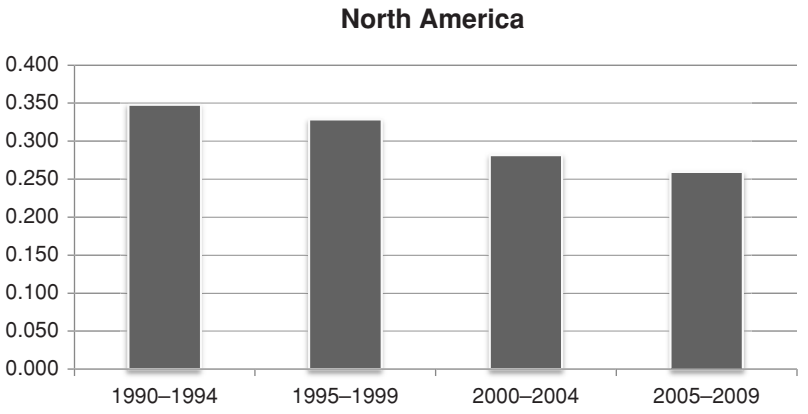

FIGURE 1.8 By measuring the market noise of North American equity index markets during 5-year intervals, we can see the increase in noise over the past 20 years.

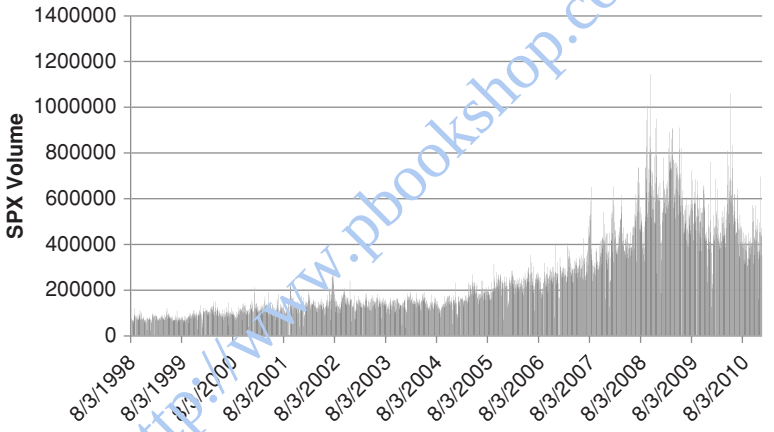

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FIGURE 1.9 Volume traded of the S&P 500 index components for the most recent 10 years.

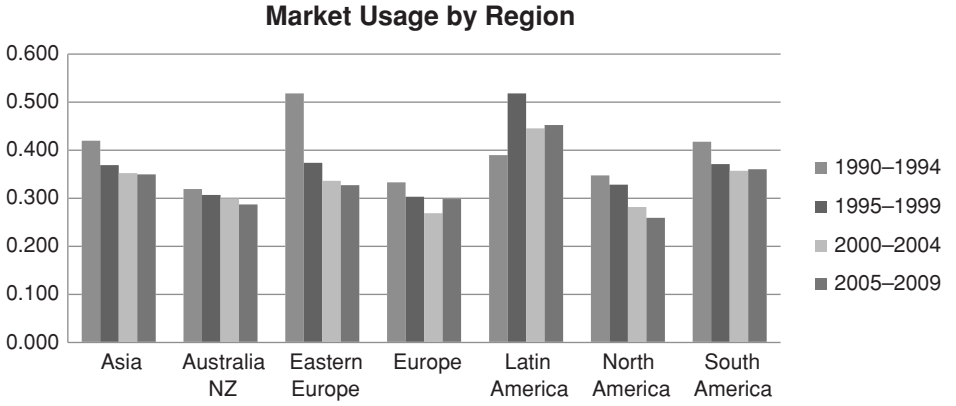

FIGURE 1.10 Relative change in maturity of world markets by region.

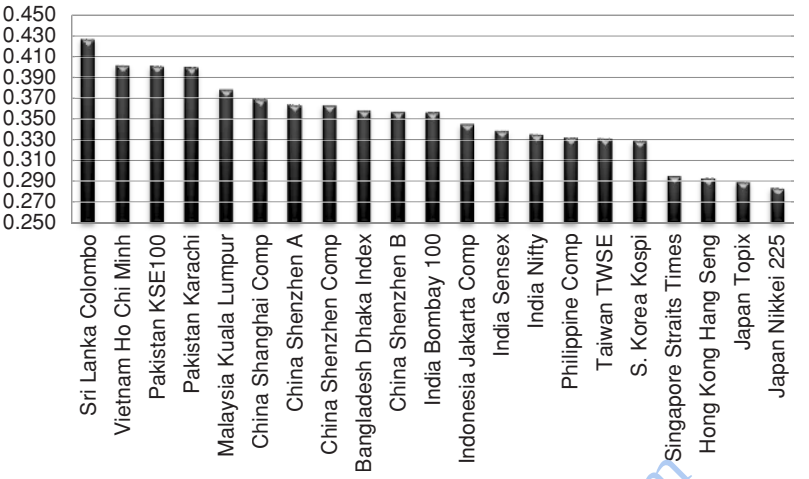

FIGURE 1.11 Ranking of Asian Equity Index Markets, 2005–2010.

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investors are not as committed to the equity markets, and the economic crisis of the past few years has resulted in more investors exiting those markets than in the United States.

Asia is the most important area of world development at this time. China, which holds most of the U.S. debt, has given a great deal of economic freedom to its people, but limited access to the equity markets for outside investors. Figure 1.11, which is ranked from higher to lower noise values (less maturity to more maturity) from left to right, shows the relative development of the Asian equity markets. It is not surprising that Japan is the most developed, followed by Hong Kong, Singapore, South Korea, and Taiwan. These represent the most open economies in Asia. At the other end are Sri Lanka, Vietnam, Pakistan, and Malaysia, countries without access to global investors. India's Sensex shows greater participation than the China Shanghai Composite, but both are toward the center of the ranking. Those countries that allow greater access to traders in the futures will move toward the right in the ranking. For now, the Shanghai Composite shows an average value of about 0.37, while the North American markets are at 0.25.

BACKGROUND MATERIAL

The contents of this book assume an understanding of the stock market and futures markets, 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 rules and mechanics of those markets are not explained here unless they directly relate to a trading strategy. 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 contract specifications of 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 competitive games and you like to win.

There are excellent books available to both the beginning and advanced trader. The ones that stand out as valuable sources of general information are Jack Schwager's two-volume set, *Schwager on Futures*, which includes one volume on fundamental analysis and one on technical analysis. John Murphy's *Technical Analysis of the Futures Markets*, second edition, and *Intermarket Technical Analysis* are highly recommended. There are excellent books on more specific topics. Of these you should consider reading John Bollinger's *Bollinger on Bollinger Bands* and Martin Pring's *Pring on Market Momentum*. Two other more comprehensive books worth considering are Peter Bernstein's *The Portable MBA in Investment* and *The Encyclopedia of Technical Market Indicators* by Robert W. Colby and Thomas A. Meyers; 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. More recently, Thomas Bulkowski's *Encyclopedia of Chart Patterns* is a well-organized, clear review and analysis of all chart patterns.

The basic reference book for general contract information has always been the *Commodity Trading Manual*, but each year *Futures* magazine publishes a *Reference Guide* that 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 Jeffrey B. Little and Lucien Rhodes, *Understanding Wall Street*, third edition, and Todd Lofton's *Getting Started in Futures*, fourth edition. The introductory material is not repeated here.

A good understanding of the most popular charting method requires reading the classic by Robert D. Edwards and John Magee (and now W. H. C. Bassetti), *Technical Analysis of Stock Trends*, eighth edition (originally published by John Magee), a comprehensive study of bar charting. For a constant flow of both classic and new techniques, the magazines *The Technical Analyst* (a U.K. publication), *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 Edwin Lefevre, *Reminiscences of a Stock Operator* (originally published by Doran, reprinted by John Wiley & Sons in 1994). Richard D. Wyckoff mixes humor and philosophy in most of his books, but *Wall Street Ventures and Adventures through Forty Years* may be of general interest. Jack Schwager's *Market Wizards* is now considered a classic.

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, offers a Certified Market Technician credential, and the Association for Investment

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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. Readers will also find Sunny Harris's *TradeStation Made Easy!* a valuable resource.

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 knowledge of the type of probability found in Edward Thorp's *Beat the Dealer* is adequate. Fortunately, computer spreadsheet programs, such as Excel, 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 Bloomberg or CQG, you will also have access to technical studies that you will find very helpful. Bloomberg is also an excellent source of data.

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RESEARCH GUIDELINES

Before starting, there are eight 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. It comes from the experience of observing price movement, reminiscent of Jesse Livermore. If that's not possible, then select ideas from credible books or articles.
2. **State your idea or premise 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. Remember *Occam's razor*.
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. 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.

5. **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.
6. **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. "Surprisingly good" results are often wrong.
7. **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 formulas manually. One error can ruin all of your hard work.
8. **Start at the end.** Define your goal and work backward to find only the necessary input. In this way, you only work with information relevant to the results; otherwise, you may expend a lot of unnecessary effort.

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OBJECTIVES OF THIS BOOK

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 and definitions, such as 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 the trend and momentum. All chapters are organized by common grouping so that you can compare variations of the same basic method. 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 a key reversal day). There has been no attempt to provide a comprehensive text on charting; however, 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 that will be harmful to specific approaches. By grouping similar systems and techniques together, and by presenting many of the results in a uniform way, 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. With a more complete picture, common sense should prevail over computing power.

PROFILE OF A TRADING SYSTEM

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 or choosing a trading system.

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Changing Markets and System Longevity

Markets are not static. They evolve as does everything else. During the past 10 years, changes have been predominately in technology, participation, globalization, and the cost of doing business.

Technology includes communications, trading equipment (primarily computers and handheld devices), electronic exchanges, and order entry. These innovations have accelerated the trading process, provided faster access to quotes, and instantaneous order entry for computerized strategies. Electronic markets have changed the nature of the order flow and made information about buyers and sellers more accessible. They have accelerated the price discovery process and changed the way prices react to news, and they have facilitated high frequency trading.

Increased participation that followed the historic bull market of the 1990s—aided by the proliferation of financial news networks, better communications, and faster computers—did not suffer during the economic crisis that began in 2008. 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 electronically. Equally important, we do not think about the reliability of our communications equipment. We expect our telephones and Internet connections, mostly wireless, 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 a fraction of a cent 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 (alternating with an occasional price shock). 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. The increase in trading choices—ETFs, mutual funds, stocks, futures, options—causes a complex interdependence of markets. Index arbitrage and the trading of sector ETFs force the component stocks to move in the same direction regardless of their individual fundamentals. The creation of your own successful trading program may be of the utmost simplicity or include strategies 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 data and weekly energy inventories, may add a level of robustness to the results but are less convenient to obtain and less timely.

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Diversification

Not all traders are interested in diversification, which tends to reduce returns at the same time that 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.

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 from 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 overfitting or no trading.

Testing

A mistake in testing may cause you to trade a losing strategy or discard a profitable one. Backtesting 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, will never appear as good as an optimized result 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 all levels. It begins with the individual trade, but must also reflect all trades in a common sector, the risk of the single system portfolio, and finally the risk of a portfolio of systems. Trade risk can be controlled using a stop-loss but can effectively be managed by volatility. Futures traders must also pay attention to leverage. Risk management does not need to be complex, but it has many tiers.

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Transaction Costs

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 overstating 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 the system is performing properly. It is very likely that actual execution slippage

will cause you to make 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

In order to make the contents of this book more useful for trading, some 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 has experience with a programming language. This edition has greatly expanded the number of complete spreadsheets and programs. These are available on the Companion Website. This should be more convenient for the reader and allow updating where necessary. In addition, some of the more complex mathematical examples and some of the older trading systems have been removed from the text but made available on the Companion Website to readers who have a sense of history or would like to have a deeper understanding of the process

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. 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 needed to express the simplest statistical functions. For the standard deviation, Excel uses *stdev* while EasyLanguage 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.

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AND FINALLY . . .

Throughout this book the principle of unnecessary plurality, better known as *Occam's razor*, will be stressed. The principle states that, *given more than one explanation or solution, the simplest one is the preferred.* When developing or choosing a trading strategy, it is normally the case that adding complexity for the sake of a few extra basis points increases the potential problems and risk more than it increases returns.

Pluralitas non est ponenda sine necessitate.

William of Ockham (ca 1285–1349)

It is not the purpose of this book to test every system and draw a conclusion as to which methods are best. That conclusion is not even possible. There are countless ways to generate trading signals, and markets change over time. The goal here is to provide the tools and the understanding to help aspiring and experienced traders develop systematic ways to trade that satisfy their inherent risk preference and their investment objectives. It is unlikely that any two traders will develop the same system, but the greater their knowledge, the more likely it will be profitable.

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