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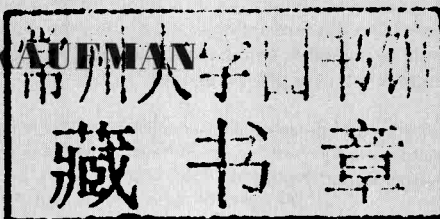


**PERRY
KAUFMAN**

Alpha Trading

*Profitable Strategies That
Remove Directional Risk*

PERRY KAUFMAN



WILEY

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Preface

I wanted to write this book after the collapse of the tech bubble in 2000, but it wasn't until the subprime disaster of 2008 that I decided to do it. Investors should not be subject to the tremendous losses that the market serves up. And traders do not need to make a commitment to a long or short position all the time. There are other choices, and those choices do not necessitate compromising returns. They do require somewhat more complicated positions, but the reward is that, if the S&P collapses because of a terrorist attack, or program trading by one of the big investment houses runs amok and causes a 10 percent drop in the S&P, you are safe.

We've learned greater respect for risk in the past few years. It's a lesson that we all should have learned much sooner, but any time is a good time to improve your skills. Part of that advancement is to be aware of unconscious risks. When we trade more than one stock, each trade should have equal risk. That gives each trade an equal opportunity to contribute to the final results. If you don't do that, you are consciously or unconsciously saying that you think the trade with the largest risk is most likely to give you the best return. If that's the case, you should only make one trade in the best item and forget about diversification.

This book is as much about the process as it is about the results. Its target audience is active traders but not necessarily intraday traders. The intended reader is someone who spends time deciding which stocks or futures markets to buy or sell and doesn't hold a trade indefinitely when it goes the wrong way. Each step is explained, and there are examples of how the numbers should look. There is also a website that has the basic spreadsheets needed to do all the calculations.

The strategies in this book are well known to be profitable. They are called statistical arbitrage, or stat-arb, and they can be traded by holding positions for a few days, as suggested here, or for milliseconds, as implemented by the big investment houses. To trade, all you need is a spreadsheet to do a few calculations; then enter prices at the end of the day or anytime during the day when you think there is an opportunity. Trades have a high probability of success.

You cannot just believe that something works; you need to prove it to yourself. The black box approach is unacceptable and has proved a disaster to many investors. It's your money, and you owe it to yourself to understand and verify everything—even what is shown in this book.

It is one thing to be given a strategy and another to use it successfully. Once you have verified and paper-traded the strategies, you have a better chance of being successful because you have become part of the development process.

The development process is an exciting exploration. It begins with a sound premise and moves down various paths that may or may not turn out to be useful. But at the same time, it teaches valuable lessons. You understand why one idea works and another doesn't. You understand the robust and the fragile parts of the strategies. At some time in the future, you may be called upon to change the strategy because the market has changed—volatility has dropped to a level that limits opportunity or risen to a point of unacceptable risk. Markets that used to move together no longer do so, or as in the fourth quarter of 2008, markets moved together for no apparent reason.

Without having gone through the process, you do not have the knowledge to make these changes or the confidence that they will work. This book will present important strategies that should be part of any trader's portfolio. It will develop and explain the features that are incorporated, as well as choices that were not taken. But it is the sound premise of these ideas that is the underlying reason for its success. At the end, I hope you have learned a lot and that you trade successfully.

Perry Kaufman
January 2011

Contents

Preface	ix
CHAPTER 1 Uncertainty	1
<hr/>	
Impact on Trading	2
The Inevitable Price Shocks	3
Why So Much about Price Shocks?	9
Complexity and Contagion Risk	10
The Ugly Side	11
Taking Defensive Action	11
Accepting Performance for What It Is	13
 CHAPTER 2 The Importance of Price Noise	 15
<hr/>	
Noise Explained	15
Different Markets	19
A Closer Look at Equity Index Markets	21
Importance of Noise	22
Determining the Strategy	25
Capitalizing on the Trend of Noise	29
 CHAPTER 3 Pairs Trading: Understanding the Process	 31
<hr/>	
The Process	32
The Basics	32
Target Volatility	54

Home Builders	65
Using ETFs	78
Portfolio of Home Builder Pairs	84
Execution and the Part-Time Trader	89
Stop-Losses	89
Trading Intraday	90
Key Points to Remember	90
 CHAPTER 4 Pairs Trading Using Futures	 93
<hr/>	
Futures	94
Mechanics of a Pairs Trade in Futures	97
Inflation Scares	100
Trading Energy Pairs	102
Revisiting Momentum with Energy Markets	105
A Miniportfolio of Natural Gas Pairs	112
The Inflation Pairs: Crude, the EURUSD, and Gold	119
Equity Index Pairs	128
Leveraging with Futures	138
London Metals Exchange Pairs	141
Volatility Filters	153
Interest Rate Futures	154
Summary	154
 CHAPTER 5 Risk-Adjusted Spreads	 155
<hr/>	
Dell and Hewlett-Packard	155
Trading Both Long-Term (Hedged) Trends and Short-Term Mean Reversion	159
Gold, Platinum, and Silver	161
The Platinum/Gold Ratio	163
Implied Yield	170
The Yield Curve	174
Trend Trading of London Metal Exchange Pairs	179
Summary	184

CHAPTER 6 Cross-Market Trading and the Stress Indicator	187
<hr/>	
The Crossover Trade	188
The Stress Indicator	189
Gold, Copper, and Platinum	195
Mining Companies	198
Agribusiness Pairs	206
The Major Energy Producers	208
Portfolio of Cross-Market Energy Pairs	220
Other Opportunities	226
Some Final Notes	228
CHAPTER 7 Revisiting Pairs Using the Stress Indicator	229
<hr/>	
Futures Markets and the Stress Indicator	229
Equity Index Futures	230
Interest Rate Futures	238
The Portfolio Spreadsheet	245
Summary of Pairs Trading	248
CHAPTER 8 Traditional Market-Neutral Trading	249
<hr/>	
Home Builders	250
Trend or Mean Reversion?	250
Basic Market-Neutral Concept	251
Volatility-Adjusting the Position Size	264
Arbing the Dow: A Large-Scale Program	267
Thoughts about Market-Neutral Trend Following	274
Market Neutral Using Futures	274
Market-Neutral Comments	277
CHAPTER 9 Other Stat-Arb Methods	281
<hr/>	
Trade-Offs	282
System Briefs	282
New Highs and New Lows	290

Merger Arb	290
Creating Your Own Index Arbitrage	292
Arbing the Dow	301
Arbing the S&P 500—Index Arbitrage	302
About the Companion Web Site	305
About the Author	306
Index	307

Uncertainty

The investment world had a rude reminder in August and September of 2008 that forecasts and risk have more uncertainty than it would like to believe. From August 28 to the following March 9, the Standard & Poor's (S&P) 500 dropped 47%. Even more remarkable was that every investment was dragged down with it—hedge funds that were expected to offer diversification, commodity funds where you have the security of so-called hard currency, real estate, art, and of course, every possible stock in nearly every country.

Oddly, the U.S. dollar strengthened against the euro by about 15% during that time. It was odd because it was the United States that originated what we now call the *subprime disaster*. Yet in a crisis, investors still move money to the United States for safety.

What did we learn from this? Mainly, we learned that there is more uncertainty than we thought in the world of investments. Maybe that's not entirely correct. We just tend to ignore the risks when everything goes well for a long time. During the late 1990s, a similar move occurred in the tech stocks, with NASDAQ dropping from 5000 to below 1200. For those a bit older, or students of history, there was the crash of 1987 resulting in a drop of 39.8% in the S&P from October 6 to October 22. But the stock market had recovered by the end of the year, so investors who didn't react to the drop never suffered a sustained loss. By contrast, the recent drop in the S&P lasted from August 11, 2008, to March 3, 2009, far longer than 1987 but not comparable to the Black Monday of 1929.

At the time of this writing, the stock market is down only 15% from its highs. Again, investors who had closed their eyes are still suffering a

loss in their pensions, but nothing devastating. Those who liquidated their portfolios and moved them to money market funds locked in their losses. The right decision is only known afterward.

IMPACT ON TRADING

But this book is about trading, not investing, and 2008 was a banner year for futures traders at the same time the equity markets were collapsing. The same could have been true for someone trading *exchange-traded funds* (ETFs) or any investment in which going short is a natural part of trading. The main beneficiaries were trend followers, who were able to get short (equity index markets), or long (interest rates), and stay with the trend for months, capturing what is known as the *fat tail*.

We can then say that many traders lost money and some profited, but the most important lesson is that the risk was enormous. Volatility rose from under 20% to 80%, a previously unthinkable level (see Figure 1.1). If you can't manage risk, then your interim losses may be too big to ever see the profits.

Money Moves the Markets

Normally, risk is reduced through diversification, but that wasn't true during this last crisis because the movement of money reversed the direction of all markets at the same time. In a crisis, most investors simply want to get their money out. If they are long equities, then equities fall; if they are long the Goldman Sachs Commodity Index (GSCI), then that falls; and

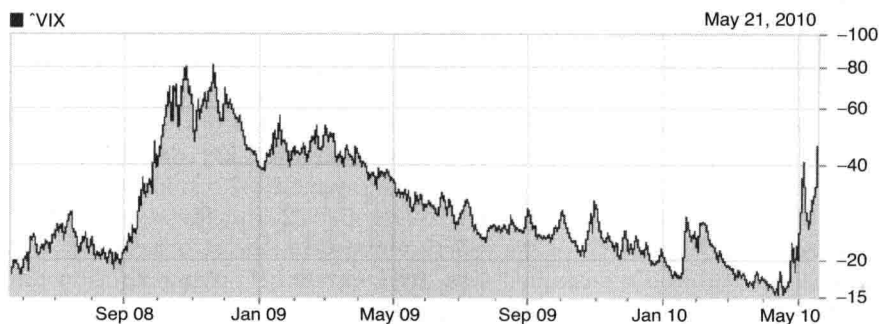


FIGURE 1.1 The volatility index (VIX) for S&P 500 from August 2008 through mid-May 2010.

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if they are short the Japanese yen in the carry trade, the yen rises. Cash, or guaranteed government debt, is the only safe place, provided it's not Greece, Italy, Spain, Portugal, or a variety of emerging markets that may have even greater risk.

THE INEVITABLE PRICE SHOCKS

We all know that price shocks are extreme price moves that cannot be predicted. We also understand that they are worse when the investing public is holding the wrong position, that is, when we expect the Fed to lower interest rates to stimulate the economy, but instead they raise rates to prevent inflation. Of course, that's not supposed to happen in our new era of transparency. But what about a military coup in an oil-rich country that cuts off the needed flow of supply to the West? Or an assassination? Or a surprise election result? All of these have happened.

We might think of all price movement as a series of price shocks of different sizes—all reactions to today's news. Most often, these shocks are very small, but some are bigger, and occasionally one is gigantic. Do you ever wonder how these price shocks net against your market positions? Is it different if you are a long-term rather than a short-term trader? Is there something you can do to take advantage of a price shock, or at least not be hurt by it?

Biased against You

First of all, understand that you can't change the odds to have better than a 50% chance that you will profit from a price shock. Realistically, you would be lucky to have 50% of the price shocks in your favor. However, it does seem clear that when more people hold the same positions, any surprise that is contrary to that direction will have a greater impact while surprising news in a favorable direction will have little effect. But that information is not enough to make money because we still don't know when the next price shock will come.

Very few traders, professional or amateur, recognize the importance of price shocks and the effect that they have on profits. Given how ill-prepared and undercapitalized many traders are, one large price shock is all they need to be forced out permanently.

Price Shocks and Your Position Do price shocks hurt the short-term or the long-term trader more? To find out, we ran a moving average

test of a few different markets and totaled the value of the price shocks that caused profits or losses. Specifically,

- The moving average calculation periods ranged from 10 days to 200 days, in steps of 10 days.
- A *price shock* was defined as any day in which the ratio of today's price change to the standard deviation of the previous 10 day price changes was greater than 2.5. That means, if the standard deviation of the S&P daily price changes was 6 big points, then a gain or loss of 15 points would trigger a price shock. Specifically, if the threshold for a price shock $t = 2.5$ and $n = 10$, then if

$$|P_t - P_{t-1}| > \text{stdev}(P_i - P_{i-1}) \text{ where } i = t - 1, \dots, t - n$$

we can say that day t is a price shock.

By using the standard deviation of the daily changes, we can test using either the cash index or back-adjusted futures. Back-adjusting does not change the price differences or the standard deviation, although it will change any percentage calculation because the divisor is scaled to an artificial price. When working with futures, it's best to use price differences, and with stocks or stock indices, we should use returns.

S&P Price Shocks The impact of price shocks on the S&P is unique. We believe that there is an upward bias in the index markets, caused by favorable tax treatment of capital gains as well as legal restrictions in some pension plans, which results in investors holding long positions. Short sales are limited to a far smaller group of professional traders, perhaps a few more now that inverse ETFs and bear funds (inverse mutual funds, such as ProFunds) allow easy access. Investors also seem to gravitate toward a clear bull market in any investment, whether the stock market or gold or oil. It should not be a surprise that downside shocks would hurt most investors. Our moving average system, however, is unbiased because it goes long or short according to the direction of the trend and not because of tax consequences.

Figure 1.2 shows the daily price changes of the S&P futures as a ratio of the standard deviation of the previous 10 days, as given in the previous formula. The data cover 13 years, ending in May 2010. Even though prices were well off the lows of the subprime crisis by February 2009, it is easy to see that there is still a bias toward downward price shocks. By looking at the ± 4 lines on the left axis, we see that only seven events came close to that level, and not many moved above the 2 level, while there were many more both crossing -2 and penetrating -4 . We might have expected that more computerized trading, and perhaps more investment sophistication,

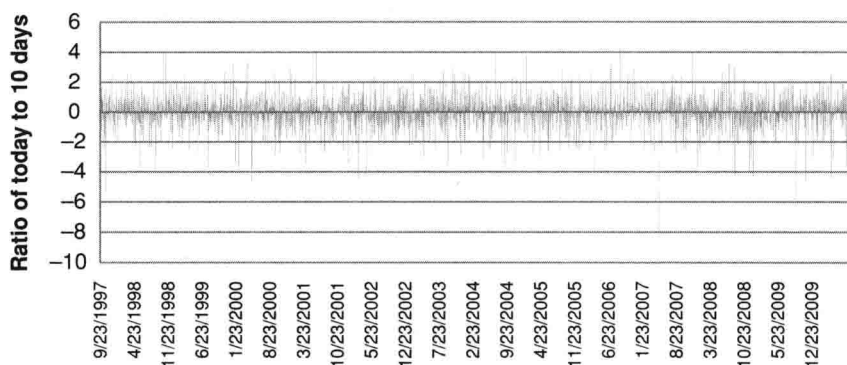


FIGURE 1.2 S&P 1-day volatility as a ratio to the standard deviation of the previous 10 days.

would cause shocks to be more symmetrical in recent years, but that doesn't seem to be the case.

Using this chart, we choose two price-shock thresholds, 3.0 and 4.0, to compare the impact of what we will call *more shocks* and *fewer shocks*. The *fewer* case is also larger shocks. We run a test of moving averages using calculation periods from 10 days to 200 days over the past 10 years. The rules are that a long position is entered when the moving average turns up, and a short is entered when the moving average turns down. The system is always in the market. A \$25 round-turn commission is charged to cover all costs. Results are shown as Net PL in Figure 1.3, along with the net results of the 1-day price shocks. The performance pattern of the S&P begins with

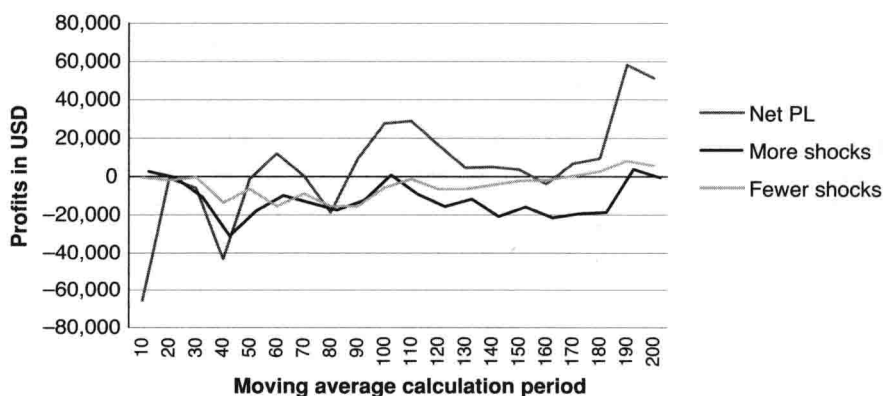


FIGURE 1.3 Comparison of the net returns for S&P moving average systems through May 2010 and the contribution from "more" and "fewer" 1-day price shocks.

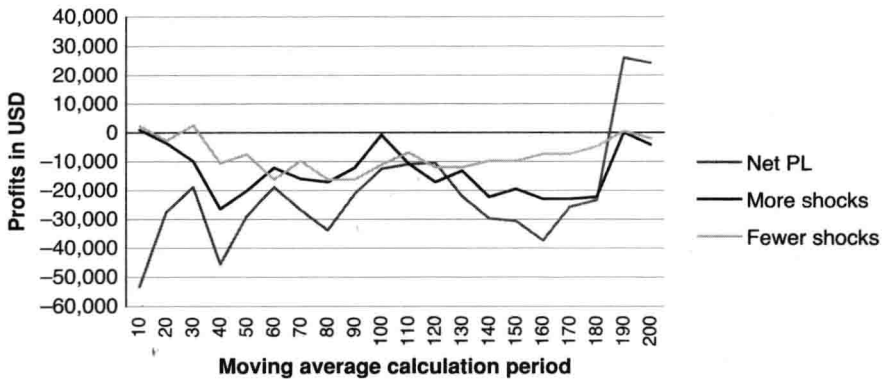


FIGURE 1.4 S&P price shocks for the period beginning January 1991 and ending on the last day of 2007, to avoid the effects of the subprime crisis.

large losses for faster trends and finally shows profits for trend periods approaching 200 days.

The lines representing the contributions from 1-day price shocks show that in nearly all cases, the net impact of price shocks are negative returns. This can be attributed to most investors holding the same long position when there is a sustained bull market. We would caution traders not to believe that price shocks will contribute to short-term profits, even though the chart shows some net gains for the 10-day average and again for the longest calculation periods. At best, you can assume a 50% chance of a price shock in your favor. Anything else is strictly luck.

We thought it would be interesting to compare the results of these tests without the impact of the subprime crisis; therefore, we retested the data beginning at the same point, 1997, when the e-mini S&P began trading, and ending on January 1, 2008. The results are shown in Figure 1.4. The results are actually very similar for the contribution of price shocks because only a few shocks would have been added. In addition, the measurement of a price shock is relative to the previous 10 days, so that the sustained high volatility during the months from August 2008 through February 2009 made it difficult to have any shock that would have been 3 times larger. Instead, we see that the S&P was a poor performer, using a simple moving average system, and that the large downward move and the following rally from August 2008 through the current mid-2010 boosted the profits from \$25,000 for the longest trends to nearly \$60,000. Simple systematic trend following can perform well when traders can't.

Interest Rates Interest rates are a far less volatile and more orderly market than any equity index. Using the Eurobund as the representative,

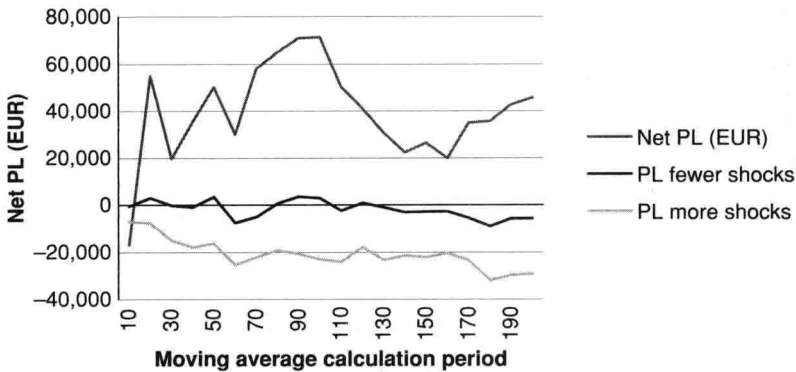


FIGURE 1.5 Impact of price shocks on Euro bund moving average returns.

we run the same tests as we did for the S&P, using €25 as the round-turn cost for each trade, and beginning in 1991. The results are shown in Figure 1.5. They differ considerably from the S&P results because more shocks total very negative returns, averaging about half of the net profits. The fewer, larger price shocks netted an impact closer to zero, but the more frequent shocks, the results of periodic economic reports, move consistently against the trend position.

The large losses due to price shocks can be attributed to the Eurobund trend over the test period, as seen in Figure 1.6. With prices moving higher over the past 18 years, we would expect most investors to be holding long positions. Then price shocks to the downside would most often generate losses. As the trend calculation period increases, the time holding a long position increases; therefore, price shocks to the upside become a larger profit component, and shocks to the downside a larger losing component.

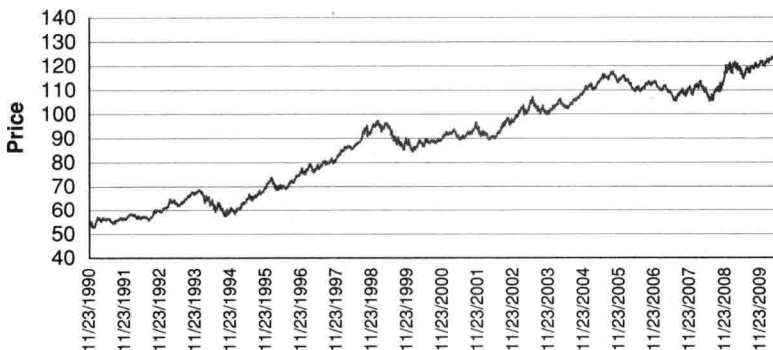


FIGURE 1.6 Eurobund futures prices, nearest contract, back-adjusted from 1990.

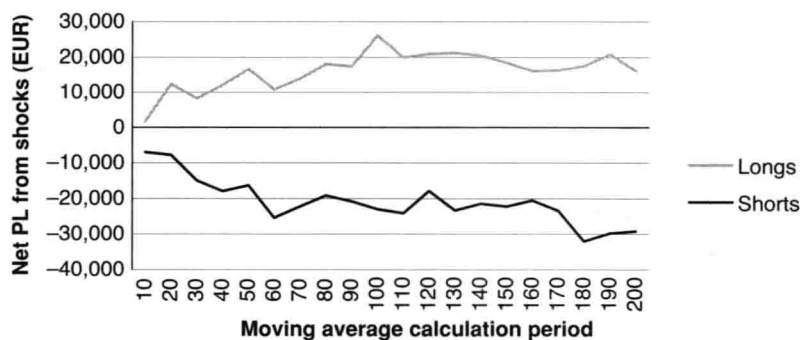


FIGURE 1.7 Net effect of price shocks on Eurobund long and short positions.

These can be seen in Figure 1.7, where the losses due to short-side shocks far outweigh the gains from upside shocks.

Crude Oil Another market that has attracted a great deal of attention is crude oil, rallying from \$40 per barrel to nearly \$150 before falling back to \$30 in just over three months, shown in Figure 1.8. A breakdown of the price shocks (Figure 1.9) shows that more shocks added to profits, while the largest shocks moved against the positions being held. This was a remarkable period for oil, and any news (more shocks) was taken as bullish. While there were big downside surprises, the market ignored them.

The profits from varying the calculation period of the moving average show that the slowest trends held the long position too far into the reversal that followed the peak of \$150, giving back most of the gains. In hindsight, the perfect trend was about 110 days, but it's not likely we would have been trading it. Most macrotrend programs would have chosen something in the

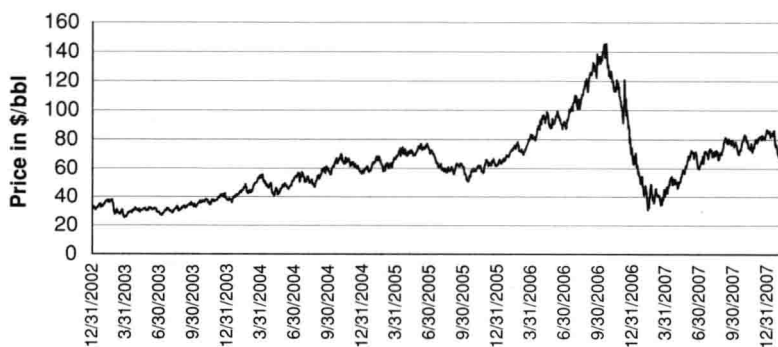


FIGURE 1.8 Crude oil, back-adjusted futures from 2003.