8 Chapter

The Efficient Market Hypothesis

After Studying This Chapter You Should Be Able To:

● Demonstrate why security price movements should be essentially unpredictable in an efficient market.

● Cite evidence that supports and contradicts the efficient market hypothesis.

● Provide interpretations of various stock market "anomalies."

● Formulate investment strategies that make sense in informationally efficient markets.

One of the early applications of computers in economics in the 1950s was to analyze economic time series. Business cycle theorists felt that tracing the evolution of several economic variables over time would clarify and predict the progress of the economy through boom and bust periods. A natural candidate for analysis was the behavior of stock market prices over time. On the assumption that stock prices reflect the prospects of the firm, recurrent patterns of peaks and troughs in economic performance ought to show up in those prices.

When Maurice Kendall (1953) examined this proposition, however, he found to his great surprise that he could identify no predictable patterns in stock prices. Prices seemed to evolve randomly. They were as likely to go up as they were to go down on any particular day, regardless of past performance. The data provided no way to predict price movements.

At first blush, Kendall's results were disturbing to some financial economists. They seemed to imply that the stock market is dominated by erratic market psychology, or "animal spirits"—that it follows no logical rules. In short, the results appeared to confirm the irrationality of the market. On further reflection, however, economists came to reverse their interpretation of Kendall's study.

It soon became apparent that random price movements indicated a well-functioning or efficient market, not an irrational one. In this

chapter we explore the reasoning behind what may seem a surprising conclusion. We show how competition among analysts leads naturally to market efficiency, and we examine the implications of the efficient market hypothesis for investment policy. We also consider empirical evidence that supports and contradicts the notion of market efficiency.

8.1 Random Walks and The Efficient Market Hypothesis

Suppose Kendall had discovered that stock prices are predictable. What a gold mine this would have been. If they could use Kendall's equations to predict stock prices, investors would reap unending profits simply by purchasing stocks that the computer model implied were about to increase in price and by selling those stocks about to fall in price.

A moment's reflection should be enough to convince yourself that this situation could not persist for long. For example, suppose that the model predicts with great confidence that XYZ stock price, currently at $100 per share, will rise dramatically in three days to $110. What would all investors with access to the model's prediction do today? Obviously, they would place a great wave of immediate buy orders to cash in on the forthcoming increase in stock price. No one holding XYZ, however, would be willing to sell. The net effect would be an *immediate* jump in the stock price to $110. The forecast of a future price increase will lead instead to an immediate price increase. In other words, the stock price will immediately reflect the "good news" implicit in the model's forecast.

This simple example illustrates why Kendall's attempt to find recurrent patterns in stock price movements was likely to fail. A forecast about favorable *future* performance leads instead to favorable *current* performance, as market participants all try to get in on the action before the price increase.

More generally, one might say that any information that could be used to predict stock performance should already be reflected in stock prices. As soon as there is any information indicating that a stock is underpriced and therefore offers a profit opportunity, investors flock to buy the stock and immediately bid up its price to a fair level, where only ordinary rates of return can be expected. These "ordinary rates" are simply rates of return commensurate with the risk of the stock.

However, if prices are bid immediately to fair levels, given all available information, it must be that they increase or decrease only in response to new information. New information, by definition, must be unpredictable; if it could be predicted, then the prediction would be part of today's information. Thus stock prices that change in response to new (unpredictable) information also must move unpredictably.

This is the essence of the argument that stock prices should follow a **random walk,** that is, that price changes should be random and unpredictable. Far from a proof of market irrationality, randomly evolving stock prices would be the necessary consequence of intelligent investors competing to discover relevant information on which to buy or sell stocks before the rest of the market becomes aware of that information.

Don't confuse randomness in price *changes* with irrationality in the *level* of prices. If prices are determined rationally, then only new information will cause them to change. Therefore, a random walk would be the natural result of prices that always reflect all current knowledge. Indeed, if stock price movements were predictable, that would be damning evidence of stock market inefficiency, because the ability to predict prices would indicate that all available information was not already reflected in stock prices. Therefore, the notion that stocks already reflect all available information is referred to as the **efficient market hypothesis** (EMH).[1]

Figure 8.1 illustrates the response of stock prices to new information in an efficient market. The graph plots the price response of a sample of 194 firms that were targets of takeover attempts. In most takeovers, the acquiring firm pays a substantial premium over current market

random walk

The notion that stock price changes are random and unpredictable.

efficient market hypothesis

The hypothesis that prices of securities fully reflect available information about securities.

[1]Market efficiency should not be confused with the idea of efficient portfolios introduced in Chapter 6. An informationally efficient *market* is one in which information is rapidly disseminated and reflected in prices. An efficient *portfolio* is one with the highest expected return for a given level of risk.
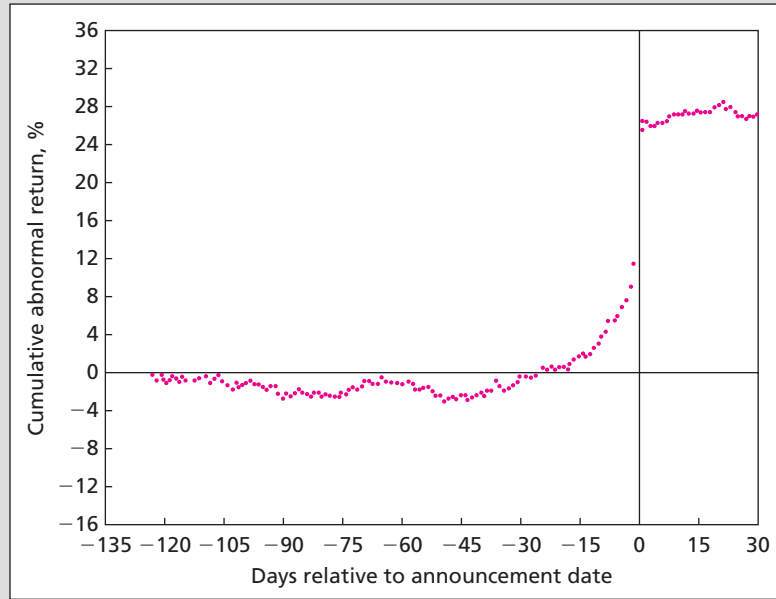
prices. Therefore, announcement of a takeover attempt should cause the stock price to jump. The figure shows that stock prices jump dramatically on the day the news becomes public. However, there is no further drift in prices *after* the announcement date, suggesting that prices reflect the new information, including the likely magnitude of the takeover premium, by the end of the trading day.

Even more dramatic evidence of rapid response to new information may be found in intraday prices. For example, Patel and Wolfson (1984) show that most of the stock price response to corporate dividend or earnings announcements occurs within 10 minutes of the announcement. A nice illustration of such rapid adjustment is provided in a study by Busse and Green (2002), who track minute-by-minute stock prices of firms that are featured on CNBC's "Morning" or "Midday Call" segments.[2] Minute 0 in Figure 8.2 is the time at which the stock
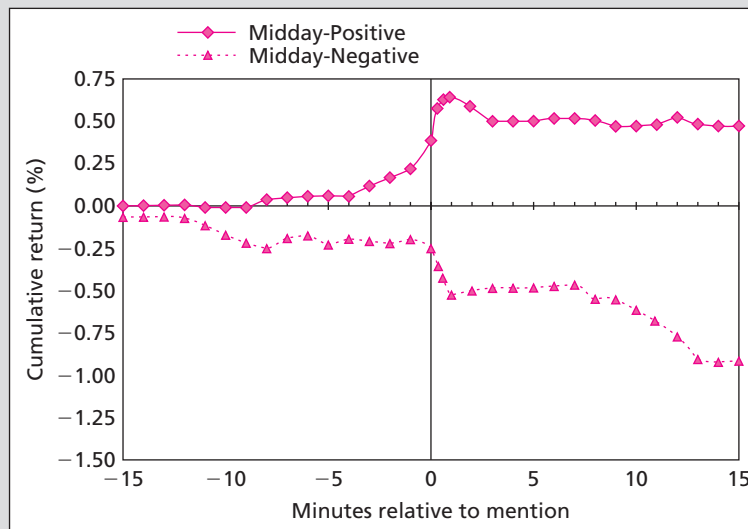
[2]You can find a nice intraday movie version of this figure at **www.bus.emory.edu/cgreen/docs/cnbc/cnbc.html.**

is mentioned on the midday show. The top line is the average price movement of stocks that receive positive reports, while the bottom line reports returns on stocks with negative reports. Notice that the top line levels off, indicating that the market has fully digested the news, within 5 minutes of the report. The bottom line levels off within about 12 minutes.

Competition as the Source of Efficiency

Why should we expect stock prices to reflect "all available information"? After all, if you are willing to spend time and money on gathering information, it might seem reasonable that you could turn up something that has been overlooked by the rest of the investment community. When information is costly to uncover and analyze, one would expect investment analysis calling for such expenditures to result in an increased expected return.

This point has been stressed by Grossman and Stiglitz (1980). They argued that investors will have an incentive to spend time and resources to analyze and uncover new information only if such activity is likely to generate higher investment returns. Thus, in market equilibrium, efficient information-gathering activity should be fruitful. Moreover, it would not be surprising to find that the degree of efficiency differs across various markets. For example, emerging markets that are less intensively analyzed than U.S. markets and in which accounting disclosure requirements are less rigorous may be less efficient than U.S. markets. Small stocks which receive relatively little coverage by Wall Street analysts may be less efficiently priced than large ones. Therefore, while we would not go so far as to say that you absolutely cannot come up with new information, it makes sense to consider and respect your competition.

EXAMPLE 8.1
Rewards for Incremental Performance

Consider an investment management fund currently managing a $5 billion portfolio. Suppose that the fund manager can devise a research program that could increase the portfolio rate of return by one-tenth of 1% per year, a seemingly modest amount. This program would increase the dollar return to the portfolio by $5 billion × .001, or $5 million. Therefore, the fund would be willing to spend up to $5 million per year on research to increase stock returns by a mere tenth of 1% per year. With such large rewards for such small increases in investment performance, it should not be surprising that professional portfolio managers are willing to spend large sums on industry analysts, computer support, and research effort, and therefore that price changes are, generally speaking, difficult to predict.

With so many well-backed analysts willing to spend considerable resources on research, easy pickings in the market will be rare. Moreover, the incremental rates of return on research activity may be so small that only managers of the largest portfolios will find them worth pursuing.

Although it may not literally be true that "all" relevant information will be uncovered, it is virtually certain that there are many investigators hot on the trail of most leads that seem likely to improve investment performance. Competition among these many well-backed, highly paid, aggressive analysts ensures that, as a general rule, stock prices ought to reflect available information regarding their proper levels.

A concrete illustration of this point appears in the nearby box, which reports on hedge funds paying lobbying firms up to $20,000 per *month* for tips on upcoming legislation that may affect the prospects of particular firms. These "investments in information" can easily pay for themselves when applied to very large portfolios. The article also notes that both Congress and the SEC are uneasy about the ethics and legalities of such arrangements.

Versions of the Efficient Market Hypothesis

It is common to distinguish among three versions of the EMH: the weak, semistrong, and strong forms of the hypothesis. These versions differ by their notions of what is meant by the term "all available information."

The **weak-form** hypothesis asserts that stock prices already reflect all information that can be derived by examining market trading data such as the history of past prices, trading volume, or short interest. This version of the hypothesis implies that trend analysis is fruitless. Past stock price data are publicly available and virtually costless to obtain. The weak-form

weak-form EMH

The assertion that stock prices already reflect all information contained in the history of past trading.

HEDGE FUNDS HIRE LOBBYISTS TO GATHER TIPS IN WASHINGTON

As federal authorities try to crack down on illegal trading using secrets leaked from companies, some hedge-fund managers are tapping another source of information: the corridors of the Capitol.

Hedge funds are finding that Washington can be a gold mine of market-moving information, easily gathered by the politically connected. The funds are hiring lobbyists—not to influence government, but to tell them what it's going to do. Several lobbying firms are ramping up their "political-intelligence" units and charging hedge funds between $5,000 and $20,000 a month for tips and predictions.

The Securities and Exchange Commission is looking into whether laws are being broken somewhere in the transfer of information between Congress and Wall Street. It's not illegal for lawmakers to disclose information that is not publicly known about the workings of Congress, even if it could affect stock prices. It breaks congressional ethics rules only if they or their aides profit directly. But one question the SEC is trying to resolve is whether the passing of market-sensitive information by lobbyists to investors could violate insider-trading law.

The use of lobbyists as tipsters also is drawing attention from Congress. Democrats are considering requiring lobbyists to disclose their political-intelligence clients. Right now, lobbyists only have to disclose their work for clients seeking to influence government, while hedge funds and other clients seeking market-beating tips can stay in the shadows. Increasingly, lobbyists acting as advocates for a company on an issue may also have a client looking to trade on information about the same issue.

Employees of publicly traded companies are tightly bound by insider-trading laws, which also ban investors from trading public securities using material, nonpublic information that has been passed on improperly. But in most cases, members of Congress and their aides don't have a duty under the law to keep information private. They routinely exchange information about politics and policy with lobbyists—often not realizing that mere morsels are being sold to hedge funds who trade on the tidbits.

hypothesis holds that if such data ever conveyed reliable signals about future performance, all investors already would have learned to exploit the signals. Ultimately, the signals lose their value as they become widely known because a buy signal, for instance, would result in an immediate price increase.

semistrong-form EMH

The assertion that stock prices already reflect all publicly available information.

The **semistrong-form** hypothesis states that all publicly available information regarding the prospects of a firm already must be reflected in the stock price. Such information includes, in addition to past prices, fundamental data on the firm's product line, quality of management, balance sheet composition, patents held, earning forecasts, and accounting practices. Again, if investors have access to such information from publicly available sources, one would expect it to be reflected in stock prices.

strong-form EMH

The assertion that stock prices reflect all relevant information, including inside information.

Finally, the **strong-form** version of the efficient market hypothesis states that stock prices reflect all information relevant to the firm, even including information available only to company insiders. This version of the hypothesis is quite extreme. Few would argue with the proposition that corporate officers have access to pertinent information long enough before public release to enable them to profit from trading on that information. Indeed, much of the activity of the Securities and Exchange Commission is directed toward preventing insiders from profiting by exploiting their privileged situation. Rule 10b-5 of the Security Exchange Act of 1934 sets limits on trading by corporate officers, directors, and substantial owners, requiring them to report trades to the SEC. These insiders, their relatives, and any associates who trade on information supplied by insiders are considered in violation of the law.

Defining insider trading is not always easy, however. After all, stock analysts are in the business of uncovering information not already widely known to market participants. As we saw in Chapter 3, the distinction between private and inside information is sometimes murky.

CONCEPT *check* **8.1**

a. Suppose you observed that high-level managers make superior returns on investments in their company's stock. Would this be a violation of weak-form market efficiency? Would it be a violation of strong-form market efficiency?
b. If the weak form of the efficient market hypothesis is valid, must the strong form also hold? Conversely, does strong-form efficiency imply weak-form efficiency?

8.2 | Implications of The EMH

Technical Analysis

Technical analysis is essentially the search for recurrent and predictable patterns in stock prices. Although technicians recognize the value of information regarding future economic prospects of the firm, they believe that such information is not necessary for a successful trading strategy. This is because whatever the fundamental reason for a change in stock price, if the stock price responds slowly enough, the analyst will be able to identify a trend that can be exploited during the adjustment period. The key to successful technical analysis is a sluggish response of stock prices to fundamental supply-and-demand factors. This prerequisite, of course, is diametrically opposed to the notion of an efficient market.

Technical analysts are sometimes called *chartists* because they study records or charts of past stock prices, hoping to find patterns they can exploit to make a profit. As an example of technical analysis, consider the *relative strength* approach. The chartist compares stock performance over a recent period to performance of the market or other stocks in the same industry. A simple version of relative strength takes the ratio of the stock price to a market indicator such as the S&P 500 Index. If the ratio increases over time, the stock is said to exhibit relative strength because its price performance is better than that of the broad market. Such strength presumably may continue for a long enough period of time to offer profit opportunities.

One of the most commonly heard components of technical analysis is the notion of **resistance levels** or **support levels.** These values are said to be price levels above which it is difficult for stock prices to rise, or below which it is unlikely for them to fall, and they are believed to be levels determined by market psychology.

technical analysis

Research on recurrent and predictable stock price patterns and on proxies for buy or sell pressure in the market.

resistance level

A price level above which it is supposedly unlikely for a stock or stock index to rise.

support level

A price level below which it is supposedly unlikely for a stock or stock index to fall.

Consider stock *XYZ*, which traded for several months at a price of $72, and then declined to $65. If the stock eventually begins to increase in price, $72 is considered a resistance level (according to this theory) because investors who bought originally at $72 will be eager to sell their shares as soon as they can break even on their investment. Therefore, at prices near $72 a wave of selling pressure would exist. Such activity imparts a type of "memory" to the market that allows past price history to influence current stock prospects.

EXAMPLE   8.2

Resistance Levels

The efficient market hypothesis implies that technical analysis is without merit. The past history of prices and trading volume is publicly available at minimal cost. Therefore, any information that was ever available from analyzing past prices has already been reflected in stock prices. As investors compete to exploit their common knowledge of a stock's price history, they necessarily drive stock prices to levels where expected rates of return are exactly commensurate with risk. At those levels one cannot expect abnormal returns.

As an example of how this process works, consider what would happen if the market believed that a level of $72 truly were a resistance level for stock *XYZ* in Example 8.2. No one would be willing to purchase the stock at a price of $71.50, because it would have almost no room to increase in price, but ample room to fall. However, if no one would buy it at $71.50, then $71.50 would become a resistance level. But then, using a similar analysis, no one would buy it at $71, or $70, and so on. The notion of a resistance level is a logical conundrum. Its simple resolution is the recognition that if the stock is ever to sell at $71.50, investors *must* believe that the price can as easily increase as fall. The fact that investors are willing to purchase (or even hold) the stock at $71.50 is evidence of their belief that they can earn a fair expected rate of return at that price.

If everyone in the market believes in resistance levels, why do these beliefs not become self-fulfilling prophecies?

CONCEPT
check   **8.2**

An interesting question is whether a technical rule that seems to work will continue to work in the future once it becomes widely recognized. A clever analyst may occasionally uncover a

profitable trading rule, but the real test of efficient markets is whether the rule itself becomes reflected in stock prices once its value is discovered. Once a useful technical rule (or price pattern) is discovered, it ought to be invalidated when the mass of traders attempts to exploit it. In this sense, price patterns ought to be *self-destructing.*

Thus the market dynamic is one of a continual search for profitable trading rules, followed by destruction by overuse of those rules found to be successful, followed by more search for yet-undiscovered rules. We return to the rationale for technical analysis as well as some of its methods in the next chapter.

Fundamental Analysis

fundamental analysis

Research on determinants of stock value, such as earnings and dividend prospects, expectations for future interest rates, and risk of the firm.

Fundamental analysis uses earnings and dividend prospects of the firm, expectations of future interest rates, and risk evaluation of the firm to determine proper stock prices. Ultimately, it represents an attempt to determine the present discounted value of all the payments a stockholder will receive from each share of stock. If that value exceeds the stock price, the fundamental analyst would recommend purchasing the stock.

Fundamental analysts usually start with a study of past earnings and an examination of company financial statements. They supplement this analysis with further detailed economic analysis, ordinarily including an evaluation of the quality of the firm's management, the firm's standing within its industry, and the prospects for the industry as a whole. The hope is to attain insight into future performance of the firm that is not yet recognized by the rest of the market. Chapters 12 through 14 provide a detailed discussion of the types of analyses that underlie fundamental analysis.

Once again, the efficient market hypothesis predicts that *most* fundamental analysis also is doomed to failure. If the analyst relies on publicly available earnings and industry information, his or her evaluation of the firm's prospects is not likely to be significantly more accurate than those of rival analysts. There are many well-informed, well-financed firms conducting such market research, and in the face of such competition it will be difficult to uncover data not also available to other analysts. Only analysts with a unique insight will be rewarded.

Fundamental analysis is much more difficult than merely identifying well-run firms with good prospects. Discovery of good firms does an investor no good in and of itself if the rest of the market also knows those firms are good. If the knowledge is already public, the investor will be forced to pay a high price for those firms and will not realize a superior rate of return.

The trick is not to identify firms that are good, but to find firms that are *better* than everyone else's estimate. Similarly, poorly run firms can be great bargains if they are not quite as bad as their stock prices suggest.

This is why fundamental analysis is difficult. It is not enough to do a good analysis of a firm; you can make money only if your analysis is better than that of your competitors because the market price will already reflect all commonly available information.

Active versus Passive Portfolio Management

By now it is apparent that casual efforts to pick stocks are not likely to pay off. Competition among investors ensures that any easily implemented stock evaluation technique will be used widely enough so that any insights derived will be reflected in stock prices. Only serious analysis and uncommon techniques are likely to generate the *differential* insight necessary to yield trading profits.

Moreover, these techniques are economically feasible only for managers of large portfolios. If you have only $100,000 to invest, even a 1% per year improvement in performance generates only $1,000 per year, hardly enough to justify herculean efforts. The billion-dollar manager, however, reaps extra income of $10 million annually from the same 1% increment.

If small investors are not in a favored position to conduct active portfolio management, what are their choices? The small investor probably is better off investing in mutual funds. By pooling resources in this way, small investors can gain from economies of scale.

More difficult decisions remain, though. Can investors be sure that even large mutual funds have the ability or resources to uncover mispriced stocks? Furthermore, will any mispricing be sufficiently large to repay the costs entailed in active portfolio management?

Proponents of the efficient market hypothesis believe that active management is largely wasted effort and unlikely to justify the expenses incurred. Therefore, they advocate a **passive investment strategy** that makes no attempt to outsmart the market. A passive strategy aims only at establishing a well-diversified portfolio of securities without attempting to find under- or overvalued stocks. Passive management is usually characterized by a buy-and-hold strategy. Because the efficient market theory indicates that stock prices are at fair levels, given all available information, it makes no sense to buy and sell securities frequently, which generates large brokerage fees without increasing expected performance.

One common strategy for passive management is to create an **index fund,** which is a fund designed to replicate the performance of a broad-based index of stocks. For example, Vanguard's 500 Index Fund holds stocks in direct proportion to their weight in the Standard & Poor's 500 stock price index. The performance of the 500 Index Fund therefore replicates the performance of the S&P 500. Investors in this fund obtain broad diversification with relatively low management fees. The fees can be kept to a minimum because Vanguard does not need to pay analysts to assess stock prospects and does not incur transaction costs from high portfolio turnover. Indeed, while the typical annual expense ratio for an actively managed equity fund is more than 1% of assets, the expense ratio of the 500 Index Fund is only .15%. Today, Vanguard's 500 Index Fund is among the largest equity mutual funds with about $75 billion of assets in May 2009, and about 10% of equity funds are indexed.

Indexing need not be limited to the S&P 500, however. For example, some of the funds offered by the Vanguard Group track the Wilshire 5000 Index, the Salomon Brothers Broad Investment Grade Bond Index, the MSCI index of small-capitalization U.S. companies, the European equity market, and the Pacific Basin equity market. Several other mutual fund complexes offer indexed portfolios, but Vanguard dominates the retail market for indexed products.

Exchange traded funds, or ETFs, are a close (and usually lower-expense) alternative to indexed mutual funds. As noted in Chapter 4, these are shares in diversified portfolios that can be bought or sold just like shares of individual stock. ETFs matching several broad stock market indexes such as the S&P 500 or Wilshire 5000 indexes and dozens of international and industry stock indexes are available to investors who want to hold a diversified sector of a market without attempting active security selection.

A hybrid strategy also is fairly common, where the fund maintains a *passive core,* which is an indexed position, and augments that position with one or more actively managed portfolios.

passive investment strategy

Buying a well-diversified portfolio without attempting to search out mispriced securities.

index fund

A mutual fund holding shares in proportion to their representation in a market index such as the S&P 500.

What would happen to market efficiency if *all* investors attempted to follow a passive strategy?	**CONCEPT** *check* **8.3**

The Role of Portfolio Management in an Efficient Market

If the market is efficient, why not throw darts at *The Wall Street Journal* instead of trying rationally to choose a stock portfolio? This is a tempting conclusion to draw from the notion that security prices are fairly set, but it is far too facile. There is a role for rational portfolio management, even in perfectly efficient markets.

You have learned that a basic principle in portfolio selection is diversification. Even if all stocks are priced fairly, each still poses firm-specific risk that can be eliminated through diversification. Therefore, rational security selection, even in an efficient market, calls for the selection of a well-diversified portfolio providing the systematic risk level that the investor wants.

Rational investment policy also requires that tax considerations be reflected in security choice. High-tax-bracket investors generally will not want the same securities that low-bracket investors find favorable. At an obvious level, high-bracket investors find it advantageous to buy tax-exempt municipal bonds despite their relatively low pretax yields, whereas those

same bonds are unattractive to low-tax-bracket investors. At a more subtle level, high-bracket investors might want to tilt their portfolios in the direction of capital gains as opposed to interest income, because capital gains are taxed less heavily and because the option to defer the realization of capital gains income is more valuable the higher the current tax bracket. Hence these investors may prefer stocks that yield low dividends yet offer greater expected capital gain income. They also will be more attracted to investment opportunities for which returns are sensitive to tax benefits, such as real estate ventures.

A third argument for rational portfolio management relates to the particular risk profile of the investor. For example, a Toyota executive whose annual bonus depends on Toyota's profits generally should not invest additional amounts in auto stocks. To the extent that his or her compensation already depends on Toyota's well-being, the executive is already over-invested in Toyota and should not exacerbate the lack of diversification. This lesson was learned with considerable pain in September 2008 by Lehman Brothers employees who were famously invested in their own firm when the company failed. Roughly 30% of the shares in the firm were owned by its 24,000 employees, and their losses on those shares were around $10 billion.

Investors of varying ages also might warrant different portfolio policies with regard to risk bearing. For example, older investors who are essentially living off savings might choose to avoid long-term bonds whose market values fluctuate dramatically with changes in interest rates (discussed in Part Four). Because these investors are living off accumulated savings, they require conservation of principal. In contrast, younger investors might be more inclined toward long-term inflation-indexed bonds. The steady flow of real income over long periods of time that is locked in with these bonds can be more important than preservation of principal to those with long life expectancies.

In conclusion, there is a role for portfolio management even in an efficient market. Investors' optimal positions will vary according to factors such as age, tax bracket, risk aversion, and employment. The role of the portfolio manager in an efficient market is to tailor the portfolio to these needs, rather than to beat the market.

Resource Allocation

We've focused so far on the investments implications of the efficient market hypothesis. Deviations from efficiency may offer profit opportunities to better-informed traders at the expense of less-informed traders.

However, deviations from informational efficiency would also result in a large cost that will be borne by all citizens, namely, inefficient resource allocation. Recall that in a capitalist economy, investments in *real* assets such as plant, equipment, and know-how are guided in large part by the prices of financial assets. For example, if the value of telecommunication capacity reflected in stock market prices exceeds the cost of installing such capacity, managers might justifiably conclude that telecom investments seem to have positive net present value. In this manner, capital market prices guide allocation of real resources.

If markets were inefficient and securities commonly mispriced, then resources would be systematically misallocated. Corporations with overpriced securities will be able to obtain capital too cheaply and corporations with undervalued securities might forgo investment opportunities because the cost of raising capital will be too high. Therefore, inefficient capital markets would diminish one of the most potent benefits of a market economy. As an example of what can go wrong, consider the dot-com bubble of the late 1990s, which sent a strong but, as it turned out, wildly overoptimistic signal about prospects in Internet and telecommunication firms and ultimately led to substantial overinvestment in those industries.

Before writing off markets as a means to guide resource allocation, however, one has to be reasonable about what can be expected from market forecasts. In particular, you shouldn't confuse an efficient market, where all available information is reflected in prices, with a perfect foresight market. Even "all available information" is still far from complete information, and generally rational market forecasts will sometimes be wrong; sometimes, in fact, they will be very wrong.

8.3   Are Markets Efficient?

The Issues

Not surprisingly, the efficient market hypothesis does not exactly arouse enthusiasm in the community of professional portfolio managers. It implies that a great deal of the activity of portfolio managers—the search for undervalued securities—is at best wasted effort, and quite probably harmful to clients because it costs money and leads to imperfectly diversified portfolios. Consequently, the EMH has never been widely accepted on Wall Street, and debate continues today on the degree to which security analysis can improve investment performance. Before discussing empirical tests of the hypothesis, we want to note three factors that together imply that the debate probably never will be settled: the *magnitude issue,* the *selection bias issue,* and the *lucky event issue.*

The magnitude issue   We noted that an investment manager overseeing a $5 billion portfolio who can improve performance by only .1% per year will increase investment earnings by .001 × $5 billion = $5 million annually. This manager clearly would be worth her salary! Yet can we, as observers, statistically measure her contribution? Probably not: A .1% contribution would be swamped by the yearly volatility of the market. Remember, the annual standard deviation of the well-diversified S&P 500 Index has been around 20%. Against these fluctuations a small increase in performance would be hard to detect.

   All might agree that stock prices are very close to fair values and that only managers of large portfolios can earn enough trading profits to make the exploitation of minor mispricing worth the effort. According to this view, the actions of intelligent investment managers are the driving force behind the constant evolution of market prices to fair levels. Rather than ask the qualitative question, Are markets efficient? we should instead ask a more quantitative question: How efficient are markets?

The selection bias issue   Suppose that you discover an investment scheme that could really make money. You have two choices: either publish your technique in *The Wall Street Journal* to win fleeting fame, or keep your technique secret and use it to earn millions of dollars. Most investors would choose the latter option, which presents us with a conundrum. Only investors who find that an investment scheme cannot generate abnormal returns will be willing to report their findings to the whole world. Hence opponents of the efficient markets view of the world always can use evidence that various techniques do not provide investment rewards as proof that the techniques that do work simply are not being reported to the public. This is a problem in *selection bias;* the outcomes we are able to observe have been preselected in favor of failed attempts. Therefore, we cannot fairly evaluate the true ability of portfolio managers to generate winning stock market strategies.

The lucky event issue   In virtually any month it seems we read an article about some investor or investment company with a fantastic investment performance over the recent past. Surely the superior records of such investors disprove the efficient market hypothesis.

   Yet this conclusion is far from obvious. As an analogy to the investment game, consider a contest to flip the most number of heads out of 50 trials using a fair coin. The expected outcome for any person is, of course, 50% heads and 50% tails. If 10,000 people, however, compete in this contest, it would not be surprising if at least one or two contestants flipped more than 75% heads. In fact, elementary statistics tells us that the expected number of contestants flipping 75% or more heads would be two. It would be silly, though, to crown these people the "head-flipping champions of the world." Obviously, they are simply the contestants who happened to get lucky on the day of the event. (See the nearby box.)

   The analogy to efficient markets is clear. Under the hypothesis that any stock is fairly priced given all available information, any bet on a stock is simply a coin toss. There is equal likelihood of winning or losing the bet. However, if many investors using a variety of schemes make fair bets, statistically speaking, *some* of those investors will be lucky and win a great

On the MARKET FRONT

HOW TO GUARANTEE A SUCCESSFUL MARKET NEWSLETTER

Suppose you want to make your fortune publishing a market news-letter. You need first to convince potential subscribers that you have talent worth paying for. But what if you have no talent? The solution is simple: Start eight newsletters.

In year 1, let four of your newsletters predict an up-market and four a down-market. In year 2, let half of the originally optimistic group of newsletters continue to predict an up-market and the other half a down-market. Do the same for the originally pessimistic group. Continue in this manner to obtain the pattern of predictions in the table that follows (U = prediction of an up-market, D = prediction of a down-market).

After three years, no matter what has happened to the market, one of the newsletters would have had a perfect prediction record. This is because after three years there are $2^3 = 8$ outcomes for the market, and we have covered all eight possibilities with the eight newsletters. Now, we simply slough off the seven unsuccessful newsletters, and market the eighth newsletter based on its perfect track record. If we want to establish a newsletter with a perfect track

record over a four-year period, we need $2^4 = 16$ newsletters. A five-year period requires 32 newsletters, and so on.

After the fact, the one newsletter that was always right will attract attention for your uncanny foresight and investors will rush to pay large fees for its advice. Your fortune is made, and you have never even researched the market!

WARNING: This scheme is illegal! The point, however, is that with hundreds of market newsletters, you can find one that has stumbled onto an apparently remarkable string of successful predictions without any real degree of skill. After the fact, *someone's* prediction history can seem to imply great forecasting skill. This person is the one we will read about in *The Wall Street Journal;* the others will be forgotten.

Newsletter Predictions								
Year	1	2	3	4	5	6	7	8
1	U	U	U	U	D	D	D	D
2	U	U	D	D	U	U	D	D
3	U	D	U	D	U	D	U	D

majority of the bets. For every big winner, there may be many big losers, but we never hear of these managers. The winners, though, turn up in *The Wall Street Journal* as the latest stock market gurus; then they can make a fortune publishing market newsletters.

Our point is that after the fact there will have been at least one successful investment scheme. A doubter will call the results luck, the successful investor will call it skill. The proper test would be to see whether the successful investors can repeat their performance in another period, yet this approach is rarely taken.

With these caveats in mind, we turn now to some of the empirical tests of the efficient market hypothesis.

CONCEPT *check* **8.4**   Legg Mason's Value Trust, managed by Bill Miller, outperformed the S&P 500 in each of the 15 years ending in 2005. Is Miller's performance sufficient to dissuade you from a belief in efficient markets? If not, would *any* performance record be sufficient to dissuade you? Now consider that in the next 3 years, the fund dramatically underperformed the S&P 500; by the end of 2008, its cumulative 18-year performance was barely different from the index. Does this affect your opinion?

Weak-Form Tests: Patterns in Stock Returns

Returns over short horizons   Early tests of efficient markets were tests of the weak form. Could speculators find trends in past prices that would enable them to earn abnormal profits? This is essentially a test of the efficacy of technical analysis.

One way of discerning trends in stock prices is by measuring the *serial correlation* of stock market returns. Serial correlation refers to the tendency for stock returns to be related to past returns. Positive serial correlation means that positive returns tend to follow positive returns (a momentum type of property). Negative serial correlation means that positive returns tend to be followed by negative returns (a reversal or "correction" property). Both Conrad and Kaul (1988) and Lo and MacKinlay (1988) examine weekly returns of NYSE stocks and find positive serial correlation over short horizons. However, the correlation coefficients of weekly returns tend to be fairly small, at least for large stocks for which price data are the most

reliably up-to-date. Thus, while these studies demonstrate weak price trends over short periods,[3] the evidence does not clearly suggest the existence of trading opportunities.

While broad market indexes demonstrate only weak serial correlation, there appears to be stronger momentum in performance across market sectors exhibiting the best and worst recent returns. In an investigation of intermediate-horizon stock price behavior (using 3- to 12-month holding periods), Jegadeesh and Titman (1993) found a **momentum effect** in which good or bad recent performance of particular stocks continues over time. They conclude that while the performance of individual stocks is highly unpredictable, *portfolios* of the best-performing stocks in the recent past appear to outperform other stocks with enough reliability to offer profit opportunities. Thus, it appears that there is evidence of short- to intermediate-horizon price momentum in both the aggregate market and cross-sectionally (i.e., across particular stocks).

momentum effect
The tendency of poorly performing stocks and well-performing stocks in one period to continue that abnormal performance in following periods.

Returns over long horizons   Although short- to intermediate-horizon returns suggest momentum in stock market prices, studies of long-horizon returns (i.e., returns over multiyear periods) by Fama and French (1988) and Poterba and Summers (1988) indicate pronounced *negative* long-term serial correlation in the performance of the aggregate market. The latter result has given rise to a "fads hypothesis," which asserts that the stock market might overreact to relevant news. Such overreaction leads to positive serial correlation (momentum) over short time horizons. Subsequent correction of the overreaction leads to poor performance following good performance and vice versa. The corrections mean that a run of positive returns eventually will tend to be followed by negative returns, leading to negative serial correlation over longer horizons. These episodes of apparent overshooting followed by correction give the stock market the appearance of fluctuating around its fair value.

These long-horizon results are dramatic, but the studies offer far from conclusive evidence regarding efficient markets. First, the study results need not be interpreted as evidence for stock market fads. An alternative interpretation of these results holds that they indicate only that the market risk premium varies over time. For example, when the risk premium and the required return on the market rises, stock prices will fall. When the market then rises (on average) at this higher rate of return, the data convey the impression of a stock price recovery. The apparent overshooting and correction is in fact no more than a rational response of market prices to changes in discount rates.

In addition to studies suggestive of overreaction in overall stock market returns over long horizons, many other studies suggest that over long horizons, extreme performance in particular securities also tends to reverse itself: The stocks that have performed best in the recent past seem to underperform the rest of the market in following periods, while the worst past performers tend to offer above-average future performance. De Bondt and Thaler (1985) and Chopra, Lakonishok, and Ritter (1992) find strong tendencies for poorly performing stocks in one period to experience sizable reversals over the subsequent period, while the best-performing stocks in a given period tend to follow with poor performance in the following period.

For example, the De Bondt and Thaler study found that if one were to rank-order the performance of stocks over a five-year period and then group stocks into portfolios based on investment performance, the base-period "loser" portfolio (defined as the 35 stocks with the worst investment performance) outperformed the "winner" portfolio (the top 35 stocks) by an average of 25% (cumulative return) in the following three-year period. This **reversal effect,** in which losers rebound and winners fade back, suggests that the stock market overreacts to relevant news. After the overreaction is recognized, extreme investment performance is reversed. This phenomenon would imply that a *contrarian* investment strategy—investing in recent losers and avoiding recent winners—should be profitable. Moreover, these returns seem pronounced enough to be exploited profitably.

reversal effect
The tendency of poorly performing stocks and well-performing stocks in one period to experience reversals in the following period.

[3]On the other hand, there is evidence that share prices of individual securities (as opposed to broad market indexes) are more prone to reversals than continuations at very short horizons. See, for example, B. Lehmann, "Fads, Martingales and Market Efficiency," *Quarterly Journal of Economics* 105 (February 1990), pp. 1–28; and N. Jegadeesh, "Evidence of Predictable Behavior of Security Returns," *Journal of Finance* 45 (September 1990), pp. 881–98. However, as Lehmann notes, this is probably best interpreted as due to liquidity problems after big movements in stock prices as market makers adjust their positions in the stock.

Thus it appears that there may be short-run momentum but long-run reversal patterns in price behavior both for the market as a whole and across sectors of the market. One interpretation of this pattern is that short-run overreaction (which causes momentum in prices) may lead to long-term reversals (when the market recognizes its past error).

Predictors of Broad Market Returns

Several studies have documented the ability of easily observed variables to predict market returns. For example, Fama and French (1988) showed that the return on the aggregate stock market tends to be higher when the dividend/price ratio, the dividend yield, is high. Campbell and Shiller (1988) found that the earnings yield can predict market returns. Keim and Stambaugh (1986) showed that bond market data such as the spread between yields on high- and low-grade corporate bonds also help predict broad market returns.

Again, the interpretation of these results is difficult. On the one hand, they may imply that stock returns can be predicted, in violation of the efficient market hypothesis. More probably, however, these variables are proxying for variation in the market risk premium. For example, given a level of dividends or earnings, stock prices will be lower and dividend and earnings yields will be higher when the risk premium (and therefore the expected market return) is higher. Thus a high dividend or earnings yield will be associated with higher market returns. This does not indicate a violation of market efficiency. The predictability of market returns is due to predictability in the risk premium, not in risk-adjusted abnormal returns.

Fama and French (1989) showed that the yield spread between high- and low-grade bonds has greater predictive power for returns on low-grade bonds than for returns on high-grade bonds, and greater predictive power for stock returns than for bond returns, suggesting that the predictability in returns is in fact a risk premium rather than evidence of market inefficiency. Similarly, the fact that the dividend yield on stocks helps to predict bond market returns suggests that the yield captures a risk premium common to both markets rather than mispricing in the equity market.

Semistrong Tests: Market Anomalies

Fundamental analysis uses a much wider range of information to create portfolios than does technical analysis. Investigations of the efficacy of fundamental analysis ask whether publicly available information beyond the trading history of a security can be used to improve investment performance, and therefore are tests of semistrong-form market efficiency. Surprisingly, several easily accessible statistics, for example a stock's price–earnings ratio or its market capitalization, seem to predict abnormal risk-adjusted returns. Findings such as these, which we will review in the following pages, are difficult to reconcile with the efficient market hypothesis, and therefore are often referred to as efficient market **anomalies.**

anomalies

Patterns of returns that seem to contradict the efficient market hypothesis.

A difficulty in interpreting these tests is that we usually need to adjust for portfolio risk before evaluating the success of an investment strategy. Many tests, for example, have used the CAPM to adjust for risk. However, we know that even if beta is a relevant descriptor of stock risk, the empirically measured quantitative trade-off between risk as measured by beta and expected return differs from the predictions of the CAPM. If we use the CAPM to adjust portfolio returns for risk, inappropriate adjustments may lead to the conclusion that various portfolio strategies can generate superior returns, when in fact it simply is the risk adjustment procedure that has failed.

Another way to put this is to note that tests of risk-adjusted returns are *joint tests* of the efficient market hypothesis *and* the risk adjustment procedure. If it appears that a portfolio strategy can generate superior returns, we must then choose between rejecting the EMH and rejecting the risk adjustment technique. Usually, the risk adjustment technique is based on more-questionable assumptions than is the EMH; by opting to reject the procedure, we are left with no conclusion about market efficiency.

P/E effect

Portfolios of low P/E stocks have exhibited higher average risk-adjusted returns than high P/E stocks.

An example of this issue is the discovery by Basu (1977, 1983) that portfolios of low price–earnings (P/E) ratio stocks have higher returns than do high P/E portfolios. The **P/E effect** holds up even if returns are adjusted for portfolio beta. Is this a confirmation that the market systematically misprices stocks according to P/E ratio? This would be an extremely

surprising and, to us, disturbing conclusion, because analysis of P/E ratios is such a simple procedure. Although it may be possible to earn superior returns by using hard work and much insight, it hardly seems plausible that such a simplistic technique is enough to generate abnormal returns.

Another interpretation of these results is that returns are not properly adjusted for risk. If two firms have the same expected earnings, the riskier stock will sell at a lower price and lower P/E ratio. Because of its higher risk, the low P/E stock also will have higher expected returns. Therefore, unless the CAPM beta fully adjusts for risk, P/E will act as a useful additional descriptor of risk, and will be associated with abnormal returns if the CAPM is used to establish benchmark performance.

The small-firm-in-January effect   The so-called size or **small-firm effect,** originally documented by Banz (1981), is illustrated in Figure 8.3. It shows the historical performance of portfolios formed by dividing the NYSE stocks into 10 portfolios each year according to firm size (i.e., the total value of outstanding equity). Average annual returns between 1926 and 2007 are consistently higher on the small-firm portfolios. The difference in average annual return between portfolio 10 (with the largest firms) and portfolio 1 (with the smallest firms) is 8.8%. Of course, the smaller-firm portfolios tend to be riskier. But even when returns are adjusted for risk using the CAPM, there is still a consistent premium for the smaller-sized portfolios.

Imagine earning a premium of this size on a billion-dollar portfolio. Yet it is remarkable that following a simple (even simplistic) rule such as "invest in low-capitalization stocks" should enable an investor to earn excess returns. After all, any investor can measure firm size at little cost. One would not expect such minimal effort to yield such large rewards.

Later studies (Keim, 1983; Reinganum, 1983; and Blume and Stambaugh, 1983) showed that the small-firm effect occurs virtually entirely in January, in fact, in the first 2 weeks of January. The size effect is in fact a "small-firm-in-January" effect.

The neglected-firm and liquidity effects   Arbel and Strebel (1983) gave another interpretation of the small-firm-in-January effect. Because small firms tend to be neglected by large institutional traders, information about smaller firms is less available. This information deficiency makes smaller firms riskier investments that command higher returns. "Brand-name" firms, after all, are subject to considerable monitoring from institutional investors, which promises high-quality information, and presumably investors do not purchase "generic" stocks without the prospect of greater returns.

small-firm effect

Stocks of small firms have earned abnormal returns, primarily in the month of January.

neglected-firm effect

The tendency of investments in stock of less-well-known firms to generate abnormal returns.

As evidence for the **neglected-firm effect,** Arbel (1985) divided firms into highly researched, moderately researched, and neglected groups based on the number of institutions holding the stock. The January effect was in fact largest for the neglected firms. An article by Merton (1987) shows that neglected firms might be expected to earn higher equilibrium returns as compensation for the risk associated with limited information. In this sense the neglected firm premium is not strictly a market inefficiency, but is a type of risk premium.

Work by Amihud and Mendelson (1986, 1991) on the effect of liquidity on stock returns might be related to both the small-firm and neglected-firm effects. They argue that investors will demand a rate-of-return premium to invest in less-liquid stocks that entail higher trading costs. Indeed, spreads for the least-liquid stocks can be more than 5% of stock value. In accord with their hypothesis, Amihud and Mendelson showed that these stocks show a strong tendency to exhibit abnormally high risk-adjusted rates of return. Because small and less-analyzed stocks as a rule are less liquid, the liquidity effect might be a partial explanation of their abnormal returns. However, this theory does not explain why the abnormal returns of small firms should be concentrated in January. In any case, exploiting these effects can be more difficult than it would appear. The high trading costs on small stocks can easily wipe out any apparent abnormal profit opportunity.

Book-to-market ratios   Fama and French (1992) showed that a powerful predictor of returns across securities is the ratio of the book value of the firm's equity to the market value of equity. Fama and French stratified firms into 10 groups according to book-to-market ratios and examined the average rate of return of each of the 10 groups. Figure 8.4 is an updated version of their results. The decile with the highest book-to-market ratio had an average annual return of 17.5%, while the lowest-ratio decile averaged only 11.2%. The dramatic dependence of returns on book-to-market ratio is independent of beta, suggesting either that high book-to-market ratio firms are relatively underpriced or that the book-to-market ratio is serving as a proxy for a risk factor that affects equilibrium expected returns.

book-to-market effect

The tendency for investments in shares of firms with high ratios of book value to market value to generate abnormal returns.

In fact, Fama and French found that after controlling for the size and **book-to-market effects,** beta seemed to have no power to explain average security returns.[4] This finding is an important challenge to the notion of rational markets, since it seems to imply that a factor that should affect returns—systematic risk—seems not to matter, while a factor that should not

FIGURE 8.4

Average annual return as a function of the book-to-market ratio, 1926–2007.

Source: Web site of Prof. Kenneth French, **http://mba.tuck. dartmouth.edu/pages/faculty/ ken. french/data_library.html.**

[4]However, a study by S. P. Kothari, Jay Shanken, and Richard G. Sloan (1995) finds that when betas are estimated using annual rather than monthly returns, securities with high beta values do in fact have higher average returns. Moreover, the authors find a book-to-market effect that is attenuated compared to the results in Fama and French and furthermore is inconsistent across different samples of securities. They conclude that the empirical case for the importance of the book-to-market ratio may be somewhat weaker than the Fama and French study would suggest.

matter—the book-to-market ratio—seems capable of predicting future returns. We will return to the interpretation of this anomaly.

Post–earnings-announcement price drift   A fundamental principle of efficient markets is that any new information ought to be reflected in stock prices very rapidly. When good news is made public, for example, the stock price should jump immediately. A puzzling anomaly, therefore, is the apparently sluggish response of stock prices to firms' earnings announcements, as uncovered by Ball and Brown (1968). Their results were later confirmed and extended in many other papers.[5]

The "news content" of an earnings announcement can be evaluated by comparing the announcement of actual earnings to the value previously expected by market participants. The difference is the "earnings surprise." (Market expectations of earnings can be roughly measured by averaging the published earnings forecasts of Wall Street analysts or by applying trend analysis to past earnings.) Rendleman, Jones, and Latané (1982) provide an influential study of sluggish price response to earnings announcements. They calculate earnings surprises for a large sample of firms, rank the magnitude of the surprise, divide firms into 10 deciles based on the size of the surprise, and calculate abnormal returns for each decile. The abnormal return of each portfolio is the return adjusting for both the market return in that period and the portfolio beta. It measures return over and above what would be expected given market conditions in that period. Figure 8.5 plots cumulative abnormal returns by decile.

Their results are dramatic. The correlation between ranking by earnings surprise and abnormal returns across deciles is as predicted. There is a large abnormal return (a jump in cumulative abnormal return) on the earnings announcement day (time 0). The abnormal return is positive for positive-surprise firms and negative for negative-surprise firms.
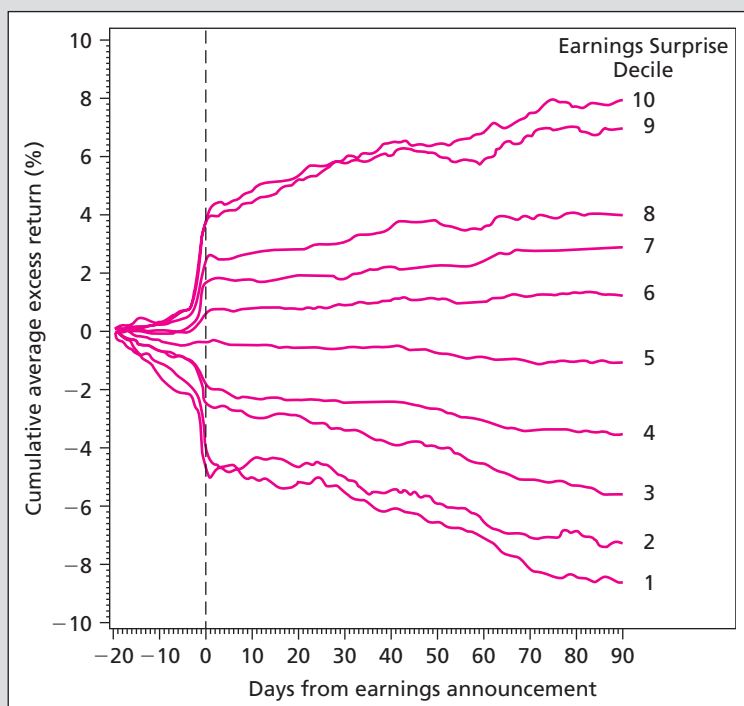

FIGURE 8.5

Cumulative abnormal returns in response to earnings announcements

Source: Reprinted from R. J. Rendleman Jr., C. P. Jones, and H. A. Latané, "Empirical Anomalies Based on Unexpected Earnings and the Importance of Risk Adjustments," *Journal of Financial Economics* 10 (1982), pp. 269–287. Copyright 1982 with permission from Elsevier Science.

[5]There is a voluminous literature on this phenomenon, often referred to as post–earnings-announcement price drift. For more recent papers that focus on why such drift may be observed, see V. Bernard and J. Thomas, "Evidence That Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings," *Journal of Accounting and Economics* 13 (1990), pp. 305–40, or R. H. Battalio and R. Mendenhall, "Earnings Expectation, Investor Trade Size, and Anomalous Returns around Earnings Announcements," *Journal of Financial Economics* 77 (2005), pp. 289–319.

The more remarkable, and interesting, result of the study concerns stock price movement *after* the announcement date. The cumulative abnormal returns of positive-surprise stocks continue to rise—in other words, exhibit momentum—even after the earnings information becomes public, while the negative-surprise firms continue to suffer negative abnormal returns. The market appears to adjust to the earnings information only gradually, resulting in a sustained period of abnormal returns.

Evidently, one could have earned abnormal profits simply by waiting for earnings announcements and purchasing a stock portfolio of positive-earnings-surprise companies. These are precisely the types of predictable continuing trends that ought to be impossible in an efficient market.

Bubbles and market efficiency   Every so often, it seems (at least in retrospect) that asset prices lose their grounding in reality. For example, in the tulip mania in seventeenth-century Holland, tulip prices peaked at several times the annual income of a skilled worker. This episode has become the symbol of a speculative "bubble" in which prices appear to depart from any semblance of intrinsic value. Less than a century later, the South Sea bubble in England became almost as famous. In this episode, the share price of the South Sea Company rose from £128 in January 1720 to £550 in May, and peaked at around £1,000 in August—just before the bubble burst and the share price collapsed to £150 in September, leading to widespread bankruptcies among those who had borrowed to buy shares on credit. In fact, the company was a major lender of money to investors willing to buy (and thus bid up) its shares. This sequence may sound familiar to anyone who lived through the dot-com boom and bust of 1995–2002[6] or, more recently, the financial turmoil of 2008, with origins widely attributed to a collapsing housing price bubble.

It is hard to defend the position that security prices in these instances represented rational, unbiased assessments of intrinsic value. But beware of jumping to the conclusion that prices may generally be thought of as arbitrary and obvious trading opportunities abundant. First, most bubbles become "obvious" only in retrospect. At the time, there is often a seemingly defensible rationale for the price run-up. In the dot-com boom, for example, many contemporary observers rationalized stock price gains as justified by the prospect of a new and more profitable economy, driven by technological advances. Even the irrationality of the tulip mania may have been overblown in its later retelling.[7] In addition, security valuation is intrinsically difficult. Given the considerable imprecision of estimates of intrinsic value, large bets on perceived mispricing may entail hubris.

Moreover, even if you suspect that prices are in fact "wrong," it can be difficult to take advantage of them. We explore these issues in more detail in the following chapter. For now, we can simply point out some impediments to making aggressive bets against an asset: the costs of short-selling overpriced securities as well as potential problems obtaining the securities to sell short and the possibility that, even if you are ultimately correct, the market may disagree and prices still can move dramatically against you in the short term, thus wiping out your capital.

Strong-Form Tests: Inside Information

It would not be surprising if insiders were able to make superior profits trading in their firm's stock. In other words, we do not expect markets to be strong-form efficient; we regulate and limit trades based on inside information. The ability of insiders to trade profitably in their own stock has been documented in studies by Jaffe (1974), Seyhun (1986), Givoly and Palmon (1985), and others. Jaffe's was one of the earlier studies that documented the tendency for stock prices to rise after insiders intensively bought shares and to fall after intensive insider sales.

[6]The dot-com boom gave rise to the term *irrational exuberance*. In this vein consider that one company, going public in the investment boom of 1720, described itself simply as "a company for carrying out an undertaking of great advantage, but nobody to know what it is."

[7]For interesting discussions of this possibility, see Peter Garber, *Famous First Bubbles: The Fundamentals of Early Manias* (Cambridge: MIT Press, 2000) and Anne Goldgar, *Tulipmania: Money, Honor, and Knowledge in the Dutch Golden Age* (Chicago: University of Chicago Press, 2007).

Can other investors benefit by following insiders' trades? The Securities and Exchange Commission requires all insiders to register their trading activity and it publishes these trades in an *Official Summary of Security Transactions and Holdings.* Since 2002, insiders must report large trades to the SEC within two business days. Once the *Official Summary* is published, the trades become public information. At that point, if markets are efficient, fully and immediately processing the information released in the *Official Summary* of trading, an investor should no longer be able to profit from following the pattern of those trades. Several Internet sites contain information on insider trading.

The study by Seyhun, which carefully tracked the public release dates of the *Official Summary,* found that following insider transactions would be to no avail. Although there is some tendency for stock prices to increase even after the *Official Summary* reports insider buying, the abnormal returns are not of sufficient magnitude to overcome transaction costs.

Interpreting the Evidence

How should we interpret the ever-growing anomalies literature? Does it imply that markets are grossly inefficient, allowing for simplistic trading rules to offer large profit opportunities? Or are there other, more-subtle interpretations?

Risk premiums or inefficiencies?   The price-earnings, small-firm, market-to-book, momentum, and long-term reversal effects are currently among the most puzzling phenomena in empirical finance. There are several interpretations of these effects. First note that to some extent, some of these phenomena may be related. The feature that small firms, low-market-to-book firms, and recent "losers" seem to have in common is a stock price that has fallen considerably in recent months or years. Indeed, a firm can become a small firm or a low-market-to-book firm by suffering a sharp drop in price. These groups therefore may contain a relatively high proportion of distressed firms that have suffered recent difficulties.

Fama and French (1993) argue that these effects can be explained as manifestations of risk premiums. Using their three-factor model, they show that stocks with higher "betas" (also known as factor loadings) on size or market-to-book factors have higher average returns; they interpret these returns as evidence of a risk premium associated with the factor. This model does a much better job than the one-factor CAPM in explaining security returns. While size or book-to-market ratios per se are obviously not risk factors, they perhaps might act as proxies for more fundamental determinants of risk. Fama and French argue that these patterns of returns may therefore be consistent with an efficient market in which expected returns are consistent with risk. In this regard, it is worth noting that returns to "style factors," for example, the return on portfolios constructed based on the ratio of book-to-market value (specifically, the Fama-French high minus low book-to-market portfolio) or firm size (the return on the small minus big firm portfolio) do indeed seem to predict business cycles in many countries. Figure 8.6 shows that returns on these portfolios tend to have positive returns in years prior to rapid growth in gross domestic product.

The opposite interpretation is offered by Lakonishok, Shleifer, and Vishny (1995), who argue that these phenomena are evidence of inefficient markets, more specifically, of systematic errors in the forecasts of stock analysts. They believe that analysts extrapolate past performance too far into the future, and therefore overprice firms with recent good performance and underprice firms with recent poor performance. Ultimately, when market participants recognize their errors, prices reverse. This explanation is consistent with the reversal effect and also, to a degree, is consistent with the small-firm and book-to-market effects because firms with sharp price drops may tend to be small or have high book-to-market ratios.

If Lakonishok, Shleifer, and Vishney are correct, we ought to find that analysts systematically err when forecasting returns of recent "winner" versus "loser" firms. A study by La Porta (1996) is consistent with this pattern. He finds that equity of firms for which analysts predict low growth rates of earnings actually perform better than those with high expected earnings growth. Analysts seem overly pessimistic about firms with low growth prospects and overly optimistic about firms with high growth prospects. When these too-extreme expectations are "corrected," the low-expected-growth firms outperform high-expected-growth firms.
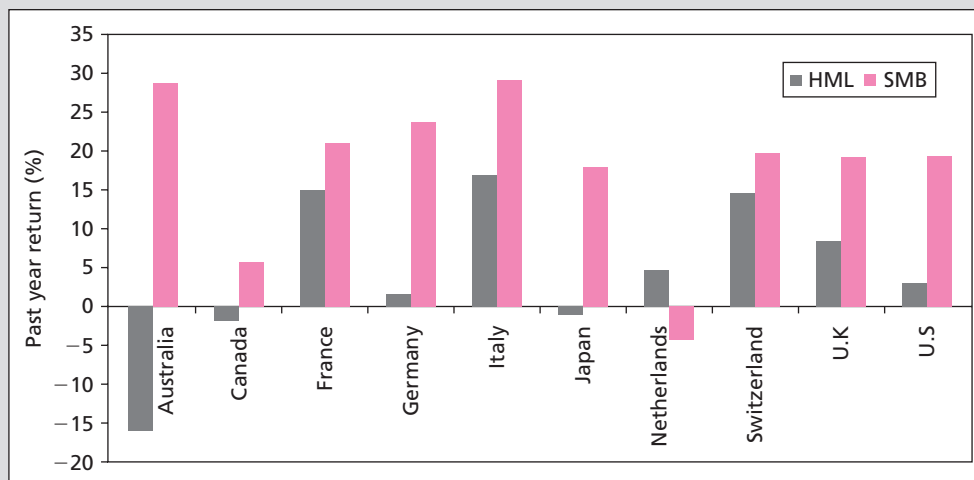
FIGURE 8.6

Return to style portfolio as a predictor of GDP growth. Average difference in the return on the style portfolio in years before good GDP growth versus in years before bad GDP growth. Positive value means the style portfolio does better in years prior to good macroeconomic performance. HML = high minus low portfolio, sorted on ratio of book-to-market value. SMB = small minus big portfolio, sorted on firm size.

Source: Reprinted from J. Liew and M. Vassalou, "Can Book-to-Market, Size, and Momentum Be Risk Factors That Predict Economic Growth?" *Journal of Financial Economics* 57 (2000), pp. 221–45. Copyright 2000 with permission from Elsevier Science.

Anomalies or data mining?   We have covered many of the so-called anomalies cited in the literature, but our list could go on and on. Some wonder whether these anomalies are really unexplained puzzles in financial markets or whether they instead are an artifact of data mining. After all, if one reruns the computer database of past returns over and over and examines stock returns along enough dimensions, simple chance will cause some criteria to *appear* to predict returns.

In this regard, it is noteworthy that some anomalies have not shown much staying power after being reported in the academic literature. For example, after the small-firm effect was published in the early 1980s, it promptly disappeared for much of the rest of the decade. Similarly, the book-to-market strategy, which commanded considerable attention in the early 1990s, was ineffective for the rest of that decade.

Still, even acknowledging the potential for data mining, a common thread seems to run through many of the anomalies we have considered, lending support to the notion that there is a real puzzle to explain. Value stocks—defined by low P/E ratio, high book-to-market ratio, or depressed prices relative to historic levels—seem to have provided higher average returns than "glamour" or growth stocks.

One way to address the problem of data mining is to find a data set that has not already been researched and see whether the relationship in question shows up in the new data. Such studies have revealed size, momentum, and book-to-market effects in other security markets around the world. While these phenomena may be a manifestation of a systematic risk premium, the precise nature of that risk is not fully understood.

8.4   Mutual Fund and Analyst Performance

We have documented some of the apparent chinks in the armor of efficient market proponents. For investors, the issue of market efficiency boils down to whether skilled investors can make consistent abnormal trading profits. The best test is to look at the performance of market professionals to see if they can generate performance superior to that of a passive index fund that buys and holds the market. We will look at two facets of professional performance: that of

stock market analysts who recommend investment positions and that of mutual fund managers who actually manage portfolios.

Stock Market Analysts

Stock market analysts historically have worked for brokerage firms, which presents an immediate problem in interpreting the value of their advice: Analysts have tended to be overwhelmingly positive in their assessment of the prospects of firms.[8] For example, Barber, Lehavy, McNichols, and Trueman (2001) find that on a scale of 1 (strong buy) to 5 (strong sell), the average recommendation for 5,628 covered firms in 1996 was 2.04. As a result, one cannot take positive recommendations (e.g., to buy) at face value. Instead, we must look at either the relative strength of analyst recommendations compared to those for other firms or at the change in consensus recommendations.

Womack (1996) focuses on changes in analysts' recommendations and finds that positive changes are associated with increased stock prices of about 5%, and negative changes result in average price decreases of 11%. One might wonder whether these price changes reflect the market's recognition of analysts' superior information or insight about firms or, instead, simply result from new buy or sell pressure brought on by the recommendations themselves. Womack argues that price impact seems to be permanent and, therefore, consistent with the hypothesis that analysts do in fact reveal new information. Jegadeesh, Kim, Krische, and Lee (2004) also find that changes in consensus recommendations are associated with price changes, but that the *level* of consensus recommendations is an inconsistent predictor of future stock performance.

Barber, Lehavy, McNichols, and Trueman (2001) focus on the level of consensus recommendations and show that firms with the most-favorable recommendations outperform those with the least-favorable recommendations. While their results seem impressive, the authors note that portfolio strategies based on analyst consensus recommendations would result in extremely heavy trading activity with associated costs that probably would wipe out the potential profits from the strategy.

In sum, the literature suggests some value added by analysts, but some ambiguity remains. Are superior returns following analyst upgrades due to revelation of new information or due to changes in investor demand in response to the changed outlook? Also, are these results exploitable by investors who necessarily incur trading costs?

Mutual Fund Managers

As we pointed out in Chapter 4, casual evidence does not support the claim that professionally managed portfolios can consistently beat the market. Figure 4.3 in that chapter demonstrated that between 1972 and 2008 the returns of a passive portfolio indexed to the Wilshire 5000 typically would have been better than those of the average equity fund. On the other hand, there was some (admittedly inconsistent) evidence of persistence in performance, meaning that the better managers in one period tended to be better managers in following periods. Such a pattern would suggest that the better managers can with some consistency outperform their competitors, and it would be inconsistent with the notion that market prices already reflect all relevant information.

The analyses cited in Chapter 4 were based on total returns; they did not properly adjust returns for exposure to systematic risk factors. In this section we revisit the question of mutual fund performance, paying more attention to the benchmark against which performance ought to be evaluated.

As a first pass, we can examine the risk-adjusted returns (i.e., the alpha, or return in excess of required return based on beta and the market return in each period) of a large sample of mutual funds. But the market index may not be an adequate benchmark against which to

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[8]This problem may be less severe in the future; as noted in Chapter 3, one recent reform intended to mitigate the conflict of interest in having brokerage firms that sell stocks also provide investment advice is to separate analyst coverage from the other activities of the firm.

TABLE 8.1

Performance of mutual funds based on three-index model

Type of Fund (Wiesenberger Classification)	Number of Funds	Alpha (%)	*t*-Statistic for Alpha
Equity funds			
Maximum capital gain	12	−4.59	−1.87
Growth	33	−1.55	−1.23
Growth and income	40	−0.68	−1.65
Balanced funds	31	−1.27	−2.73

Note: The three-index model calculates the alpha of each fund as the intercept of the following regression:

$$r - r_f = \alpha + \beta_M(r_M - r_f) + \beta_S(r_S - r_f) + \beta_D(r_D - r_f) + e$$

where r is the return on the fund, r_f is the risk-free rate, r_M is the return on the S&P 500 Index, r_s is the return on a non–S&P small-stock index, r_D is the return on a bond index, e is the fund's residual return, and the betas measure the sensitivity of fund returns to the various indexes.

Source: E. J. Elton, M. J. Gruber, S. Das, and M. Hlavka, "Efficiency with Costly Information: A Reinterpretation of Evidence from Managed Portfolios," *Review of Financial Studies* 6 (1993), pp. 1–22.

evaluate mutual fund returns. Because mutual funds tend to maintain considerable holdings in equity of small firms, whereas the S&P 500 is exclusively comprised of large firms, mutual funds as a whole will tend to outperform the S&P when small firms outperform large ones and underperform when small firms fare worse. Thus a better benchmark for the performance of funds would be an index that incorporates the stock market performance of smaller firms.

The importance of the benchmark can be illustrated by examining the returns on small stocks in various subperiods.[9] In the 20-year period between 1945 and 1964, a small-stock index underperformed the S&P 500 by about 4% per year (i.e., the alpha of the small-stock index after adjusting for systematic risk was −4%). In the following 20-year period between 1965 and 1984, small stocks outperformed the S&P 500 Index by 10%. Thus if one were to examine mutual fund returns in the earlier period, they would tend to look poor, not necessarily because fund managers were poor stock pickers, but simply because mutual funds as a group tended to hold more small stocks than were represented in the S&P 500. In the later period, funds would look better on a risk-adjusted basis relative to the S&P 500 because small stocks performed better. The "style choice," that is, the exposure to small stocks (which is an asset allocation decision) would dominate the evaluation of performance even though it has little to do with managers' stock-picking ability.[10]

Elton, Gruber, Das, and Hlavka (1993) attempted to control for the impact of non–S&P assets on mutual fund performance. They used a multifactor version of the index model of security returns and calculated fund alphas by using regressions that include as explanatory variables the excess returns of three benchmark portfolios rather than just one proxy for the market index. Their three factors are the excess return on the S&P 500 Index, the excess return on an equity index of non–S&P low capitalization (i.e., small) firms, and the excess return on a bond market index. Some of their results are presented in Table 8.1, which shows that average alphas are negative for each type of equity fund, although generally not of statistically significant magnitude. They concluded that after controlling for the relative performance of these three asset classes—large stocks, small stocks, and bonds—mutual fund managers as a group do not demonstrate an ability to beat passive index strategies that would simply mix

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[9]This illustration and the statistics cited are based on E. J. Elton, M. J. Gruber, S. Das, and M. Hlavka, "Efficiency with Costly Information: A Reinterpretation of Evidence from Managed Portfolios," *Review of Financial Studies* 6 (1993), pp. 1–22, which is discussed shortly.

[10]Remember that the asset allocation decision is usually in the hands of the individual investor. Investors allocate their investment portfolios to funds in asset classes they desire to hold, and they can reasonably expect only that mutual fund portfolio managers will choose stocks advantageously *within* those asset classes.
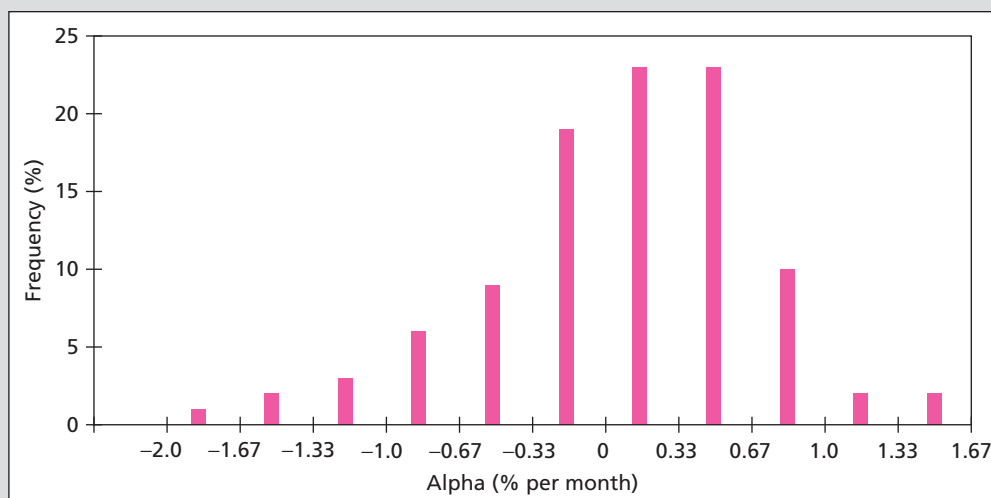
FIGURE 8.7

Mutual fund alphas computed using a four-factor model of expected return, 1993–2007. (The best and worst 2.5% of observations are excluded from this distribution.)

Source: Professor Richard Evans, University of Virginia, Darden School of Business.

index funds from among these asset classes. They also found that mutual fund performance is worse for firms that have higher expense ratios and higher turnover ratios. Thus it appears that funds with higher fees do not increase gross returns by enough to justify those fees.

The conventional performance benchmark today is a four-factor model, which employs the three Fama-French factors (the return on the market index, and returns to portfolios based on size and book-to-market ratio) augmented by a momentum factor (a portfolio constructed based on prior-year stock return). Alphas constructed using an expanded index model using these four factors control for a wide range of mutual fund–style choices that may affect average returns, for example, an inclination to growth versus value or small versus large capitalization stocks. Figure 8.7 shows a frequency distribution of four-factor alphas for U.S. domestic equity funds.[11] The results show that the distribution of alpha is roughly bell-shaped, with a slightly negative mean. On average, it does not appear that these funds outperform their style-adjusted benchmarks.

Carhart (1997) reexamined the issue of consistency in mutual fund performance—sometimes called the "hot hands" phenomenon—controlling for non–S&P factors in a manner similar to Elton, Gruber, Das, and Hlavka. Carhart used the four-factor extension described above and found that after controlling for these factors, there is some small persistence in relative performance across managers. However, much of that persistence seems due to expenses and transactions costs rather than gross investment returns. This last point is important; while there can be no consistently superior performers in a fully efficient market, there *can* be consistently inferior performers. Repeated weak performance would not be due to a tendency to pick bad stocks consistently (that would be impossible in an efficient market!) but could result from a consistently high expense ratio, high portfolio turnover, or higher-than-average transaction costs per trade. In this regard, it is interesting that in another study documenting apparent consistency across managers, Hendricks, Patel, and Zeckhauser (1993) also found the strongest consistency among the weakest performers.
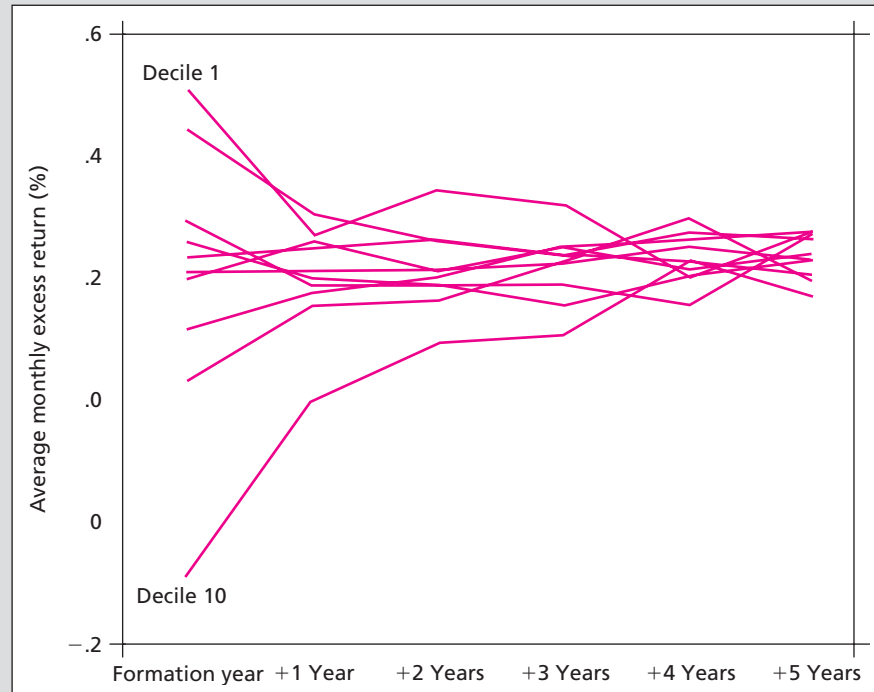
Even allowing for expenses and turnover, some amount of performance persistence seems to be due to differences in investment strategy. Carhart found, however, that the evidence of

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[11]We are grateful to Professor Richard Evans for this data.

persistence is concentrated at the two extremes. Figure 8.8, from Carhart's study, documents performance persistence. Equity funds are ranked into 1 of 10 groups by performance in the formation year, and the performance of each group in the following years is plotted. It is clear that except for the best-performing top-decile group and the worst-performing 10th decile group, performance in future periods is almost independent of earlier-year returns. Carhart's results suggest that there may be a small group of exceptional managers who can with some consistency outperform a passive strategy, but that for the majority of managers over- or underperformance in any period is largely a matter of chance.

In contrast to the extensive studies of equity fund managers, there have been few studies of the performance of bond fund managers. Blake, Elton, and Gruber (1993) examined the performance of fixed-income mutual funds. They found that, on average, bond funds under-perform passive fixed-income indexes by an amount roughly equal to expenses, and that there is no evidence that past performance can predict future performance. Their evidence is consistent with the hypothesis that bond managers operate in an efficient market in which performance before expenses is only as good as that of a passive index.

Thus the evidence on the risk-adjusted performance of professional managers is mixed at best. We conclude that the performance of professional managers is broadly consistent with market efficiency. The amounts by which professional managers as a group beat or are beaten by the market fall within the margin of statistical uncertainty. In any event, it is quite clear that performance superior to passive strategies is far from routine. Studies show either that most managers cannot outperform passive strategies or that if there is a margin of superiority, it is small.

On the other hand, a small number of investment superstars—Peter Lynch (formerly of Fidelity's Magellan Fund), Warren Buffett (of Berkshire Hathaway), John Templeton (of Templeton Funds), or George Soros among them—have compiled career records that show a consistency of superior performance hard to reconcile with absolutely efficient markets. In a careful statistical analysis of mutual fund "stars," Kosowski, Timmerman, Wermers, and White (2006) conclude that the stock-picking ability of a minority of managers is sufficient

to cover their costs and that their superior performance tends to persist over time. However, Nobel Prize–winner Paul Samuelson (1989) points out that the records of the vast majority of professional money managers offer convincing evidence that there are no easy strategies to guarantee success in the securities markets.

Survivorship Bias in Mutual Fund Studies

In any period, some managers may be lucky, and others unlucky. We argued in Chapter 4 that a good way to separate skill from luck is to see whether the managers who perform well in one period tend to be above-average performers in subsequent periods. If they are, we should be more willing to ascribe their success to skill. Unfortunately, studies of mutual fund performance can be affected by *survivorship bias,* the tendency for less-successful funds to go out of business over time, thus leaving the sample. This can give rise to the appearance of persistence in performance, even if there is none in reality.

Define a "winner" fund as one in the top half of the distribution of returns in a given period and a "loser" fund as one in the bottom half of the sample. If performance is due solely to chance, the probability of being a winner or loser in the next period is the same regardless of first-period performance. A 2 × 2 tabulation of performance in two consecutive periods would look like this:

	Second Period	
First Period	**Winners**	**Losers**
Winners	.25	.25
Losers	.25	.25

For example, the first-period winners (50% of the sample) are equally likely to be winners or losers in the second period, so 25% of total outcomes fall in each cell in the first row.

But what happens if losing funds or managers are removed from the sample because they are shut down by their management companies? This can lead to the appearance of performance persistence. Brown, Goetzmann, Ibbotson, and Ross (1992) use a sample of mutual fund returns to simulate the potential import of survivorship bias. They simulate annual returns over a four-year period for 600 managers drawing from distributions constructed to mimic historical equity and fund returns in the United States, compute performance over two two-year periods, and construct 2 × 2 tables of winner/loser performance like the one above. Their results appear in Table 8.2. If all 600 managers remain in the simulated sample, the results

TABLE 8.2 Two-way table of managers classified by risk-adjusted returns over successive intervals	**Second-Period Winners**	**Second-Period Losers**
A. No cut-off (*n* = 600)		
First-period winners	150.09	149.51
First-period losers	149.51	150.09
B. 5% cut-off (*n* = 494)		
First-period winners	127.49	119.51
First-period losers	119.51	127.49
C. 10% cut-off (*n* = 398)		
First-period winners	106.58	92.42
First-period losers	92.42	106.58

Source: S. J. Brown, W. Goetzmann, R. G. Ibbotson, and S. A. Ross, "Survivorship Bias in Performance Studies," *Review of Financial Studies* 5 (1992), pp. 553–580.

look much like the ones above (see Panel A). But if the bottom 5% of first-period performers are removed from the sample each year (5% cut-off, Panel B), the diagonal terms are larger than the off-diagonal terms: winners seem more likely to remain winners, and losers to remain losers. If a higher fraction of poor performers are removed from the sample (Panel C), there is even greater appearance of performance persistence.

The appearance of persistence in the simulation is due to survivorship bias. Average alphas are constructed to be zero for all groups. These results serve as a warning that data sets used to assess performance of professional managers must be free of survivorship bias. Unfortunately, many are not.

So, Are Markets Efficient?

There is a telling joke about two economists walking down the street. They spot a $20 bill on the sidewalk. One starts to pick it up, but the other one says, "Don't bother; if the bill were real someone would have picked it up already."

The lesson is clear. An overly doctrinaire belief in efficient markets can paralyze the investor and make it appear that no research effort can be justified. This extreme view is probably unwarranted. There are enough anomalies in the empirical evidence to justify the search for underpriced securities that clearly goes on.

The bulk of the evidence, however, suggests that any supposedly superior investment strategy should be taken with many grains of salt. The market is competitive *enough* that only differentially superior information or insight will earn money; the easy pickings have been picked. In the end it is likely that the margin of superiority that any professional manager can add is so slight that the statistician will not easily be able to detect it.

We conclude that markets are very efficient, but that rewards to the especially diligent, intelligent, or creative may in fact be waiting.

SUMMARY

- Statistical research has shown that to a close approximation stock prices seem to follow a random walk with no discernible predictable patterns that investors can exploit. Such findings are now taken to be evidence of market efficiency, that is, evidence that market prices reflect all currently available information. Only new information will move stock prices, and this information is equally likely to be good news or bad news.
- Market participants distinguish among three forms of the efficient market hypothesis. The weak form asserts that all information to be derived from past trading data already is reflected in stock prices. The semistrong form claims that all publicly available information is already reflected. The strong form, which generally is acknowledged to be extreme, asserts that all information, including insider information, is reflected in prices.
- Technical analysis focuses on stock price patterns and on proxies for buy or sell pressure in the market. Fundamental analysis focuses on the determinants of the underlying value of the firm, such as current profitability and growth prospects. Because both types of analysis are based on public information, neither should generate excess profits if markets are operating efficiently.
- Proponents of the efficient market hypothesis often advocate passive as opposed to active investment strategies. The policy of passive investors is to buy and hold a broad-based market index. They expend resources neither on market research nor on frequent purchase and sale of stocks. Passive strategies may be tailored to meet individual investor requirements.
- Empirical studies of technical analysis do not generally support the hypothesis that such analysis can generate superior trading profits. One notable exception to this conclusion is the apparent success of momentum-based strategies over intermediate-term horizons.

- Several anomalies regarding fundamental analysis have been uncovered. These include the P/E effect, the small-firm-in-January effect, the neglected-firm effect, post–earnings-announcement price drift, and the book-to-market effect. Whether these anomalies represent market inefficiency or poorly understood risk premiums is still a matter of debate.
- By and large, the performance record of professionally managed funds lends little credence to claims that most professionals can consistently beat the market.

KEY TERMS

anomalies, 240	neglected-firm effect, 242	semistrong-form
book-to-market effect, 242	passive investment	EMH, 232
efficient market	strategy, 235	small-firm effect, 241
hypothesis, 229	P/E effect, 240	strong-form EMH, 232
fundamental analysis, 234	random walk, 229	support level, 233
index fund, 235	resistance level, 233	technical analysis, 233
momentum effect, 239	reversal effect, 239	weak-form EMH, 231

PROBLEM SETS

Select problems are available in McGraw-Hill Connect. Please see the packaging options section of the preface for more information.

Basic

1. If markets are efficient, what should be the correlation coefficient between stock returns for two non-overlapping time periods?

2. "If all securities are fairly priced, all must offer equal expected rates of return." Comment.

3. If prices are as likely to increase as decrease, why do investors earn positive returns from the market on average?

4. A successful firm like Microsoft has consistently generated large profits for years. Is this a violation of the EMH?

5. At a cocktail party, your co-worker tells you that he has beaten the market for each of the last three years. Suppose you believe him. Does this shake your belief in efficient markets?

6. Which of the following statements are *true* if the efficient market hypothesis holds?
   a. It implies that future events can be forecast with perfect accuracy.
   b. It implies that prices reflect all available information.
   c. It implies that security prices change for no discernible reason.
   d. It implies that prices do not fluctuate.

7. In an efficient market, professional portfolio management can offer all of the following benefits *except*
   a. Low-cost diversification.
   b. A targeted risk level.
   c. Low-cost record keeping.
   d. A superior risk-return trade-off.

8. Which version of the efficient market hypothesis (weak, semistrong, or strong-form) focuses on the most inclusive set of information?

9. "Highly variable stock prices suggest that the market does not know how to price stocks." Respond.

Intermediate

10. Which of the following most appears to contradict the proposition that the stock market is *weakly* efficient? Explain.

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    a. Over 25% of mutual funds outperform the market on average.

    b. Insiders earn abnormal trading profits.

    c. Every January, the stock market earns abnormal returns.

11. Suppose that, after conducting an analysis of past stock prices, you come up with the following observations. Which would appear to *contradict* the *weak form* of the efficient market hypothesis? Explain.

    a. The average rate of return is significantly greater than zero.

    b. The correlation between the return during a given week and the return during the following week is zero.

    c. One could have made superior returns by buying stock after a 10% rise in price and selling after a 10% fall.

    d. One could have made higher-than-average capital gains by holding stocks with low dividend yields.

12. Which of the following observations would provide evidence *against* the *semistrong form* of the efficient market theory? Explain.

    a. Mutual fund managers do not on average make superior returns.

    b. You cannot make superior profits by buying (or selling) stocks after the announcement of an abnormal rise in dividends.

    c. Low P/E stocks tend to have positive abnormal returns.

    d. In any year approximately 50% of pension funds outperform the market.

13. Steady Growth Industries has never missed a dividend payment in its 94-year history. Does this make it more attractive to you as a possible purchase for your stock portfolio?

14. Suppose you find that prices of stocks before large dividend increases show on average consistently positive abnormal returns. Is this a violation of the EMH?

15. "If the business cycle is predictable, and a stock has a positive beta, the stock's returns also must be predictable." Respond.

16. Which of the following phenomena would be either consistent with or a violation of the efficient market hypothesis? Explain briefly.

    a. Nearly half of all professionally managed mutual funds are able to outperform the S&P 500 in a typical year.

    b. Money managers that outperform the market (on a risk-adjusted basis) in one year are likely to outperform in the following year.

    c. Stock prices tend to be predictably more volatile in January than in other months.

    d. Stock prices of companies that announce increased earnings in January tend to outperform the market in February.

    e. Stocks that perform well in one week perform poorly in the following week.

17. Why are the following "effects" considered efficient market anomalies? Are there rational explanations for these effects?

    a. P/E effect

    b. Book-to-market effect

    c. Momentum effect

    d. Small-firm effect

18. Dollar-cost averaging means that you buy equal dollar amounts of a stock every period, for example, $500 per month. The strategy is based on the idea that when the stock price is low, your fixed monthly purchase will buy more shares, and when the price is high, fewer shares. Averaging over time, you will end up buying more shares when the stock is cheaper and fewer when it is relatively expensive. Therefore, by design, you will exhibit good market timing. Evaluate this strategy.

19. We know that the market should respond positively to good news and that good-news events such as the coming end of a recession can be predicted with at least some accuracy. Why, then, can we not predict that the market will go up as the economy recovers?

20. You know that firm XYZ is very poorly run. On a scale of 1 (worst) to 10 (best), you would give it a score of 3. The market consensus evaluation is that the management score is only 2. Should you buy or sell the stock?

21. Good News, Inc., just announced an increase in its annual earnings, yet its stock price fell. Is there a rational explanation for this phenomenon?

22. Shares of small firms with thinly traded stocks tend to show positive CAPM alphas. Is this a violation of the efficient market hypothesis?

Challenge

23. Examine the accompanying figure, which presents cumulative abnormal returns both before and after dates on which insiders buy or sell shares in their firms. How do you interpret this figure? What are we to make of the pattern of CARs before and after the event date?
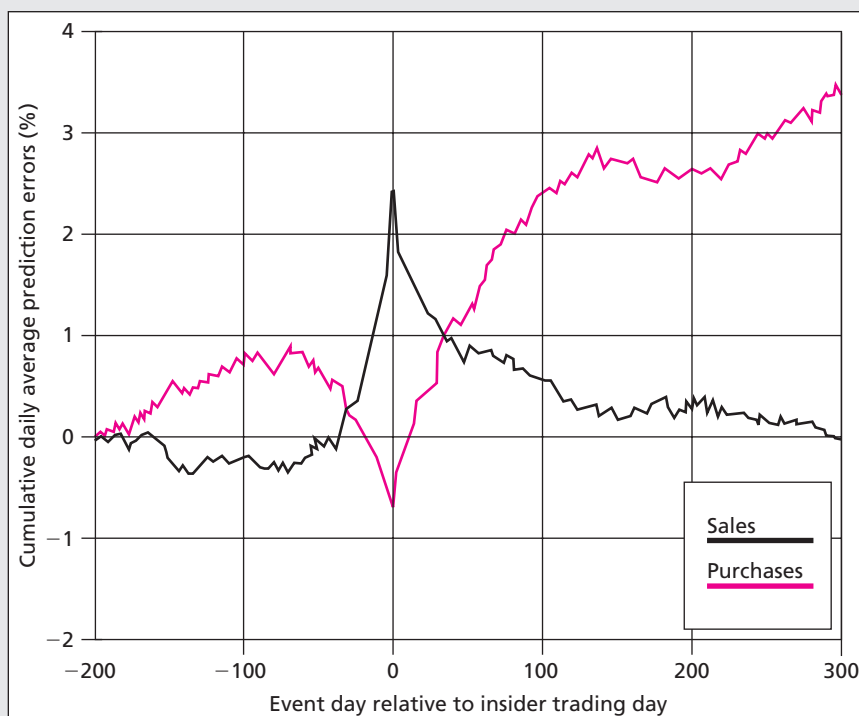
Source: Reprinted from Nejat H. Seyhun, "Insiders, Profits, Costs of Trading and Market Efficiency," *Journal of Financial Economics* 16 (1986). Copyright 1986 with permission from Elsevier Science.

24. Suppose that as the economy moves through a business cycle, risk premiums also change. For example, in a recession when people are concerned about their jobs, risk tolerance might be lower and risk premiums might be higher. In a booming economy, tolerance for risk might be higher and risk premiums lower.
    a. Would a predictably shifting risk premium such as described here be a violation of the efficient market hypothesis?
    b. How might a cycle of increasing and decreasing risk premiums create an appearance that stock prices "overreact," first falling excessively and then seeming to recover?

CFA Problems

1. The semistrong form of the efficient market hypothesis asserts that stock prices:
   a. Fully reflect all historical price information.
   b. Fully reflect all publicly available information.
   c. Fully reflect all relevant information including insider information.
   d. May be predictable.

2. Assume that a company announces an unexpectedly large cash dividend to its shareholders. In an efficient market *without* information leakage, one might expect:
   a. An abnormal price change at the announcement.
   b. An abnormal price increase before the announcement.
   c. An abnormal price decrease after the announcement.
   d. No abnormal price change before or after the announcement.

3. Which one of the following would provide evidence *against* the *semistrong form* of the efficient market theory?
   a. About 50% of pension funds outperform the market in any year.
   b. You cannot make abnormal profits by buying stocks after an announcement of strong earnings.
   c. Trend analysis is worthless in forecasting stock prices.
   d. Low P/E stocks tend to have positive abnormal returns over the long run.

4. According to the efficient market hypothesis:
   a. High-beta stocks are consistently overpriced.
   b. Low-beta stocks are consistently overpriced.
   c. Positive alphas on stocks will quickly disappear.
   d. Negative alpha stocks consistently yield low returns for arbitrageurs.

5. A "random walk" occurs when:
   a. Stock price changes are random but predictable.
   b. Stock prices respond slowly to both new and old information.
   c. Future price changes are uncorrelated with past price changes.
   d. Past information is useful in predicting future prices.

6. A market anomaly refers to:
   a. An exogenous shock to the market that is sharp but not persistent.
   b. A price or volume event that is inconsistent with historical price or volume trends.
   c. A trading or pricing structure that interferes with efficient buying and selling of securities.
   d. Price behavior that differs from the behavior predicted by the efficient market hypothesis.

7. Some scholars contend that professional managers are incapable of outperforming the market. Others come to an opposite conclusion. Compare and contrast the assumptions about the stock market that support (*a*) passive portfolio management and (*b*) active portfolio management.

8. You are a portfolio manager meeting a client. During the conversation that follows your formal review of her account, your client asks the following question:

   My grandson, who is studying investments, tells me that one of the best ways to make money in the stock market is to buy the stocks of small-capitalization firms late in December and to sell the stocks one month later. What is he talking about?

   a. Identify the apparent market anomalies that would justify the proposed strategy.
   b. Explain why you believe such a strategy might or might not work in the future.

9. a. Briefly explain the concept of the efficient market hypothesis (EMH) and each of its three forms—weak, semistrong, and strong—and briefly discuss the degree to which existing empirical evidence supports each of the three forms of the EMH.
   b. Briefly discuss the implications of the efficient market hypothesis for investment policy as it applies to:
      i. Technical analysis in the form of charting.
      ii. Fundamental analysis.
   c. Briefly explain the roles or responsibilities of portfolio managers in an efficient market environment.

10. Growth and value can be defined in several ways. "Growth" usually conveys the idea of a portfolio emphasizing or including only companies believed to possess above-average future rates of per-share earnings growth. Low current yield, high price-to-book

ratios, and high price-to-earnings ratios are typical characteristics of such portfolios. "Value" usually conveys the idea of portfolios emphasizing or including only issues currently showing low price-to-book ratios, low price-to-earnings ratios, above-average levels of dividend yield, and market prices believed to be below the issues' intrinsic values.

a. Identify and provide reasons why, over an extended period of time, value-stock investing might outperform growth-stock investing.

b. Explain why the outcome suggested in (a) should not be possible in a market widely regarded as being highly efficient.

11. Your investment client asks for information concerning the benefits of active portfolio management. She is particularly interested in the question of whether active managers can be expected to consistently exploit inefficiencies in the capital markets to produce above-average returns without assuming higher risk.

The semistrong form of the efficient market hypothesis asserts that all publicly available information is rapidly and correctly reflected in securities prices. This implies that investors cannot expect to derive above-average profits from purchases made after information has become public because security prices already reflect the information's full effects.

a. Identify and explain two examples of empirical evidence that tend to support the EMH implication stated above.

b. Identify and explain two examples of empirical evidence that tend to refute the EMH implication stated above.

c. Discuss reasons why an investor might choose not to index even if the markets were, in fact, semistrong-form efficient.

Use data from the Standard & Poor's Market Insight Database at www.mhhe.com/edumarketinsight to answer the following questions.

1. Collect the following data for 25 firms from Market Insight.
   a. Book-to-market ratio.
   b. Price/EPS from operations ratio.
   c. Market capitalization (size).
   d. Price/Cash Flow ratio
   e. Another criterion that interests you.

   You can find this information by choosing a company, then clicking on the *Financial Hlts.* link in the *Compustat Reports* section. Rank the firms based on each of the criteria separately and divide the firms into five groups based on their ranking for each criterion. Calculate the average rate of return for each group of firms.

   Do you confirm or reject any of the anomalies cited in this chapter? Can you uncover a new anomaly? Note: For your test to be valid, you must form your portfolios based on criteria observed at the *beginning* of the period when you form the stock groups. Why?

2. Use the price history from Market Insight to calculate the beta of each of the firms in the previous question. Use this beta, the T-bill rate, and the return on the S&P 500 to calculate the risk-adjusted abnormal return of each stock group. Does any anomaly uncovered in the previous question persist after controlling for risk?

3. Now form stock groups that use two criteria simultaneously. For example, form a portfolio of stocks that are both in the lowest quintile of price–earnings ratios and in the highest quintile of book-to-market ratio. Does selecting stocks based on more than one characteristic improve your ability to devise portfolios with abnormal returns? Repeat the analysis by forming groups that meet three criteria simultaneously. Does this yield any further improvement in abnormal returns?

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WEB *master*   **EARNINGS SURPRISES**

Several Web sites list information on earnings surprises. Much of the information supplied is from Zacks.com. Each day the largest positive and negative surprises are listed. Go to **www.zacks. com/research/earnings/today_eps.php** and identify the top positive and the top negative earnings surprises for the day. The table will list the time and date of the announcement.

1. Do you notice any difference between the times of day that positive announcements tend to be made versus negative announcements?

2. Identify the tickers for the top three positive surprises. Once you have identified the top surprises, go to **finance.yahoo.com.** Enter the ticker symbols and obtain quotes for these securities. Examine the five-day charts for each of the companies.

Is the information incorporated into price quickly? Is there any evidence of prior knowledge or anticipation of the disclosure in advance of the trading?

3. Choose one of the stocks listed and click on its symbol to follow the link for more information. Click on the link for Interactive Java Charting that appears under the graph. In the Graph Control dialog box choose a period of five years and select the box that says "EPS Surprise." The resulting chart will show positive earnings surprises as green bars and negative surprises as red bars. You can move the cursor over various parts of the graph to investigate what happened to the price and trading volume of the stock around each of the surprise events. Do you notice any patterns?

SOLUTIONS TO

CONCEPT
c h e c k s

8.1. *a.* A high-level manager might well have private information about the firm. Her ability to trade profitably on that information is not surprising. This ability does not violate weak-form efficiency: The abnormal profits are not derived from an analysis of past price and trading data. If they were, this would indicate that there is valuable information that can be gleaned from such analysis. But this ability does violate strong-form efficiency. Apparently, there is some private information that is not already reflected in stock prices.

b. The information sets that pertain to the weak, semistrong, and strong form of the EMH can be described by the following illustration:
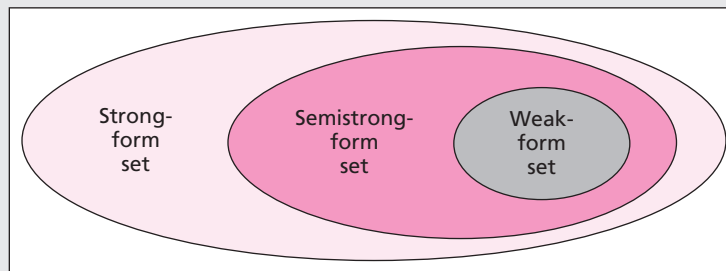
The weak-form information set includes only the history of prices and volumes. The semistrong-form set includes the weak form set *plus* all other publicly available information. In turn, the strong-form set includes the semistrong set *plus* insiders' information. It is illegal to act on this incremental information (insiders' private information). The direction of *valid* implication is

Strong-form EMH $\Rightarrow$ Semistrong-form EMH $\Rightarrow$ Weak-form EMH

The reverse direction implication is *not* valid. For example, stock prices may reflect all past price data (weak-form efficiency) but may not reflect relevant fundamental data (semistrong-form inefficiency).

8.2. The point we made in the preceding discussion is that the very fact that we observe stock prices near so-called resistance levels belies the assumption that the price can be a resistance level. If a stock is observed to sell *at any price,* then investors must believe that a fair rate of return can be earned if the stock is purchased at that price. It is logically impossible for a stock to have a resistance level *and* offer a fair rate of return at prices just below the resistance level. If we accept that prices are appropriate, we must reject any presumption concerning resistance levels.

8.3. If *everyone* follows a passive strategy, sooner or later prices will fail to reflect new information. At this point there are profit opportunities for active investors who uncover mispriced securities. As they buy and sell these assets, prices again will be driven to fair levels.

8.4. The answer depends on your prior beliefs about market efficiency. Miller's initial record was incredibly strong. On the other hand, with so many funds in existence, it is less surprising that *some* fund would appear to be consistently superior after the fact. Exceptional past performance of a small number of managers is possible by chance even in an efficient market. A better test is provided in "continuation studies." Are better performers in one period more likely to repeat that performance in later periods? Miller's record in the last three years fails the continuation or consistency criterion.