REVISED EDITION

TIME THE MARKETS

Using Technical Analysis to Interpret Economic Data

Charles D. Kirkpatrick II, CMT

Foreword by Tom McClellan

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On a project such as this book, two requirements are necessary: contemplative seclusion and the basics of life: sleep, food,
and something to pat. My dear wife, Ellie, and our furry animals kept me secure, satisfied,
and hidden. For that, I am intensely grateful.
Ellie deflected potential disturbances, not to mention providing timely sustenance; our goofy golden retriever, Posie, kept my feet warm during the cold Maine winter nights; and Frisbee,
our long-haired, reject cat from the Colorado humane society, slept on my papers and accepted my occasional strokes of her fur.
To them I dedicate this book.

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Acknowledgments

In projects like this book, the Internet and one's computer become your best friends. They provide information, complete complicated calculations, and remain alive 24 hours of the day. I am a night owl and prefer the quiet and calm of late nights and early mornings. I have a relatively small office at home that looks over the ocean during the day but could be anywhere at night. To me, this is the perfect work environment.

Working late at night means that email becomes the primary method of communication. Through such give and take over the wires, many people familiar with the work I was doing assisted me. They helped considerably in the book's organization and application. Special thanks I owe to Tom McClellan (www.mcoscillator.com) and Jason Goepfert (www.sentimenttrader.com) for their willingness to provide their historical data. Tom also reviewed the manuscript for me and made numerous helpful suggestions and changes to my fractured prose. Also helpful were Investors Intelligence (www.investorsintelligence.com), the *Economist* magazine (www.economist.com), and the Commodities Research Bureau (www.crbtrader.com). While I didn't use all their data, they were very willing to assist and were especially generous with their knowledge of economic statistics.

The primary methodology used in the book is called "walk-forward optimization." This technique is relatively new to the securities business and technical analysis specifically, and is not widely known or understood. I, too, was a novice when I began. I am especially grateful for help with it from Rob Hanna (quantifiableedges.blogspot.com), Bob Fulks of Pleasant Bay Capital Management, Wouter Oosthuizen of the Grail optimization system (now an integral part of TradeStation analysis software), and Berkhard Eichberger of the Diamond Back Testing with Walk Forward Manager system from Professional Software Solutions.

No book is the sole effort of the author. Many competent people at FT Press, most of whom I have never met, are responsible for the multiple aspects of publishing this book. I thank those with whom I have had direct contact—Jim Boyd, Kristy Hart, Jess DeGabriele, Lori Lyons, and Cheri Clark—and those who are hidden in the corporate structure somewhere for whatever excellent work they do to get this project completed and on the shelves.

Finally, as the dedication explains, I could not have finished this project without the help and encouragement from my dear wife, Ellie, and our furry household creatures.

Charlie Kirkpatrick
Kittery, Maine
October 24, 2011

About the Author

Charles D. Kirkpatrick, II, CMT, is president of Kirkpatrick & Company, Inc., a technical analysis research firm that publishes the *Market Strategist* investment newsletter. During his professional career, he was an institutional salesman, technical analyst, portfolio manager, hedge fund general partner, securities trading firm owner, option trader, floor trader, lecturer at universities, expert witness at security trials, small business owner, charitable foundation organizer and officer, and combat-decorated officer in Vietnam.

A past instructor in finance at the School of Business Administration, Fort Lewis College, Durango, Colorado, and recently Adjunct Professor of Finance at Brandeis University's International Business School, he is the only two-time winner of the Market Technicians Association's prestigious Charles H. Dow Award for research in technical analysis and winner of the Market Technicians Association 2008 Annual Award for "outstanding contributions to the field of technical analysis."

He is a Chartered Market Technician (CMT), a past member of the board of directors of the Market Technicians Association, and past editor of the *Journal of Technical Analysis*. He is a past member and vice president of the board of the Market Technicians Association Educational Foundation and is currently a member of the American Association of Professional Technicians (AAPTA).

In addition to more than ten published articles on aspects of the stock and bond markets, he coauthored *Technical Analysis: The Complete Resource for Financial Market Technicians*, the primary textbook for the CMT program and for university graduate courses in technical analysis, and he authored *Beat the Market*, a book on relative strength stock selection. A graduate of Phillips Exeter Academy, Harvard College (AB), and the Wharton School of the University of Pennsylvania (MBA), he lives in Maine with his wife of almost 50 years.

Foreword

> *"Every investor is a market timer. Some people buy when they have money and sell when they need money. Others use methods that are more sophisticated."*
>
> —Marian McClellan, 1934–2003

My mother Marian taught me that lesson many years ago, when I was first getting started as a stock market analyst. She had seen and heard a lot of good and bad market "wisdom" over the years since she and my father Sherman McClellan first created the McClellan Oscillator and Summation Index back in 1969. Since that time, hundreds of thousands of people have become aware of the tools that they originated, and a smaller number than that have learned to use them successfully to help in their market timing.

The term "market timing" has taken on a negative connotation over the years, and that is unfortunate. The "buy-and-hold" community has sought to convince all of us that the key to investing success was to stay fully invested for the long run so that you don't miss the big up days that account for a lot of the gains. And you can certainly find periods in history when that was a good idea. But they conceal from you the fact that the biggest down days are larger than the biggest up days and that the big down days tend to arrive in groups. The key to real investing success is to make as much as possible when the market is going up and to lose as little as possible when it is going down.

Sustained bull markets like the 1980s and 1990s are great when they appear. But there are more periods in history when being a "sheep" investor who just stays with the flock has led to destruction of wealth. We are in such a period now. Baby Boomers are starting to retire and are no longer participating as much in the entrepreneurial economy like they did in the 1980s and 1990s when Boomers were in their peak entrepreneurial years. Now, Boomers are seeking to hold onto what they have rather than maximize their investing and entrepreneurial potential.

Boomers are hoping to sell their stock portfolios and their McMansions to someone else, and in a few years the "echo-boomers" will be in a position to acquire those assets. But the "echo boom" peaked in 1990, and those kids are still in college now. The echo boomers are neither ready nor able to buy your McMansion, let alone your bond portfolio.

We went through a similar period in the 1970s. The United States had just come through more than 20 years of strong economic growth. But the people who were in their peak entrepreneurial years during the 1970s had been born in the 1930s and early 1940s—a time when the country and indeed the whole world was going through the Great Depression. Birth rates dropped in the 1930s because couples were afraid of having one more mouth to feed. So the kids who did not get born in the 1930s also did not go on to become workers and entrepreneurs in the 1970s, which meant that both the stock market and the economy suffered as a result.

That did not stop the U.S. government from trying to do things to "fix" the economy in the late 1960s and 1970s. President Nixon tried wage and price controls, which were a colossal failure. The Federal Reserve kept interest rates lower than the inflation rate in hopes of stimulating growth, and sometimes that was successful. But it also led to huge inflation and wealth destruction. The ebb and flow of liquidity in the system at different times created big waves up and down in the stock market. It was a great time for market timers and a lousy time for investors, just like the 1930s had been four decades earlier. And just like the 1890s had been four decades before that.

Now we are four decades forward from the 1970s, and once again, we have the Federal Reserve and the federal government trying imaginative ways to fix the economy. So just like in previous periods, we are going to see huge ebbs and flows of investing success and destruction of wealth. The game that worked in the 1980s and 1990s has changed; so if you are going to play this new game, you will have to change your style of play.

Timing Is Key

When you make up your mind what to buy, the only condition that is under your control is when you will pull the trigger. You don't get to set the price; you have to take whatever the market is offering. You can try to buy a stock at a different price than what everyone else thinks is the right price at that moment, but good luck convincing anyone to sell it to you at less than what the market sets.

And when you own an investment, the only question is whether you are going to hold onto it or sell it. If you are selling it, the essential question is "When?" You might say that you want to sell when it reaches a certain price or when it reaches some multiple of earnings, but that is not meaningful information to the market. The market wants you to say, "Sell now," or "Don't sell now." Those are the only messages that the market understands.

The people who say they do not time the market fail to understand this essential reality. Everyone times the market, whether he accepts that notion or not. The timing of your investment decisions will have a huge effect on your success or lack thereof. So to say to yourself (or anyone else) that you are not a market timer is to say that you willingly abandon the one factor that is in your control, and which is the key to your own success.

It is far better for investors to seek to maximize their success through mastering the factors within their control, while also minimizing the effects of factors that are beyond their control. To do otherwise is to be dishonest to oneself or to accept whatever the universe decides to do to you.

I have known Charlie Kirkpatrick for several years, and what I admire most about him is his willingness to share useful information with others. Charlie loves to teach and to elevate the collective wisdom of the community by sharing the great insights he has uncovered over the years. Those of us who have been smart enough to open our ears when Charlie is talking have benefited greatly.

In *Time the Markets*, Charlie leads us through proven ways to time our investment decisions using data and facts that most of us can understand. You won't have to learn to interpret tea leaves or pig entrails, to map star and planet positions, or program mathematically complex formulas into a "black box." Just take the important data that are freely available from government and other sources and learn how to read and understand what the changes in those data mean for the future of stock price movements.

Our country and our economy need the services of investors who can appropriately add liquidity at the right time and take it away from the market at the right time as well. To those who can perform this great service, the market will give rewards in the form of a larger amount of money so that they can do those services again in the future. But people who buy at tops and sell at bottoms are a hindrance to an efficient market, and the market will punish them by diminishing their ability to engage in such harmful behavior in the future.

You can choose to be in the "useful and thereby enriched" group and be a help to the market. For instructions in how to do that, read on and enjoy. Or you can be a sheep. Sheep should close the book now.

Tom McClellan
Editor, *The McClellan Market Report*
www.mcoscillator.com

Preface

The reasons for this revised edition of *Time the Market* are twofold: First, the original edition had some compromised data that slipped through the editing process. Second, and more importantly, the means of calculating walk-forward optimization became easier and more comprehensive shortly after the original edition was published. This ease and increased accuracy, as well as greater confidence in the outcomes, caused me to completely revise all the indicator system calculations. The results are more accurate and have more credibility than those in the original edition. Indeed, you can be certain that the system formulas and their outcomes are as up-to-date as possible. Those of you who wish to duplicate the calculations should have little difficulty. I use TradeStation's newly integrated walk-forward optimization programs. Using other programs may produce different results, but I have great confidence in the systems that passed successfully through the TradeStation method.

If you have serious problems with duplicating the results, please let me know. My email address is kirkco@capecod.net.

Charlie Kirkpatrick
October 27, 2011

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1

Introduction

This is a book about market timing. It applies using technical analysis on fundamental, economic, monetary, sentiment, and price data to determine the optimal times for buying and selling the stock market over the normal business cycle. Most professional analysts are bound to one of two disciplines: fundamental or technical. Fundamental is the study of economic, corporate, and monetary factors, and technical is the study of prices, especially market prices. There seems to be little common ground, and this is too bad because both have their merits. I think one of the reasons is that fundamental analysts do not understand technical methods, and vice versa; technicians distrust fundamental data as being too late. This book will change that attitude. I look at economic and financial historic data and apply some methods common to technical analysis of prices. These methods directly correlate economic information to the stock market, generate signals based on that information, and combine successful results into a market-timing model based on fundamental information.

I write this book to aid those of you who need guidance in timing the stock market specifically and who are nervous about looking at markets strictly from a technical point of view without some understanding of the relationship between fundamental information and the markets. It comes from my personal experience of over 40 years in the stock market. At various times in my life, I have traded blocks on an institutional block desk, traded options as a member of the CBOE, traded stocks in a hedge fund, and provided technical research—some of which was original—to major investing institutions. I have seen almost every method, technique, indicator, theory, and scheme you could imagine. I have also seen where the markets are made more complicated than they really are for making a mystery out of products sold to the public. Markets are not complicated, and with proper discipline, they can be analyzed and profited from with the right tools and common sense.

In this book, you look at investment timing rather than trading timing. This means you look at the markets from the primary perspective of the U.S. business cycle. The economic and fundamental information you will see is not short-term. As an investment horizon approaches shorter periods, the analysis methods become more technical and oriented solely toward price-behavior because economic information is not timely and often is reported only monthly or quarterly. To profit in the short term, swing traders must rely on changing price behavior in line with sporadic news announcements, and day traders eventually reach the intraday extreme when almost all decisions arrive from price behavior alone. Trading is the subject for another book. For present purposes I focus on timing the period of roughly four years, the average of the business cycle, and look at what types of reliable evidence you need to determine where within that business cycle the stock market may be. Forecasting markets is almost impossible in itself. This has been demonstrated repeatedly in studies of investment "gurus" and economists. I have also found that maxim to be true through painful and expensive experiences of my own, and I challenge anyone to disagree. However, you need not forecast markets to profit from them. If you can determine the direction and risk of direction reversal, you have the material necessary to capture profits and reduce the risk of capital loss.

I have also found that many analysts watch far too many indicators. There is no need for this. You do not improve your results by watching a laundry list of data. There are five areas of importance in determining stock market direction: corporate data (earnings yield, dividend yield, price-to-sales, and so on); economic data (leading economic indicators); monetary data (interest rates, money supply, Fed policy); sentiment (are investors optimistic or pessimistic?); and technical factors such as breadth, volume, cycles, and trend. Only a few examples in each category are necessary. Any more becomes redundant, time-consuming, and only marginally helpful. This book focuses on those few indicators that I have found can be systematized and for which data are publicly available.

The first section of the book is devoted to why market timing is necessary to reduce risk, evidence for and against the ability to time the markets, and, briefly, other methods that neutralize the risk of market declines. It is the major declines you need to avoid. In the past ten years, market declines have reduced wealth by trillions of dollars, and as I write this book in late 2011, the stock market averages are still below their highs of eight years earlier.

The second section introduces you to some technical analysis methods and concepts that can be helpful in analyzing the data you will gather from different sources, both from markets and from the economy. These methods do not include the traditional chart-pattern culture of technical analysis. They are more concerned with establishing where trends and oscillations along trends are beginning or ending. They involve the confluence of moving averages in economic data and the use of protective and trailing price stops in the market. The calculations involved in these techniques are relatively simple, easy to understand, and even more easily applied. My purpose is to keep this analysis as effortless and accurate as possible.

The third section of the book devises systems based on economic indicators that reliably signal when the stock market is likely to change direction. These systems give actual signals. Otherwise, they would be of little value. Having been tested with real data, they are as reliable as I can make them. In this respect, the results differ from most economic models that presuppose relationships between data and market performance without testing the significance, reliability, or even existence of such relationships.

Each of these systems is tested, using special computer software that conducts a series of statistical tests called "walk-forward optimization." Many indicators are rejected for failing to satisfy stringent requirements of reliability and predictability. The survivors are then ranked, and in the final chapter, I construct a market-timing model that uses the best systems from each of the economic and technical indicator sections.

In markets, there is no specific date or time when an actual price top or bottom occurrs. Tops and bottoms are progressions that in retrospect may be obvious, but at the time of their occurrence, with all the coexisting emotional swings and conflicting evidence, provide no ringing bell or buzzer to tell you that a major change in direction has occurred. Likewise, there are no mystical, foolproof indicators that give perfect signals. You will see some very good indicators, but none of them is 100 percent accurate. The ability to recognize a major market change in direction is an evolving thought process that depends on the evidence available but not a "thunderbolt" moment of inspiration.

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Why Time the Market, and Can It Be Done

Until recently, academia believed that the stock market could not be "timed." This was because the widely accepted belief in the Efficient Markets Hypothesis (EMH) precludes any possibility of anticipating market changes in direction. Indeed, "direction" itself is disregarded as inconsistent with randomness in prices. The EMH holds, among other things, that investors act rationally and that they immediately discount all news in the marketplace. This theory disregards all the evidence and widely accepted understanding about how investors are always optimistic at market tops and pessimistic at market bottoms. This hypothesis also implies that the marketplace can change direction only on new news, information that until then was not known by anyone. EMH thus holds that the market direction in the future cannot be determined.

Mixed in with this thesis is the theory that price action is random and thus impossible to anticipate. This aspect, not surprisingly, was proven *not* to be the case in studies over 20 years ago [1]. The markets may approach randomness at times, but they are not random. Incredibly, many people still believe prices are random and therefore unpredictable. There is also some lingering belief in the EMH, but fortunately many doubts exist. Slowly, funeral by funeral, academia is looking at markets from a more pragmatic viewpoint and finding through empirical studies certain relationships that have been known by professionals for many years. They are "discovering" that market prices do have some order and the markets can be "timed."

As part of the attempt to prove the validity of EMH, academics have spent many hours looking for methods to beat "real returns," their term for profits above the average and adjusted for "inflation risk," essentially to show that it could not be done and thus that the EMH must have merit. It was proving a theory based on having found no information to counter it.

In this process, the definition of risk became a little screwy because risk was considered related to variability of return rather than the possibility of capital loss. This interpretation of risk made true analysis of investment methods more difficult because it measured the wrong thing. The concepts of variability (or volatility) and capital loss are very different. Most investors worry more about capital loss than about variability. Who wants to lose money? There is no question that investors prefer an investment that climbs steadily without wide oscillations, but the possibility of capital loss is usually unrelated to volatility. Indeed, the shorter the time horizon for an investor or a trader, the more that volatility is a desired characteristic because it suggests that the market will be active and make wide, potentially profitable swings. However, the fact that a stock price is volatile does not imply that you will lose money. What loses you money is the trend. A downward trend guarantees that you will lose money. It can be a volatile downward trend or a steady downward trend, but if the trend is downward, you lose money. Remember, academics don't believe that prices travel in trends because price changes are random. Thus, academics and many professionals miss the whole point in investing, which is to make profits with negligible losses.

To me, the only way to make profits is to own stocks that are advancing in price. This is a function of the stock price trend and the market directional trend. Advancing prices mean the price trend is rising, regardless of theory. When prices are not rising, do you want to be in the stock market? Of course not. If prices are not advancing, you can't make money, and making money is the whole point of being in the stock market in the first place. Furthermore, if prices are declining, you don't want to lose money. That is the real definition of risk—the chance of losing money. So naturally, if you can, you want to know the odds of when the stock market will advance and when it won't. That is the point of this book—to learn methods that will help you in the pursuit of making profits and in not being caught in major market declines.

Two Basic Methods of Reducing Market Risk of Loss

Many risks of capital loss exist in the stock market, but two are the most important and the ones you can do something about. The major risk is that the market as a whole will decline and take all your stocks with it. This is called “systemic” risk or “risk of the system.” The second risk is that your stock will decline regardless of the market direction. With regard to individual investments, various selection methods that include specific entry and exit strategies are the best means of reducing what’s called “nonsystemic” risk—in other words, risk beyond that of the market itself. I won’t address these methods in this book, but I will mention that my favorite method (about which I wrote a book [2]) is the disciplined use of relative price strength and relative price-to-sales ratios combined with very specific entry and exit requirements. I’m always amazed that many professional advisors don’t have an exit strategy for selling issues in their managed portfolios. This lack of exit strategy is the primary reason many investors suffer such huge losses in market declines. How could anyone in conscience hold Citigroup (C) stock from $50 to $1, or American International Group (AIG) from $1,400 to $7? They obviously didn’t have a viable strategy for when to sell a losing stock. However, our immediate concern is not the methods of individual stock issue entry and exit strategies.

Market risk is our present concern—a force that can override any expertise in individual investment selection or exit strategy. You undoubtedly have heard of portfolio managers with the exceptional ability to pick profitable stocks but whose portfolios are clobbered in every market decline. These managers are not willing or able to adjust for market risk. There are two basic techniques to reduce that clobbering: *market neutralizing* and *market timing.*

Market Neutralizing

Market neutralizing is a hedging method that invests in portfolios of superior stocks and eliminates the market risk by selling short either market-index futures or market-index, exchange-traded funds (ETFs). By doing this, the portfolio manager offsets the market risk in each issue by the short sale in the market index fund. This method does not reduce the risk of losing on the individual issues, and the practitioner assumes that he can beat the individual stock risk by being in the "right" ones.

In a neutralizing strategy, when the market declines, the profits from the market fund short sale offset the individual stock's losses attributable to the market. Of course, when the market rises, the short sale losses offset the gain attributable to the market made in the individual issues. To use this method, then, the portfolio manager must have stocks or mutual funds that perform better than the market on the upside. This is called having a high "alpha" and is one of the reasons stock selection based on relative price strength is so successful. When this neutralizing technique is used, the resulting price and performance chart (see Figure 2.1) is much smoother and more controlled than the price curve of the stock or fund and the market individually. Over time, the net gain in the relative performance of the stocks, independent of the market, produces less volatile returns. This is the dream portfolio for academics because volatility risk is small (along with profits). This method can still lose lots of money, however, because it still relies on superior stock selection and because it has no provision for limiting capital loss in individual stocks. Because this method offsets the risk attributed to market declines, its focus is on market timing of the individual issues in the portfolio.

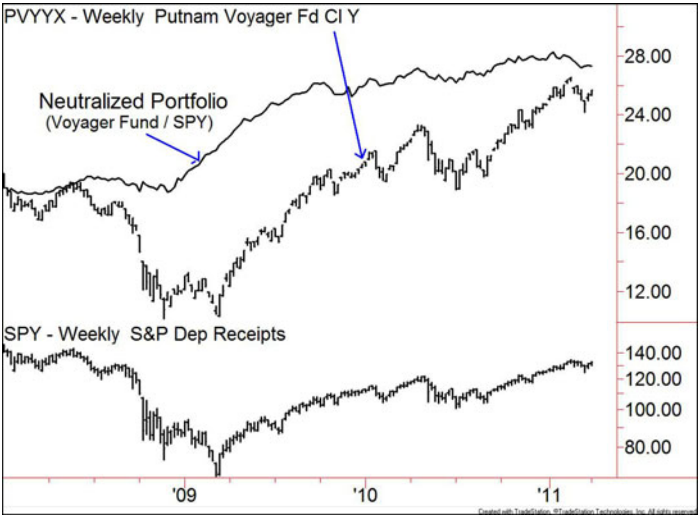

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FIGURE 2.1 Market-neutral portfolio composed of going long Putnam Voyager Fund and short S&P 500 ETF (SPY) (weekly, December 31, 2007–March 31, 2011)

Figure 2.1 shows a chart of the net performance from buying a well-performing mutual fund and selling short the S&P 500 ETF. By buying only the fund, you would have been exposed to the risk of a market decline. In Figure 2.1 the Voyager mutual fund declined over 46 percent from high to low during the market decline in 2008–2009. Short selling the S&P against the long position in the fund reduced the decline to a little over 5 percent. Of course, had you been able to time the market bottom in late 2008 to early 2009, you would have gained considerably more by investing in only the mutual fund. The Voyager fund advanced over 117 percent, while the neutralized portfolio advanced only 45 percent. The trade-off is between performance and risk of loss.

This is a method to reduce market risk not often used because it is difficult to implement. The only way to improve overall performance is to use leverage; that is, borrow money, thus taking advantage of the lower volatility and drawdown but increasing the risk that an unexpected "event" will adversely affect capital. For example, if you borrowed such that you have a 10-to-1 debt-to-capital ratio, and if you had created the neutralized portfolio shown in Figure 2.1 at the beginning in December 2007 and sold on March 31, 2011, you would have had a 1,320 percent return. However, the 5 percent decline in 2008–2009 would have wiped out half of your capital, and only a 10 percent adverse change in the portfolio would have wiped you out entirely. Any larger adverse change and you would owe money. Leverage is especially dangerous because it can cause you to lose more than you invested.

Market Timing

Standard stock market timing is simply the buying or selling of stocks based on the expectation of a change in market direction. Because market direction is such a large portion of any portfolio performance, the market timer sells the portfolio when the market's odds of decline have increased. A complete liquidation is not necessary—only that amount that reduces the potential effect of a market decline. If the market decline is anticipated to be minor, the amount liquidated could be only a small proportion of the portfolio. Any liquidation, however, can add to the ultimate portfolio performance if it is done correctly because it reduces the risk of decline in the portfolio value from the market decline. For this book, I refer to complete liquidation, only because it is easier to measure the results. Being difficult to execute for large portfolios, the professional portfolio market timer will often adjust the portfolio mix, due to market timing, by reducing stock holdings relative to some kind of cash equivalent like treasury bills. This involves complications with which the individual investor need not be concerned. Because commission rates are so low today, the individual should liquidate the entire portfolio when the risk of market decline is imminent.

I know, what about the taxes on gains? But would you prefer a loss in your portfolio over paying taxes instead? A good friend of mine sold his company to a New York City bank for millions in bank stock. A few years ago when bank stocks were looking overpriced, I asked him if he was going to sell some of the stock to protect his wealth. He said to me that he would be paying a large capital gains tax if he sold it. Instead, he preferred to hold onto the stock for his estate, when his heirs could take the cost of the shares as of his death rather than at the time of his initial investment many years before and considerably below the current price. By using the increased cost basis, he could reduce a major portion of the income tax he currently owed. Unfortunately for his plans, in the 2007–2008 market decline, the bank stock went the way of Citibank stock (from $50 to $1), and to add further injustice, just recently the tax law changed to disallow the cost adjustment for estates. The moral of the story is "take your profits and then pay your taxes." You never know what the future brings, and in any case, there is always a trade-off between taking gains and paying taxes with risking the loss of gains and not paying taxes. The only way to avoid paying taxes is not to make money, as did my friend. Making an investment decision based on taxes can be dangerous. I've found that most successful investors usually are happy to pay their taxes and keep their profits.

Another mistake investors often make is assuming that ups and downs in the stock market, or any market, balance each other and thus make the pursuit of timing the market a 50-50 proposition. Many investors assume that the market has a long upward trend as has occurred over the past 200 years, which means that remaining in the market at all times is a better bet than taking the 50-50 chance that part of that long upward trend will be missed in the future. But the mathematics don't bear this out. If you lose 50 percent of your money in a stock or the market, gaining 50 percent will not bring you back to even. A 100 percent return is necessary to return your portfolio to even from a 50 percent loss. This is called the "law of percentages." Not losing capital is thus more important than gaining profits. In this example, you would have to gain, in percentage terms, double your percentage loss to break even. The law of percentages is against you. To be practical, then, you must prevent capital loss because it is so much more difficult to regain what is lost than to reduce the loss in the first place.

This concept of timing is where traders and technical analysts break from conventional investment thinking. Conventional thinking believes that you should be in the markets at all times because markets have always gone up. Of course, that reasoning is not true either. Every stock market in the history of civilization, except the U.K. and the U.S. (so far), has at some time declined to zero. For example, after World War II, the German and Japanese stock markets were worthless. Nevertheless, even assuming that the U.S. market will continue its 200-year upward trend, the law of percentages still holds during those periods of temporary decline. Although remaining invested worked over the past 200 years, it was useful only for institutions with perpetual lives. They can weather the economic storms and wait 16 years for their portfolios to return to even, as they had to do between 1929 and 1945 (dividend-adjusted return in stocks). However, you and I have a limited life span and cannot wait for long periods even if the long-term theory is true. We must avoid those declines and keep our capital safe. Avoiding those declines will not only protect us from that once-in-a-civilization terminal decline to zero but also keep us from having to catch up at a higher rate just to return what we lost in a market decline. As you will shortly see, avoiding capital losses will also improve your overall investment performance geometrically.

Let's look at an empirical study of the U.S. stock market during the period 1926 through 2004 [3]. It's an interesting study because I believe it came to the wrong conclusions.

The longer-term part of the study, 1926–2004, took monthly returns of a capitalization-weighted composite index of all stock prices available in the New York Stock Exchange, the American Stock Exchange, and the NASDAQ during the period. Using a capitalization-weighted index, of course, is suspect because large capitalized stocks have more influence on the results than the large number of smaller capitalized stocks that normally make up a portfolio. The study used monthly returns including dividends, also favoring the larger capitalized stocks, and the one-month U.S. Treasury Bill rate as the comparison return. The point of the study was to find just how much profit was lost, not money lost, over the 79-year period, by not being fully invested at all times.

Its finding was that the average annual index return over the period without market timing was 10.04 percent per year. The average annual return for treasury bills was 2.72 percent. The overall advantage of owning stocks was thus the difference of 7.32 percent. When the "best months" during the period were dropped out, naturally, the average stock index return declined. *Missing the best six months,* for example, dropped performance to an average annual return of 8.05 percent, roughly a 20 percent decline in annual performance. To me these results were obvious. If you are looking at annual returns and eliminating the best months from the calculations, of course your performance will fall short of the maximum.

What was interesting, however, and generally uncommented on, was that if you *missed the worst six months, your performance increased* to 12.33 percent per annum. This is roughly a 23 percent increase in performance by missing the worst six months of market history, almost the same as what was lost by missing the best six months. Now let's look at how compounding return rates affect performance. When cumulated over the entire period, the maximum buy-and-hold would have converted $1 into a $1,919 gain, an impressive increase through compounding and one reason the "buy-and-hold" philosophy is touted so widely. Had you missed the best six months, your return on $1 would have been $453. On the other hand, had you *missed the worst six months,* your $1 would have gained $9,192.76, almost five times the maximum buy-and-hold cumulative gain. Compounding returns at increasing rates escalates the final return by a much larger multiple. The advantage of missing the worst six months versus missing the best six months was a multiple of 20.3. In other words, missing the worst six months is over 20 times more profitable than missing the best six months and 5 times more profitable than the buy-and-hold.

Compounded Interest Rates of Return

Compounding works in your favor when your annual gains increase. For example, a 4 percent annual gain compounded over time produces a geometric increase in wealth over a 2 percent annual gain. You would think that because 4 percent is twice 2 percent you would gain twice as much after, say, ten years. Instead you would have gained 48 percent on your investment at 4 percent versus 21 percent at 2 percent. The difference is 2.3 times your money, not twice. At higher percentages, the difference is even greater. If you can produce an annual gain of 20 percent versus 10 percent, your difference is not 2 times but 3.26 times. Compounding at higher rates of return multiplies your gain exponentially.

Which would you prefer, the maximum buy-and-hold or the market timing that missed the worst six months? Easy answer. At the extreme, and highly unlikely, was the $1,023,557.70 gain from $1 had you missed the worst 48 months in the entire 79 years. Yes, that's turning $1 into $1 million! The most you could have gained using the buy-and-hold method was $1,919—a substantial difference in end results from missing losing months. Had you had perfect market timing and avoided every monthly loss, your $1 would have gained over $20 billion. So much for the argument for buy-and-hold versus avoiding market declines.

The traditional argument against market timing is that it cannot be done and that therefore you should be in the market at all times so as not to miss the few strong upward months. In the study discussed previously, the strongest month was April 1933, with a gain of 38.3 percent. By missing this month, an investor would have decreased portfolio annual performance to 9.60 percent from the maximum buy-and-hold performance of 10.04 percent. What was omitted in the study commentary was that prior to this large gain, the stock market between 1929 and 1932 lost 83.66 percent. By the law of percentages, this horrendous loss required a 511.95 percent gain to return to the 1929 level. The April 1933 gain of 38.3 percent was helpful but far below the 511 percent necessary to counterbalance the earlier devastating loss. It seems to me, then, that avoiding losses is more important than missing gains. The problem then is to find ways to time the market to avoid these losses.

By the time you finish this book, you should be convinced that market timing can be done, not with perfection certainly, but with enough accuracy that your overall cumulative investment return is greatly improved and the odds of capital loss are considerably diminished. The major reason that investors are poor market timers is not that there aren't sufficient and accurate methods. Instead, it is the inability of the individual investor to act independently of the crowd, believe what the indicators are saying, and act with discipline, despite the public pressure to do otherwise. This is difficult for anyone to do. I can't help you with fighting your own emotions. The major reason for poor performance, individual and professional, in the markets is the inability to control emotion and bias. You will see that at market tops, for example, public opinion is generally optimistic. The investment books being sold at market tops are almost universally descriptive of higher prices, such as the now-famous example of James Glassman's book, *Dow 36000,* which was released in 1999. Likewise, at market bottoms, the prevailing public opinion is that the economy and the world are in the tank and will never recover. These opinions are reinforced by the news (a reflection of public opinion), your friends, and your business associates. You are a member of the public and, being human, you feel comfortable with that public opinion and thus resist all evidence to the contrary. This is the discipline problem that you must face, and if you don't believe you can resist the crowd behavior, you should continue with a buy-and-hold investment philosophy and throw out this book or give it to a friend. If you believe you can act rationally rather than emotionally, something very difficult to accomplish, you can have unbelievable success in investing.

Before we get into the actual market timing methods that do seem to have validity, we must first understand some of the technical methods used to analyze the data we will be looking at. That is the subject of the next two chapters. Those of you who are more interested in the results than the methods should skip the next two chapters and go to Chapter 5, "Corporate Indicators," which covers the first of the five subjects we will address. You can always return to the next two chapters after you have seen the results and if you want to perform the same calculations or even experiment with the same methods on other economic data.

Endnotes

[1] Lo, Andrew W., and A Craig MacKinlay. 1988. "Stock Market Prices Do Not Follow Random Walks: Evidence from a Simple Specification Test." *Review of Financial Studies* 41-66.

[2] Kirkpatrick, Charles D. 2009. *Beat the Market: Invest by Knowing What Stocks to Buy and What Stocks to Sell.* Upper Saddle River, NJ: Pearson Education.

[3] Seyhun, H. Nejat. "Stock Market Extremes and Portfolio Performance 1926-2004." 2005 study commissioned by Towneley Capital Management Inc., Laguna Hills, CA. www.towneley.com/pdf/MT%20Study%2004.pdf.

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3

Technical Analysis

This chapter covers the technical analysis techniques that are used later in determining the success or failure of market timing systems based on economic data. They do not include the standard chart pattern analysis, but instead they include the analysis of trends using moving averages and other methods.

Trends

As any chart of market prices will show you, prices have a predilection toward traveling in trends. The trend, of course, can be upward or downward at various slopes or sideways. Most investors in trading markets make money following the trend of an investment price. The fact that prices trend makes it possible to make money. If prices were purely random in their movement, no one would profit. But people do profit, and very handsomely, because prices travel in trends. From a technical perspective, a trend is a directional movement in prices that remains in effect long enough to be identified and still be playable. Not all trends last long enough to be recognized and then acted on. Profiting also depends on the investment horizon of the person analyzing trends. If his outlook is for long-term trends, day-to-day price motion is irrelevant. If his outlook is to swing trade over a few days, the long-term trend is unimportant.

Regardless of the trend length, prices do not follow a straight line. Around the trend, prices tend to fluctuate. When that trend changes direction, it is first evident in one of the fluctuations. However, not all fluctuations are changes in trend. They may be just countertrend oscillations about the trend that will return to the direction of the trend.

The small vacillations around a trend sometimes make the trend difficult to identify. Shorter trends are parts of longer trends. Though trends may be obvious in hindsight, ideally, we would like to spot a new trend right at its beginning and spot when the trend has ended. This ideal, however, never happens, except by luck. No magic indicator exists to spot precisely the beginning and end of a trend. Looking at a graph of prices, an analyst can spot many trends of varying length and magnitude, but such observations are observations of history only. A trend must be recognized early and last long enough to profit. If you spot it too early, your chances of failure are greater; perhaps it was just an aberration or a smaller, countertrend move, or perhaps it was a new trend but not long enough or large enough to profit. If you allow more time to prove that the trend exists, the chances of failure are less but potential profit is lost when the price continues in the new direction without your position. There is always a trade-off between potential risk and potential reward. This is why so much effort goes into accurately recognizing the beginnings and ends of trends.

Momentum

In the trading markets "momentum" is a word that is commonly used to describe the rate at which price trends are changing. Classically, a price "trend" is a series of prices that generally head in the same direction (up, down, or sideways). However, we know that prices do not trend in one direction forever. When any change in direction occurs, we say the prices changed momentum. The directional change need not be a reversal in direction. A trend change can just be a different slope or rate of change.

Imagine a car traveling at 60 miles per hour. The 60 miles per hour is its speed, or its travel "trend." Should the car slow down, we say it is "decelerating." It is still traveling in the same forward direction but at a slower speed, and to get to that speed, it had to decelerate. In markets, when the price trend is not rising as fast as it was at an earlier point, we say it is losing momentum, or decelerating. In prices, losing momentum can eventually result in a trend reversal. The car can stop and go backward. Changes in momentum thus occur before changes in direction, just as changes in the car acceleration or deceleration precede changes in direction. For this reason, we want to study momentum. It leads trends' directional changes.

This is why price analysts so thoroughly study momentum in markets. If they can detect a change in momentum, they might receive a clue as to how the price trend will change direction in the future. Momentum is an early warning device in markets.

The traditional manner of measuring momentum is to calculate the change in prices from one period to another. If the change is constant, the momentum is neither increasing nor decreasing. If the change declines, we receive a momentum warning that a price decline may be ahead. Conversely, when momentum increases, we receive a warning that an advance may be ahead. You should be somewhat careful in interpreting momentum change, however. A change in momentum does not always bring a change in price direction. A momentum change can occur when the price trend slope is increasing or decreasing but not necessarily reversing.

Because prices are never rising or falling steadily but have intermittent oscillations back and forth, you must use a method that can measure momentum yet reduce the effects of the minor oscillations. Technical analysts do this by using moving averages.

Moving Averages and Moving Average Crossovers

Moving averages are one of the most useful methods of identifying and profiting from trends in prices or in any other economic data. They are one of the oldest tools used by technical analysts, dating back to 1901 with the work of mathematician R. H. Hooker [1]. Moving averages dampen out most of the fluctuations shorter than the length of the moving average. A 40-day moving average will reduce the effect of any fluctuations of 40 days or less, for example. One-day fluctuations are almost completely erased. The moving average reflects what occurred over the entire 40 days rather than just 1 day. When a moving average changes direction, we know that the trend represented by that moving average has changed direction.

An average is the sum of a number of specific data, such as prices, divided by the number. A 20-day price average is the sum of 20 days of prices divided by 20, the number of days. (A "moving average" is the average calculation performed over successive periods and usually plotted on a chart for clarity.) A 20-day moving average, as shown in Figure 3.1, is a calculation of the 20-day average over some succession of days. When plotted on a price chart, the moving average is usually a smooth line that dampens the effects of the minor, sometimes erratic oscillations in the data. It thus represents the trend through that data over the period of the moving average and disregards the clutter around it. It is a measure of the trend and is useful for determining when the trend is changing. A rising moving average indicates a rising trend over the period of the moving average. A declining moving average indicates a declining trend. If we calculate a rate of change in a moving average, we can see changes in the trend and thus the trend momentum.

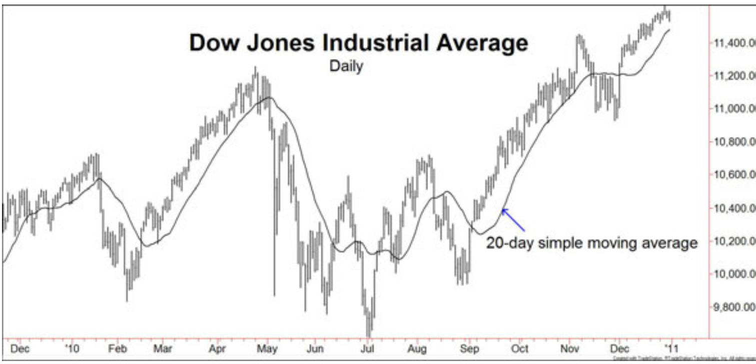

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FIGURE 3.1 Dow Jones Industrial Average with 20-day simple moving average (September 14–December 31, 2010)

The easiest type of moving average to understand is called a simple moving average, or SMA. Analysts also use other types of moving averages, such as the exponential, the linearly weighted, the Wilder, the geometric, and the triangular. There are even methods that will vary the moving average length based on the historic volatility of the prices known as "adaptive" moving averages. For our purposes, the results of these esoteric calculations provide no extra advantage. The simple moving average is easy to construct and suffices for all your calculations.

The use of moving averages in investing has been widely documented. It is the reason for the success of many commodity traders, and academics have shown that methods using moving averages demonstrate statistical significance. Early studies of moving averages as a timing method for stocks discounted their value. These studies used crossovers of prices and moving averages, not crossovers of moving averages to moving averages, and were statistically primitive. Brock, Lakonishok, and LeBaron (1992) [2] conducted the first study to show the validity of using moving average crossover rules, as well as trading range break rules. They found that moving average crossover signals generate statistically significant stock market directional signals. Since then, using market data in other markets and in other countries, additional studies have confirmed much of their original academic work. We use similar methods ourselves when we analyze the data for signals in later chapters.

We know that the markets have many different trends going at one time. There is the long, secular trend, and then the intermediate-term trend, the short-term trend, and other trends above, below, and in between. We can construct a moving average of any length, provided that the price information is available. Generally, shorter-period moving averages represent shorter price trends, and longer moving averages represent longer price trends.

If we calculate more than one moving average over different periods, we see the changes in the shorter trend versus the longer trend. Eventually the shorter moving average will cross over and under the longer moving average. These "crossovers" can be signals of impending change in price trend direction. Any system developed to use these crossovers is called a "moving average crossover system." The unknown variables in such a system are the lengths of the two moving averages. We can prejudge what those lengths should be, or we can optimize the data to see what lengths give the most reliable signals.

A longer-period length includes more data and more information. Each specific data point becomes less important. A large change in specific data thus has less influence on the longer moving average. However, if this large change in data is the beginning of a significant change in trend, it takes longer for the trend change to be recognized. The longer moving average is slower to pick up trend changes but less likely to indicate a trend change incorrectly from a short-term blip in the data.

Figure 3.2 shows two moving averages in the daily chart of the Dow Jones Industrial Average (DJIA). The shorter-length moving average, 9 days, oscillates around the 18-day average and has a wider range. The 9-day is the "faster" moving average, and the 18-day is the "slower" moving average. The shorter-length moving average is always the faster average because it turns more quickly when a trend change occurs. It is less reliable as an indicator of trend changes, however. In Figure 3.2, notice how the 9-day moving average (dashed line) makes its troughs after the actual price bottoms, and the 18-day moving average (solid line) makes its troughs even farther after the actual price bottoms.

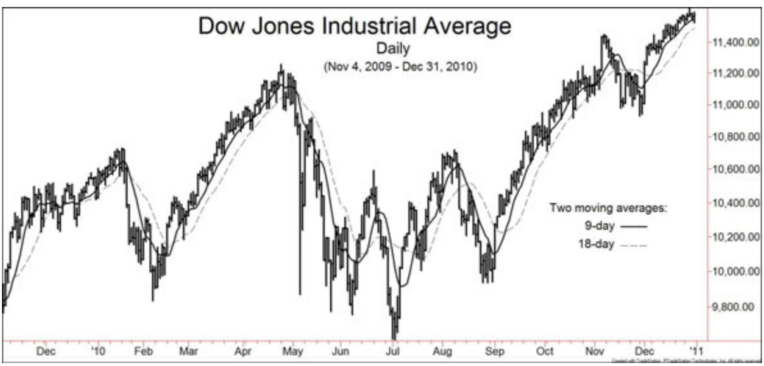

FIGURE 3.2 Two moving averages: 9-day and 18-day (Dow Jones Industrial: November 4, 2009–December 31, 2010)

The lag in turning, however, has an advantage. That is the advantage of surety of the signal. A change in direction of a moving average is more accurate the longer the moving average period. A crossover of a fast moving average and a slow moving average will tend to occur near the turning point of the slow moving average, and thus, while occurring long after the actual turn in prices, it is more reliable as a signal. The conflict between accuracy and reliability is a recurring theme in any technical signal. Reliability reduces loss and is thus a preferable characteristic of any signaling system. For this reason, moving average crossover systems are more commonly used for their reliability, even with their late signals.

A flat trend results in moving averages oscillating horizontally and crossovers not followed by directional change in prices. This causes "whipsaws" in signals whereby a buy signal is followed by a sell signal at or below the buy signal price, and vice versa. This major signal fault with moving average crossover systems occurs only when the trends are flat and the trader loses money chasing fluctuating signals.

Figure 3.3 shows a flat period in Core Laboratories' share price, when the moving average crossovers gave false signals called whipsaws. It is thus important that the moving average period lengths be long enough to bypass any flat trends in the price. Because this is not always possible, moving average crossover systems have a high rate of false signals. Fortunately, the losses are quickly recovered by reverse signals. We can reduce these whipsaws with filters and other methods but never can eliminate them. On the other hand, the advantage of a moving average crossover system is that it will catch every major trend change and "ride" that new trend to its termination.

As long as markets trend, the moving average crossover method, when properly applied, will catch the major trends.

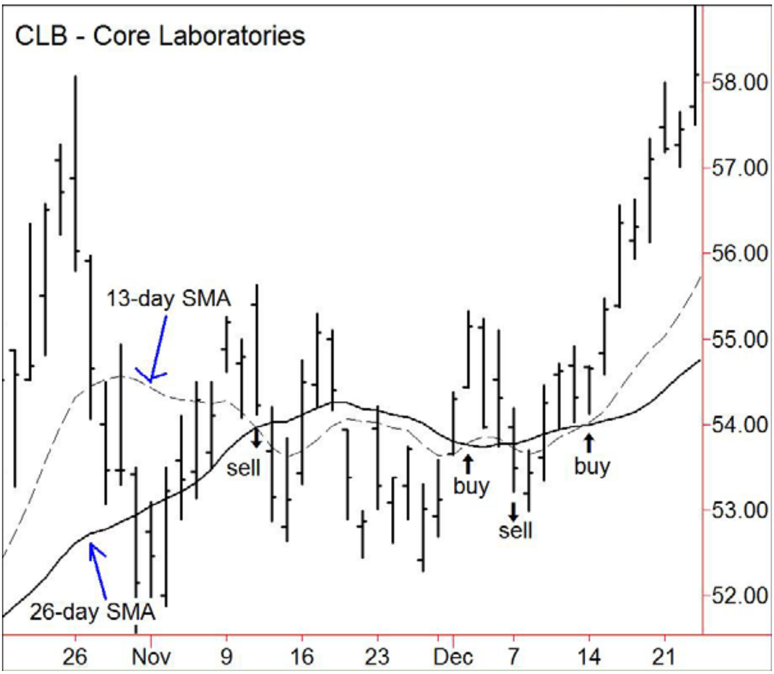

FIGURE 3.3 Simple moving average (SMA) crossovers causing whipsaws in a flat trend (Core Laboratory common stock, daily: October 19–December 23, 2009) from *Technical Analysis*, page 281

Ratio of Price to a Moving Average

We can also detrend the data by subtracting it from, or dividing it by, the moving average. The resulting data is a portrayal of the fluctuations about the trend as it is represented by the moving average. Figure 3.4 shows the DJIA with a 20-day moving average again. Following the price chart is another chart showing the ratio of the closing price to that 20-day moving average. You can see the oscillations around the trend more clearly in this lower chart. The peaks and valleys in the ratio chart show the periodicity of price oscillations. Sometimes these are regular, as in a harmonic cycle, and sometimes they are irregular and of little predictive use. In this instance, they are regular. The lows, for example, occur roughly every 68 days.

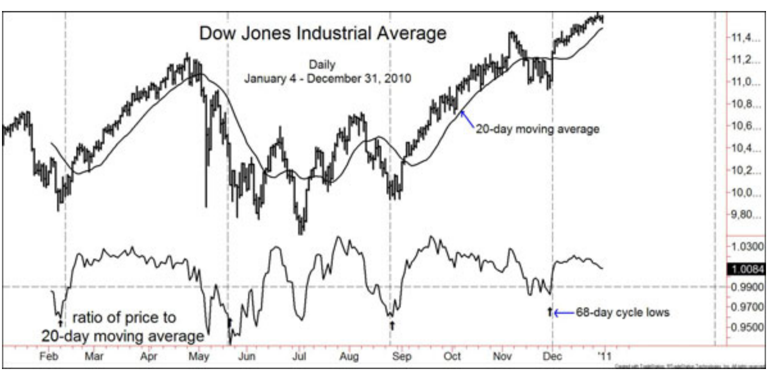

FIGURE 3.4 Dow Jones Industrial Average, 20-day moving average, and ratio of current price to the 20-day moving average, showing 68-day cycle period of lows (January 4–December 31, 2010)

Cycles

The stock market, and most other markets, has distinct cycles. Prices oscillate up and down around a trend. Sometimes these oscillations show regularity in their occurrence beyond pure chance. We call them "cycles," but they are not cycles in the harmonic sense. They are constant intervals between successive price tops or bottoms. They are also controversial. Some think cycles are imaginary, visions in the eyes of technical analysts; others discount them because their behavior is unexplained. Whereas cycles such as the 68-day are obviously difficult to justify, others are obvious and as regular as the sunrise each day.

The most obvious and easily explained are the seasonal cycles in agricultural commodities. The most predominant cycle in the stock market is the four-year cycle. This stock market cycle makes an important low roughly every four years. Wesley Mitchell (1874–1948), economics professor and founder of the National Bureau of Economic Research (NBER), discovered it. He observed that the U.S. economy from 1796 to 1923 suffered a recession approximately every four years. The stock market over the past 200 years has shown the same periodicity. Table 3.1 shows the cycle lows over the past 100 years and the average interval between lows.

There are other cycles in the stock market, but the most important, and the one we are concerned with here, is the four-year cycle. It is often associated with the business cycle, and because it bottoms every four years, it is also called the "Presidential" cycle for the interval between Presidential elections. I believe it has nothing to do with the Presidential election because it also occurs in most other countries and especially in those whose elections occur at intervals other than four years. It has also occurred for well over 150 years and began long before the U.S. became an economic superpower. It is likely due to a combination of business cycle and investor memory, but both thoughts are unproven. Nevertheless, it exists and is a very important factor when analyzing the probability of imminent market declines.

Of course, the business cycle is not a cycle in the harmonic sense either. Instead, it is a wide fluctuation in business activity with an irregular periodicity that averages four to five years. However, it does affect stock market prices and bond interest rates.

TABLE 3.1 Four-Year Cycle in the Dow Jones Industrial, 1896–2010 (Adapted from Bressert, 1991)[3]

Date of Low	Low Close	% Decline from High to Next Low	Date of High Close	High Close	% Advance to High	Months Low to Low	Months Low to High	Months High to Next Low
August 8, 1896	28	–31.2%	April 25, 1899	77	175.0%	49.0	32.0	17.0
September 24, 1900	53	–46.2%	June 17, 1901	78	47.2%	38.0	8.9	29.2
November 9, 1903	42	–48.5%	January 19, 1906	103	145.2%	48.9	26.7	22.2
November 15, 1907	53	–27.7%	November 19, 1909	101	90.6%	47.0	24.5	22.5
September 25, 1911	73	–43.6%	September 30, 1912	94	28.8%	39.5	12.4	27.2
December 24, 1914	53	–40.0%	November 21, 1916	110	107.5%	36.4	23.3	13.1
December 19, 1917	66	–46.7%	November 3, 1919	120	81.8%	44.8	22.8	22.0
August 24, 1921	64	–16.7%	February 11, 1926	162	153.1%	56.0	54.4	1.6
March 30, 1926	135	–47.8%	September 3, 1929	381	182.2%	44.1	41.8	2.4
November 13, 1929	199	–86.1%	April 17, 1930	294	47.7%	32.3	5.2	27.1
July 8, 1932	41	–49.0%	March 10, 1937	194	373.2%	69.7	56.9	12.9
March 31, 1938	99	–40.4%	September 12, 1939	156	57.6%	49.6	17.7	32.0
April 28, 1942	93	–23.5%	May 26, 1946	213	129.0%	54.2	49.6	4.5
October 9, 1946	163	–16.1%	June 15, 1948	193	18.4%	32.6	20.5	12.1
June 13, 1949	162	–12.9%	January 5, 1953	294	81.5%	51.8	43.4	8.4
September 14, 1953	256	–19.5%	April 6, 1956	522	103.9%	50.0	31.2	18.8
October 22, 1957	420	–27.1%	December 13, 1961	735	75.0%	56.9	50.4	6.5
June 26, 1962	536	–25.2%	February 9, 1966	995	85.6%	52.1	44.1	8.0
October 7, 1966	744	–35.9%	December 3, 1968	985	32.4%	44.2	26.3	18.0

Date of Low	Low Close	% Decline from High to Next Low	Date of High Close	High Close	% Advance to High	Months Low to Low	Months Low to High	Months High to Next Low
May 26, 1970	631	–45.1%	January 11, 1973	1052	66.7%	55.2	32.0	23.1
December 6, 1974	578	–26.9%	September 12, 1976	1015	75.6%	39.3	21.5	17.8
February 28, 1978	742	–24.1%	April 27, 1981	1024	38.0%	54.2	38.5	15.7
August 12, 1982	777	–36.1%	August 25, 1987	2722	250.3%	63.1	61.3	1.8
October 19, 1987	1739	–21.2%	July 17, 1990	3000	72.5%	36.3	33.4	2.9
October 11, 1990	2365	–9.7%	January 31, 1994	3978	68.2%	42.4	40.3	2.1
April 4, 1994	3593	–18.5%	July 17, 1998	9338	159.9%	54.0	52.2	1.8
September 10, 1998	7615	–37.8%	January 14, 2000	11723	53.9%	61.9	16.4	45.5
October 10, 2003	7286	–6.6%	March 4, 2005	10941	50.2%	24.5	17.0	7.4
October 13, 2005	10217	–53.8%	October 9, 2007	14165	38.6%	41.3	24.2	17.1
March 5, 2009	6547							
Averages		**–33.3%**			**99.6%**	**47.2**	**32.0**	**15.2**

Cycle Terminology

Harmonic cycles are composed of three measures: period, amplitude, and phase. Because market cycles are not true cycles in the harmonic sense—otherwise they would have been identified more precisely long ago and would be easily recognized through standard harmonic mathematics such as Fourier analysis—we find that the only consistent measure is that of "period." This refers to the time it takes to progress through one complete cycle from bottom to top to bottom again. Amplitude in markets, the amount by which prices rise from bottom to top, is not easily analyzed because it varies with the volatility of the market, which in turn is based on the emotions of the market players. It is quantifiable but is not predictable. Phase is the position of the cycle in relation to other cycles and is not considered in markets. The only measure we are interested in then is the period—how long the cycle is and thus when is it due to bottom in the future.

It is best to measure stock market cycles from bottom to bottom because tops are generally rounded and bottoms are usually sharp Vs. This difference in configuration seems to be due to their different psychological backgrounds. Panic often accompanies bottoms, and panic can come very quickly to the mass psyche. Thus, market bottoms tend to be sharp and completed quickly. On the other hand, greed is the most prevalent emotion at tops, but greed takes more time to develop. Thus, tops are rarely sharp spikes but more often are rounded and at times difficult to identify even in retrospect. In economic data series, the differences in shape between tops and bottoms are less obvious. Although we might use different length moving averages to catch the tops and bottoms, in economic data it does not seem to make much difference. We therefore use the same length moving averages to hunt for tops and bottoms in economic data.

There are various ways to measure cycle periods. The easiest is to look at a ratio chart like that shown in Figure 3.4. This chart shows the ratio of the current price to its 20-day moving average. As the price oscillates around the moving average, we see definite peaks and valleys in the ratio. If these peaks and valleys appear to occur at relatively equal intervals, we likely have a cycle period in the data. In Figure 3.5, the price chart is of the DJIA on a monthly basis with a 24-month moving average, and the lower graph shows the ratio of the current price with its moving average. The four-year market cycle is readily apparent and marked with vertical dashed lines. This is the major market cycle in the stock market and the one that we should concentrate on for market timing of investments.

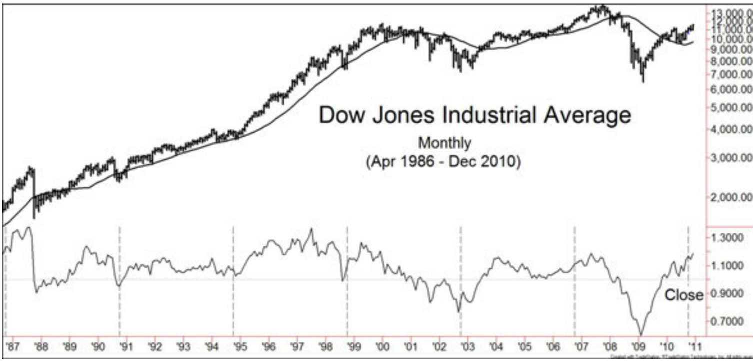

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FIGURE 3.5 Ratio of monthly close to a 24-month moving average showing 4-year cycle lows (April 1986–December 2010)

Notice in Figure 3.5 that the cycle is not perfect. Nothing is. The major declines in 1987 and 2008 did not occur at the normal four-year interval. It turns out they are part of a longer speculative cycle, but for our purposes, the four-year cycle assumption is not perfectly accurate. For this reason, as you will see in the next chapter, we use filters and stops to prevent our being hurt by unexpected events. These methods will signal us to leave the stock market despite what the fundamental and technical analysis suggests.

Conclusion

The principal difference between this book and other technical analysis books is that we are looking at measures of momentum in economic data with the intent to discover technical signals of long-term market price changes. In other words, when an economic series system gives a sell signal, it will apply not necessarily to the economic data itself but to stock market prices. It may also signal an economic recession, but we are now concerned with profiting from the market direction, not the economy's direction. The systems we create are from moving average crossovers of economic data. These crossovers will give us specific buy and sell signals that we test using sophisticated walk-forward optimizing methods for reliability and predictability. The final market-timing model includes the best of these systems.

Endnotes

[1] www.mcoscillator.com/learning_center/kb/market_history_and_background/who_first_came_up_with_moving_averages/.

[2] Brock, William, Josef Lakonishok, and Blake LeBaron. 1992. "Simple Technical Trading Rules and the Stochastic Properties of Stock Returns." *Journal of Finance* 47:5, 1731–64.

[3] Bressert, Walter. 1991. *The Power of Oscillators/Cycle Combinations*. Tucson, AZ: Walter Bressert and Associates.

4

Systems Analysis

To time the markets using technical analysis of economic data, you must first understand how to develop a system, how to test it for reliability, and how to utilize it in the future. Systems are a set of rules with specific variables. One moving average system, for example, is a system in which the price crosses a moving average to give a buy or sell signal. It has one variable: the length of the average. In a moving average system, you could have additional requirements. For example, you could require that the price cross the moving average by a certain percentage to get a signal. This is called a "filtered" moving average system. Your system now has two variables: the moving average length and the percentage filter.

What are the parameters of these variables? In other words, what numbers, called "*parameters,*" do you use for each variable to arrive at a system that provides profitable, low-risk timing results? The filtered moving average system requires you to arrive at specific parameters for each of the two variables. You need a specific percentage, and you need a specific moving average length. You can decide these numbers arbitrarily, or you can test the system with many unknown parameters to see which set of two works best. By "best" I mean that they produce the most profit and least risk. This process of developing a system is what I do in this book with economic data to create buy and sell signals in the stock market. I first apply a filtered, two moving average, crossover system that requires parameters to fill the necessary three variables. Rather than using just the price crossing a moving average, the two moving average systems use one to cross a second moving average. A percentage filter is added to the second moving average. This system requires three variables: (1) first moving average length, (2) second moving average length, and (3) filter percentage. The rules are straightforward: When the first moving average crosses above the second moving average plus the filter, the system signals to buy the S&P 500. When the first moving average crosses below the second moving average minus the filter, the system signals to sell short the S&P 500. The first moving average need not be shorter in length than the second. A shorter first moving average implies that the indicator data is in a direct relationship to the stock market. A longer first moving average implies that the relationship is reverse; the indicator data and the stock market travel in different directions.

You might ask why I include selling short when most market timing is interested principally in long-only investments. The reason I do this has nothing to do with actual investment. I am testing a system for the best parameters. If I tested only for long positions, I would not be optimizing the sell points. Selling is as important as buying, perhaps even more so because you must someday sell a long position, but you don't ever have to buy one. The system will assume that I must sell short when it generates a sell signal, forcing the tests to optimize toward the best selling price. If I use only long positions, the system might sell prematurely and still have a good performance. However, if I force it to sell short as well, it must sell at the best price to profit from the short side as well as the long side. It punishes the system for selling too early. Later you can determine as part of your investment strategy whether to sell short, but at least you know that the test determined the most advantageous time to sell.

Important Considerations

Many investors believe they are investing correctly and always seem to be shocked when they lose money. The reason for this surprise is that they have usually followed some method they read about in a book, learned about in school, or heard from someone else. They believe they are doing the correct analysis, when in fact they are not. There are many myths in investing, and investors succumb to them without question. These myths usually sound logical, and that is justification enough for most investors to commit their capital. Most investment methods, surprisingly, have never been tested statistically. I have seen test results of very sophisticated trading systems, but rarely have I seen statistical tests on the use of price/earnings ratios or earnings growth, and almost no tests of capital risk or the odds of losing capital on a bad investment. No one seems to want to touch these methods with statistical tests, perhaps because they are afraid the tests will fail, or they are so sure of their reasoning that such testing is not deemed necessary. Nevertheless, to invest successfully, you should know a number of things about your method. You should especially know the method's profitability and potential risk of losing money. Without this information, you are investing blindly and unlikely to beat the market. How do you test any method? You develop a system using the rules implied by the method, and you test it. The system must have a means for profit and a means of controlling capital risk. Some system developers concentrate more on risk than on profit and argue that buying could be done on the flip of a coin, but selling must involve strict discipline and control. As many investors found in the major market declines in 2000 and 2008, a system without risk control is doomed.

Investment systems are traditionally divided into two types: *discretionary* and *nondiscretionary systems,* the latter often called *algorithmic systems*. Discretionary systems are those that require you to enter the orders for buying and selling yourself at your discretion. A discretionary investor should have a system but rely on the system for guidance rather than specific action. Algorithmic systems are those that act automatically, without question or deliberation because their intricacies have been thoroughly tested. Obviously, there are gradations between the two extremes from a computer-generated execution system to the freewheeling action of a market maker. The latter system is difficult to test because the rules are not strict or specific. Nevertheless, the freewheeler, to be successful, must have a logical basis for investment or trading decisions. On the other hand, the nondiscretionary system can be tested and optimized.

Some talented investors and traders can invest successfully by making personal, gut decisions, but even the successful investors, like Warren Buffett or Peter Lynch, have a system that guides them in their investing. Buffett's system of buying companies with product monopolies, lack of competitive pricing, low debt-to-equity, and so on is a successful discretionary system. Many of the most successful traders, however, utilize nondiscretionary systems. Examples are John Henry, the owner of the Red Sox baseball team, and Richard Dennis, of "turtle" fame. Many are investors you have never heard of because they keep to themselves and their systems, favoring a low profile.

Algorithmic systems have a strict set of rules and operate automatically. These provide definite advantages. Tested with real market data, an algorithmic system provides a mathematical "edge." It reduces the emotion that often accompanies the decisions to buy or sell. It prevents large capital losses and lessens the chances of financial ruin, a concept foreign to the thinking of most investors. It adjusts to subtle changes in the market behavior. It "pursues trading profit with the relentless consistency and objectivity of computer logic." [1]

Many investors have no idea about the true capital risks they take in their investment and portfolio decisions. An algorithmic system provides certainty, develops confidence, and produces less stress. Though a good system cannot predict the future, it can react to changes in the markets and provide responses to events beyond the investor's control or understanding.

Algorithmic systems do have pitfalls. Tests can be poorly conceived and executed, giving a false sense of certainty. Profits can come in clumps, separated by many small losses. Some very successful systems make profitable trades only 40 percent of the time. Because no system is perfect, small losses always occur. You must be able to accept small losses when using any system. You control losses through risk-control methods such as *stops* and *position sizing* and must abide by them faithfully. Systems contain certain rules, and you must stick with these rules. Otherwise, you compromise the validity of your tests, and you are back to a random method likely to fail. Sticking to the rules, even though the occasional losses are small, is often difficult for investors to do because most expect perfection and give up easily on any system that doesn't automatically make scads of money. These considerations apply to all discretionary and nondiscretionary systems, fundamental, technical, or astrological. To invest without having tested a system is extremely risky and likely to fail.

After the system is successfully developed, you must follow it closely. This is often difficult to do. Losses and no action for long periods dull your senses and make you want to do something just for the sake of doing something. Your mind is still active, though your portfolio is not. You see news, hear rumors, read articles on investment, and are tempted to act. In practice, however, you should never have an opinion of the market. Opinions introduce emotion and divert your attention from the tested system. You should only react when the proven system gives a signal. This is also difficult to do consistently, especially because a system can fail too. To prevent the possible loss from such a development, the system should have a level at which it is closed down. The systems developed here will tell you the level at which it will fail. This level then becomes the point at which, if reached, you should shut down the system and close all invested positions. Additionally, these systems will let you know when it should be updated. This allows for continuation of the system with slightly new and updated parameters.

You should consider other matters as well. Don't fiddle with the system after it has been developed. Realize that your emotions and impatience will tug at you to play with the system, to perhaps second-guess it or anticipate signals. Be organized, and don't wing it. Be brutal and cold-hearted in your buy and sell decisions based on the system. Never deviate from it unless it no longer works.

The following discussion covers the methodology and logic behind this book's model of investing using moving average crossovers in economic data to time the market. This model is not the ultimate system. Undoubtedly, many other systems have been developed and will be developed with more sophisticated mathematics and statistics. This model is meant to be simple, something that you can do for yourself when you understand which economic systems have value and what to do with them to develop market signals.

The assumptions I use for the specific system tests are basic. I am looking for a long-term timing system, not a trading system. I disregard as incidental any concern about commissions, position size, leverage, or any of the other normal factors involved in portfolio management. Those are useful for managing actual money, but you should set aside those considerations when trying to identify a successful market-timing method and to see if something works. I apply simple technical systems to the economic data and review the results based on hypothetical buying and short selling the Standard & Poor's 500 Index. My purpose is to see if there is a relationship between the raw economic data and the timing of the markets. This is a different approach than conventional analysis, which compares the trends of the data and the markets, looking for leading or lagging correlations. It is how technicians look at data from a practical rather than theoretical point of view. I want specific signals, and I want to know the likely results both in profit and in capital risk.

Data

The most important ingredient in testing any system is reliable and accurate data. In our case, it is also important that the data be publicly available. When looking at economic data, we can find many series that might prove useful. The data we use, however, must abide by our constraint of accuracy and availability in a timely manner.

Categories

The important economic categories for market timing to be considered in this book are aggregate corporate data (S&P 500 earnings and dividends), standard national economic data (leading economic indicators), the monetary data (money supply, interest rates), sentiment data (advisory opinion, consumer expectations), and finally, market price data itself. Within each category are a number of different indicators. I optimize each indicator with the filtered, moving average crossover system. The best indicator systems from all categories are merged in the final chapter to create a business-cycle market-timing model.

Data Reporting Delay

Most economic data is published some period after its record date. In the case of monthly data, the lag between the data and its report date can be as long as three months. Sometimes, when preliminary data is reported, the final figures may not appear until many months thereafter. To be sure that the optimization tests in this book are realistic, I delay each system signal to account for any standard delay in data reporting.

Length of Data

Because I am looking at long-term investing, I should have sufficient samples of data to use in tests. Frankly, I cannot ever have enough history. Most economic data comes out either monthly or quarterly. This means that to test a system adequately, I should have many years of it. What I have will be representative of the markets and economy in the past but not enough to satisfy purists who would like 1,000 years or more. I have not used quarterly data in this study because most such data goes back only to the 1940s, roughly 70 years. At four data points each year, this gives me only 280 data points with which to work, not enough to develop a reliable system. The data I use is therefore only that which is reported monthly. Most is reported monthly. I reject the monthly data series that began after 1960 because from then to the present leaves only 600 readings to test. Some data goes back to 1871 or earlier, but most begins in the 1920s to 1940s.

To keep the period consistent between indicators, I use only the past 50 years of data. In the past 50 years, the markets have experienced about everything that could be imagined: bull markets, bear markets, panics, and speculations. Earlier data, while sometimes available, is likely to be less accurate.

I have found that the markets changed their character in the mid-1980s, when index options and futures began trading and when the long-term inflation ended and interest rates reached their historic peaks. Many methods used prior to that time do not work well at present. One problem with this kind of testing is not only the amount of data needed but also the necessity to cover different economic events. A study that includes only bull markets, for example, will have trouble adjusting to a bear market, as many hedge fund managers found out in 2008. The study must therefore have broadness to it as well as length. This study, in all cases, ends with the stock market close on June 30, 2011.

Optimizing

In the pages that follow, you see a lot of statistical information describing different ways to use these technical methods on both economic and price data. Don't be afraid of the word "statistical." I use it only to show that I am looking seriously at relationships between economic data and price data. Though the actual statistics will be numerous, I show only those that are pertinent to the discussion.

Optimization and Model Parameters

An analysis making something function at its best using multiple, effective variables in a system is called "optimization," a dirty word in some sectors because it suggests that the models are made to fit the data (called "curve fitting") rather than allowing the data to determine the model. Curve fitting has no predictive value. It only describes what has happened in the past. If done correctly, however, the immediate advantage of optimization is that it eliminates parameters and variables that do not work. Even with curve fitting this is one important step in the right direction. Elimination of nonworking variables leaves potentially productive variables to investigate further. The advantages of proper optimization are many. Robert Pardo, in his 2008 book [1], outlines the benefits of proper optimizing:

1. Achievement of peak performance: *performance* being profit versus capital risk.

2. Evaluation of robustness of the strategy: *robustness* being the ability to adjust to changes in the marketplace.

3. Maintenance of peak performance: *maintenance* being the ability to adjust and keep peak performance.

4. Adaptation to different markets: the ability to succeed in more than one market.

5. Adaptation to different investors: the ability to accommodate differences in investment capital, time available, computing resources, profit expectations, tolerance for risk, and temperaments.

To determine what seems to work, analysts use many optimization methods to reduce the risk of just fitting the data to a curve. I use two methods: genetic algorithms and walk-forward analysis. In this book, I will primarily use walk-forward optimization because it is unquestionably the best method available to date without becoming so complex and computer-driven as to be incomprehensible.

The walk-forward method is a two-step process. The first step is optimization to calculate a reasonable number of parameter combinations. In our case, the rules are the two moving averages and filter rules mentioned earlier. The range of possible parameters for each of these rules is first determined either by guess or by step elimination. Too many parameters make the optimization process long and tedious. The details of the step process, optimization, and walk-forward analysis are shown in Chapter 5, "Corporate Indicators." The standard optimization program (I use the

Grail software from TradeStation) takes all combinations of parameters, creates a system for each set of parameters, and reports the facts of each system. These facts are ratios, risk calculations, profit levels, drawdowns, and a multitude of other information. The systems are screened and sorted based on any of a large number of *objective functions*. An "objective function" is the ratio or calculation analysts prefer to use in determining the best system. The Sharpe ratio, for example, could be an objective function. Net system profit could be an objective function. In other words, all the systems are sorted by the objective function for the analyst to see which ranks the highest in terms of that function. Net profit is the most common objective function. Naturally, the analyst wants to know parameters for the systems with the best net profit. Unfortunately, net profit doesn't account for capital risk. The better objective functions do consider risk. One I use is called the PROC. "PROC" stands for "pessimistic return on capital." It assumes that the system will gain less and lose more than the simulation suggests. It is a cold-hearted look at the system. A second objective function I use is the MAR ratio, the ratio of compound annual return to the maximum drawdown. Finally, I use a walk-forward efficiency ratio that compares the out-of-sample annual results with the in-sample annual results. The details of these objective function calculations are explained in Pardo's 2008 book [1].

Walk-forward analysis answers ten necessary questions in any algorithmic system [1]:

1. Is the system profitable across multiple runs of the data? (Using different time segments per run, is the system profitable?)
2. Is the efficiency 50% or better? (Does the annual return with unknown, new data equal at least 50% of the annual return with old, historical data?)
3. Are the profits consistent? (Do they occur in different market conditions?)
4. Are the profits evenly distributed? (Are the profits not due to one or just a few profitable trades?)
5. Is the maximum drawdown less than 30%? (Is the capital risk limited?)
6. Is the system invested long or short a majority of the time?
7. Will the system continue to profit?
8. At what rate will the profits continue in the future?
9. What will be the impact of market changes on future profits?
10. How often should the system be reoptimized?

The only perfect way to test a system is to run it in real time. Walk-forward analysis eliminates that requirement by taking only portions of the historic data and testing it again and again against historic data that has not been seen in the optimization process. It thus simulates real-time trading over many intervals and gathers the information needed to determine if the system is robust and will perform with new data in the future.

This method divides the data into many sections, some called the "in-sample data" and some called the "out-of-sample data." It takes the in-sample data, develops the optimal parameters for each variable, and tests those parameters on the out-of-sample data to see if the results still hold. The out-of-sample data is not used to develop the system parameters. The method refines an idea with one set of data, then tests it on another set of data just to make sure the system is on the right track.

Eventually, after many iterations, without touching the out-of-sample data in its optimizing, the walk-forward process produces a few results that have promise. These results are ones that produce profits in both in-sample and out-of-sample data. It is these results that I then analyze for risk, principally for risk of capital loss. If it cannot pass the test for capital risk control, I reject the system even if the earlier results seem promising. After a thorough analysis of reward, risk, and durability are completed, I report the important results of the new system and compare it to all other systems in this book.

Market Stops

Finally, because no system is immune from sudden adverse reactions, I use stops on the S&P 500. Stops signal you to buy or sell when a price reaches a specified level beyond which the S&P 500 position will create an unacceptable loss in capital or loss in profit. They are used to limit losses by exiting from a losing position at a predetermined price. In portfolio management, they are also useful for determining position size and risk, but here I use them only to prevent major loss.

Protective Stops

I use two types of stop signals: the "protective stop" and the "trailing stop." The protective stop is a stop signal determined at the time of the buy or sell entry signal. In each system, I test the placing of a protective stop a certain percentage away from the entry price. The parameters for the percentages are determined from optimizing in the same manner as for the moving averages and use monthly highs, and lows, and closes.

Trailing Stop

The second type of stop I use is a "trailing stop." It is used in the S&P 500 price as well. Depending on which works the best, I test two kinds of trailing stops—the profit percentage stop and the volatility stop. These stops "trail" behind a profitable position as its profit progresses and trigger an exit signal when that profit is threatened. They trigger when the market price changes by a predetermined amount from its most profitable extreme. The parameters for the trailing stops in this book are also determined through walk-forward optimization testing of the S&P 500 over the life of the economic data.

As an example of a profit percentage stop, say your market-timing system tells you to buy the S&P 500 at 980. When the S&P 500 closes above that level, you buy the stock market equivalent and immediately place two stop orders. Based on your studies, you determine a 5 percent protective stop should exist at 931 (5 percent below the 980 entry price). When the S&P 500 advances, you calculate that a trailing stop should trigger when a price reversal has wiped out 10 percent of your profit. If the S&P reaches a high of 1040, for example, your profit percentage trailing stop would trigger at 1034 (10 percent of the $60 profit below the 1040 high). If the S&P 500 declines below your protective stop level at 931, you sell, taking a 5 percent loss. Should the S&P 500 advance as intended, any time that it retraces 10 percent from a profit high since being purchased, you also sell it. You have protected your original investment with the protective stop and protected a large amount of the profits accrued by the rise in the stock with the trailing stop.

The other kind of trailing stop is a volatility-based trailing stop, one that adjusts for the market's recent volatility rather than one based on a specific percentage. Volatility in any market changes with unpredictable oscillations. A trailing stop based on a fixed number runs the risk that a position will be closed simply because volatility increased rather than because the position was in immediate danger. To avoid the risk of volatility prematurely closing a position and to tighten the trailing stop in periods of dull activity, many traders and investors use a stop based on the recent volatility of the market.

"ATR stop" is the name of the volatility-based trailing stop applied in this book. "ATR" is an acronym for "average true range." J.Welles Wilder first introduced the concept in his 1978 book [2]. It is an average of individual periods' true ranges (TR). "True range" is the largest absolute value of three possibilities:

1. The current high to the current low for the current period (hour, day, month)

2. The current low to the previous close

3. The current high to the previous close

The true range measures how much the price vacillates from one period to the next period, as in bar charts from one bar to the next. The average true range (ATR) is the average of the true ranges over a past number of periods, usually 14.

The ATR increases and decreases with the price range and is thus a measure of volatility. It is more realistic than "standard deviation" because it compares price ranges to each other rather than determining the distance from a hypothetical mean. For a trailing stop, there are two variables. The first is the length of the average of TRs. For example, the standard is 14 bars (a bar is one period, say a month, day, or week of price action). In that case, the ATR is an average of the immediate past 14 TRs and is measured in terms of price. The length is a variable to be tested. After the ATR is calculated, the trailing stop is placed a certain number of ATRs from the most profitable price. As an example, the calculation might use a 14-month ATR of 2.5 points and require that the price close 3.2 ATRs from the most profitable position price. The trailing sell stop in a long position would be 2.5 points times 3.2 ATRs, or 8 points from the most recent profitable price high. The number of ATRs is also a variable to be tested. This stop level will change each month as the ATR fluctuates with price volatility. I must determine the optimal length of the ATR and number of ATRs to use as the best final figure for the trailing-stop calculation. I thus optimize for the ATR length (number of past ranges in the ATR calculation) and for the number of ATRs from the recent position price extreme that will produce the best trailing-stop results for both longs and shorts. Using the monthly S&P price bars for the period of the system, I can optimize the best configurations for long and short trailing stops.

Equity Curve

To measure the success or failure of a timing system, or any investment or trading system, you must have a means of determining the practical implications of the system. The common way to do this is to create an "equity curve." An equity curve is a graphic plot of the net result of the system. Thus, if you have a system that times the market, you first determine the investment vehicle (S&P 500), the type of signals (long and short), trade size ($50,000), and mix of orders (entries and stops) that you will use to make the system portfolio realistic. After these mechanics have been determined, you run the system model to see how it performs. This produces an "equity curve" graphic that represents the gains or losses in sequence that would have accrued had the system operated during the period specified. From this graphic, you can immediately tell not only if you have a system that would have been profitable but also the weak periods and the irregularities or odd configurations of profits from the system.

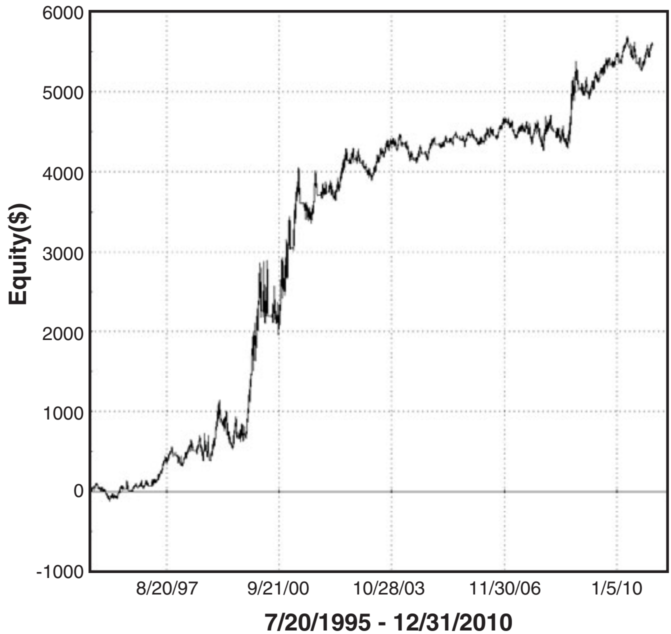
Ideally, the equity curve graph should rise from lower left to upper right as profits accumulate and should be a smooth curve with a minimum of corrections. Any corrections to the equity curve are called "drawdowns." They measure the potential capital loss risk of the system at any time during its progression. The largest drawdown in the system is called the "maximum drawdown" or MDD. This is the one figure most often associated with estimating the capital risk of any system. Some system designers use an average of the five largest drawdowns for their risk assessment. I prefer to use the MDD, the single largest.

All profitable systems have losses at some time. A very profitable system, for example, might have times when it corrects 50 percent or more. Curtis Faith, in his book on the Turtles [3], writes of suffering a 70 percent drawdown in his portfolio and still profiting in the end. Would you want this system? Even if you had seen that it was a good system over time, would you be able to withstand a 70 percent or greater loss in your assets and still hang in with the system? Not likely. Nerves are strong, but not that strong. You should make a percentage limit before trading any system and agree that you would only be willing to look further into any system that has an equity curve maximum drawdown of less than that limit. Before beginning, you should also agree that if you use the system, you will abandon it anytime it loses that percentage. The percentage risk figure usually is estimated from the MDD. The conventional method is to use 1.5 times the MDD as the system limit. Thus, if the system has a 20 percent MDD, the "close-down" percentage is 30. If 30 percent is too much for your nerves, you should not pursue the system. Different types of traders and investors have different thresholds of capital risk loss. This is a personal decision. You will take losses in any system, more so as you tighten the stop constraints above what a system suggests. It's a question of how much loss are you willing to take. You will see later that many systems with large MDDs also produce large profits. Determine before you begin activating a system what loss level you are willing to accept and what loss tells you that the system is no longer working. When a system is developed and tested, its MDD is well established. You can't change it with any new tricks, and you should never restrict it with stops or other methods not already tested. The risk level of each walk-forward optimized system is an unalterable fact. If the system's risk level is too large for your tastes and nerves, don't use the system.

In Appendix A, "System Parameters," for the methods I describe in the following pages of this book, I give the maximum drawdown percentage of the equity curves shown for your consideration. I generally use the 20 percent figure as the critical level for a system to be considered further. From these percentage maximum drawdowns, you can calculate the terminal percentage correction for abandonment of the system.

I also show the maximum loss within any one trade. This is called the "maximum adverse excursion" (MAE). It is the percentage adverse correction that a trade takes before it closes, regardless of whether the trade eventually wins or loses money. The maximum adverse excursion of a losing trade often becomes the estimate of where you should place your protective stops. Any trade that loses more than the maximum previous loss suggests that something is definitely wrong with that trade and that you should close it.

In Figure 4.1, you can see the equity curve of what at first appears to be a very profitable system. The equity curve is rising to the right, suggesting that the system continuously adds profits to the portfolio. Indeed, it had a 1,500 percent return over the 15-year period. Because of the scale, the largest drawdown seems to be in September 2000 when the equity declined from $2,617 to $2,028 (daily closing value), or 21.7 percent. However, in early June 1999, equity declined from $1,117 to $550, or 50.7 percent. This would make this system unsatisfactory to most investors because they would be unable to withstand that kind of drawdown. Thus, we have a very profitable system that is unsatisfactory because of capital loss risk. The equity curve is the method that told us to disregard this otherwise profitable system. The system is a good one for profits, but due to the arithmetic scaling of this chart, which gives advantages to profits seen late in the study period, examining the percentage drawdown shows us that there are problems to explore.



Created with TradeStation. ©TradeStation Technologies, Inc.

FIGURE 4.1 Example of an equity curve

The use of stops "fine-tunes" the system results by preventing the occasional errant signal from doing too much damage, but it doesn't change the system basics. Because stops can close a long or short position before a new signal is generated, the equity curve may have flat periods when the hypothetical portfolio is not invested. At that time, the portfolio is neither gaining nor losing. The equity curve then continues when the next entry signal occurs.

Stock Market Data

I use only the past 50 years of S&P 500 price data. All entry signals are recorded at the close of the month and hypothetically executed at the opening price of the following month. Because all the optimizations are based on closing prices, signals must wait for the closing price to be valid. A signal generated intra-month, for example, should never be used because the tests include only month end data. Protective and trailing stops, however, may signal intra-month whenever their requirements are met.

Conclusion

After I analyze all the possible systems using fundamental data for market timing, I pick the best ones to be included in the final timing model. To do this, I use a self-determined scoring system. The formula is described in Chapter 5, in Table 5.1.

This scoring system is the primary method used to screen through the different systems to see which is the most profitable with the least capital risk. The final picks for the timing model are based on the score, the maximum drawdown, the time in the market, and whether the system beat the market. Drawdown must be less than 30% over the 50 years; time in the market must be greater than 50 percent; and a performance ratio relative to buy-and-hold must be greater than one. When a system meets the robustness requirements and passes these three additional requirements, it is ranked with others based on its score.

Endnotes

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5

Corporate Indicators

In this book, the five indicator categories used to time the stock market over the business cycle are corporate, economic, monetary, sentiment, and market. In this chapter, I look for the best method of using corporate data. By "corporate data," I mean things like aggregate corporate profits and dividends.

Investment thinking has long assumed that corporate earnings and dividends are the principle driving forces behind stock prices. These tests partially confirm that thesis but not to the degree we would necessarily like. Only six out of the ten combinations of dividends, earnings, and interest rates showed robust characteristics, and they did not score high enough to be included in the final model.

Models of Future Stock Market Returns

Finance professionals focus on what they call "valuation ratios" because ratios take out the change in components over time. For example, the S&P 500's earnings yield ratio is a ratio of the operating corporate earnings to the market value of all stocks in the S&P 500. Academics change the name from the more commonly known "price-to-earnings ratio" or "p/e" to "e/p" or "earnings yield" by inverting the ratio. This makes sense because the resulting ratio is the yield or investment return on the S&P market value assets. If stocks are valued at $10 trillion, hypothetically, and their aggregate earnings are $1 trillion, stocks are yielding 10 percent ($1 trillion/$10 trillion). Over time, the components of the ratio, earnings and market value, change and grow as the economy expands. However, the ratio itself varies much less than its components because it measures the relationship between the two components, not the details of each. Ratios, therefore, are useful in assessing relationships rather than specific data. Sometimes these relationships have predictive value.

Federal Reserve Model ("Fed Model")

Ed Yardeni, when he was a strategist for Prudential Securities, found in the Federal Reserve Humphrey-Hawkins Report for July 1997 a depiction of the S&P 500 earnings yield against the U.S. 10-year constant-maturity bond yield [1]. At that time, the Federal Reserve postulated that there was a close correlation between the two figures. Many investment institutions took this "model" as an indicator of the prospects for the stock market. In other words, you can rearrange the formula to [stock price = (1 / bond yield) × stock earnings per share] and substitute the bond yield and either current or expected stock earnings, to get an estimate of the stock market value. If the current market price is above that estimate, it is overvalued, and vice versa when it is below that estimate. This hypothesis assumes, of course, that stock investors think only in terms of bond yields, which is not always true. It also assumes that inflation affects bond yields and equity yields equally, a conclusion inconsistent with modern asset pricing theory. This inconsistency is argued away by incorporating uncertainty (always undefined!) into the equation. For our purposes, of course, these academic arguments are irrelevant. Recently the correlation between earnings yields, but not bond yields, and the inflation rate has been high, thus refuting, to some extent, asset pricing theory. Despite the theories, the facts are that the correlation between earnings yields and dividend yields with the stock market has also been high. This latter relationship is what we want to know and use in timing the stock market.

Valuation Ratios

Studies [2] show that the corporate factors with the highest correlation to the stock market's performance are the following: valuation ratios, yield spread (also known as the "yield curve"), interest rate levels, corporate finance patterns, and more recently the level of consumption in relation to wealth. I look at interest rates and yield curves in Chapter 7, "Monetary Indicators." The other data was not available to me in a publicly available format.

Academic studies [3] have also found that valuation ratios that have explanatory power in the stock market are the earnings yield, the smoothed earnings yield (smoothed with a moving average), the dividend yield, and the book-to-market ratio (book value of all stocks to the market value of all stocks). The latter two ratios were found to be important in individual stock assessment and thus important for the entire stock market.

The practical problem for nonprofessional investors is that although these ratios might be useful in explaining market turns, much of the data is not publicly available. In the tests that follow on corporate indicators, I use only data acquired from the Federal Reserve, Standard & Poor's, and *Barron's* magazine. The historical data from 1871 comes in Excel format from Yale Professor Robert Shiller's website [4]. This data is the price, earnings per share, and dividend per share. The earnings yield and dividend yield were calculated from the base data. Other corporate statistics reportedly have value in market timing, such as price-to-book, cash flow, and price-to-sales. These are difficult figures to find, however, with a long enough history to test. In general, these statistics can also be unreliable. They are easily manipulated to produce favorable impressions. Paying out a dividend, or not, is harder to fudge. For my moving average crossover systems, the only public data with a long, consistent history available is Standard & Poor's reports of earnings, dividends, and prices. The Federal Reserve reports on them weekly and have since 1921, and you can access them weekly in *Barron's*. If you use them, be sure to use only month-end prices and actual month-end reports of earnings and dividends. These are the numbers used in the study, and your results will be different if other numbers are used. Also be wary of trying to anticipate what the numbers might be in the future, just to get an "edge." Doing that puts you right back into the guessing game and prevents you from making a rational decision based on practical studies such as these.

Earnings Yield

Most academic studies of the factors affecting stock price returns show that earnings yield has the highest correlation. Of course, most of these studies, unlike this one, fail to measure an out-of-sample test to see whether the correlation holds up in a set of data unknown to the system, or if it is just over-optimizing the existing, in-sample data. As you have seen in the preceding chapter, a relationship between one set of data must be tested against another out-of-sample data before we can judge that it might have predictive value. Regardless of how successful a system is during the in-sample data test, it must be disregarded if it cannot show profitable, minimal-risk results in unknown, out-of-sample data.

As with most tests in this book, this optimization creates a moving average crossover system with a filter. Such a system has a set of moving averages and a percentage filter by which the first moving average must cross the second moving average before a signal is given. There are thus three variables: first moving average, second moving average, and percentage filter. The final moving average length and percent filter parameters are determined solely through the walk-forward optimization.

To give you insight into the entire process, for earnings yield in this chapter alone, I go through the entire optimization, testing, and evaluation process in detail. In the experiments remaining after this one, I report only the resulting figures and add some commentary on the each indicator's character.

Walk-Forward Optimization Method

The process begins with earnings yield. Later, I also look at earnings themselves, the annual percent change in earnings, earnings yield annual percent change, and earnings yield less the three-month Treasury bill rate.

First Step

The first step is to run a standard optimization of the earnings yield to develop all the systems possible within a range of a certain set of parameters. These parameters are the possible values for the three variables: first moving average length, second moving average length, and filter percentage. The recorded data for each system include the buy and sell points, prices, profit and loss, drawdown, and sequence for each set of parameters. The total number of possible permutations can reach as high as 1,000,000, depending on the number of different parameters I wish to test in each variable. It sounds complicated, but what I am really doing is recording the outcomes of all combinations of first and second moving averages and filters over a wide range of possibilities. Of course, I have to guess at first what range to test. I usually begin with 1 to 100 for each moving average length in months or weeks, and from 0 percent to 100 percent for the filter. The length of 50 months is close to four years, the average length of the business and stock market cycle. This results in 1,000,000 possible combinations over a period of 50 years.

All searches for best parameters in optimization require an "objective function." This is a goal that all possible systems are compared to in the search, and the relative achievement of that goal is how different systems are compared. For example, we could use maximum drawdown as the objective function for the study. This would require that each set of parameters be combined to produce the system with the lowest maximum drawdown. Unfortunately, this objective function is not a good one because it doesn't account for profit. A system that doesn't lose money also doesn't make money. I've found that one of the best objective functions is the Pessimistic Return on Capital (PROC). This is a slight variation of Pardo's Pessimistic Return on Margin (PROM) in that it assumes a cash-only investment style, not including financial leverage.

This objective function reduces the gross return and increases the gross loss to arrive at a pessimistic estimate of the profitability of the system. Specifically, the number of winning trades is reduced by one standard deviation, and the number of losing trades is increased by one standard deviation. The adjusted number of winning trades is multiplied by the average winning trade profit to arrive at a new lower estimate of gross profit. The adjusted number of losing trades is multiplied by the average losing trade loss to arrive at a new higher estimate of gross loss. The difference between the adjusted profit and adjusted loss is then annualized to make the function comparable to that of other systems.

Using a "grid" search that looks at all possible combinations is time-consuming and tedious. Rather than cranking through all the data or when the data series requires a large number of iterations, I perform a genetic algorithm scan. This is a method derived from evolutionary science. It takes "individuals" (combinations of parameters), matches them together over a "generation," and through the biological methods of selection, crossover, and mutation produces systems that best fit the objective function. It is a method much quicker than the grid method of scanning, and in investment scanning it is particularly accurate.

The standard optimization process records the possible systems that best meet the objective function. This gives me a set of parameters to use in the second step, the walk-forward optimization. In the earnings yield example, the genetic algorithm optimization using the PROC objective function as the measure of the best performance, produced a range of parameter combinations on which to continue with the walk-forward optimization. Although the genetic algorithm is "evolving" the best set of parameters, it is also recording the records for all the sets it looks at. This procedure eliminates the parameter combinations that have little chance of surviving and gives me a range of "best" parameter sets upon which I can run the walk-forward optimization and analysis.

The other reason for finding the best solutions first is that the less profitable are eliminated in the beginning. The walk-forward optimization selects only those top systems that work reliably with new, unseen data.

It doesn't care if they are profitable. First selecting a large sample of profitable systems through the initial optimization thus eliminates those that we will never consider no matter how well they duplicate their results in unknown data. On the other hand, a large sample of best systems does not guarantee that any of them will continue to be profitable with new data.

In the earnings yield example, the genetic algorithm selected for walk-forward analysis is 3,254 potential systems from the original 1,000,000.

Second Step

The second step is the walk-forward optimization. This procedure takes the information from the first step and reoptimizes it using the walk-forward method. It then gives us a few examples of systems that have passed the robustness requirements of the walk-forward optimization method.

Walk-Forward Method

The principal problem that trading and investment system designers come across is that systems tested with past data often don't work in the future. Testing a system in real time takes many months of observation, especially as in our case where the periods between signals may be many years. To work in the future, a system must be tested in the future, or at least the "future" from the standpoint of the system. To do this, a system test must use some historical data to develop the parameters of the system, and then test these parameters in data that the system has never "seen" as if it were data in the future. If the system continues to profit in the new, unknown data, we have excellent evidence that it will profit with any similar data, including that which will come in the future. The walk-forward testing method is one way to do this.

The walk-forward method divides the historical data to be tested into two subdivisions: the "in-sample data" and the "out-of-sample data." The in-sample data is usually the first 70 percent of the historic record and the out-of-sample data is the last 30 percent. The walk-forward method never uses the out-of-sample data to adjust the parameters of a system. The out-of-sample data is used only to test the system designed by the in-sample data. Taking the two subdivisions, the walk-forward method then separates the subdivisions into multiple windows. In each window, the method derives a system and then tests it in a subsequent window. The test progresses through each window of derivation-and-test, called a "run," until the entire data set has been evaluated. In the end, the results show the system with the best chance of continuing into the future.

Each run performs a "rolling" optimization on the data windows. This means that each window is optimized, tested against the following unknown percentage segment. Using the best system, it then shifts forward to the next window and does the same optimization until the entire database is tested and all walk-forward tests are complete. If we take an example of one test of historic data with 1,000 bars (the testing is done by bars, not by dates), an out-of-sample percentage of 10 percent, and five walk-forward runs, we see that the total bars per run would be 1000 / (5 runs * 0.10 + 0.90) or 714 bars per run for five runs. In-sample bars would be 642 (714 × 0.90) and out-of-sample bars 71 (714 × 0.10). Thus the series of runs would be as shown here:

	In-Sample		Out-of-Sample	
	Start Bar	End Bar	Start Bar	End Bar
Run #1	1	642	643	715
Run #2	72	714	715	786
Run #3	143	785	786	857
Run #4	214	856	857	928
Run #5	285	927	928	999

As you can see, each optimization run uses known data for optimizing and unknown data for testing and never uses unknown data in any optimization.

In looking for the best system combination of parameters based on the objective function, I prefer the MAR ratio, an acronym for a now-defunct hedge fund performance-measuring firm that is the ratio between the net annual profit percentage and the maximum drawdown percentage for the system. This measures, in my experience, the best relation between reward and capital risk. The initial system scan focused on profits versus losses using the PROC method. The final scan will take those systems that produce the best MAR ratio, thus testing them for maximum drawdown as well as profit.

With the small amount of data in this study, the walk-forward procedure normally arrives at several optimal results for the final list. The parameters for the systems that meet these criteria are reported, as well as other information. One interesting derivation from the analysis is the number of months the best system is expected to continue to profit. I found that in almost all instances for this book, the outcomes were good for around 57 months, roughly four years after June 2011, the final test date of this study. After that period, the systems must be reoptimized.

The second step is the analysis of the walk-forward results to find which of the derived systems are worth further study. The walk-forward optimization produces several statistics that are necessary for a system to be profitable in the future with some predictability and with robustness. "Robustness" refers to the system's ability to adjust to market changes. To be selected in the final list, the criteria for optimal results are that the system must: 1) be profitable, 2) show efficiency of 50 percent (out-of-sample annual results at least 50 percent of in-sample annual results), 3) have 50 percent of runs be profitable, 4) show an even distribution of profit from more than just one or two large trades, and 5) have a maximum drawdown of less that 40 percent.

Parameters also must be able to change slightly without affecting the profitability of the system. The system must be able to operate successfully in bull and bear markets, sideways markets, and any of a large number of odd market situations. It should be able to handle long and short trades with equal ease. A system that fulfills all these features is said to be "robust." One test for robustness is called the "walk-forward efficiency" (WFE). This is the comparison of the annualized profit from the out-of-sample period to the in-sample period's annualized profit. For example, the annualized net profit for a system run on historic data during the optimization is $9,000 per year. When the same system is run on the out-of-sample data, the annualized return is $6,000 per year. The WFE is 66.7 percent ($6,000/$9,000).

To pass as a viable system, it must have a WFE greater than 50 percent. In addition, it must have a maximum drawdown less than 40 percent and must have more than 50 percent of its out-of-sample trades profitable. If all these criteria are met or exceeded, the system has passed the robustness test and is likely viable into the future. If any one of these requirements is not met, the system is rejected because it is likely to fail in the future.

In the earnings yield example, only one system met the robustness requirements for further study. It was a 33-month first moving average, 23-month second moving average, and a 9 percent filter.

Notice that the first moving average was longer than the second. This suggests an inverse relationship between the earnings yield and stock prices. In truth, though, we don't care which moving average is longer than the other as long as we receive reliable and robust signals.

Third Step

After meeting the above requirements, the systems must next be analyzed for risk versus profit. There are three more requirements: maximum drawdown less than 30 percent, time in the market more than 50 percent, and total compound return better than the buy-and-hold total return. Total compound return is calculated as the compounded return of the system over the entire test period from the first trade entry. Each trade is considered to be fully invested, and its percentage change over the period of the trade is calculated. The same is done for each successive trade, treating it as a separate and independent trade. The performance of the first trade is then multiplied by the performance of the second trade and so on through the entire list of trades. The result is the compounded annual growth rate (CAGR) for the system over the total trading period. This method eliminates the problem of determining position size (always 100 percent invested from the results of the previous trade). Knowing the total compound return, we then compare it to the buy-and-hold total return from assuming a buy signal at the first system signal and holding the position throughout the test period. The ratio of total return to buy-and-hold return must be above one, and preferably above two, or the system is rejected because it provides no advantage.

The more time the system is invested in the stock market, the more suitable it is for investors. On the other hand, systems with only a minor amount of time in the market can have much more reliable signals. Some systems may be invested only 10 percent of the time but are 100 percent accurate in their signals. They are worth following separately from our final model but are not included because their long period of dormancy discourages investors who wish to be more active.

Table 5.1 shows the best system from the initial walk-forward optimization of the earnings yield systems. This system has the highest robustness and best profit versus drawdown loss of all the potential systems the optimization procedure scanned for earnings yield signals.

TABLE 5.1 Best Earnings Yield System Parameters and Performance Results

FLEN	33
SLEN	23
Filter	9%
Protective stop long:	23.5%
Protective stop short:	0.1%
ATR trailing stop long:	
Length	25
Number	3.1
ATR trailing stop short:	none
Length	
Number	
Initial Trade $	$100
Net Profit $	$6,290
# of Trades	10
Time in Mkt %	39.5%
Time in Mkt yrs	17.0
CAGR %	27.7%
MDD %	19.13%
MAR	1.447
BAH %	1,687%
ROC %	6,290%
RR Ratio	3.729
Max Fav Excursion %	112.3%
Max Adv Excursion %	12.16%
Exc Ratio	9.235
Score	74.73

Legend:

Score: *(CAGR)+(30-(MDD))+10?(MAR)+5?(TR/BAH)+sqrt(MFE/MAE)*

FLEN: *Fast moving average in months.*

SLEN: *Slow moving average in months.*

Filter: *The percentage by which the fast moving average (FLEN) must cross the slow moving average (SLEN) to receive a signal.*

Initial Trade $: *Assumed value of an account at the beginning of the test, usually $100.*

Net Profit $: *Amount accrued to the account over the test period using the signals generated by the system.*

# of Trades: *The number of completed transactions, long or short, from entry to exit.*

Time in Mkt %: *The percentage of the historical data period that the system was invested long or short.*

Time in Mkt yrs: *The number of years that the system was invested long or short.*

CAGR %: *Compound Annual Growth Rate—Average annual system return compounded.*

MDD %: *Maximum Drawdown—Largest percent capital drawdown in the history of the system; greater than 20 percent is likely more than an investor can withstand.*

MAR: *Ratio of CAGR to MDD—Shows relationship of system reward versus risk; any number greater than 1 is good, greater than 2 is excellent.*

BAH %: *Total buy-and-hold return over the period that the system was tested.*

ROC %: *Total return-on-capital for the system over the period that the system was tested.*

RR Ratio (ROC/BAH): *Relative Return Ratio—System total return to buy-and-hold return, shows system performance versus doing nothing; greater than 1 is favorable, greater than 2 is better.*

Max Fav Excursion %: *Maximum Favorable Excursion (MFE)—Largest favorable single trade percentage advance; the higher, the better.*

Max Adv Excursion %: *Maximum Adverse Excursion (MAE)—Largest unfavorable single trade percentage decline within all trades; the lower, the better; percentage greater than 100 percent is usually a short sale.*

EXC Ratio (MFE/MAE): *Excursion ratio—Reward versus risk within individual trades; good is greater than 10.*

You will notice in Table 5.1 at the bottom there is a score number. This score number is explained in the legend. I summarize the results of the system into this score to provide a common evaluation number to compare any system with the other systems in this book. You will be looking at many different systems in this book, and the score number is the way in which I will compare them. The highest-scoring system from each category will be used in the final market timing system developed in Chapter 9, "Putting It Together." Generally, a score greater than 50 is an excellent system.

The principal components of the scoring number are three ratios: the MAR ratio, the relative return, and the excursion ratio.

The MAR ratio, the ratio between the compound annual growth rate of the system divided by the maximum drawdown, was discussed earlier. It is the objective function for the walk-forward optimizer. It measures the relative importance of the maximum drawdown to net profit. Large drawdowns can occur either from a series of small losses or from one single bad trade. If the drawdowns are from a series of small losses, I must discard the system. This is like rolling craps and busting out on every roll of the dice. Martingale systems, like doubling up losing bets in craps and roulette, only make the eventual loss worse. It means there is something wrong with the system and that we probably cannot improve on it, as it exists. On the other hand, if the drawdowns are due to one or two bad trades, we can use stops signals to lessen the effect of those bad trades. Most of the systems in this book had trouble in the 1987 crash, for example, because it occurred so suddenly and was so deep. The *MAR ratio* is best when it is above 1. The earnings yield system has a MAR of 1.447. This is an extremely high ratio and suggests that the maximum drawdown will be covered by profits in less than one year.

The other important figures in comparing systems are the *relative return ratio* and the *excursion ratio*. The relative return ratio tells us whether the system has performed better than the general market. It measures the ratio of net profit to the buy-and-hold profit had the investor done nothing. A ratio less than 1 is sufficient to reject the system, and ideally the ratio should be greater than 2. In the earnings yield system, the relative return ratio at 3.729 shows excellent performance versus the buy-and-hold. The preferable ratio is 2.0, and the earnings yield result is much higher.

The excursion ratio measures the reward and risk derived from the single best and worst trade called respectively the "maximum favorable excursion" and the "maximum adverse excursion." The excursion ratio should be above 10. The earnings yield excursion ratio is 9.235, close to the ideal. The maximum adverse excursion has one other function. If it is large and doesn't eventually return to a profit, it establishes a potential level for a protective stop. When the system is optimized for protective stops, the adverse excursion should be checked against the optimized protective stop percentage.

Stops

The traditional method to reduce drawdowns even further, provided they are not a series of losses, is the use of stop levels. These levels signal when a system position has reached a point where it is in danger of producing a large drawdown and should be closed.

As explained in Chapter 4, "Systems Analysis," there are many stop methods. The two I use are the protective stop and the trailing stop. The protective stop is placed at a specific percentage below the entry price and protects the initial investment from a large decline. The trailing stop follows the price in the direction of the trade and exits once the price reverses by a specified amount. For a trailing stop, I could use either a profit-percentage trailing amount or an average true range (ATR) volatility stop. The percentage method has a weakness in that it is fixed regardless of the volatility of the price. The percentage-trailing stop works in the instance when volatility widens the ATR stop range at some major market tops and thus delays the stop signal. For this reason, it is rarely applied. On the other hand, the ATR method accounts for the immediate past price volatility and determines a stop level based on that volatility. I first use an ATR stop and test for the optimal combination of look-back period and amount of volatility I am willing to accept before closing the position. Next, I optimize for a profit-percentage trailing stop to see if I improve the results.

A profit-percentage trailing stop requires parameters for two variables in long positions and two in short positions. Unlike the volatility stop, the percentage stop must kick in after the price has traveled a certain distance of profit. Otherwise, the percentage stop would make premature exits from positions. This requirement forces the system design to optimize for profit needed before a trailing stop is calculated and determines the percentage of the trailing stop itself. The trailing stops in this test determine the amount of profit in each trade based on a percentage, and the percentage stop becomes a percentage of that profit, not the investment itself. Thus, the percentage-trailing stop is based on the profit of the trade, not the value of the investment.

An example would be a trailing percentage stop with a 10 percent profit requirement and a 20 percent profit retracement once that 10 percent profit had been reached. A stock purchased at $100 and now trading at $140 would surpass the 10 percent profit requirement for initiation at $110. From then on, the system would check to see if the existing profit had declined by 20 percent from its high. At $150, the stock would have to decline by $10, or 20 percent of the $50 profit, to trigger the protective stop. In future tests, I use both the ATR volatility and the percentage trailing stop methods in each of the systems designed in this book to see which has the best profit versus drawdowns. It turns out that ATR volatility stops usually provide the best results.

To optimize for the best protective stops and the best trailing stops, I use the same optimizing procedure as for the original moving average optimization. I determine the best range from the initial optimization based on the PROC function and then run the results through the walk-forward optimizer using the MAR ratio as the objective function. Each kind of stop is analyzed separately. In a long position, a protective stop will almost never interfere with a trailing stop because it is usually below the entry price, whereas the trailing stop is usually above the entry price. At first, I optimize specifically for protective stops. Regardless of whether I receive favorable results, the system is then optimized specifically for trailing stops. When optimizing for stop levels, I never adjust the moving average lengths or filter of the basic system. They are the result of earlier optimization of the primary crossover system variables and are inviolate. When optimizing the stop levels, I run a walk-forward optimization on each variable for each stop type to determine if they are robust. If they are not, I reject them.

The protective stop requires a different percentage for long and short positions. Thus, there are two variables to optimize. Each trailing stop method requires four variables—two for long and two for short positions. Each trailing ATR stop requires the length of the true ranges to calculate the average true range (ATR) and the number of ATRs to use from the price extreme for the stop. Each profit-percentage trailing stop requires the profit percentage to trigger the stops and the percentage profit retracement for the stop signal.

The calculation for an ATR is explained in Chapter 4, and the calculation for profit-percentage trailing stops is discussed in the following text.

Results for Protective Stops

In the earnings yield system, the walk-forward optimization finds protective stops for long positions is 23.5 percent below the entry price, and 0.1 percent for short positions above the entry prices.

Trailing Stops

The final optimization is for the trailing stops. The earnings yield system has one robust ATR trailing stop for long positions. The figures are a 25-month length for the ATR, and the number of ATR's above the highest level reached while holding the position is 3.1. This is a close stop and will block any errant long positions almost immediately. Profit-percentage trailing stops have no robust parameters in the earnings yield system and are disregarded. In sum, the earnings yield system has one ATR stop to protect against capital risk.

Other Reasons for System Rejection

Additional causes for rejection are a time in the market of less than 50 percent and a maximum drawdown of more than 30 percent. The time constraint is important because most investors want to have knowledge at all times—just what the indicator is suggesting. If it only signals occasionally, it may be an excellent indicator to trading, but for investments it is difficult to comply with. Most signals that occur over short periods catch specific types of market moves, but do not say much about the overall trend. They give quick in and out signals and often are very good, but the time between signals should be short for investors seeking a continuous position. The maximum drawdown limit is obvious. I use 30 percent, and others may use a higher or lower threshold. To me, losing 30 percent is painful enough without having to worry with a higher drawdown whether the system itself has failed. Lesser maximum drawdowns in concert with high profits, of course, are the ideal. The MAR ratio measures that relationship on a relative basis, but regardless of a high MAR ratio, you must have an absolute percentage drawdown as a guide to the continuing viability of the system. The time and maximum drawdown constraints are investigated after all stops have been investigated for robustness.

Earnings

There is no dispute that corporate earnings are directly responsible for the underlying, long-term trend in the stock market. Although prices may fluctuate in a wider range than do earnings, due to the emotions and expectations of investors, earnings ultimately determine the value of the stock market and its ability to provide a return to investors. Standard & Poor's publishes on their Web site [5] the anticipated earnings for the S&P 500 out several years ahead. They publish the actual earnings with a considerable delay, usually about a quarter or three months. However, the near-term estimates are accurate for calculating the moving averages until the real numbers come in. I use one-month delay between the month-end earnings estimates and the crossover signal, believing that one month is enough time to learn of reported earnings figures. Usually they are out in several weeks after the quarter end.

As with earnings yield, I run a walk-forward optimization on four configurations of earnings to see if I can get a better system based on the raw earnings figures. These optimizations are summarized in Table 5.2.

TABLE 5.2 Optimization figures for various configurations of earnings reports.

	Total Return	Max DD	Score	Result
Raw earnings	2,162%	27.4%	29.33	Okay
Earnings yield	6,290%	19.1%	74.73	rejected-time
Annual percent change in earnings	2,457%	25.7%	36.40	Okay
Annual percent change in earnings yield	6,728	15.5	67.11	BEST
Earnings yield minus the 3-month Treasury bill rate	LOSS			FAIL

Legend

time:	time in the market less than 50 percent
BAH:	performance less than Buy-and-Hold
MDD:	maximum drawdown more than 30 percent

Earnings yield annual percentage change seems to show the best potential for market timing with a score of 67.11, the highest of any passing score in this chapter. All other systems connected with earnings either fail or are rejected for lack of risk avoidance.

Dividends

Because the dividend-discount model is still prevalent in some analyst circles, you would think that dividends would make an excellent market-timing system. That turns out not to be the case when using a filtered, moving average crossover system. Table 5.3 shows the results of optimizing different configurations of dividends in the manner done for earnings.

TABLE 5.3 Optimization figures for various configurations of dividend reports.

	Total Return	**Max DD**	**Score**	**Result**
Raw dividends	43,710	32.85	218.7	Rejected for MDD
Dividend yield	FAIL	FAIL	FAIL	FAIL
Annual percent change in dividends	FAIL	FAIL	FAIL	FAIL
Annual percent change in dividend yield	FAIL	FAIL	FAIL	FAIL
Dividend yield minus the 3-month Treasury bill rate	FAIL	FAIL	FAIL	FAIL

Legend

time: time in the market less than 50 percent
BAH: performance less than Buy-and-Hold
MDD: maximum drawdown more than 30 percent

All five combinations of dividends either fail the initial test for robustness or are rejected later. Dividends, therefore, are not the answer for this type of market-timing model.

Conclusion

Of the ten configurations in earnings and dividends, corporate earning systems perform better than dividend systems, with at least a few that pass all the robustness and risk tests. Of those systems that do pass, earnings yield annual percent change has a high enough score to be considered for the final model.

Endnotes

[1] Bekaert, Geert, and Eric Engstrom. September 2008. "Inflation and the Stock Market: Understanding the 'Fed Model.'" Working paper draft, Federal Reserve Board of San Francisco. www.frbsf.org/economics/conferences/0901/Bekaert-Engstrom.pdf.

[2] Campbell, John Y., and Samuel B. Thompson. 2008. "Predicting Excess Stock Returns Out of Sample: Can Anything Beat the Historical Average?" The Review of Financial Studies (21)4:1509-1531.

[3] Goyal, A., and J. Welch. 2010. “A Comprehensive Look at the Empirical Performance of Equity Premium Prediction.” The Review of Financial Studies (23)2:821-862.

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[5] www.standardandpoors.com/indices/articles/en/us.

6

Economic Indicators

Economic data, as opposed to corporate data, also affects the stock market. The principal divisions within the economy on which the average person can find easily available and accurate data are prices (consumer, industrial and crude oil), production (industry, housing, and efficiency), and income (personal and unemployment). You will see that many economic indicators have a connection to the stock market using a moving average crossover system.

Prices

Industrial, raw-material prices were once a component in the Conference Board's Index of Leading Economic Indicators. They are no longer because factors other than economic pressure, like currency and exchange rates, now affect industrial prices differently than in the 1990s and before. The question then is whether there is a leading connection between prices and the stock market. The dropping of industrial raw material prices from the Index of Leading Economic Indicators would suggest that the Conference Board decided they have little effect on stock prices, yet some evidence seems to show there has been a recent connection. Currently there are many price indexes but only a few with a satisfactory and accurate price history going back far enough for us to use in determining possible parameters for a market-timing system. The ones remaining with a history are the Consumer Price Index (CPI) and the Producer Price Index (PPI). I added crude oil price (West Texas Intermediate Crude) as well because analysts have blamed oil for sudden changes in stock market direction. These indexes and prices are all available on the Federal Reserve Web site [1]. I use a delay of one month in the optimizations of price data with the exception of oil prices, which are not delayed at all.

Consumer Price Index

The Consumer Price Index is the most widely reported price index, though it has many flaws. The Bureau of Labor Statistics, Department of the Census, produces it, and the series dates back to 1913. It is an attempt to measure the price inflation of consumer goods and as such is used in many employment contracts as a standard adjustment for inflation. In 1983, it removed house prices and substituted “owners’ equivalent rent of residences” to avoid the effects of changes in the investment value of a house. The CPI has many variations that include or exclude items such as energy costs and food. These are considered too volatile for economic projections and are excluded in what is called the “core” inflation rate. The Bureau of Labor Statistics calculates other variations such as the CPI-W (W for Urban Wage Earners and Clerical Workers), used in Social Security payment adjustments. The widest-coverage index is the CPI-U (U for all urban consumers) and is the one used here for historical correlations. You can imagine the complexities in calculating such an index because people tend to switch between commodities when prices change, thus affecting the weighting in the indexes. Some items included in the index improve their performance with time, such as personal computers, or become less expensive as technology improves their efficiency. However, over the long term, these discrepancies become minor. I use a one-month delay in the optimizations, though the statistics are reported two weeks after the month end.

The CPI annual-percent-change, walk-forward analysis produces a final score of 68.13, one of the highest in this book. It will very likely be a system considered in Chapter 9, "Putting it Together," as one of the components of the final market-timing model. The reasons for the strong score are that the evaluation ratios were especially high. While the MAR ratio at 0.544 is below the excellent level of 1, the performance ratio is 7.56, very much above the ideal 2, and the excursion ratio is 38.5, far above the ideal 10.

Producer Price Index

The Bureau of Labor Statistics also calculates the Producer Price Index. Variations divide producer prices by industry, by stage of processing, and by item. The results can be used to compare the changes in input and output prices in manufacturing, farming, construction, energy and other natural resources, transportation, education and health, leisure, business services, and even financial services. The various indexes often become adjustment factors in purchase and sales agreements in industry, and the composite index is used as a deflator in many economic producer data. I use the overall commodity price index because it has the longest history going back to 1913 and duplicates, as best I can find in publicly available data, the old industrial raw material prices.

Optimizing the Producer Price Index on a year-to-year change and with a one-month delay produced a failed system. It could not meet the initial requirements of the walk-forward process.

Crude Oil Price

For the price of oil, I use the monthly closing of Texas Crude published by the Federal Reserve. Because the price is timely, I use no delay in the optimization. Texas crude oil is also called "Texas West Intermediate," and is the underlying oil in most domestic futures contracts. It is a low-sulphur, light-density crude and usually commands a higher price per barrel than the other benchmark price: Brent crude. The Brent crude price is used in Europe, Africa, and Asia as the standard for pricing inventory. Its name comes from the Brent goose found in the North Sea area. West Texas crude is traded on the Chicago Mercantile Exchange and Brent crude is traded in Europe on the Intercontinental Exchange, known as "ICE," and on the New York Mercantile Exchange now owned by the parent company of the Chicago Mercantile Exchange.

Optimization of a moving average crossover system in the oil price produces a system with a very high score of 63.30. The problem lies with the amount of time that an investor would be in the stock market with this system. It is only 17.4 years, roughly 35.5 percent of the time. The reason for the high score is the low maximum drawdown of only 10.54 percent and the high annual return of 16.558 percent, giving us a MAR ratio of 1.573, well above the ideal of 1.00. You will often find that as the optimization looks for ideal parameters in the system, it finds them increasingly robust as the time in the investment shortens. There is thus a tradeoff between performance, drawdown, and length of time invested. The oil system is rejected in this case because the time in market is too short even though the results of reward versus risk are excellent.

Summary of Prices

While recent comparisons between price indexes and the stock market show high correlations, the data used in these optimizations go back to 1960. This should allay the theory that prices affecting stock prices are a recent phenomenon. The CPI and crude oil have excellent results with scores of 68.13 and 63.30 respectively. The crude oil system is rejected because it is invested for too short of a time, but the CPI meets all requirements and is forwarded to Chapter 9 for inclusion in the final model.

Industry

The Conference Board [2] produces each month the Index of Leading Economic Indicators, along with Coincident and Lagging Indicators. Without subscribing to the Conference Board service, you will have difficulty in finding historical data on many of their indicators. The Conference Board each month makes available on its Web site the most recent and past six months' data for you to update your records, but earlier data is illusive in many of the indicators. They also change their formulas frequently and thus interrupt the continuity of the data, raising the question in my mind as to whether their historic record is useful for studies such as these.

In this section, however, I use the indicators they use that are available to the public through the Federal Reserve [1]. These include *capacity utilization*, *housing starts*, and *industrial production*. An additional indicator I test is the Purchasing Managers Index [3]. Its history is available at ISM. In addition, this material is available at other locations on the Web and can easily be downloaded. The reason for experimenting with leading economic indicators is that the stock market is often considered a leading indicator itself. At least the Conference Board thinks so because they include it in their leading indicators index. It thus seems logical that a connection might exist between these leading indicators and the stock market. For this reason, I use those indicators for which I can easily access historical data.

Capacity Utilization

Capacity utilization refers to the amount of manufacturing taking place in relation to the amount of plant capacity available. The Federal Reserve Board surveys manufacturing businesses on their maximum level of production with their plant and normal circumstances. It then produces a monthly report on "Industrial Production and Capacity Utilization." [1] This survey creates an index of industrial production (used below in one of the tests) and ranks capacity utilization on a scale from zero to 100, with 100 being the most fully utilized existing plant and equipment. This utilization figure is used as a leading indicator of inflation and is included in the Conference Board's Index of Leading Economic Indicators. A level approaching 85 percent suggests that inflationary pressures will build from the strain on capacity, because manufacturers need to have a certain amount of their production equipment out of service for maintenance, repair, upgrade, and so on. Getting too high in capacity utilization means that there is no spare capacity to produce things, and so upward pressure will be felt on prices. A similar survey and calculation is available for many European countries, Japan, Australia, Brazil, India, and Canada.

The Census Bureau also produces a Quarterly Survey of Plant Capacity based on the Federal Reserve method and supported by the Federal Reserve and the Defense Department. This survey is comprehensive and includes an estimate of plant capacity utilization in case of national emergency. However, it should not be confused with the monthly report from the Federal Reserve that I use in the present study.

Optimization of capacity utilization with a one-month delay produces a moving average system with a high score of 57.81. Its MAR ratio of 1.573 is well above the excellent 1.000. Unfortunately, as with oil prices, the time in the market is below 50 percent at 34.3 percent. For this latter reason, it is rejected.

Industrial Production

At the same time that the Federal Reserve [1] surveys and calculates capacity utilization, it produces an index of industrial production. This index includes the production of all mining, manufacturing, and utilities in the U.S. It has been available since shortly after the founding of the Federal Reserve in 1914. The figures I use in this study are from 1919 to the present. Current figures are available at the same Web site as mentioned in the preceding section, "Capacity Utilization."

Optimization of industrial production data, with a 1-month lag, provides s system with a slightly below-average score of 25.66. The system is rejected from further consideration because it failed to beat the buy-and-hold alternative during the period studied.

Housing Starts

The Conference Board uses data on building permits as a leading economic indicator. The historical data on building permits, however, is scant and not long enough to use for long-term market timing. Instead of building permits, I use housing starts, which the Census Bureau also publishes jointly with HUD (Housing and Urban Development) [4]. The Federal Reserve Board has a recorded history back to 1946. The Census Bureau reports the figure each month along with building permits and housing completions. The difference between building permits and housing starts is that the "starts" suggest building has actually begun as opposed to just issuing a permit. They are both leading economic indicators and are available monthly. I use a one-month delay in the optimization study. Because the housing industry is seasonal, the figures in this study are year-to-year percentage changes. As in many prices, housing has its own seasonal pattern with fewer built in the winter than the summer. The annual percentage change smoothes these minor variations to get at the actual trend. Housing starts are a leading economic indicator and this optimization shows that a moving average crossover system has merit in using housing starts to time the stock market. The score for this system is 37.94. In addition, one minor problem has occurred recently in that the system has not generated a signal since October 2008. Overall, the time in the market is 50.48 percent, just barely above the required 50 percent, but for some unknown reason, the system has not signaled in the past three years. This may be due to the large decline in housing nationwide, an anomaly that the system has not met before. As all good systems do, it shut down when the behavior changed and went to a cash recommendation in the stock market in October 2008. By doing this, however, it missed the short side of the decline into 2009 and the rise into 2011. I leave it as a consideration for the final model but lean against using it for these reasons.

Purchasing Managers Index

Based on a monthly survey conducted by the ISM (Institute for Supply Management, formerly the National Association of Purchasing Management, or NAPM), this index measures the relative speed at which industrial companies receive deliveries from their suppliers. The survey asks purchasing managers if deliveries from their suppliers have been faster, slower, or the same as the previous month. This index is a leading indicator of the economy, and the Conference Board derives a variation of it, called "The Index of Supplier Deliveries" or "Vendor Performance."

ISM publishes the Purchasing Managers Index (PMI) [5] each month and has done so since 1948. It surveys production levels, new orders, speed of deliveries, levels of inventory, and employment from 400 purchasing managers in manufacturing in the U.S. and compiles several indexes to reflect their answers. The PMI ranges from zero to 100, with better than 50 suggesting that manufacturing conditions are improving. It has become a leading indicator of prices, although not as accurate as the later reported PPI and CPI, but useful as a measure of manufacturing inflation. Reported on the first day of the following month, it is widely followed for its timeliness and accuracy.

The PMI turns in a below-average score for its optimization into a moving average crossover system. It is the lowest yet in this chapter, at 31.70. It seems the chain of logic between the index and the economy and thus the stock market seems to have broken down. The principle adverse statistic in this system is the very large maximum drawdown of 36.4 percent. When measured against the annual percentage return of only 9.75 percent, its MAR ratio is extremely low at 0.268. A 0.50

in the MAR ratio is good and a 1.00 is excellent. The system did beat the buy-and-hold strategy with a performance ratio of 4.27, a level considered excellent, but it did so in only one trade of a 723 percent gain. Any system that shows single large trades is suspect because that trade may be an anomaly. In any case, for a number of reasons, the PMI system is rejected from further consideration. Summary of Industry

The segment devoted to industry that included industrial production, capacity utilization, and the Purchasing Managers Index fared poorly. Except possibly for housing starts, not one of the industry indicators could be optimized into a robust system of market timing signals.

Income

In the pursuit of indicators of personal income, I test disposable income, the number of persons unemployed, and the weekly initial claims for unemployment. The Bureau of Economic Analysis [5] reports on disposable income at the end of the month following its report date. Because the figure changes only slightly each month, I use a year-to-year percent change and a two-month delay in the testing. The Bureau of Labor Statistics [6] reports the number of unemployed within a few days of its calculation. I use no delay in tests for timing, nor do I use a delay in the data for initial claims of unemployment. The Department of Labor reports these figures weekly. They are always current.

Disposable Income

Disposable income is total personal income minus current taxes. Taxes include income taxes, capital gains, and personal property. It is a vague number on which there are many questions about accuracy, especially on a monthly basis, but it does express the overall spendable income of Americans. I converted the data to a year-to-year rate of change and using a two-month delay for optimization, found useful parameters that passed the robustness tests.

One of the great surprises to me in this study is that the stodgy old disposable income figure turns out to be one of the best economic-indicator systems, even with a two month reporting delay. Its score is 45.70. It doubles the buy-and-hold return, has a MAR ratio of 0.710 because its maximum drawdown is only 16.92 percent, and it remains invested in the market 63.4 percent of the time. This high score may qualify this system for the final model.

Unemployment Rate

The unemployment rate is the conventional number used to report the employment situation in the U.S., but it is flawed by the fact that the pool from which the unemployed number is taken does not include those who have given up on finding a job. This skews the ratio of unemployed to that pool and gives an unrealistic historical figure. Nevertheless, analysts follow it, and it is reported widely in the media. Some econometric models use it in their projections for the economy.

The unemployment rate system failed to meet any of the robustness requirements to become a legitimate timing system.

Initial Claims for Unemployment

This is a weekly statistic from the Department of Labor [7] that measures the number of applications for unemployment at state unemployment offices. It segments the information by state, as well as by total unemployed receiving unemployment benefits, and now extended benefits from the Federal government. The most sensitive figure is the combined U.S. initial claims because it gives an idea as to how the labor market is handling changes in the economy. It is one of the first indicators to advance when economic trouble begins, and one of the first to decline when the economy improves. The Conference Board also uses it in its Index of Leading Economic Indicators. It is timely, accurate, and sensitive to the labor market.

Rather than use the weekly reported figures, I adjust the data to monthly to keep in line with the other economic data. Weekly initial claims are available historically from 1967 onward, and I use all of them in the optimization process. I use no delay in signals because the data is current as of its reporting.

The optimization process develops a system for initial claims but is unimpressive. Perhaps the changing of the weekly period to monthly affected the outcome. As a weekly indicator, it could have been optimized for shorter-term signals. Indeed, the system generated here was also short-term even with monthly data. The score is a low 32.89, and the number of trades is 130 over the 50-year period. It is unusual that with this many trades the system is unable to beat the buy-and-hold return. Moreover, with all those trades, the system is in the market only 42.3 percent of the time. The system is rejected for numerous reasons.

Summary of Income

Income data are a bust for the market-timing model. Only disposable income provided a satisfactory set of parameters. The critique may arise that the robustness requirements are too stiff. However, they are derived from many more sophisticated system tests and are already less stringent than they could be. It is better to reject an unsatisfactory system than to develop a false belief in a system that later loses money.

Conclusion

Like the admissions officer at a college, we must make a cut at this point and keep only the systems from the economic sector that appear most reliable, most profitable, and least risky. To do this, I use the scoring system explained in Chapter 4, "Systems Analysis," that encompasses all the important factors in selecting a system. The highest scoring systems of the economic indicators are the CPI Index and the disposable income systems. These systems and the winners from the other indicator sectors are compared in Chapter 9 to determine the final system or systems that I use in the market-timing model. Table 6.1 shows the parameters and results for these systems. Appendix A, "System Parameters," shows the parameters and results for all indicators tested.

TABLE 6.1 Final results and parameters for the CPI and disposable income systems

	CPI System	Disposable Income
First Moving Average Length	36	4
Second Moving Average Length	1	1
Filter on Second Moving Average	35%	15%
Stop protective long	0.0%	0.0
Stop protective short	3.7%	12.0
Stop trailing ATR long		
ATR length	9	none
Number of ATRs	9.3	none
Stop trailing ATR short		
ATR length	5	10
Number of ATRs	13.7	13.2

TABLE 6.1 Final results and parameters for the CPI and disposable income systems *continued*

	CPI System	**Disposable Income**
Profit-Percent Trailing Stop		
Long initial profit trigger	none	none
Long percent retracement	none	none
Short initial profit trigger	none	none
Short percent retracement	none	none
Initial Trade $	$100	$100
Net Profit $	$13,351	$2,916
# of Trades	18	39
Time in Mkt %	78.9%	63.4%
Time in Mkt yrs	38.6	30.0
CAGR %	13.54%	12.02%
MDD %	24.88%	16.92%
MAR	0.544	0.710
BAH %	1,765%	1,394%
ROC %	13,351%	2,916%
Ratio	7.564	2.085
Max Fav Excursion %	1,272.9%	293.9%
Max Adv Excursion %	33.05%	31.2%
Ratio	38.5	9.42
Score	68.13	45.70

End Notes

[1] http://research.stlouisfed.org/fred2.

[2] www.conference-board.org.

[3] www.ism.ws/ismreport/mfgrob.cfm.

[4] www.census.gov/const/www/newresconst-index.html.

[5] www.bea.gov/newsreleases/national/pi/pinewsrelease.htm.

[6] www.bls.gov/news.release/empsit.nr0.htm.

[7] www.dol.gov/opa/media/press/ eta/ui/current.htm.

7

Monetary Indicators

Monetary factors include interest rates, bond prices, spreads between interest rates, and credit. I test several of these monetary indicators to see if a moving average crossover system can be developed using their data for market timing. As always, with any method using market prices, a protective stop and trailing stop rule are applied from optimization of the in-sample data.

Interest Rates

As the Fed's stock market model suggests in Chapter 5, "Corporate Indicators," many analysts believe that the stock market is affected by interest rates, not only as a competing investment to stocks, but also as an indicator of increased economic activity. Generally, higher interest rates reflect increased borrowing costs for plant and equipment, a sign that the economy is healthy. Corporate interest rates also reflect the fear of possible bond defaults in time of severe recession. Of course, interest rates also can become too high and choke off economic activity. In sum, because they are so intimately connected to the economy, corporate bond rates should have a relationship with stock prices that is close enough to be useful in market timing.

Interest rates are either short-term or long-term and high or low quality. I look at corporate Moody's Baa rated interest rates to see if the riskier side on long-term interest rates can produce a viable system. Then I look at the least risky long-term rate, the U.S. ten-year bond rate. Finally, I look at the 3-month Treasury bill rate to see if short-term rates might have a robust system hidden in their data.

Corporate Baa Bond Rate

I use this interest rate because the Federal Reserve has been tracking it since 1919 and it is available on the Web. The rating of "Baa" is from Moody's Investors Service (www.moodys.com) and indicates that, in their opinion, the corporate bond so rated is a "moderate credit risk." This is the lowest rating for investment-grade bonds. Below that category are speculative grades with ratings of Ba1 down through C, the lowest rated and typically in-default bonds.

Optimization of the corporate bond system parameters shows slightly above-average results. Even with a score of 39.46, it is rejected for a high maximum drawdown of 33.9 percent and a low MAR ratio below 0.5 of 0.358.

Long-Term U.S. Bond Rate

The breadth theory in the stock market holds that the A-D line peaks before the stock market averages. The

A-D line is composed of a cumulative total of daily advancing and declining issues, and it changes each day by the A-D difference. Indeed, this method has been very successful for over 80 years and still works today, having signaled the market decline in 2008 by having the A-D line peak way back in June 2007, well ahead of prices.

The long-standing premise for its success is that the stock market is composed of a large number of interest-related stocks, stocks like utilities, and now interest-rate ETFs. The theory is that as the economy expands, long-term interest rates rise as demand for plant and equipment forces industry to borrow in the long-term bond market to finance their expansion. This leads to an increase in long-term interest rates and a consequent decline in bond prices and prices of interest-sensitive stocks. The number of advancing stocks in total begins to diminish, and the A-D line fails to keep up with the averages. This theory therefore assumes a relationship between the long-term interest rate market and the stock market.

To test whether I can take advantage of this relationship, I use the ten-year U.S. Government bond rate because it reflects the changes in the long-term interest rate. The Federal Reserve reports the bond price weekly, though I use the monthly data for the optimizing process. Because the data is timely, no delay is used in the testing.

The optimizing results fail to pass the robustness requirements. One system passes all the robustness requirements but includes a maximum drawdown of 107 percent. Because maximum drawdown is calculated on the basis of the original investment to be conservative, a decline below 100 percent means that all profits were lost as well as part of the original investment. An example would be a $10,000 initial investment that rises in value to $20,000 and then declines to $9,300. This would be a 107 percent decline of the original investment. Some analysts calculate the maximum drawdown on the existing equity, in which case this example would record a 53.5 percent decline from the peak of $20,000 to $9,300. You can see how using the initial investment as the base is more conservative. It presumes that each trade is a $10,000 investment, not a new amount based on the previous performance of the system.

Three-Month Treasury Bill Rate

I next look at short-term interest rates. These rates are controlled by the Federal Reserve and various market signals such as the "three steps and a stumble" rule that states when the Federal Reserve takes three steps to raise interest rates, the market will decline. Ned Davis Research [1] argues that this signal has 87 percent accuracy and a median subsequent stock market decline of 17 percent. The corollary is the "two tumbles and a jump" rule that states when the Federal Reserve takes two steps to lower rates, the market will advance. Ned Davis Research argues that since 1915 this rule has been accurate 84 percent of the time with a median subsequent market advance of 55 percent [2]. Because this relationship appears to be strong, you would think that a moving average crossover system using short-term, three-month Treasury bills would have robust characteristics, and it turns out that way.

The Treasury bill system provides excellent results in each of the three important ratios. Its performance versus the buy-and-hold is 1.961, almost at the 2.00 considered excellent; its MAR ratio (compound annual return to maximum drawdown) is 1.536, well over the excellence figure of 1.00; and its excursion ratio at 11.851 is above the excellent 10 level. In other words, this is close to a perfect system using filtered, moving average crossovers. The Treasury bill score is 45.123. Table 7.1 shows the particulars. Since 2000, this system has given few signals and only for short periods. It is therefore useful for when it gives a signal, but signals do not occur frequently.

TABLE 7.1 Three-month Treasury Bill System Parameters and Performance Results

FLEN	15
SLEN	1
Filter	6%
Protective stop long:	7.8%
Protective stop short:	0.2%
ATR trailing stop long:	None
Length	
Number	
ATR trailing stop short:	None
Length	
Number	
Initial Trade $	$100
Net Profit $	$2,194
# of Trades	25
Time in Mkt %	54.3%
Time in Mkt yrs	23.3
CAGR %	14.4%
MDD %	9.4%
MAR	1.54
BAH %	1,119%
ROC %	2,194%
RR Ratio	1.961
Max Fav Excursion %	130.6%
Max Adv Excursion %	11.0%
Exc Ratio	11.85
Score	45.123

Spreads

Spreads are data that represent the difference between two other sets of data. In the money world, two spreads are important: the default spread and the time spread.

Default Spread

Interest rates have a core value that represents both time and safety. Long-term bonds have a maturity date over which inflation can affect rates. Interest rates therefore reflect investor expectations for inflation. In addition, there is the risk that the bond will not be paid at its maturity date or that coupons will not be honored when due. This is the safety risk of bonds. It is also reflected in the bond price and rate.

There are, of course, many types of bonds. The safest, because it has the least likelihood of defaulting, is the U.S. Treasury bond (or note or bill). Because it is the least risky, the U.S. bond rate is the base rate against which all other bonds are valued. Because interest rates fluctuate, the actual rate of a bond tells us little, but when you compare a corporate bond rate to the equivalent maturity U.S. bond rate, it tells you how the market is judging the default possibility of the corporate bond versus the U.S. bond and thus the relative risk of that bond as an investment. High-risk bonds have high interest rates relative to U.S. rates.

This difference between the corporate rate and the U.S. bond rate is called the "default spread." In this study, the default spread is a continuous series of the difference between the Moody's Baa bond rate and the five- to ten-year U.S. bond rate. In aggregate, if the default spread (or ratio) is high, it suggests that the economy is under stress and that marginal companies with bonds have an increased potential to default. Because bond rates are sensitive to such pressures not only in each company but also for all companies, the default spread can fluctuate as the perceived risk of default waxes and wanes. The actual risk may be different from how the market senses it to be, just as the actual value of a company can be different from its stock price. The default spread, as a measurement of economic and monetary stress on corporations, thus gives a look at that economic pressure and to some extent the psychology of the market.

The psychology of the bond market has been measured by another method called the "Barron's Confidence Index." This ratio, published by Barron's since 1932, measures the average yield-to-maturity of high-grade bonds to that of intermediate-term grade corporate bonds. When intermediate-term yields rise relative to high-grade bonds, it is an indication of nervousness and thus a warning of a peak in the stock market. When the opposite occurs, it is a warning of a better stock market ahead. The default spread is similar, though differently constructed, and to see if the spread has any use in our market timing method, I optimized the monthly series.

When I optimize for a moving average crossover system, default spreads show no promise as a reliable system. No efficiency rate occurred above 10 percent when 50 percent is a minimum, and no combination of parameters produced a robust system.

Time Spread (Yield Curve)

The "time spread" is the difference between the interest rates of long-term versus short-term debt instruments of the same quality. Usually, the time spread is measured with U.S. government bonds and bills. There doesn't seem to be a standard for different maturities. Commonly, the spread is calculated as the difference between the twenty-year bond rate and the three-month bill rate. Because twenty-year bonds have a short history, in this study, I use the difference between ten-year notes and three-month bills because they each have a history back to the 1940s.

Another name used for time spreads is the "yield curve." Actually, the yield curve is a plot of the many different bond yields by their maturity lengths and is also called the "term structure of interest rates." The curve is said to reflect the expectations for future interest rates as well as inflation. The normal shape of the curve is for long-term rates to be higher than short-term rates. Sometimes, however, the curve is flat where the long- and short-term rates are roughly equivalent, and rarely the curve is "inverted" when short rates are higher than long rates. This inverted yield curve often occurs when the Federal Reserve raises short-term interest rates to curb inflation, and historically it has lead to recessions.

In this study, however, the actual shape of the curve is irrelevant. What I am testing is the spread between the long and short rates to see if the change in the relationship has enough predictive value to be used as a system for timing the stock market.

Despite the infatuation of many analysts with the yield spread as a predictive device for the economy, it doesn't seem to have much value in a moving average crossover system for timing the stock market. At least that is true for the period prior to 1984. After 1984, all correlations of interest rates to the stock market gradually changed. Many of the widely used methods of relating interest rates to the stock market suddenly began to fail. Figure 7.1, for example, shows the change in drawdowns in the Baa corporate system before and after 1984. The early years are characterized by large drawdowns, suggesting that the system was failing. Then, after 1984, the drawdowns almost disappeared. They declined from a high of 100 percent to less than 10 percent during that short period. Some analysts speculate that the relationship changed because the advent of floating exchange rates changed the entire world of interest rates. The year 1984 was also shortly after the introduction of stock index futures in 1982, and options in 1983, which changed how some portfolio managers managed their investments. Finally, the long, secular upward trend in long-term interest rates ended in 1982 with the peak in inflation. Whatever the reason, almost all the old methods of using interest rates as a stock market indicator changed during the 1980s. By the 1990s, any remnants of those relationships had completely reversed.

Although the period since those behavior changes is too short to be reliable as a test period for evaluating a timing method, I nevertheless look at the post-1984 period in the time spread to see if a relationship is developing that might be used in the future. Unfortunately, I could find none. The potential systems immediately fail to meet the robustness requirements.

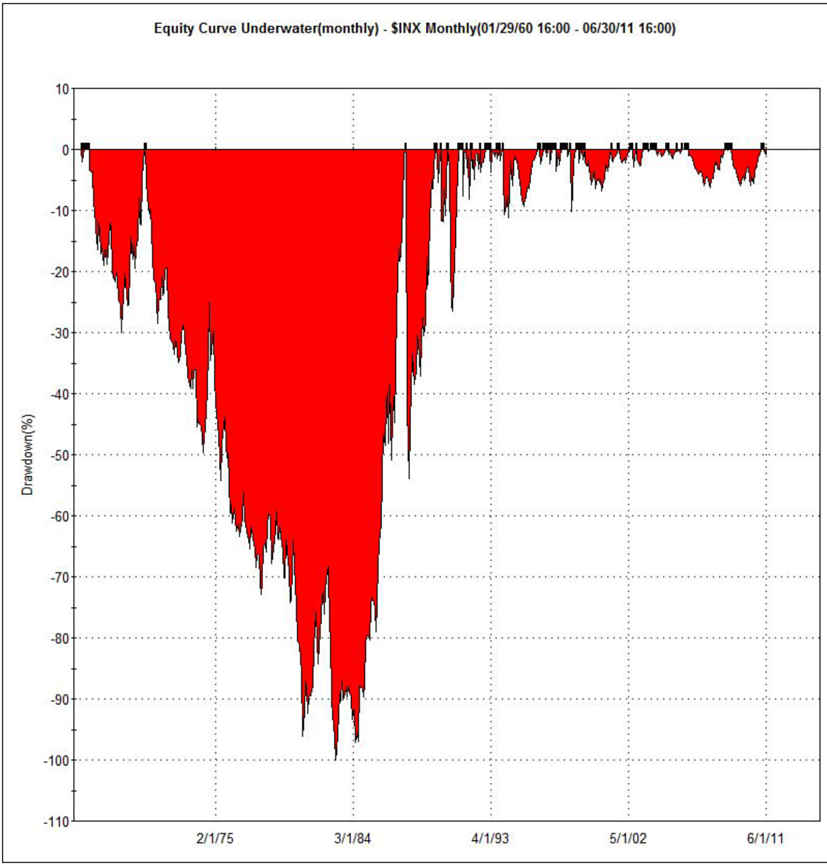

FIGURE 7.1 Percentage drawdowns in the Baa Corporate Bond moving average crossover system showing the substantial change in market character around 1984

Money

The final segment of the monetary indicators is the subject of money. The most obvious and easily gathered statistic on money is the M2 money stock from the Federal Reserve. I also include an optimization of consumer credit because, although it is not money in a strict sense, the consuming public treats it like money. It turns out that consumer credit produced one of the best systems of all the monetary indicators.

Money Stock M2

Money stock or "money supply" M2 is a measure of all currency, demand deposits (checking accounts), savings accounts, money market accounts, money market mutual funds, and small-time deposits (CDs) less than $100,000 in the economy. It is directly influenced by Federal Reserve policy as it relates to controlling inflation and the economy. The Conference Board considers changes in M2 as a leading indicator to the economy. It also has been an indicator of potential inflation, assuming that increases in money supply translate directly into increases in prices. Recently, the financial uses for money have increased to the point where sometimes increases in money supply can translate into increases in stock prices or commodity prices. For this reason, changes in money supply may have a predictive ability in timing the stock market.

M2 fails as a system. Unfortunately, it did not pass the robustness tests within the walk-forward analysis. Part of the reason for this system's difficulty is the earlier-mentioned change in interest rate behavior relative to the stock market starting around 1984. Systems developed before that date have a difficult time adjusting for the major change that then took place. Systems using recent data are excellent so far but fail to have sufficient history to provide the confidence that they will continue into the future without another major change in behavior. For this reason, taking any indicator based on monetary or interest data is suspect with relation to forecasting changes in long-term stock market direction.

Consumer Credit

The Federal Reserve defines consumer credit as "most short- and intermediate-term credit extended to individuals, excluding loans secured by real estate." It is a measure of consumer spending for consumer goods such as autos, boats, mobile homes and using credit cards, bank loans, and revolving credit. It therefore reflects the liability side of the public balance sheet. Changes in consumer credit occur for many reasons, mostly having to do with employment prospects, confidence in the economy, overextension of debt, and habit. I look to see if consumer credit can be helpful in timing the stock market.

Interestingly, consumer credit produced a robust system with an excellent score of 89.26, considerably above what I see as the level to exceed for consideration in the final model. Of the three scoring ratios, consumer credit has an excellent rating in two. The excellent ratios are the performance ratio of total return against the buy-and-hold method return of 7.402, well above the 2.00 needed and a MAR of 1.433. The ratio that fell behind is the excursion ratio of 2.885. Table 7.2 shows the results.

TABLE 7.2 Consumer Credit System Parameters and Performance Results

FLEN	40
SLEN	11
Filter	1%
Protective stop long:	0.0%
Protective stop short:	2.4%
ATR trailing stop long:	
Length	28
Number	14.8
ATR trailing stop short:	
Length	5
Number	15
Initial Trade $	$100
Net Profit $	$11,251
# of Trades	14
Time in Mkt %	58.8%
Time in Mkt yrs	25.3

CAGR %	20.57%
MDD %	14.35%
MAR	1.433
BAH %	1,520%
ROC %	11,251%
RR Ratio	7.402
Max Fav Excursion %	80.7%
Max Adv Excursion %	27.97%
Exc Ratio	2.805
Score	89.26

Conclusion

The change in character of monetary indicators early in the 1950s, and later in the 1980s, makes long-term reliability suspect the results from monetary indicators. Despite this warning, the studies show that two of the monetary indicators have excellent scores, far above most others. The best are the three-month Treasury bill system at 45.123 and the consumer credit system at 89.26. While the Treasury bill score is admirable, the consumer credit system is one of the best in this book and thus worthy of consideration in the final market-timing model.

End Notes

[1] www.ndr.com/vendorinfo.

[2] Kirkpatrick, C. D., and J. R.. Dahlquist. 2011. *Technical Analysis: The Complete Resource for Financial Market Technicians*. p193.

8

Sentiment Indicators

Sentiment is a reflection of how investors feel about the market. The classic interpretation of sentiment is that when investors are optimistic, the market is at a top, and vice versa when investors are pessimistic. But this is true only at market extremes. In between, sentiment can contribute to the market direction. Bullishness can be a strong force generating higher prices—until there is too much bullishness. What is "too much?" That is what a good sentiment indicator system should tell us.

Generally, sentiment indicators come in two styles: the opinion style and the action style. The opinion style is derived from either surveys of opinion or composites of others opinions. The Advisory Opinion survey of Investors Intelligence [1], for example, monitors more than 120 newsletters and gauges from these letters whether the advisors are generally bullish or bearish. It then produces a numerical percentage of each group. The University of Michigan [2] surveys consumers by telephone and arrives at a percentage of consumer expectations and attitude.

The sentiment indicators based on action are those that show what investors are actually doing rather than what they are saying. Margin debt, for example, shows how much they are borrowing to invest and if they are over borrowed. Short interest shows how many shares are sold short, presumably in anticipation of a market decline. Mutual fund cash shows how mutual fund managers are hedging against a market decline and thus how bearish they might be. On a shorter-term period, traders like to watch the put/call ratio, which compares bullish and bearish options trades.

Not all these indicators behave as you would expect, however, because there are other influences on them that are not immediately obvious. Short interest, for example, may just be offsetting derivative or option contracts. Mutual fund cash may be high in anticipation of redemptions. The only truth is the numbers.

In developing a system using sentiment, I find that all the methods proposed produced robust systems, but none has an excellent score. Sentiment indicators, as a rule, do not easily fit into a system, and you will see that a majority of the ones I test do not do well. The best sentiment system using a filtered, moving-average crossover system is the one from margin debt, closely followed by mutual fund cash percentage minus the T-bill rate. Even these systems are unable to score higher than 30.

Advisory Opinion

Each week editors of the Investors Intelligence Service [1] read more than 120 investment newsletters. These are letters from independent authors not connected with either a brokerage firm or a mutual fund. The editors divide these newsletter opinions on the stock market into one of three categories: bullish, bearish, or expecting a correction. At the end of the reading, they produce a summary of the percentage of advisors in each category. They have done this weekly since 1969 and at less regular intervals since 1963. Their survey is one of the longest stock market opinion surveys available. I use the month end figures for the optimization process to be consistent with the other monthly indicators and allow a one-month delay in reporting the survey.

You would think that a survey of investment professionals would show bullishness at market bottoms and bearishness at market tops. These newsletter writers are supposed to understand the market better than common folk and should be right about its direction. In fact, the results are just the opposite. Investment advisory letters tend to follow the public sentiment and become bullish at market tops and bearish at market bottoms. Various explanations have been proposed for this seemingly counterintuitive relationship, but for my purposes, I don't care what the reason may be. What I find is that the relationship is truly similar to public opinion polls of the market, and that therefore newsletter writers are no more prescient than any other group of investors. They advise buying at tops and selling at bottoms. The fact that they are consistent in this behavior, however, is helpful because it implies that their percentages are useful for market timing.

Investors Intelligence uses a ratio that I also use in this system development. They calculate the ratio of bullish percentage to a sum of bullish and bearish percentage, leaving out the percentage of writers believing in a correction. This ratio oscillates with the market, considerably more than the market itself, and seems to follow short-term swings more than long-term trends. For this reason, the selection of profitable moving averages has to include longer lengths to dampen out the effects of the short-term swings. Despite this use of logic, all the tests for robust parameters failed. This was surprising to me because I have looked faithfully at the opinion numbers for over 30 years. But the brutal strength of statistics implies that using a moving average crossover system on advisory opinion will not work in timing the market.

Consumer Sentiment

Since 1952, the University of Michigan's Survey of Consumers, now affiliated with Thomson Reuters, has published the "Index of Consumer Sentiment" [3]. Each month, by telephone, surveyors contact randomly picked consumers and ask five questions that never change. They tabulate the answers into an index that they report on the Web and occasionally to the press. It is the longest publicly available index on consumer sentiment available. They also calculate an index of

"Current Economic Conditions" and an index of "Consumer Expectations" from the same questions. The latter is the index used by the Conference Board for their index of leading indicators. The complete index is what I use for the consumer sentiment system.

I use no delay in the testing because the university reports its findings on the first day of the month. The system performance from consumer sentiment is robust but low in score (14.89). Its performance is far below the buy-and-hold return; its drawdown is close to 30 percent; and its compound annual growth is only 7.4 percent. With the failure to best the buy-and-hold return, this system is rejected.

Margin Debt

Every month the NYSE compiles a summary of brokerage-firm margin accounts and reports total margin debt and total free credit balances [4]. Margin debt is the amount of money investors have borrowed in their margin accounts to purchase securities. The New York Stock Exchange has reported margin actively since 1959, and some statistics go back further. Free credit balances are the amount of cash in margin accounts that are available for security purchase, withdrawal, or any other desired use by the brokerage-firm customer. One statistic watched closely is the difference between the free credit balances and the margin debt. If this figure is high, it means that margin speculation is low and money is available for investment. On the other hand, if the difference is negative, meaning that margin accounts are fully committed to the markets and have no cash remaining for further purchases, the market is often close to a top. Any sudden sharp decline can force those heavily borrowed investors to liquidate their holdings, adding to the market weakness. I use only the margin debt in this study because it has a longer history than free credit balances. In time, the free credit calculation will likely be a better measure.

Margin debt provides two possible robust systems. The best has the lower score of 29.67. It has few faults except in magnitude of profit versus risk. All three valuation ratios are satisfactory. The second system has a score of 31.59, slightly higher than the first, but suffers from a large drawdown. It is a good example of how a very high return is often accompanied by a large drawdown. In this system, the profit performance is 350% better than the buy-and-hold performance and is invested almost 90 percent of the time. Unfortunately, its maximum drawdown is 44.5 percent, much too large for most investors. Some good news is that the drawdown has been declining and presently is less than 10 percent. Figure 8.1 shows the historical drawdown for this system. You can see how it has declined over the past 50 years. Of course, drawdowns could move higher—as we know they have done in the past. Its past thus forces me to reject it for the market-timing model; its history of drawdowns is much too excessive.

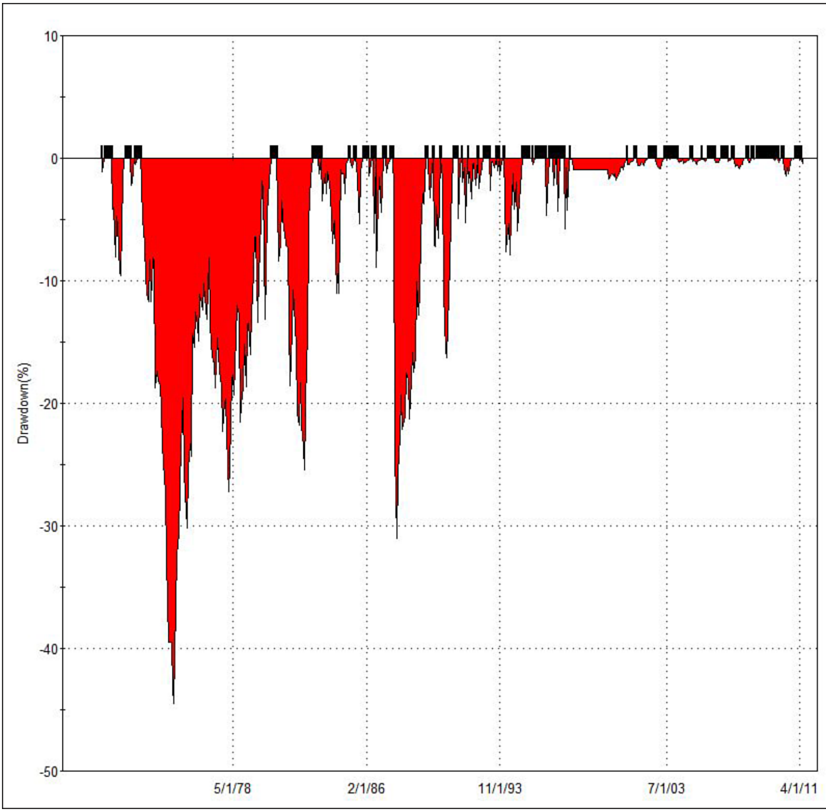

FIGURE 8.1 Drawdowns in second Margin Debt system, showing the steady decline in drawdowns over the past 50 years

Mutual Fund Cash Percent

The Investment Company Institute calls the mutual fund cash percentage "liquid assets of stock mutual funds" [5]. It is the percent of assets in stock mutual funds that can be converted to cash immediately. Historically, the level of cash has been a contrary indicator of the market direction at extremes. High cash levels suggest hesitancy on the part of investment managers to invest, and low levels suggest that the funds are fully invested. Because portfolio managers are people, just like investment advisory newsletter writers, they succumb to the same emotions about investing that the public does and by and large are equally wrong at major turning points in the market.

Jason Goepfert, publisher of the Sentiment Trader [6], is a student of mutual fund cash positions. He provided me with the historical data on mutual fund cash positions back to 1954. The Investment Company Institute publishes this data each month. Goepfert argues that low levels of cash in a mutual fund can be the result of various factors:

1. There's a belief in the market strength.
2. Derivatives have taken the place of cash as a hedge against market decline.
3. The mutual fund charter requires the fund to be fully invested.

4. Market timing is not allowed or sought.
5. Short-term instruments have a higher reward to risk than other investments.

Because of the latter reason, he has discovered that adjusting cash percentages at mutual funds by the prevailing interest rate provides a useful statistic for market timing. In this study, I use the mutual fund cash percentage less the three-month Treasury bill rate to develop the crossover system. But I agree that the figures could be refined further.

I use a one-month delay in testing mutual fund cash positions. The optimization process shows one robust system with a high drawdown that satisfies all the requirements including the performance ratios, drawdowns, and time in the market. It has a score of 28.87, somewhat on the low side because its maximum drawdown is 29.94 percent, almost above my threshold of 30 percent. Nevertheless, it is a viable system that invests over 85 percent of the time.

Short Interest

When an investor sells stock short, that stock must be borrowed through a brokerage firm from one of the accounts in the firm. The shares must be delivered to the buyer within the settlement time. This task is a lot easier these days, now that the accounting for the holding of shares is all done electronically; in the old days, the actual share certificates were surrendered and run across town to the brokerage firm on the other side of the trade. The investor who takes the short position then is obligated at some time to buy back the shares and return them to the account from which they were borrowed. He is also responsible for paying out any dividends that the company pays on those shares. "Short interest" [7] is the total amount of stock, in this case listed on the New York Stock Exchange (NYSE), which is held short and must be returned to the owners at some time in the future. The "short interest ratio" is the ratio of the short interest to the average volume for the month it is reported.

Historically, a high short interest ratio was thought to be an indicator of investor bearishness and thus a positive sign because those investors who hold short positions at some time have to buy back their short shares. It also represents a pool of buyers who stand ready to push prices higher. If the price of the short stock advances, the short seller has a loss and is forced to "cover" the position. This is called a "squeeze," and high short positions in individual stocks can often be an opportunity for those traders expecting such a squeeze on the short sellers. The relationship between sentiment and short sales, however, has changed substantially in recent years with the advent of derivatives. Often short sales are now hedged with an option or future contract, and the investor is no longer exposed to the risk of having to return the stock. It was with some hesitation, then, that I looked at short interest as a possible indicator system. As it turns out, the short interest system produced mediocre results.

The system produced a below-average score of 21.34. It exceeded the buy-and-hold performance by over 50 percent and the excursion ratio by well over the favored 10. It has a tendency to be early at tops, and it does not always catch market bottoms, but its overall performance is still very good. Because short interest is reported every two weeks, I use a two-week delay in the signals. This seems to have made little difference in the performance of the system. The one detractor from its ranking is the 45.9 percent drawdown, for which the system is rejected. This drawdown occurs in a long position during the 1987 crash and is difficult to reduce using stops because it happened so fast. The optimization software tests all data. If a position is sold prior to the crash but not immediately reentered with a new buy signal, the system judges that it was better to have remained invested during the crash than to have missed the subsequent price climb. Thus, the drawdown from the crash remains on the record and detracts from the viability of the system that was unable to avoid it.

Conclusion

Technical analysts have long held that sentiment is a valuable indicator for foretelling changes in market direction. When I put the popular sentiment indicators through stringent tests, however, they did not fare as well as I had expected. The best system is the stable margin debt system, but even it has a low ranking relative to the better systems in the other indicator categories. My inclination is to avoid all the sentiment systems in the final model. The problem with most sentiment indicators is that sentiment is much more reliable as an indicator at market bottoms. Market tops tend to be rounded and thus not easily pinpointed. Sentiment generally becomes bullish as the market rallies and only becomes excessive after a sizable market uptrend. Bullish sentiment by itself, then, is not a reliable indicator. However, when markets collapse, bearish sentiment increases rapidly and is very reliable in picking market bottoms. Further study then in selecting separate moving average crossover systems, one for bullish signals and another for bearish signals, would likely produce much better results. Unfortunately, the present study does not provide any sentiment system worth relying upon.

Endnotes

[1] www.investorsintelligence.com.

[2] http://thomsonreuters.com/products_services/financial/financial_products/a-z/umichigan_surveys_of_consumers/#tab3.

[3] www.sca.isr.umich.edu/main.php.

[4] www.nyxdata.com/nysedata/asp/factbook.

[5] www.ici.org/research/stats/trends.

[6] www.sentimentrader.com.

[7] www.nyse.com/press.

9

Putting It Together

Final Results

Using a filtered, moving average crossover system for each of a number of economic indicators, a final stock market timing model is now possible. I have selected three systems with large profits consistent with limited capital risk. The most profitable systems are not always the best because they often incur large drawdowns. The best systems are a compromise between profit and capital risk. Notice that volatility is not an issue. Risk equates with potential drawdowns in capital, not the variability of return. You will also notice, however, that in the charts of the performance of the model, volatility is almost nil. This comes from selecting systems that have minimal capital risk rather than minimal volatility.

To develop these systems, I have first selected a wide array of parameter combinations that historically have been profitable. I test these sets of parameters for robustness and then run them through a walk-forward optimizing program to select only those systems that have excellent results in out-of-sample data. This is the best way to determine if a system is not just a simple curve fitting to the data that has no future predictive value. A system developed purely from a set of data is descriptive of the past but not necessarily predictive of the future. It must be tested in data that has not been a part of the original parameter derivations.

Finally, the systems that have proven profitable in both in-sample and out-of-sample data, I screen for capital risk, specifically maximum drawdown and maximum adverse excursion. The best of these I select for each economic indicator. The best systems are detailed in Table 9.1.

TABLE 9.1 Parameters and Results for Winning Systems

	Consumer Credit	**CPI**	**EPS Yield Annual % Change**
FLEN	40	36	40
SLEN	11	1	41
Filter	1%	35%	7%
Stop protective long	0%	0%	0%
Stop protective short	2.4%	3.7%	5.4%
Stop trailing ATR long			
ATR length	28	9	4
Number of ATRs	14.8	9.3	36
Stop trailing ATR short			
ATR length	5	5	None
Number of ATRs	15	13.7	None
Initial Trade $	$100	$100	$100
Net Profit $	$11,251	$13,351	$6,728
# of Trades	14	18	19
Time of Mkt %	58.8%	78.9%	80.1%
Time in Mkt yrs	25.3	38.6	34.5
CAGR %	20.57%	13.54%	13.02%
MDD %	14.35%	24.88%	15.45%
MAR	1.433	0.544	0.843

TABLE 9.1 Parameters and Results for Winning Systems (*continued*)

	Consumer Credit	CPI	EPS Yield Annual % Change
BAH %	1,520%	1,765%	1,171%
ROA %	11,251%	13,351%	6,728%
Ratio	7.402	7.564	5.746
Max Fav Excursion %	80.7%	1,272.90%	132.1%
Max Adv Excursion %	28.0%	33.05%	23.14%
Ratio	2.88	38.51	5.709
Rank	89.26	68.13	67.11

You might have noticed that many of the high scoring systems are not included in the final model. The Treasury bill rate system scored extremely high (63.62), but it has not had a profitable trade since 1999. It's living off its past success, which does not help today. It is interesting to note that most short-term interest rate and Fed policy changes have not affected the stock market as they did prior to 1999. For the purpose of a contemporary timing model, the Treasury bill system has to be rejected as possibly out of date. The other high scoring system is based on Texas Intermediate crude oil (61.07). This system was very profitable but only traded 35.5 percent of the time. It is a system more suitable to traders who can use other methods between signals. Other high-scoring systems not included were EPS Yield (74.73) and Industrial Production (111.9). These omissions are discussed in earlier chapters.

The Technical System

In addition to the economic-based systems in the final model, I add a stock market system derived entirely through the walk-forward optimization of stock prices, with a little twist.

The stock market is cyclical but it is asymmetrical. In other words, it oscillates up and down in a regular fashion, but its tops and bottoms have different shapes. A cyclical top is not the mirror image of a cyclical bottom. Indeed, tops tend to be long and rounded; whereas bottoms tend to be sharp and relatively quick. Tops take time to form because they are generated by greed, and greed takes a while to develop. On the other hand, bottoms are sharp and quick because they are generated by fear and sometimes panic, and panic can happen instantly. Thus, if we are to develop a system for the market using moving average crossovers, we should consider these differences. Because a top takes time, it is logical that a moving average crossover system that signals tops will have longer moving averages than one that signals bottoms, which must be shorter in length to adjust more quickly to the different price curve. For the current model then, I developed through walk-forward optimization a technical system using two separate filtered, moving average crossover systems, one for tops and another for bottoms, both running concurrently. I use the same basic formula for the filtered, moving averages but differentiate by using one to give only buy signals and the other to give only sell signals. The results are quite remarkable and equate to the best systems generated by economic data alone. As expected, the buy signal moving averages for bottoms are less than the sell signals for moving averages at tops. Over the same period as the economic indicator systems, the dual moving average crossover system applied directly to stock prices produces a score of 57.809. The only higher score comes from the consumer credit system. Table 9.2 below shows the results and parameters of the stock market dual moving average system.

TABLE 9.2 Parameters and Results for the Dual Moving Average Crossover System of Stock Prices

Buy Signals	
FLEN	1
SLEN	7
Filter	2%
Sell Signals	
FLEN	8
SLEN	18
Filter	2%
Stop protective long	6
Stop protective short	23
Stop trailing ATR long	
ATR length	27
Number of ATRs	4.4
Stop trailing ATR short	
ATR length	5
Number of ATRs	13.5

Initial Trade $	$100
Net Profit $	$8,807
# of Trades	19
Time of Mkt %	91.7%
Time in Mkt yrs	39.5
CAGR %	12.0%
MDD%	16.4
MAR	0.732
BAH %	1,307%
ROA %	8,807%
Ratio	6.738
Max Fav Excursion %	351.5%
Max Adv Excursion %	13.41%
Ratio	26.21
Rank	71.735

Creating a Timing Model

The four successful systems can be integrated into a timing model in numerous ways. Considerations, as always, must be made for the likelihood of system failure and risk of capital loss. By using four systems rather than one, the timing model has a better chance of survival because a failure in one system will still leave three systems operating successfully. Thus, the model must give equal weight to each, regardless of the apparent differences in rank. Each system has its own failure trigger in a series of protective and trailing stops that will presumably exit the system on its failure. Because a system's potential failure would be independent of the other systems, it would have minimal influence on the total portfolio results. The model must also be flexible enough to be useful for long-only investors as well as those desiring to take advantage of market weakness through short selling.

I take the simple route and give each system equal weight. Each has a weight of 25 percent of the whole model. When one system gives a buy signal, for example, the portfolio becomes 25 percent invested. If all systems are operating on a buy signal, the portfolio is 100 percent invested. If a stop is triggered in any one system, the portfolio closes that percentage. Say it is 75 percent invested and one of the four systems exits on a stop trigger. The portfolio would then be reduced to 50 percent invested. The only time that a portfolio is rebalanced is when there is a signal from one of the components. The balance between cash and investment is then adjusted to the new percentage.

Short selling is a little trickier. A short position can be thought of similarly to a long position in reverse. A portfolio could be 100 percent short, for example, if all four systems have given short signals. When there is a mix of signals, some systems long and others short, the net position is the one taken. For example, if two systems are long, one is neutral, and one is short, the portfolio would be 25 percent invested long. The short position would cancel out one of the long positions.

Using this scheme, the hypothetical performance of two portfolio models is shown in Figure 9.1.

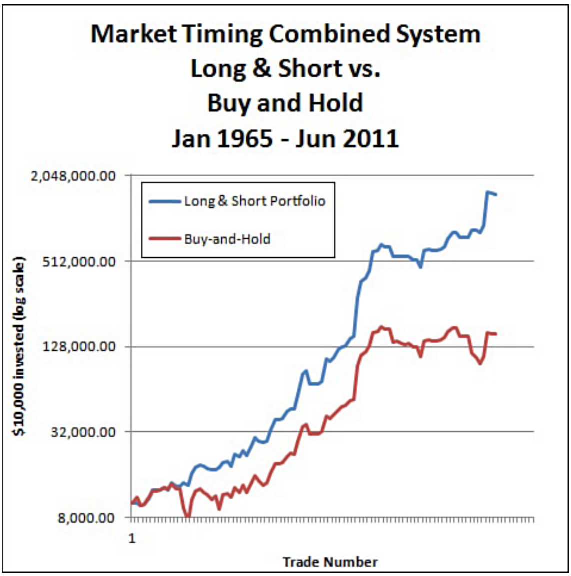

FIGURE 9.1 Timing model invested long and short over the past 46.5 years versus buy-and-hold

In Figure 9.1 the first plot shows the results from investing $10,000 in a hypothetical portfolio of the S&P 500 in January 1965, using both long and short positions in the percentages suggested by the combination of the four best indicator systems.

You can see in Figure 9.1 that the model separates itself from the buy-and-hold immediately and gains value during the tough years in the late 1960s and early 1970s. Again, when the stock market suffered large declines after 2000, the model performance continued higher at the expense of a generally flat market. Market timing systems really shine in terms of relative performance when there are declines to avoid (or profit from on the short side).

The model, including short sales, generated a 8.57 percent compound annual rate of return over 46.5 years. The chart in Figure 9.1 shows minimal trade drawdowns, certainly nothing like the buy-and-hold portfolio. The compound annual return for the buy-and-hold portfolio is only 5.85 percent. This doesn't sound like much because it is only a 2.72 percent point difference, but after 46.5 years of using the model, $10,000 grows at this rate to $458,375 versus $155,828 for the buy-and-hold. It shows the importance of small differences in compounded returns. Notice also that the line depicting the model portfolio is much straighter than the buy-and-hold performance, with very few zigzags representing trade drawdowns. The portfolio using only long positions gained 7.26 compounded per year over the 46.5 years, enough to grow $10,000 to $259,880, considerably more than the buy-and-hold return of $155,828. Appendix A, "System Parameters," shows all the system parameters that met the initial requirements for robustness, and

Appendix B, "Model Signals," shows all the trades of the hypothetical model portfolio using the four systems generated for this book. Appendix C, "EasyLanguage Programs," shows the TradeStation formulas used in this study.

Conclusion

This study shows that using technical analysis methods on fundamental, economic data is a valid means of timing the stock market. Every precaution that could be taken is taken in these studies, and the results speak for themselves. The largest profits are sought but only if the risk of capital loss is small. And the systems used in the timing model are derived from the combination of in-sample and out-of-sample walk-forward testing. Undoubtedly, the parameters derived in these systems will change over time and require periodic updates to be sure that the systems are keeping up with the natural changes in the marketplace. The optimization in most tests showed that a reoptimization should occur within five to six years of these studies, sometime around 2015. To be safe and thorough, the study should include all the indicators used this time as well as any others that may become publicly available. Through these tests, you have already seen how a change in bond market character in the mid-1980s and a change in the short-term interest rate market in 1999 changed the results of systems that had worked well until then. There will always be changes in the markets, and every investor needs to be prepared to adapt to them in a systematic way so that the changes work to his or her advantage.

Appendix A

System Parameters

The table in this appendix lists all indicators optimized for a filtered moving average crossover system to generate long and short signals in the S&P 500 monthly over the period from 1960 through 2010. Results and parameters are listed in the columns for each indicator that passed the robustness tests of a walk-forward analysis. The final column provides the composite rank on which each system was compared for inclusion in the final market timing model. Those rank numbers in dark lettering with an asterisk (*) represent the indicators that were included in the final model. Those with “FAIL” in the rank column were unable to pass the stringent walk-forward tests of profit, robustness, maximum drawdown, or efficiency.

Legend by column:

CAGR%	Compound annual growth rate
MDD%	Maximum system drawdown percent
MAR	Ratio of CAGR% to MDD%
Time in Market	Years in market with system
% Time in Market	Percent of years in market with system
Buy & Hold %	Percentage return from buying and holding during the entire period after the first signal
Total Return %	Percentage return from acting on system signals
Return ratio	Ratio of Total Return to Buy & Hold
No trades	Number of trades for system during entire period
1st avg	Length of first average in months
2nd avg	Length of second average in months
Filter	Percent filter applied to second average
LX ATR Len	Lookback period for trailing ATR stop for long positions
LX ATR num	Number of ATRs below highest high for long position stop
LX % Stop	Percent protective stop applied to initial long position buy price
SX ATR Len	Lookback period for trailing ATR stop for short positions
SX ATR Num	Number of ATRs above lowest low for short position stop
SX % Stop	Percent protective stop applied to initial short position sell price
MFE	Maximum Favorable Excursion: the maximum single trade profit
MAE	Maximum Adverse Excursion: the maximum single trade loss
Ratio MFE/MAE	Ratio of maximum favorable excursion to maximum unfavorable excursion
Rank	Comparative rank of system

Sector	Indicator	CAGR %	MDD %	Ratio MAR	Time in Market	% Time in Market	Buy-&-Hold %	Tot Return %	Ratio (Return/ B&H)
	Averages	14.725	23.003	0.64013	28.175	61.05188	1283.813	5843.4375	4.4205
Corporate	Earnings	9.88	27.36	0.36111	33.10	70.00	1,120	2,162	1.9304
Corporate	Dividend Yield								
Corporate	Earnings % chg	13.84	25.67	0.53915	25.00	52.95	1,373	2,457	1.7895
Corporate	Earnings Yield ann % chg	13.02	15.45	0.84272	34.50	80.10	1,171	6,728	5.7455
Corporate	Earnings Yield	27.70	19.13	1.44799	17.00	39.53	1,687	6,290	3.7285
Corporate	Dividend Minus T-bill Rate								
Corporate	Dividend Yld ann % chg								
Corporate	EPS Yield Minus T-Bill Rate	10.18	22.94	0.44377	28.20	65.80	792	1,440	1.8182
Corporate	Dividends % chg								
Corporate	Dividends								
Economic	CPI - 12Mo % chg	13.54	24.88	0.54421	38.6	78.9	1765	13351	7.564306
Economic	Disposable Income yty	12.02	16.92	0.7104	30	63.4	1394	2906	2.084648
Economic	Texas Intermediate Crude Oil	16.58	10.54	1.57306	17.40	35.50	1,268	1,569	1.2374
Economic	Housing Starts	13.69	25.05	0.54651	24.70	50.48	1,123	2,281	2.0312
Economic	Capacity Utilization	20.79	17.26	1.20452	16.80	34.29	1,255	2,290	1.8247
Economic	PPI yty								
Economic	Unemployment, Rate of								
Economic	Initial Unemployment Claims	10.68	16.21	0.65885	20.70	42.30	1,108	717	0.6471
Economic	Industrial Prod yty	16.81	52.63	0.3194	35.70	75.84	1,178	25,513	21.6579
Economic	PMI Mfg Index	9.75	36.36	0.26815	44.30	90.64	1,422	6,068	4.2672
Monetary	US 3Mo T-bill Rate	14.39	9.37	1.53575	23.30	54.25	1,119	2,194	1.9607
Monetary	Consumer Credit yty	20.57	14.35	1.43345	25.3	58.8	1520	11251	7.401974
Monetary	Corp Bond BAA	12.16	33.93	0.35838	36.20	84.05	1,246	6,278	5.0385
Monetary	US 10yr Rate								
Monetary	M2								
Monetary	Default Spread								
Monetary	Time Spread								
Sentiment	Margin Debt	10.38	24.85	0.41771	29.00	67.30	1,174	1,652	1.4072
Sentiment	Mutual Fund Cash - 3Mo T-bill	9.50	29.94	0.3173	36.80	85.50	1,172	2,725	2.3251
Sentiment	Short Interest	10.02	45.90	0.2183	32.10	69.10	1,318	2,043	1.5501
Sentiment	MI Consumer Sentiment	7.40	29.18	0.2536	27.80	60.00	1,170	628	0.5368
Sentiment	Advisory Opinion			#DIV/0!					#DIV/0!
Stock Market	S&P - SMA - M close	12.04	16.44	0.73236	39.50	91.70	1,307	8,807	6.7383

No Trades	Buy 1st avg	2nd avg	Filter	LX ATR Len	LX ATR Num	% Stop	SX ATR Len	SX ATR Num	SX % Stop	Max Fav Excursion	Max Adverse Excursion	Ratio MFE/MAE	Score	Remarks
22.813										374.12313	23.12	13.488	55.066	
11	5	15	0.08			9.0			23.0	250.2	19.94	12.548	29.325	Rejected-MAR
														FAIL-No Passes
15						11.0			1.0	166.2	11.00	15.109	36.396	OK
19	40	41	0.07	4	3.6	0.0			5.4	132.1	23.14	5.709	67.114	OK
10	33	23	0.09	25	3.1	23.5			0.1	112.3	12.16	9.235	74.731	Rejected-Time
														FAIL-No Passes
														FAIL-No Passes
5	79	58	0.76							369.4	36.60	10.093	33.946	Rejected-MAR
														FAIL-No Passes
														FAIL-Only 2 Trades
18	36	1	0.35	9	9.3	0	5	13.7	3.7	1272.9	33.05	38.5143722	68.129647	OK
29	4	1	0.15			0	10	3.2	12	293.9	31.17	9.42893808	45.697919	OK
19	15	2	0.17				7	0.2		266.7	27.47	9.709	61.073	Rejected-Time
15	29	35	0.72			18.0	6	1.6	18.0	243.3	18.00	13.517	37.937	OK
15	32	38	0.00	25	3.8	10.9	15	0.4	0.0	105.3	10.90	9.661	57.807	Rejected-Time
														FAIL-No Passes
														FAIL-No Passes
130	4	1	0.01	26	3.2	11.8	14	0.1	0.0	38.5	11.49	3.351	32.889	Rejected-BAH,Time
4	30	49	0.02			0.0	26	9.6	1.0	1711	43.00	39.791	111.971	Rejected-MDD,MAR
6	35	6	0.12							723.2	39.30	18.402	31.697	Rejected-MDD,MAR
25	15	1	0.06			7.8			0.2	130.6	11.02	11.851	63.623	FAIL-No Passes
14	40	11	0.01	28	14.8	0	5	15	2.4	80.7	27.97	2.88523418	89.262961	OK
30	8	3	0.03				10	14.9		89.7	13.71	6.000	39.456	Rejected-MDD,MAR
														FAIL-No Passes
														FAIL-No Passes
														FAIL-No Passes
														FAIL-No Passes
49	1	7	0.00			13.8			1.0	118.6	13.80	8.594	29.674	FAIL-No Passes
20	10	1	0.77							677.3	33.30	20.339	28.868	Rejected-MAR
15	1	41	0.00	28	7.4	0.0	19	0.1	23.1	2119.0	7.09	298.872	21.341	Rejected-MDD,MAR
7	49	26	0.08	4	5.8	23.0			2.0	279.9	16.41	17.057	14.886	Rejected-MAR,BAH
												#DIV/0!	#DIV/0!	FAIL-No Passes
19	double system - see note									351.5	13.41	26.212	71.735	OK

Appendix B

Model Signals

The following table is a list of hypothetical trades generated by the final market timing model outlined in Chapter 9 "Putting It Together." The sequence of trades is by trade, not by date. Forty-one trades occurred in the period of 31 years.

Legend:

Date	Date of trade
S&P 500	Standard & Poor's 500 at close of trade date
% Invested	Percent of portfolio invested in the S&P 500 based on the number of system signals then in effect and whether long or short
Buy-and-Hold Portfolio	Cumulative portfolio value for a portfolio that had no changes to its percent invested and did not buy or sell during the period
Long and Short Portfolio Value	Cumulative portfolio value for a portfolio that adjusted to the changes in number of systems active and included short sales with long buys
Long-Only Portfolio	Columns apply to the final model system as if it traded only on the long side and avoided trading short sales

Signal Date	S&P 500	% Invested	Buy-and-Hold Portfolio	Long and Short Portfolio Value	% Invested	Buy-and-Hold Portfolio	Long-Only Portfolio
12/31/64	84.75		10000.00	10000.00		10000.00	10000.00
11/28/69	93.81	-0.25	11069.03	10000.00	0.00	11069.03	10000.00
8/31/70	81.52	0.00	9618.88	10327.52	0.25	9618.88	10000.00
9/30/70	84.30	0.50	9946.90	10327.52	0.50	9946.90	10085.26
11/30/71	93.99	0.75	11090.27	10921.08	0.75	11090.27	10664.89
1/31/72	103.94	0.25	12264.31	11788.18	0.50	12264.31	11511.65
1/31/72	103.94	0.00	12264.31	11788.18	0.50	12264.31	11511.65
3/1/72	106.57	0.25	12574.63	11788.18	0.75	12574.63	11657.29
3/1/72	109.56	0.50	12927.43	11870.86	1.00	12927.43	11902.58
3/31/72	107.20	0.75	12648.97	11743.01	1.00	12648.97	11646.19
11/30/72	116.67	0.25	13766.37	12521.04	0.75	13766.37	12675.01
9/28/73	108.43	-0.25	12794.10	12299.96	0.50	12794.10	12003.62
9/28/73	108.43	-0.75	12794.10	12299.96	0.25	12794.10	12003.62
7/31/74	79.31	-0.25	9358.11	14777.42	0.50	9358.11	11197.69
9/30/74	63.54	0.00	7497.35	15512.01	0.50	7497.35	10084.42
1/31/75	76.98	0.50	9083.19	15512.01	0.75	9083.19	11150.95
1/1/76	90.19	0.75	10641.89	16842.96	1.00	10641.89	12586.10
3/31/76	102.77	1.00	12126.25	18604.94	1.00	12126.25	14341.65
12/31/76	107.46	0.50	12679.65	19454.00	0.75	12679.65	14996.15
2/1/77	102.03	0.75	12038.94	18962.49	1.00	12038.94	14427.83
8/31/77	96.77	0.25	11418.29	18229.30	0.75	11418.29	13684.02
10/1/77	91.25	0.00	10766.96	17969.34	0.50	10766.96	13098.59
12/30/77	95.10	-0.25	11221.24	17969.34	0.50	11221.24	13374.92
4/28/78	96.83	0.25	11425.37	17887.62	0.75	11425.37	13496.57
4/29/78	100.24	0.50	11827.73	18045.10	1.00	11827.73	13853.05
10/31/78	93.15	0.75	10991.15	17406.93	1.00	10991.15	12873.22
9/28/79	109.32	0.25	12899.12	19673.20	0.75	12899.12	15107.90
11/1/79	101.82	0.50	12014.16	19335.78	1.00	12014.16	14330.53
1/31/80	114.16	0.25	13470.21	20507.47	0.75	13470.21	16067.30
3/31/80	102.09	0.50	12046.02	19965.41	0.75	12046.02	14793.22
7/1/80	118.39	0.75	13969.32	21559.28	1.00	13969.32	16564.67
5/29/81	132.59	0.25	15644.84	23498.69	0.75	15644.84	18551.48
12/31/81	122.55	-0.25	14460.18	23053.84	0.50	14460.18	17497.91
2/26/82	113.11	0.00	13346.31	23497.80	0.50	13346.31	16823.98
8/31/82	119.51	0.50	14101.47	23497.80	0.75	14101.47	17299.95
10/1/82	139.75	0.75	16489.68	25487.57	1.00	16489.68	19497.36
5/31/83	162.39	1.00	19161.06	28584.38	1.00	19161.06	22656.01
7/29/83	162.56	0.50	19181.12	28614.31	0.75	19181.12	22679.73
9/1/83	164.40	0.75	19398.23	28776.25	0.75	19398.23	22872.26
2/28/85	181.18	0.25	21378.17	30979.10	0.50	21378.17	24623.15
6/1/85	190.97	0.50	22533.33	31397.59	0.75	22533.33	25288.41
10/31/85	189.82	0.75	22397.64	31303.05	0.75	22397.64	25174.19
9/30/86	231.32	1.00	27294.40	36435.85	1.00	27294.40	29302.03
3/31/87	291.70	0.50	34418.88	45946.47	0.75	34418.88	36950.56
5/30/87	307.46	0.75	36278.47	47187.67	1.00	36278.47	38447.84

Signal Date	S&P 500	% Invested	Buy-and-Hold Portfolio	Long and Short Portfolio Value	% Invested	Buy-and-Hold Portfolio	Long-Only Portfolio
10/1/87	260.68	0.50	30758.70	41802.97	0.75	30758.70	32598.00
4/29/88	261.33	0.75	30835.40	41855.09	0.75	30835.40	32658.96
4/29/88	261.33	0.50	30835.40	41855.09	0.75	30835.40	32658.96
9/30/88	271.91	1.00	32083.78	42702.34	1.00	32083.78	33650.62
9/29/89	349.15	0.50	41197.64	54832.57	0.75	41197.64	43209.57
11/1/89	340.36	0.75	40160.47	54142.35	0.75	40160.47	42393.70
7/31/90	356.13	1.00	42021.24	56023.80	1.00	42021.24	43866.88
7/31/91	387.81	0.50	45759.29	61007.46	0.75	45759.29	47769.12
11/30/91	408.76	0.75	48231.27	62655.31	1.00	48231.27	49704.53
5/29/92	415.35	1.00	49008.85	63412.91	1.00	49008.85	50505.86
7/30/93	448.13	0.50	52876.70	68417.54	0.75	52876.70	54491.85
9/1/93	463.55	0.75	54696.17	69594.66	0.75	54696.17	55898.14
1/31/97	786.16	1.00	92762.24	105920.72	1.00	92762.24	85075.09
9/30/97	947.28	0.50	111773.45	127628.70	0.75	111773.45	102510.85
1/31/98	998.44	0.75	117810.03	131075.14	1.00	117810.03	106663.09
10/30/98	1098.67	1.00	129636.58	140943.78	1.00	129636.58	117370.64
10/29/99	1362.93	0.50	160817.70	174844.60	0.75	160817.70	145601.47
12/1/99	1395.65	0.75	164678.47	176943.35	0.75	164678.47	148223.07
3/31/00	1498.58	0.25	176823.60	186730.61	0.50	176823.60	156421.72
9/30/00	1436.52	0.50	169500.88	184797.36	0.75	169500.88	153182.81
10/31/00	1429.40	0.25	168660.77	184339.39	0.50	168660.77	152613.39
3/31/01	1160.33	-0.25	136912.09	175664.39	0.25	136912.09	138249.43
8/1/01	1175.70	-0.50	138725.66	175082.67	0.00	138725.66	138707.25
12/31/01	1148.08	0.00	135466.67	177139.22	0.25	135466.67	138707.25
1/31/02	1130.20	-0.25	133356.93	177139.22	0.25	133356.93	138167.20
3/29/02	1147.39	0.25	135385.25	176465.66	0.50	135385.25	138692.57
5/1/02	1076.92	0.00	127070.21	173756.14	0.25	127070.21	134433.48
5/31/02	1067.14	0.25	125916.22	173756.14	0.50	125916.22	134128.27
4/30/03	916.92	0.50	108191.15	167641.28	0.75	108191.15	124687.73
12/1/04	1191.24	0.75	140559.29	192718.36	1.00	140559.29	152665.37
12/31/04	1211.92	0.25	142999.41	195227.56	0.75	142999.41	155315.65
2/1/05	1181.27	0.50	139382.89	193993.21	1.00	139382.89	152369.65
3/31/05	1180.59	0.75	139302.65	193937.38	1.00	139302.65	152281.93
10/31/05	1207.01	0.50	142420.06	197192.42	0.75	142420.06	155689.80
12/1/05	1249.48	0.75	147431.27	200661.64	1.00	147431.27	159798.39
10/31/06	1377.94	1.00	162588.79	216134.27	1.00	162588.79	176227.38
11/30/07	1481.14	0.50	174765.78	232321.52	0.75	174765.78	189425.83
11/30/07	1481.14	0.00	174765.78	232321.52	0.50	174765.78	189425.83
1/1/08	1277.99	-0.25	150795.28	232321.52	0.25	150795.28	176435.21
6/30/08	1280.00	-0.50	151032.45	232230.17	0.25	151032.45	176504.58
8/29/08	1282.83	-1.00	151366.37	231973.45	0.00	151366.37	176602.14
10/31/08	968.75	-0.50	114306.78	288768.36	0.25	114306.78	176602.14
12/31/08	903.25	0.00	106578.17	298530.59	0.50	106578.17	173617.00
1/30/09	825.88	0.50	97448.97	298530.59	0.75	97448.97	166181.21
5/29/09	919.14	1.00	108453.10	315385.93	1.00	108453.10	180255.34
4/29/11	1363.61	0.50	160897.94	467897.60	0.75	160897.94	267421.71
6/1/11	1345.20	0.75	158725.66	464739.08	1.00	158725.66	264713.88
6/30/11	1320.64	0.75	155827.73	458375.34	1.00	155827.73	259880.86

Appendix C

EasyLanguage Programs

for Filtered, Two Moving-Average Crossover Systems

Buys and Sells if Fast Average Crosses Over Slow Average Plus a Percentage Filter With Delay.

```
inputs: FLen(86), SLen(35),Filter(0.07),delay(1);

variables: FMA(0),SMA(0),Btime(0),Stime(0);

FMA = average(Close of data2,FLen) of data2;
SMA = average(Close of data2,SLen) of data2;
If Currentbar > SLen and FMA crosses above
SMA*(1+Filter) then
        Begin
                Btime=currentbar+delay;
                Stime=0;
        End;
If Currentbar = Btime then Buy this bar at close;
If Currentbar > SLen and FMA crosses below SMA*(1-
Filter) then
        Begin
                Stime=currentbar+delay;
                Btime=0;
        End;
If Currentbar = Stime then Sellshort this bar at
close;
```

Percent Protective Stop for Longs and Shorts

```
inputs: LXStopLossPct(5),SXStopLossPct(5) ; { pass in
XX for XX percent }

if LXStopLossPct > 0 and MarketPosition = 1 then Sell
( "PctProtLX" ) next bar at entryprice * ( 1 -
LXStopLossPct/100 ) stop ;
if SXStopLossPct >0 and MarketPosition = -1 then Buy
To Cover ( "PctProtSX" ) next bar at entryprice * ( 1
+ SXStopLossPct/100 ) stop ;
```

ATR Trailing Stop for Longs

```
inputs:  ATRLengthLX( 10 ), NumATRsLX( 3 ) ;
variables:  ATRCalcLX( 0 ), poshigh(0);

ATRCalcLX = AvgTrueRange( ATRLengthLX ) * NumATRsLX ;
If NumATRslx > 0 then
        begin
        if Marketposition = 1 then
                begin
                        If high>poshigh then poshigh =
high;
                        Sell ( "atrLX" ) next bar at
(poshigh - ATRCalcLX) stop;
                end;
        end;
If Marketposition <= 0 then poshigh = 0;
```

ATR Trailing Stop for Shorts

```
inputs: ATRLength( 10 ), NumATRs( 3 ) ;
variables: ATRCalc( 0 ),PosLow( 0 ) ;ATRCalc =
AvgTrueRange( ATRLength ) * NumATRs ;

If NumATRs > 0 then
        begin
                if Marketposition = -1 then
                        begin
                                if Low < PosLow then
PosLow = Low ;
                                Buy To Cover ( "atrSX"
) next bar at PosLow + ATRCalc stop;
                        end;
        End;
If Marketposition <= 0 then poslow=0;
```

Percent Profit Trailing Stop for Longs

```
inputs: FloorPct( 5 ), TrailingPct( 20 ) { pass in XX
for XX percent } ;
variables: FloorAmt (0);

if MarketPosition = 1 then
       Begin
              FloorAmt=entryprice*Floorpct/100;
              SetPercentTrailing( FloorAmt,
TrailingPct ) ;
       End;
```

Percent Profit Trailing Stop for Shorts

```
inputs: FloorPct( 5 ), TrailingPct( 20 ); { pass in
XX for XX percent }
Variables: FloorAmt(0);

FloorAmt = Close*FloorPct/100;
if MarketPosition = -1 then
       Begin
              FloorAmt=entryprice*Floorpct/100;
              SetPercentTrailing( FloorAmt,
TrailingPct ) ;
       end;
```

I N D E X

N-O