CHAPTER THIRTEEN

CORPORATE FINANCING AND THE SIX LESSONS OF MARKET EFFICIENCY

UP TO THIS point we have concentrated almost exclusively on the left-hand side of the balance sheet—the firm's capital expenditure decision. Now we move to the right-hand side and to the problems involved in financing the capital expenditures. To put it crudely, you've learned how to spend money, now learn how to raise it.

Of course, we haven't totally ignored financing in our discussion of capital budgeting. But we made the simplest possible assumption: all-equity financing. That means we assumed the firm raises its money by selling stock and then invests the proceeds in real assets. Later, when those assets generate cash flows, the cash is returned to the stockholders. Stockholders supply all the firm's capital, bear all the business risks, and receive all the rewards.

Now we are turning the problem around. We take the firm's present portfolio of real assets and its future investment strategy as given, and then we determine the best financing strategy. For example,

- Should the firm reinvest most of its earnings in the business, or should it pay them out as dividends?
- If the firm needs more money, should it issue more stock or should it borrow?
- Should it borrow short-term or long-term?
- Should it borrow by issuing a normal long-term bond or a convertible bond (i.e., a bond which can be exchanged for stock by the bondholders)?

There are countless other financing trade-offs, as you will see.

The purpose of holding the firm's capital budgeting decision constant is to separate that decision from the financing decision. Strictly speaking, this assumes that capital budgeting and financing decisions are *independent*. In many circumstances this is a reasonable assumption. The firm is generally free to change its capital structure by repurchasing one security and issuing another. In that case there is no need to associate a particular investment project with a particular source of cash. The firm can think, first, about which projects to accept and, second, about how they should be financed.

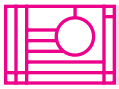
Sometimes decisions about capital structure depend on project choice or vice versa, and in those cases the investment and financing decisions have to be considered jointly. However, we defer discussion of such interactions of financing and investment decisions until later in the book.

We start this chapter by contrasting investment and financing decisions. The objective in each case is the same—to maximize NPV. However, it may be harder to find positive-NPV financing opportunities. The reason it is difficult to add value by clever financing decisions is that capital markets are efficient. By this we mean that fierce competition between investors eliminates profit opportunities and causes debt and equity issues to be fairly priced. If you think that sounds like a sweeping statement, you are right. That is why we have devoted this chapter to explaining and evaluating the efficient-market hypothesis.

You may ask why we start our discussion of financing issues with this conceptual point, before you have even the most basic knowledge about securities and issue procedures. We do it this way because financing decisions seem overwhelmingly complex if you don't learn to ask the right questions. We are afraid you might flee from confusion to the myths that often dominate popular discussion of corporate financing. You need to understand the efficient-market hypothesis not because it is *universally* true but because it leads you to ask the right questions.

We define the efficient-market hypothesis more carefully in Section 13.2. The hypothesis comes in different strengths, depending on the information available to investors. Sections 13.2 and 13.3 review the evidence for and against efficient markets. The evidence "for" is massive, but over the years a number of puzzling anomalies have accumulated.

The chapter closes with *the six lessons of market efficiency.*



13.1 WE ALWAYS COME BACK TO NPV

Although it is helpful to separate investment and financing decisions, there are basic similarities in the criteria for making them. The decisions to purchase a machine tool and to sell a bond each involve valuation of a risky asset. The fact that one asset is real and the other is financial doesn't matter. In both cases we end up computing net present value.

The phrase *net present value of borrowing* may seem odd to you. But the following example should help to explain what we mean: As part of its policy of encouraging small business, the government offers to lend your firm $100,000 for 10 years at 3 percent. This means that the firm is liable for interest payments of $3,000 in each of the years 1 through 10 and that it is responsible for repaying the $100,000 in the final year. Should you accept this offer?

We can compute the NPV of the loan agreement in the usual way. The one difference is that the first cash flow is *positive* and the subsequent flows are *negative:*

$$\begin{aligned}\text{NPV} &= \text{amount borrowed} - \text{present value of interest payments} \\ &\quad - \text{present value of loan repayment} \\ &= +100{,}000 - \sum_{t=1}^{10} \frac{3{,}000}{(1+r)^t} - \frac{100{,}000}{(1+r)^{10}}\end{aligned}$$

The only missing variable is r, the opportunity cost of capital. You need that to value the liability created by the loan. We reason this way: The government's loan to you is a financial asset: a piece of paper representing your promise to pay $3,000 per year plus the final repayment of $100,000. How much would that paper sell for if freely traded in the capital market? It would sell for the present value of those cash flows, discounted at r, the rate of return offered by other securities issued by your firm. All you have to do to determine r is to answer the question, What interest rate would my firm have to pay to borrow money directly from the capital markets rather than from the government?

Suppose that this rate is 10 percent. Then

$$\begin{aligned}\text{NPV} &= +100{,}000 - \sum_{t=1}^{10} \frac{3{,}000}{(1.10)^t} - \frac{100{,}000}{(1.10)^{10}} \\ &= +100{,}000 - 56{,}988 = +\$43{,}012\end{aligned}$$

Of course, you don't need any arithmetic to tell you that borrowing at 3 percent is a good deal when the fair rate is 10 percent. But the NPV calculations tell you just how much that opportunity is worth ($43,012).[1] It also brings out the essential similarity of investment and financing decisions.

Differences between Investment and Financing Decisions

In some ways investment decisions are simpler than financing decisions. The number of different financing decisions (i.e., securities) is continually expanding. You will have to learn the major families, genera, and species. You will also need to become familiar with the vocabulary of financing. You will learn about such matters as caps, strips, swaps, and bookrunners; behind each of these terms lies an interesting story.

[1] We ignore here any tax consequences of borrowing. These are discussed in Chapter 18.

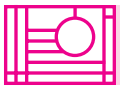
There are also ways in which financing decisions are much easier than investment decisions. First, financing decisions do not have the same degree of finality as investment decisions. They are easier to reverse. That is, their abandonment value is higher. Second, it's harder to make or lose money by smart or stupid financing strategies. That is, it is difficult to find financing schemes with NPVs significantly different from zero. This reflects the nature of the competition.

When the firm looks at capital investment decisions, it does *not* assume that it is facing perfect, competitive markets. It may have only a few competitors that specialize in the same line of business in the same geographical area. And it may own some unique assets that give it an edge over its competitors. Often these assets are intangible, such as patents, expertise, or reputation. All this opens up the opportunity to make superior profits and find projects with positive NPVs.

In financial markets your competition is all other corporations seeking funds, to say nothing of the state, local, and federal governments that go to New York, London, and other financial centers to raise money. The investors who supply financing are comparably numerous, and they are smart: Money attracts brains. The financial amateur often views capital markets as *segmented,* that is, broken down into distinct sectors. But money moves between those sectors, and it moves fast.

Remember that a good financing decision generates a positive NPV. It is one in which the amount of cash raised exceeds the value of the liability created. But turn that statement around. If selling a security generates a positive NPV for the seller, it must generate a negative NPV for the buyer. Thus, the loan we discussed was a good deal for your firm but a negative NPV from the government's point of view. By lending at 3 percent, it offered a $43,012 subsidy.

What are the chances that your firm could consistently trick or persuade investors into purchasing securities with negative NPVs to them? Pretty low. In general, firms should assume that the securities they issue are fairly priced. That takes us into the main topic of this chapter: efficient capital markets.



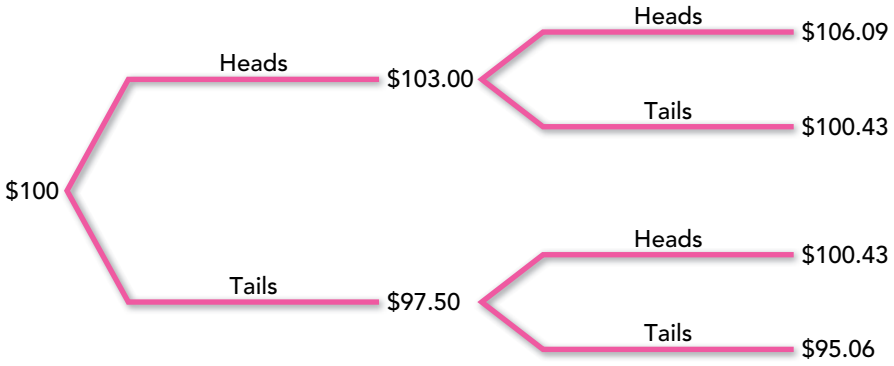
13.2 WHAT IS AN EFFICIENT MARKET?

A Startling Discovery: Price Changes Are Random

As is so often the case with important ideas, the concept of efficient capital markets stemmed from a chance discovery. In 1953 Maurice Kendall, a British statistician, presented a controversial paper to the Royal Statistical Society on the behavior of stock and commodity prices.[2] Kendall had expected to find regular price cycles, but to his surprise they did not seem to exist. Each series appeared to be "a 'wandering' one, almost as if once a week the Demon of Chance drew a random number . . . and added it to the current price to determine the next week's price." In other words, the prices of stocks and commodities seemed to follow a *random walk.*

[2]See M. G. Kendall, "The Analysis of Economic Time Series, Part I. Prices," *Journal of the Royal Statistical Society* 96 (1953), pp. 11–25. Kendall's idea was not wholly new. It had been proposed in an almost forgotten thesis written 53 years earlier by a French doctoral student, Louis Bachelier. Bachelier's accompanying development of the mathematical theory of random processes anticipated by five years Einstein's famous work on the random Brownian motion of colliding gas molecules. See L. Bachelier, *Theorie de la Speculation,* Gauthiers-Villars, Paris, 1900. Reprinted in English (A. J. Boness, trans.) in P. H. Cootner (ed.), *The Random Character of Stock Market Prices,* M.I.T. Press, Cambridge, MA, 1964, pp. 17–78.

If you are not sure what we mean by "random walk," you might like to think of the following example: You are given $100 to play a game. At the end of each week a coin is tossed. If it comes up heads, you win 3 percent of your investment; if it is tails, you lose 2.5 percent. Therefore, your capital at the end of the first week is either $103.00 or $97.50. At the end of the second week the coin is tossed again. Now the possible outcomes are:



This process is a random walk with a positive drift of .25 percent per week.[3] It is a random walk because successive changes in value are independent. That is, the odds each week are the same, regardless of the value at the start of the week or of the pattern of heads and tails in the previous weeks.

If you find it difficult to believe that there are no patterns in share price changes, look at the two charts in Figure 13.1. One of these charts shows the outcome from playing our game for five years; the other shows the actual performance of the Standard and Poor's Index for a five-year period. Can you tell which one is which?[4]

When Maurice Kendall suggested that stock prices follow a random walk, he was implying that the price changes are independent of one another just as the gains and losses in our coin-tossing game were independent. Figure 13.2 illustrates this. Each dot shows the change in the price of Microsoft stock on successive days. The circled dot in the southeast quadrant refers to a pair of days in which a 1 percent increase was followed by a 1 percent decrease. If there was a systematic tendency for increases to be followed by decreases, there would be many dots in the southeast quadrant and few in the northeast quadrant. It is obvious from a glance that there is very little pattern in these price movements, but we can test this more precisely by calculating the coefficient of correlation between each day's price change and the next. If price movements persisted, the correlation would be positive; if there was no relationship, it would be 0. In our example, the correlation between successive price changes in Microsoft stock was +.022; there was a negligible tendency for price rises to be followed by further price rises.[5]

[3]The drift is equal to the expected outcome: (1/2) (3) + (1/2) (−2.5) = .25%.

[4]The bottom chart in Figure 13.1 shows the real Standard and Poor's Index for the years 1980 through 1984; the top chart is a series of cumulated random numbers. Of course, 50 percent of you are likely to have guessed right, but we bet it was just a guess. A similar comparison between cumulated random numbers and actual price series was first suggested by H. V. Roberts, "Stock Market 'Patterns' and Financial Analysis: Methodological Suggestions," *Journal of Finance* 14 (March 1959), pp. 1–10.

[5]The correlation coefficient between successive observations is known as the *autocorrelation coefficient*. An autocorrelation of +.022 implies that, if Microsoft stock price rose by 1 percent more than average yesterday, your best forecast of today's price change would be a rise of .022 percent more than average.

FIGURE 13.1

One of these charts shows the Standard and Poor's Index for a five-year period. The other shows the results of playing our coin-tossing game for five years. Can you tell which is which?

Figure 13.2 suggests that Microsoft's price changes were effectively uncorrelated. Today's price change gave investors almost no clue as to the likely change tomorrow. Does that surprise you? If so, imagine that it were not the case and that changes in Microsoft's stock price were expected to persist for several months. Figure 13.3 provides an example of such a predictable cycle. You can see that an

FIGURE 13.2

Each dot shows a pair of returns for Microsoft stock on two successive days between March 1990 and July 2001. The circled dot records a daily return of +1 percent and then −1 percent on the next day. The scatter diagram shows no significant relationship between returns on successive days.

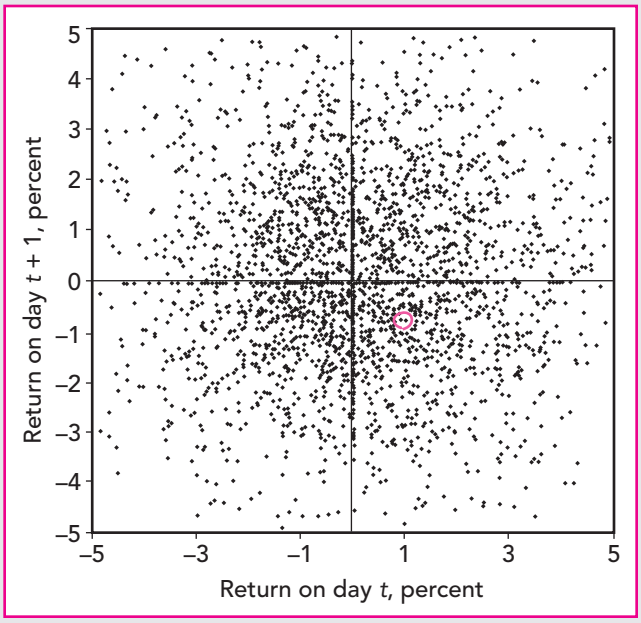
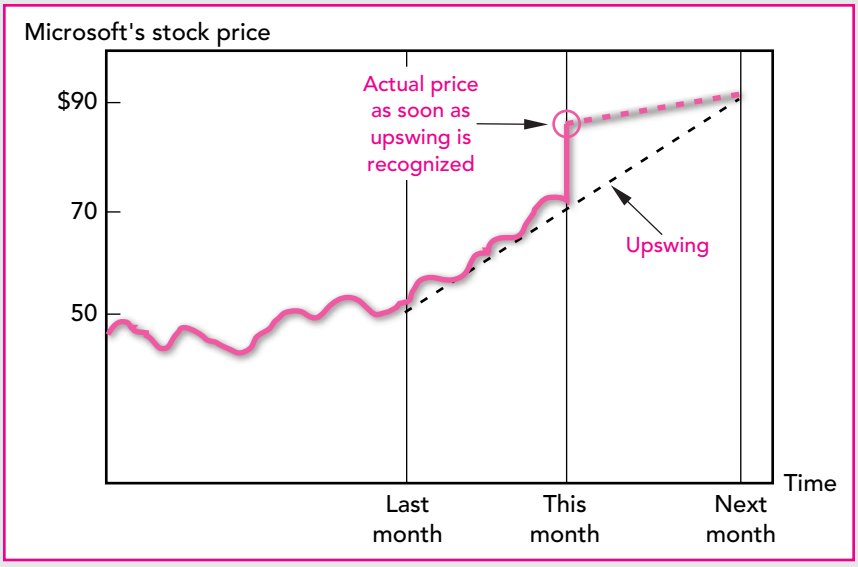


FIGURE 13.3

Cycles self-destruct as soon as they are recognized by investors. The stock price instantaneously jumps to the present value of the expected future price.



upswing in Microsoft's stock price started last month, when the price was $50, and it is expected to carry the price to $90 next month. What will happen when investors perceive this bonanza? It will self-destruct. Since Microsoft stock is a bargain at $70, investors will rush to buy. They will stop buying only when the stock offers a normal rate of return. Therefore, as soon as a cycle becomes apparent to investors, they immediately eliminate it by their trading.

Three Forms of Market Efficiency

You should see now why prices in competitive markets must follow a random walk. If past price changes could be used to predict future price changes, investors could make easy profits. But in competitive markets easy profits don't last. As investors try to take advantage of the information in past prices, prices adjust immediately until the superior profits from studying past price movements disappear. As a result, all the information in past prices will be reflected in *today's* stock price, not tomorrow's. Patterns in prices will no longer exist and price changes in one period will be independent of changes in the next. In other words, the share price will follow a random walk.

In competitive markets today's stock price must already reflect the information in past prices. But why stop there? If markets are competitive, shouldn't today's stock price reflect *all* the information that is available to investors? If so, securities will be fairly priced and security returns will be unpredictable, whatever information you consider.

Economists often define three levels of market efficiency, which are distinguished by the degree of information reflected in security prices. In the first level, prices reflect the information contained in the record of past prices. This is called the *weak* form of efficiency. If markets are efficient in the weak sense, then it is impossible to make consistently superior profits by studying past returns. Prices will follow a random walk.

The second level of efficiency requires that prices reflect not just past prices but all other published information, such as you might get from reading the financial press. This is known as the *semistrong* form of market efficiency. If markets are efficient in this sense, then prices will adjust immediately to public information such as the announcement of the last quarter's earnings, a new issue of stock, a proposal to merge two companies, and so on.

Finally, we might envisage a *strong* form of efficiency, in which prices reflect all the information that can be acquired by painstaking analysis of the company and the economy. In such a market we would observe lucky and unlucky investors, but we wouldn't find any superior investment managers who can consistently beat the market.

Efficient Markets: The Evidence

In the years that followed Maurice Kendall's discovery, financial journals were packed with tests of the efficient-market hypothesis. To test the weak form of the hypothesis, researchers measured the profitability of some of the trading rules used by those investors who claim to find patterns in security prices. They also employed statistical tests such as the one that we described when looking for patterns in the returns on Microsoft stock. For example, in Figure 13.4 we have used the same test to look for relationships between stock market returns in successive weeks. It appears that throughout the world there are few patterns in week-to-week returns.

To analyze the semistrong form of the efficient-market hypothesis, researchers have measured how rapidly security prices respond to different items of news, such as earnings or dividend announcements, news of a takeover, or macroeconomic information.

Before we describe what they found, we should explain how to isolate the effect of an announcement on the price of a stock. Suppose, for example, that you need

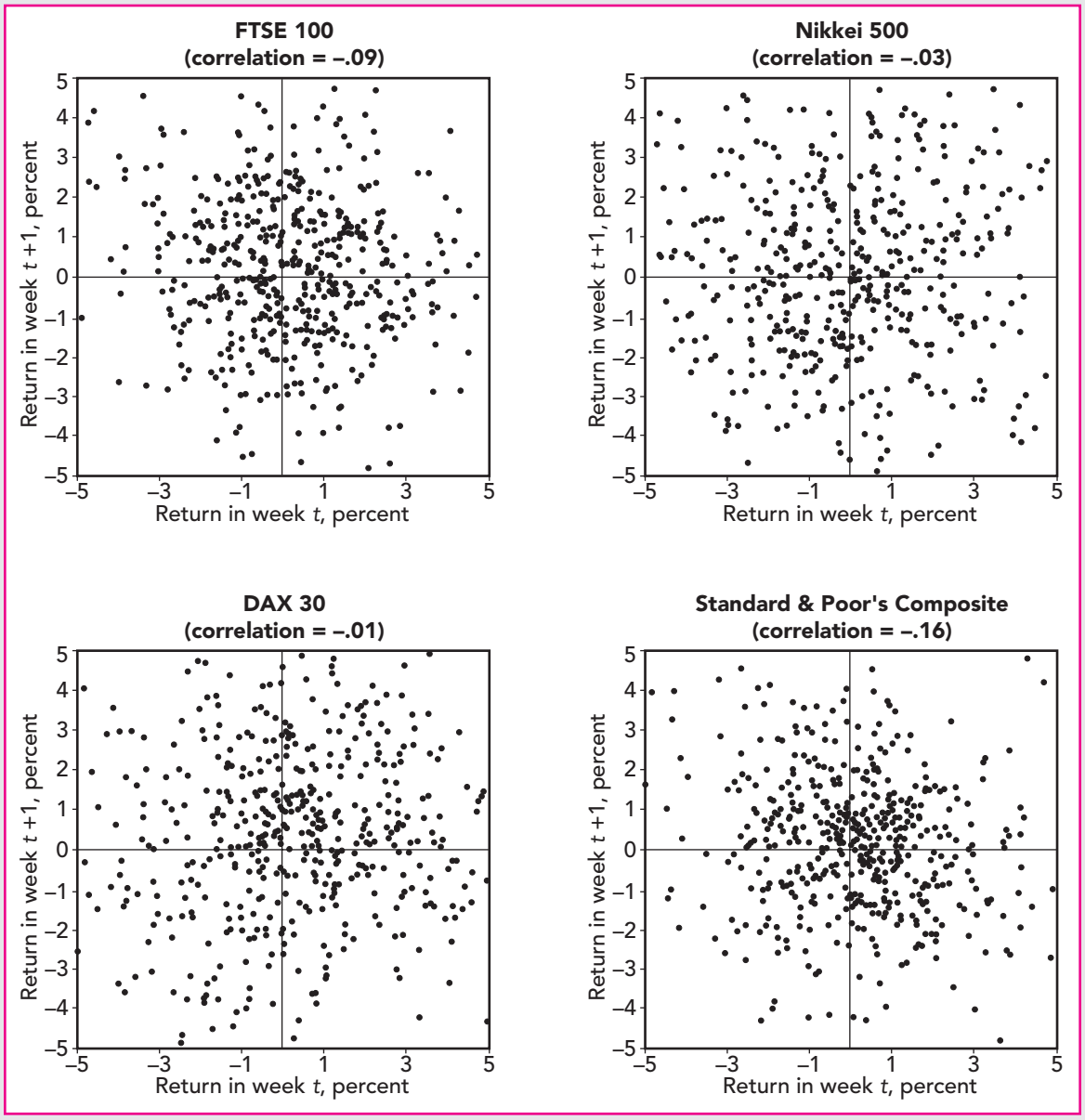


FIGURE 13.4

Each point in these scatter diagrams shows the return in successive weeks on four stock market indexes between September 1991 and July 2001. The wide scatter of points shows that there is almost no correlation between the return in one week and in the next. The four indexes are FTSE 100 (UK), the Nikkei 500 (Japan), DAX 30 (Germany), and Standard & Poor's Composite (USA).

to know how the stock price responds to news of a takeover. As a first stab, you could look at the returns on the stock in the months surrounding the announcement. But that would provide a very noisy measure, for the price would reflect among other things what was happening to the market as a whole. A second possibility would be to calculate a measure of relative performance.

$$\text{Relative stock return} = \text{return on stock} - \text{return on market index}$$

This is almost certainly better than simply looking at the returns on the stock. However, if you are concerned with performance over a period of several months or years, it would be preferable to recognize that fluctuations in the market have a larger effect on some stocks than others. For example, past experience might suggest that a change in the market index affected the value of a stock as follows:

$$\text{Expected stock return} = \alpha + \beta \times \text{return on market index}^{6}$$

Alpha (α) states how much on average the stock price changed when the market index was unchanged. Beta (β) tells us how much *extra* the stock price moved for each 1 percent change in the market index.[7] Suppose that subsequently the stock price provides a return of $\tilde{r}$ in a month when the market return is $\tilde{r}_m$. In that case we would conclude that the abnormal return for that month is

$$\begin{aligned}\text{Abnormal stock return} &= \text{actual stock return} - \text{expected stock return}\\ &= \tilde{r} - (\alpha + \beta\tilde{r}_m)\end{aligned}$$

This abnormal return abstracts from the fluctuations in the stock price that result from marketwide influences.[8]

Figure 13.5 illustrates how the release of news affects abnormal returns. The graph shows the price run-up of a sample of 194 firms that were targets of takeover attempts. In most takeovers, the acquiring firm is willing to pay a large premium over the current market price of the acquired firm; therefore when a firm becomes the target of a takeover attempt, its stock price increases in anticipation of the takeover premium. Figure 13.5 shows that on the day the public become aware of a takeover attempt (Day 0 in the graph), the stock price of the typical target takes a big upward jump. The adjustment in stock price is immediate: After the big price move on the public announcement day, the run-up is over, and there is no further drift in the stock price, either upward or downward.[9] Thus within the day, the new stock prices apparently reflect (at least on average) the magnitude of the takeover premium.

A study by Patell and Wolfson shows just how fast prices move when new information becomes available.[10] They found that, when a firm publishes its latest earnings or announces a dividend change, the major part of the adjustment in price occurs within 5 to 10 minutes of the announcement.

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[6]This relationship is often referred to as the *market model.*

[7]It is important when estimating α and β that you choose a period in which you believe that the stock behaved normally. If its performance was abnormal, then estimates of α and β cannot be used to measure the returns that investors expected. As a precaution, ask yourself whether your estimates of expected returns look sensible. Methods for estimating abnormal returns are analyzed in S. J. Brown and J. B. Warner, "Measuring Security Performance," *Journal of Financial Economics* 8 (1980), pp. 205–258.

[8]The market is not the only common influence on stock prices. For example, in Section 8.4 we described the Fama–French three-factor model, which states that a stock's return is influenced by three common factors—the market factor, a size factor, and a book-to-market factor. In this case we would calculate the expected stock return as $a + b_{\text{market}}(\tilde{r}_{\text{market factor}}) + b_{\text{size}}(\tilde{r}_{\text{size factor}}) + b_{\text{book-to-market}}(\tilde{r}_{\text{book-to-market factor}})$.

[9]See A. Keown and J. Pinkerton, "Merger Announcements and Insider Trading Activity," *Journal of Finance* 36 (September 1981), pp. 855–869. Note that prices on the days *before* the public announcement do show evidence of a sustained upward drift. This is evidence of a gradual leakage of information about a possible takeover attempt. Some investors begin to purchase the target firm in anticipation of a public announcement. Consistent with efficient markets, however, once the information becomes public, it is reflected fully and immediately in stock prices.

[10]See J. M. Patell and M. A. Wolfson, "The Intraday Speed of Adjustment of Stock Prices to Earnings and Dividend Announcements," *Journal of Financial Economics* 13 (June 1984), pp. 223–252.

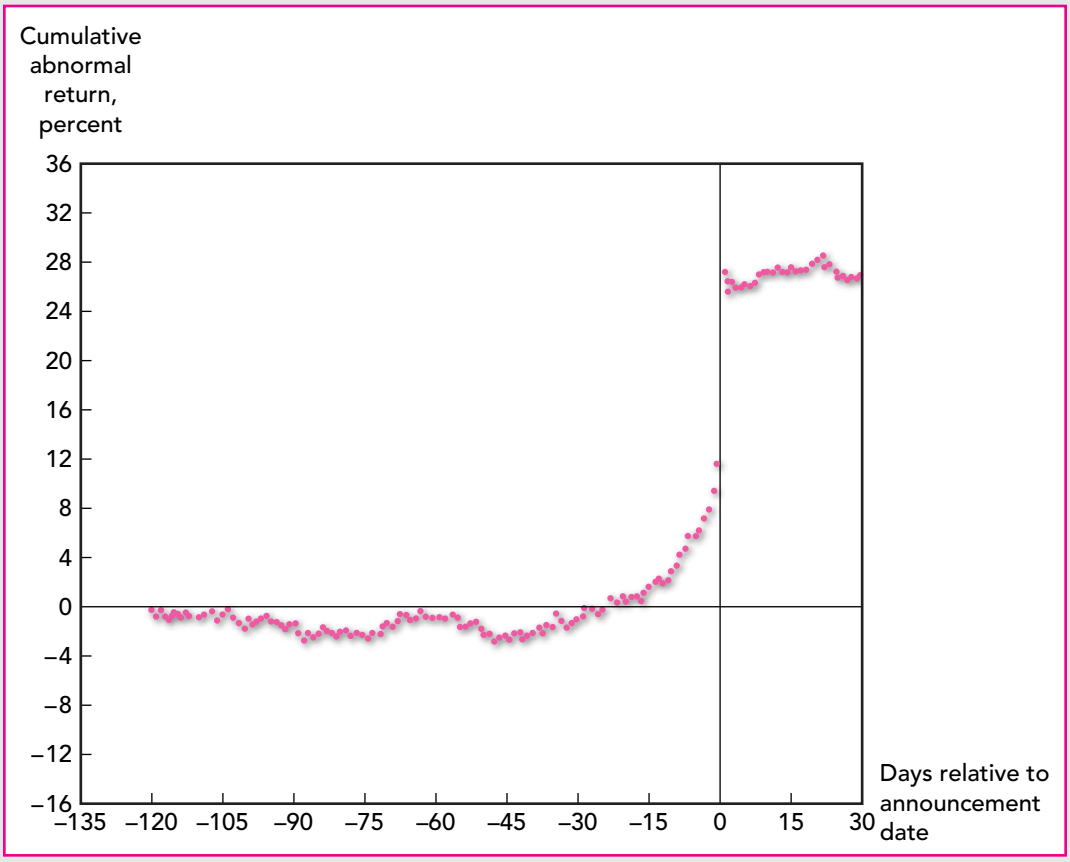


FIGURE 13.5

The performance of the stocks of target companies compared with that of the market. The prices of target stocks jump up on the announcement day, but from then on, there are no unusual price movements. The announcement of the takeover attempt seems to be fully reflected in the stock price on the announcement day.

Source: A. Keown and J. Pinkerton, "Merger Announcements and Insider Trading Activity," *Journal of Finance* 36 (September 1981), pp. 855–869.

Tests of the strong form of the hypothesis have examined the recommendations of professional security analysts and have looked for mutual funds or pension funds that could predictably outperform the market. Some researchers have found a slight persistent outperformance, but just as many have concluded that professionally managed funds fail to recoup the costs of management. Look, for example, at Figure 13.6, which is taken from a study by Mark Carhart of the average return on nearly 1,500 U.S. mutual funds. You can see that in some years the mutual funds beat the market, but as often as not it was the other way around. Figure 13.6 provides a fairly crude comparison, for mutual funds have tended to specialize in particular sectors of the market, such as low-beta stocks or large-firm stocks, that may have given below-average returns. To control for such differences, each fund needs to be compared with a benchmark portfolio of similar securities. The study by Mark Carhart did this, but the message was unchanged: The funds earned a lower return than the benchmark portfolios *after* expenses and roughly matched the benchmarks *before* expenses.

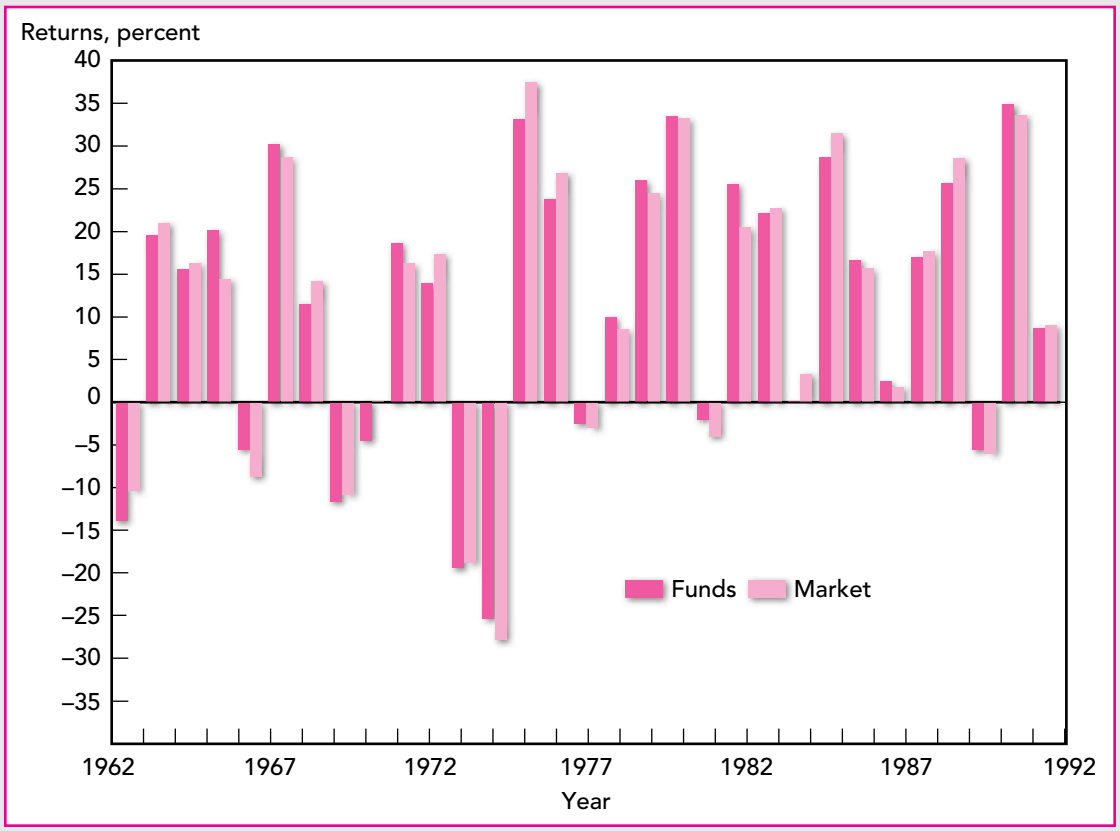


FIGURE 13.6

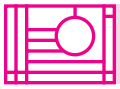
Average annual returns on 1,493 U.S. mutual funds and the market index, 1962–1992. Notice that mutual funds underperform the market in approximately half the years.

Source: M. M. Carhart, "On Persistence in Mutual Fund Performance," *Journal of Finance* 52 (March 1997), pp. 57–82.

It would be surprising if some managers were not smarter than others and could earn superior returns. But it seems difficult to spot the smart ones, and the top-performing managers one year have about an average chance of falling on their face the next year. For example, *Forbes Magazine,* a widely read investment periodical, has published annually since 1975 an "honor roll" of the most consistently successful mutual funds. Suppose that each year, when *Forbes* announced its honor roll, you had invested an equal sum in each of these exceptional funds. You would have outperformed the market in only 5 of the following 16 years, and your average annual return before paying any initial fees would have been more than 1 percent below the return on the market.[11]

[11]See B. G. Malkiel, "Returns from Investing in Equity Mutual Funds 1971 to 1991," *Journal of Finance* 50 (June 1995), pp. 549–572. It seems to be difficult to measure whether good performance does persist. Some contrary evidence is provided in E. J. Elton, M. J. Gruber, and C. R. Blake, "The Persistence of Risk-Adjusted Mutual Fund Performance," *Journal of Business* 69 (April 1996), pp. 133–157. There is, however, widespread agreement that the worst performing funds continue to underperform. That is not surprising, for they are shrinking and the costs of running them are proportionately higher.

Such evidence on strong-form efficiency has proved to be sufficiently convincing that many professionally managed funds have given up the pursuit of superior performance. They simply "buy the index," which maximizes diversification and minimizes the costs of managing the portfolio. Corporate pension plans now invest over a quarter of their United States equity holdings in index funds.



13.3 PUZZLES AND ANOMALIES—WHAT DO THEY MEAN FOR THE FINANCIAL MANAGER?

Almost without exception, early researchers concluded that the efficient-market hypothesis was a remarkably good description of reality. So powerful was the evidence that any dissenting research was regarded with suspicion. But eventually the readers of finance journals grew weary of hearing the same message. The interesting articles became those that turned up some puzzle. Soon the journals were packed with evidence of anomalies that investors have apparently failed to exploit.

We have already referred to one such puzzle—the abnormally high returns on the stocks of small firms. For example, look back at Figure 7.1, which shows the results of investing $1 in 1926 in the stocks of either small or large firms. (Notice that the portfolio values are plotted in Figure 7.1 on a logarithmic scale.) By 2000 the $1 invested in small company stocks had appreciated to $6,402, while the investment in large firms was worth only $2,587.[12] Although small firms had higher betas, the difference was not nearly large enough to explain the difference in returns.

Now this may mean one (or more) of three things. First, it could be that investors have demanded a higher expected return from small firms to compensate for some extra risk factor that is not captured in the simple capital asset pricing model. That is why we asked in Chapter 8 whether the small-firm effect is evidence against the CAPM.

Second, the superior performance of small firms could simply be a coincidence, a finding that stems from the efforts of many researchers to find interesting patterns in the data. There is evidence for and against the coincidence theory. Those who believe that the small-firm effect is a pervasive phenomenon can point to the fact that small-firm stocks have provided a higher return in many other countries. On the other hand, you can see from Figure 7.1 that the superior performance of small-firm stocks in the United States is limited to a relatively short period. Until the early 1960s small-firm and large-firm stocks were neck and neck. A wide gap then opened in the next two decades but it narrowed again in the 1980s when the small-firm effect first became known. If you looked simply at recent years, you might judge that there is a *large-firm* effect.

The third possibility is that we have here an important exception to the efficient-market theory, one that provided investors with an opportunity to make predictably superior profits over a period of two decades. If such anomalies offer easy pickings, you would expect to find a number of investors eager to take advantage of them. It turns out that, while many investors do try to exploit such anomalies, it is surprisingly difficult to get rich by doing so. For example, Professor Richard Roll, who probably knows as much as anyone about market anomalies, confesses

[12] In each case the portfolio values assume that dividends are reinvested.

> Over the past decade, I have attempted to exploit many of the seemingly most promising "inefficiencies" by actually trading significant amounts of money according to a trading rule suggested by the "inefficiencies" . . . I have never yet found one that worked in practice, in the sense that it returned more after cost than a buy-and-hold strategy.[13]

Do Investors Respond Slowly to New Information?

We have dwelt on the small-firm effect, but there is no shortage of other puzzles and anomalies. Some of them relate to the short-term behavior of stock prices. For example, returns appear to be higher in January than in other months, they seem to be lower on a Monday than on other days of the week, and most of the daily return comes at the beginning and end of the day.

To have any chance of making money from such short-term patterns, you need to be a professional trader, with one eye on the computer screen and the other on your annual bonus. If you are a corporate financial manager, these short-term patterns in stock prices may be intriguing conundrums, but they are unlikely to change the major financial decisions about which projects to invest in and how they should be financed. The more troubling concern for the corporate financial manager is the possibility that it may be several years before investors fully appreciate the significance of new information. The studies of daily and hourly price movements that we referred to above may not pick up this long-term mispricing, but here are two examples of an apparent long-term delay in the reaction to news.

The Earnings Announcement Puzzle The earnings announcement puzzle is summarized in Figure 13.7, which shows stock performance following the announcement of unexpectedly good or bad earnings during the years 1974 to 1986.[14] The 10 percent of the stocks of firms with the best earnings news outperform those with the worst news by more than 4 percent over the two months following the announcement. It seems that investors underreact to the earnings announcement and become aware of the full significance only as further information arrives.

The New-Issue Puzzle When firms issue stock to the public, investors typically rush to buy. On average those lucky enough to receive stock receive an immediate capital gain. However, researchers have found that these early gains often turn into losses. For example, suppose that you bought stock immediately following each initial public offering and then held that stock for five years. Over the period 1970–1998 your average annual return would have been 33 percent less than the return on a portfolio of similar-sized stocks.

The jury is still out on these studies of longer-term anomalies. Take, for example, the new-issue puzzle. Most new issues during the past 30 years have involved growth stocks with high market values and limited book assets. When the long-run performance of new issues is compared with a portfolio that is matched in terms of both size and book-to-market, the difference in performance disappears.[15] So

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[13]R. Roll, "What Every CFO Should Know about Scientific Progress in Financial Economics: What Is Known and What Remains to be Resolved," *Financial Management* 23 (Summer 1994), pp. 69–75.

[14]V. L. Bernard and J. K. Thomas, "Post-Earnings Announcement Drift: Delayed Price Response or Risk Premium?" *Journal of Accounting Research* 27 (Supplement 1989), pp. 1–36.

[15]The long-run underperformance of new issues was described in R. Loughran and J. R. Ritter, "The New Issues Puzzle," *Journal of Finance* 50 (1995), pp. 23–51. The figures are updated on Jay Ritter's website and the returns compared with those of a portfolio which is matched in terms of size and book-to-market. (See **http://bear.cba.ufl.edu/ritter.**)

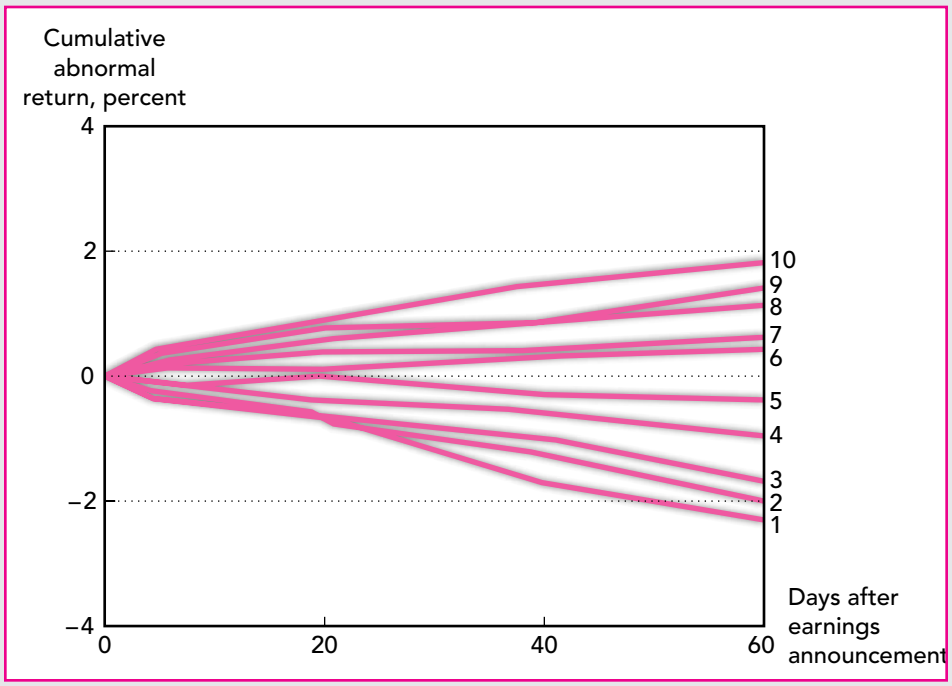

FIGURE 13.7

The cumulative abnormal returns of stocks of firms over the 60 days following an announcement of quarterly earnings. The 10 percent of the stocks with the best earnings news (Group 10) outperformed those with the worst news (Group 1) by more than 4 percent.

Source: V. L. Bernard and J. K. Thomas, "Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium?" *Journal of Accounting Research* 27 (Supplement 1989), pp. 1–36.

the new-issue puzzle could well turn out to be just the book-to-market puzzle in disguise.

Stock Market Anomalies and Behavioral Finance

In the meantime, some scholars are casting around for an alternative theory that might explain these apparent anomalies. Some argue that the answers lie in behavioral psychology. People are not 100 percent rational 100 percent of the time. This shows up in two broad areas—their attitudes to risk and the way that they assess probabilities.

1. *Attitudes toward risk* Psychologists have observed that, when making risky decisions, people are particularly loath to incur losses, even if those losses are small.[16] Losers tend to regret their actions and kick themselves for having been so foolish. To avoid this unpleasant possibility, individuals will tend to avoid those actions that may result in loss.

[16] This aversion to loss is modeled in D. Kahneman and A. Tversky, "Prospect Theory: An Analysis of Decision under Risk," *Econometrica* 47 (1979), pp. 263–291.

The pain of a loss seems to depend on whether it comes on the heels of earlier losses. Once investors have suffered a loss, they may be even more concerned not to risk a further loss and therefore they become particularly risk-averse. Conversely, just as gamblers are known to be more willing to make large bets when they are ahead, so investors may be more prepared to run the risk of a stock market dip after they have experienced a period of substantial gains.[17] If they do then suffer a small loss, they at least have the consolation of being up on the year.

When we discussed risk in Chapters 7 through 9, we pictured investors as concerned solely with the distribution of the possible returns, as summarized by the expected return and the variance. We did not allow for the possibility that investors may look back at the price at which they purchased stock and feel elated when their investment is in the black and depressed when it is in the red.

2. *Beliefs about probabilities* Most investors do not have a PhD in probability theory and may make systematic errors in assessing the probability of uncertain outcomes. Psychologists have found that, when judging the possible future outcomes, individuals commonly look back to what has happened in recent periods and then assume that this is representative of what may occur in the future. The temptation is to project recent experience into the future and to forget the lessons learned from the more distant past. Thus, an investor who places too much weight on recent events may judge that glamorous growth companies are very likely to continue to grow rapidly, even though very high rates of growth cannot persist indefinitely.

   A second systematic bias is that of overconfidence. Most of us believe that we are better-than-average drivers, and most investors think that they are better-than-average stock pickers. Two speculators who trade with one another cannot both make money from the deal; for every winner there must be a loser. But presumably investors are prepared to continue trading because each is confident that it is the other one who is the patsy.

Now these behavioral tendencies have been well documented by psychologists, and there is plenty of evidence that investors are not immune to irrational behavior. For example, most individuals are reluctant to sell stocks that show a loss. They also seem to be overconfident in their views and to trade excessively.[18] What is less clear is how far such behavioral traits help to explain stock market anomalies. Take, for example, the tendency to place too much emphasis on recent events and therefore to overreact to news. This phenomenon fits with one of our possible long-term puzzles (the long-term underperformance of new issues). It looks as if investors observe the hot new issues, get carried away by the apparent profits to be made, and then spend the next few years regretting their enthusiasm. However, the tendency to overreact doesn't help to explain our other long-term puzzle (the *underreaction* of investors to earnings announcements). Unless we have a theory of

[17]The effect is described in R. H. Thaler and E. J. Johnson, "Gambling with the House Money and Trying to Break Even: The Effects of Prior Outcomes on Risky Choice," *Management Science* 36 (1990), pp. 643–660. The implications for expected stock returns are explored in N. Barberis, M. Huang, and T. Santos, "Prospect Theory and Asset Prices," *Quarterly Journal of Economics* 116 (February 2001), pp. 1–53.

[18]See T. Odean, "Are Investors Reluctant to Realize their Losses?" *Journal of Finance* 53 (October 1998), pp. 1775–1798; and T. Odean, "Boys Will Be Boys: Gender, Overconfidence, and Common Stock Investment," *Quarterly Journal of Economics* 116 (February 2001), pp. 261–292.

human nature that can tell us when investors will overreact and when they will underreact, we are just as well off with the efficient-market theory which tells us that overreactions and underreactions are equally likely.[19]

There is another question that needs answering before we accept a behavioral bias as an explanation of an anomaly. It may well be true that many of us have a tendency to over- or underreact to recent events. However, hard-headed professional investors are constantly on the lookout for possible biases that may be a source of future profits.[20] So it is not enough to refer to irrationality on the part of individual investors; we also need to explain why professional investors have not competed away the apparent profit opportunities that such irrationality offers. The evidence on the performance of professionally managed portfolios suggests that many of these anomalies were not so easy to predict.

Professional Investors, Irrational Exuberance, and the Dot.com Bubble

Investors in technology stocks in the 1990s saw an extraordinary run-up in the value of their holdings. The Nasdaq Composite Index, which has a heavy weighting in high-tech stocks, rose 580 percent from the start of 1995 to its high in March 2000. Then even more rapidly than it began, the boom ended. By November 2001 the Nasdaq index had fallen 64 percent.

Some of the largest price gains and losses were experienced by the new "dot.com stocks." For example, Yahoo! shares, which began trading in April 1996, appreciated by 1,400 percent in just four years. At this point Yahoo! stock was valued at $124 billion, more than that of GM, Heinz, and Boeing combined. It was not, however, to last; just over a year later Yahoo!'s market capitalization was little more than $6 billion.

What caused the boom in high-tech stocks? Alan Greenspan, chairman of the Federal Reserve, attributed the run-up in prices to "irrational exuberance," a view that was shared by Professor Robert Shiller from Yale. In his book *Irrational Exuberance*[21] Shiller argued that, as the bull market developed, it generated optimism about the future and stimulated demand for shares.[22] Moreover, as investors racked up profits on their stocks, they became even more confident in their opinions.

But this brings us back to the $64,000 question. If Shiller was right and individual investors were carried away by irrational optimism, why didn't smart professional investors step in, sell high-tech stocks, and force their prices down to fair value? Were the pros also carried away on the same wave of euphoria? Or were they rationally reluctant to undertake more than a limited amount of selling if they could not be sure where and when the boom would end?

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[19]This point is made in E. F. Fama, "Market Efficiency, Long-Term Returns, and Behavioral Finance," *Journal of Financial Economics* 49 (September 1998), pp. 283–306. One paper that does seek to model why investors may both underreact and overreact is N. Barberis, A. Shleifer, and R. Vishny, "A Model of Investor Sentiment," *Journal of Financial Economics* 49 (September 1998), pp. 307–343.

[20]Many financial institutions employ behavioral finance specialists to advise them on these biases.

[21]See R. J. Shiller, *Irrational Exuberance,* Broadway Books, 2001. Shiller also discusses behavioral explanations for the boom in R. J. Shiller, "Bubbles, Human Judgment, and Expert Opinion," Cowles Foundation Discussion Paper No. 1303, Cowles Foundation for Research in Economics, Yale University, New Haven, CT, May 2001.

[22]Some economists believe that the market price is prone to "bubbles"—situations in which price grows faster than fundamental value, but investors don't sell because they expect prices to keep rising. Of course, all such bubbles pop eventually, but they can in theory be self-sustaining for a while. The *Journal of Economic Perspectives* 4 (Spring 1990) contains several nontechnical articles on bubbles.

The Crash of 1987 and Relative Efficiency

On Monday, October 19, 1987, the Dow Jones Industrial Average (the Dow) fell 23 percent in *one day.* Immediately after the crash, everybody started to ask two questions: Who were the guilty parties? and Do prices reflect fundamental values?

As in most murder mysteries, the immediate suspects are not the ones "who done it." The first group of suspects included *index arbitrageurs,* who trade back and forth between index futures[23] and the stocks comprising the market index, taking advantage of any price discrepancies. On Black Monday futures fell first and fastest because investors found it easier to bail out of the stock market by way of futures than by selling individual stocks. This pushed the futures price below the stock market index.[24] The arbitrageurs tried to make money by selling stocks and buying futures, but they found it difficult to get up-to-date quotes on the stocks they wished to trade. Thus the futures and stock markets were for a time disconnected. Arbitrageurs contributed to the trading volume that swamped the New York Stock Exchange, but they did not cause the crash; they were the messengers who tried to transmit the selling pressure in the futures market back to the exchange.

The second suspects were large institutional investors who were trying to implement *portfolio insurance* schemes. Portfolio insurance aims to put a floor on the value of an equity portfolio by progressively selling stocks and buying safe, short-term debt securities as stock prices fall. Thus the selling pressure that drove prices down on Black Monday led portfolio insurers to sell still more. One institutional investor on October 19 sold stocks and futures totalling $1.7 billion. The immediate cause of the price fall on Black Monday may have been a herd of elephants all trying to leave by the same exit.

Perhaps some large portfolio insurers can be convicted of disorderly conduct, but why did stocks fall *worldwide,*[25] when portfolio insurance was significant only in the United States? Moreover, if sales were triggered mainly by portfolio insurance or trading tactics, they should have conveyed little fundamental information, and prices should have bounced back after Black Monday's confusion had dissipated.

So why did prices fall so sharply? There was no obvious, new fundamental information to justify such a sharp and widespread decline in share values. For this reason, the idea that the market price is the best estimate of intrinsic value seems less compelling than before the crash. It appears that either prices were irrationally high before Black Monday or irrationally low afterward. Could the theory of efficient markets be another casualty of the crash?

The events of October 1987 remind us how exceptionally difficult it is to value common stocks. For example, imagine that in November 2001 you wanted to check whether common stocks were fairly valued. At least as a first stab you might use the constant-growth formula that we introduced in Chapter 4. The annual expected dividend on the Standard and Poor's Composite Index was about 18.7.

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[23] An index future provides a way of trading in the stock market as a whole. It is a contract that pays investors the value of the stocks in the index at a specified future date. We discuss futures in Chapter 27.

[24] That is, sellers pushed the futures prices below their *proper relation* to the index (again, see Chapter 27). The proper relation is not exact equality.

[25] Some countries experienced even larger falls than the United States. For example, prices fell by 46 percent in Hong Kong, 42 percent in Australia, and 35 percent in Mexico. For a discussion of the worldwide nature of the crash, see R. Roll, "The International Crash of October 1987," in R. Kamphuis (ed.), *Black Monday and the Future of Financial Markets,* Richard D. Irwin, Inc., Homewood, IL, 1989.

Suppose this dividend was expected to grow at a steady rate of 10 percent a year and investors required an annual return of 11.7 percent from common stocks. The constant growth formula gives a value for the index of

$$\text{PV(index)} = \frac{\text{DIV}}{r - g} = \frac{18.7}{.117 - .10} = 1{,}100$$

which was roughly the actual level of the index in mid-November 2001. But how confident could you be about any of these figures? Perhaps the likely dividend growth was only 9.5 percent per year. This would produce a 23 percent downward revision in your estimate of the right level of the index, from 1,100 to 850!

$$\text{PV(index)} = \frac{\text{DIV}}{r - g} = \frac{18.7}{.117 - .095} = 850$$

In other words, a price drop like Black Monday's could have occurred if investors had become just 0.5 percentage point less optimistic about future dividend growth.

The extreme difficulty of valuing common stocks from scratch has two important consequences. First, investors almost always price a common stock relative to yesterday's price or relative to today's price of comparable securities. In other words, they generally take yesterday's price as correct, adjusting upward or downward on the basis of today's information. If information arrives smoothly, then as time passes, investors become more and more confident that today's price level is correct. However, when investors lose confidence in the benchmark of yesterday's price, there may be a period of confused trading and volatile prices before a new benchmark is established.

Second, the hypothesis that stock price *always* equals intrinsic value is nearly impossible to test, because it is so difficult to calculate intrinsic value without referring to prices. Thus the crash did not conclusively disprove the hypothesis, but many people find it less plausible.

However, the crash does not undermine the evidence for market efficiency with respect to *relative* prices. Take, for example, Hershey stock, which sold for $66 in November 2001. Could we prove that true intrinsic value is $66? No, but we could be more confident that the price of Hershey should be roughly double that of Smucker ($33) since Hershey's earnings per share and dividend were about twice those of Smucker and the two shares had similar growth prospects. Moreover, if either company announced unexpectedly higher earnings, we could be quite confident that its share price would respond instantly and without bias. In other words, the subsequent price would be set correctly relative to the prior price. The most important lessons of market efficiency for the corporate financial manager are concerned with relative efficiency.

Market Anomalies and the Financial Manager

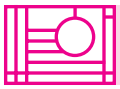
The financial manager needs to be confident that, when the firm issues new securities, it can do so at a fair price. There are two reasons that this may not be the case. First, the strong form of the efficient-market hypothesis may not be 100 percent true, so that the financial manager may have information that other investors do not have. Alternatively, investors may have the *same* information as management, but be slow to react to it. For example, we described above some evidence that new issues of stock tend to be followed by a prolonged period of low stock returns.

You sometimes hear managers say something along the following lines:

> Great! Our stock is clearly overpriced. This means we can raise capital cheaply and invest in Project X. Our high stock price gives us a big advantage over our competitors who could not possibly justify investing in Project X.

But that doesn't make sense. If your stock is truly overpriced, you can help your current shareholders by selling additional stock and using the cash to invest in other capital market securities. But you should *never* issue stock to invest in a project that offers a lower rate of return than you could earn elsewhere in the capital market. Such a project would have a negative NPV. You can always do better than investing in a negative-NPV project: Your company can go out and buy common stocks. In an efficient market, such purchases are always *zero* NPV.

What about the reverse? Suppose you know that your stock is *underpriced.* In that case, it certainly would not help your current shareholders to sell additional "cheap" stock to invest in other fairly priced stocks. If your stock is sufficiently underpriced, it may even pay to forego an opportunity to invest in a positive-NPV project rather than to allow new investors to buy into your firm at a low price. Financial managers who believe that their firm's stock is underpriced may be justifiably reluctant to issue more stock, but they may instead be able to finance their investment program by an issue of debt. In this case the market inefficiency would affect the firm's choice of financing but not its real investment decisions. In Chapter 15 we will have more to say about the financing choice when managers believe their stock is mispriced.



13.4 THE SIX LESSONS OF MARKET EFFICIENCY

Sorting out the puzzles will take time, but we believe that there is now widespread agreement that capital markets function sufficiently well that opportunities for easy profits are rare. So nowadays when economists come across instances where market prices apparently don't make sense, they don't throw the efficient-market hypothesis onto the economic garbage heap. Instead, they think carefully about whether there is some missing ingredient that their theories ignore.

We suggest therefore that financial managers should assume, at least as a starting point, that security prices are fair and that it is very difficult to outguess the market. This has some important implications for the financial manager.

Lesson 1: Markets Have No Memory

The weak form of the efficient-market hypothesis states that the sequence of past price changes contains no information about future changes. Economists express the same idea more concisely when they say that the market has no memory. Sometimes financial managers *seem* to act as if this were not the case. For example, studies by Taggart and others in the United States and by Marsh in the United Kingdom show that managers generally favor equity rather than debt financing after an abnormal price rise.[26] The idea is to catch the market while it is high. Similarly, they

[26]R. A. Taggart, "A Model of Corporate Financing Decisions," *Journal of Finance* 32 (December 1977), pp. 1467–1484; P. Asquith and D. W. Mullins, Jr., "Equity Issues and Offering Dilution," *Journal of Financial Economics* 15 (January–February 1986), pp. 16–89; P. R. Marsh, "The Choice between Debt and Equity: An Empirical Study," *Journal of Finance* 37 (March 1982), pp. 121–144.

are often reluctant to issue stock after a fall in price. They are inclined to wait for a rebound. But we know that the market has no memory and the cycles that financial managers seem to rely on do not exist.[27]

Sometimes a financial manager will have inside information indicating that the firm's stock is overpriced or underpriced. Suppose, for example, that there is some good news which the market does not know but you do. The stock price will rise sharply when the news is revealed. Therefore, if the company sold shares at the current price, it would be offering a bargain to new investors at the expense of present stockholders.

Naturally, managers are reluctant to sell new shares when they have favorable inside information. But such information has nothing to do with the history of the stock price. Your firm's stock could be selling at half its price of a year ago, and yet you could have special information suggesting that it is *still* grossly overvalued. Or it may be undervalued at twice last year's price.

Lesson 2: Trust Market Prices

In an efficient market you can trust prices, for they impound all available information about the value of each security. This means that in an efficient market, there is no way for most investors to achieve consistently superior rates of return. To do so, you not only need to know more than *anyone* else, but you also need to know more than *everyone* else. This message is important for the financial manager who is responsible for the firm's exchange-rate policy or for its purchases and sales of debt. If you operate on the basis that you are smarter than others at predicting currency changes or interest-rate moves, you will trade a consistent financial policy for an elusive will-o'-the-wisp.

The company's assets may also be directly affected by management's faith in its investment skills. For example, one company may purchase another simply because its management thinks that the stock is undervalued. On approximately half the occasions the stock of the acquired firm will with hindsight turn out to be undervalued. But on the other half it will be overvalued. On average the value will be correct, so the acquiring company is playing a fair game except for the costs of the acquisition.

Example—Orange County In December 1994, Orange County, one of the wealthiest counties in the United States, announced that it had lost $1.7 billion on its investment portfolio. The losses arose because the county treasurer, Robert Citron, had raised large short-term loans which he then used to bet on a rise in long-term bond prices.[28] The bonds that the county bought were backed by government-guaranteed mortgage loans. However, some of them were of an unusual type known as *reverse*

[27] If high stock prices signal expanded investment opportunities and the need to finance these new investments, we would expect to see firms raise more money *in total* when stock prices are historically high. But this does not explain why firms prefer to raise the extra cash at these times by an issue of equity rather than debt.

[28] Orange County borrowed money in the following way. Suppose it bought bond A and then sold it to a bank with a promise to buy it back at a slightly higher price. The cash from this sale was then invested in bond B. If bond prices fell, the county lost twice over: Its investment in bond B was worth less than the purchase price, and it was obliged to repurchase bond A for more than the bond was now worth. The sale and repurchase of bond A is known as a reverse repurchase agreement, or reverse "repo." We describe repos in Chapter 31.

floaters, which means that as interest rates rise, the interest payment on each bond is reduced, and vice versa.

Reverse floaters are riskier than normal bonds. When interest rates rise, prices of all bonds fall, but prices of reverse floaters suffer a double whammy because the interest rate payments decline as the discount rate rises. Thus Robert Citron's policy of borrowing to invest in reverse floaters ensured that when, contrary to his forecast, interest rates subsequently rose, the fund suffered huge losses.

Like Robert Citron, financial managers sometimes take large bets because they believe that they can spot the direction of interest rates, stock prices, or exchange rates, and sometimes their employers may encourage them to speculate.[29] We do not mean to imply that such speculation always results in losses, as in Orange County's case, for in an efficient market speculators win as often as they lose.[30] But corporate and municipal treasurers would do better to trust market prices rather than incur large risks in the quest for trading profits.

Lesson 3: Read the Entrails

If the market is efficient, prices impound all available information. Therefore, if we can only learn to read the entrails, security prices can tell us a lot about the future. For example, in Chapter 29 we will show how information in a company's financial statements can help the financial manager to estimate the probability of bankruptcy. But the market's assessment of the company's securities can also provide important information about the firm's prospects. Thus, if the company's bonds are offering a much higher yield than the average, you can deduce that the firm is probably in trouble.

Here is another example: Suppose that investors are confident that interest rates are set to rise over the next year. In that case, they will prefer to wait before they make long-term loans, and any firm that wants to borrow long-term money today will have to offer the inducement of a higher rate of interest. In other words, the long-term rate of interest will have to be higher than the one-year rate. Differences between the long-term interest rate and the short-term rate tell you something about what investors expect to happen to short-term rates in the future.[31]

Example—Hewlett Packard Proposes to Merge with Compaq On September 3, 2001, two computer companies, Hewlett Packard and Compaq, revealed plans to merge. Announcing the proposal, Carly Fiorina, the chief executive of Hewlett Packard, stated: "This combination vaults us into a leadership role" and creates "substantial shareowner value through significant cost structure improvements and access to new growth opportunities." But investors and analysts gave the proposal a big thumbs-down. Figure 13.8 shows that over the following two days the shares of Hewlett Packard underperformed the market by 21 percent, while Compaq shares underperformed by 16 percent. Investors, it seems, believed that the merger had a negative net present value of $13 billion. When on November 6 the Hewlett family announced that it would vote against the proposal, investors took

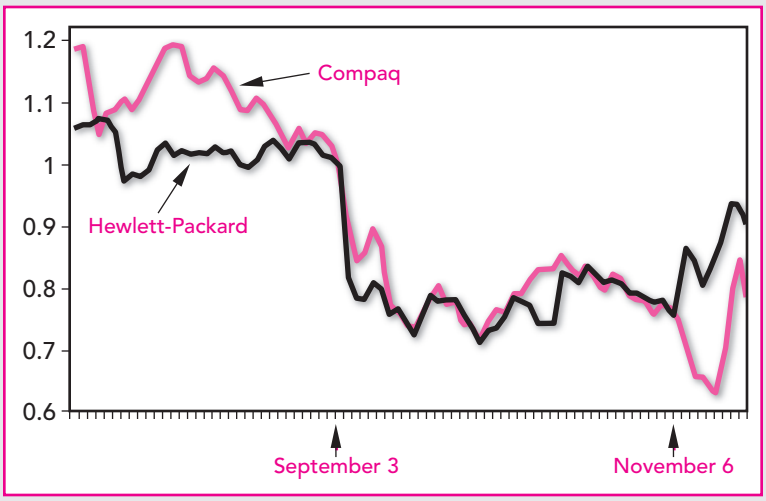
[29]We don't know why Robert Citron gambled with Orange County's money, but he was under pressure to make up for a shortfall in tax revenues.

[30]Watch out for the speculators who are making very large profits; they are almost certainly taking correspondingly large risks.

[31]We will discuss the relationship between short-term and long-term interest rates in Chapter 24. Notice, however, that in an efficient market the difference between the prices of *any* short-term and long-term contracts always says something about how participants expect prices to move.

FIGURE 13.8

Cumulative abnormal returns on Hewlett Packard and Compaq stocks during four-month period surrounding the announcement on September 3, 2001, of a proposed merger. Hewlett Packard stock recovered after the Hewlett family announced on November 6 that it would vote against the merger.



heart, and the next day Hewlett Packard shares gained 16 percent.[32] We do not wish to imply that investor concerns about the merger were justified, for management may have had important information that investors lacked. Our point is simply that the price reaction of the two stocks provided a potentially valuable summary of investor opinion about the effect of the merger on firm value.

Lesson 4: There Are No Financial Illusions

In an efficient market there are no financial illusions. Investors are unromantically concerned with the firm's cash flows and the portion of those cash flows to which they are entitled.

Example—Stock Dividends and Splits We can illustrate our fourth lesson by looking at the effect of stock dividends and splits. Every year hundreds of companies increase the number of shares outstanding either by subdividing the existing shares or by distributing more shares as dividends. This does not affect the company's future cash flows or the proportion of these cash flows attributable to each shareholder. For example, suppose the stock of Chaste Manhattan is selling for $210 per share. A 3-for-1 stock split would replace each outstanding share with three new shares. Chaste would probably arrange this by printing two new shares for each original share and distributing the new shares to its stockholders as a "free gift." After the split we would expect each share to sell for 210/3 = $70. Dividends per share, earnings per share, and all other per-share variables would be one-third their previous levels.

Figure 13.9 summarizes the results of a classic study of stock splits during the years 1926 to 1960.[33] It shows the cumulative abnormal performance of stocks

[32]The stock of Compaq, which was thought to be less badly affected by the merger, fell on the news, before also rising.

[33]See E. F. Fama, L. Fisher, M. Jensen, and R. Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review* 10 (February 1969), pp. 1–21. Later researchers have discovered that shareholders make abnormal gains both when the split or stock dividend is announced and when it takes place. Nobody has offered a convincing explanation for the latter phenomenon. See, for example, M. S. Grinblatt, R. W. Masulis, and S. Titman, "The Valuation Effects of Stock Splits and Stock Dividends," *Journal of Financial Economics* 13 (December 1984), pp. 461–490.

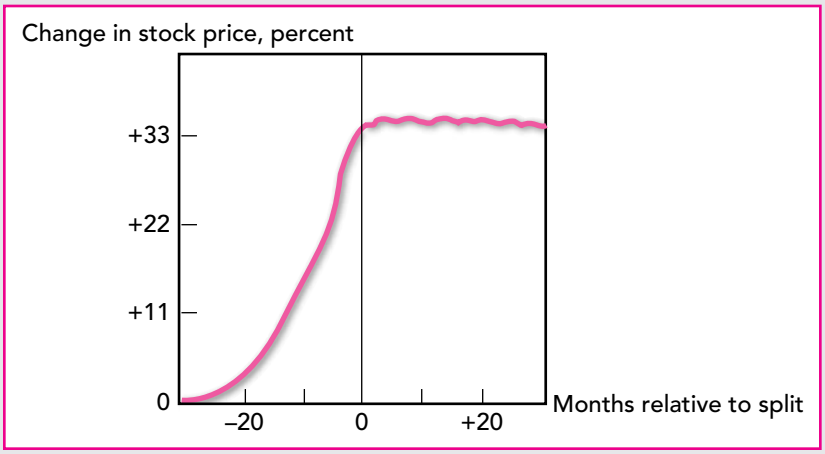


FIGURE 13.9

Cumulative abnormal returns at the time of a stock split. (Returns are adjusted for the increase in the number of shares.) Notice the rise before the split and the absence of abnormal changes after the split.

Source: E. Fama, L. Fisher, M. Jensen, and R. Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review* 10 (February 1969), fig. 2b, p. 13.

around the time of the split after adjustment for the increase in the number of shares.[34] Notice the rise in price before the split. The announcement of the split would have occurred in the last month or two of this period. That means the decision to split is both the consequence of a rise in price and the cause of a further rise. It looks as if shareholders are not as hard-headed as we have been making out. They do seem to care about the form as well as the substance. However, during the subsequent year two-thirds of the splitting companies announced above-average increases in cash dividends. Normally such an announcement would cause an unusual rise in the stock price, but in the case of the splitting companies there was no such occurrence at any time after the split. The apparent explanation is that the split was accompanied by an explicit or implicit promise of a dividend increase and the rise in price at the time of the split had nothing to do with a predilection for splits as such but with the information that it was thought to convey.

This behavior does not imply that investors like the dividend increases for their own sake, for companies that split their stocks appear to be unusually successful in other ways. For example, Asquith, Healy, and Palepu found that stock splits are frequently preceded by sharp increases in earnings.[35] Such earnings increases are very often transitory, and investors rightly regard them with suspicion. However, the stock split appears to provide investors with an assurance that in this case the rise in earnings is indeed permanent.

Example—Accounting Changes There are other occasions on which managers seem to assume that investors suffer from financial illusion. For example, some firms devote considerable ingenuity to the task of manipulating earnings reported to stockholders. This is done by "creative accounting," that is, by choosing accounting methods that stabilize and increase reported earnings. Presumably firms

[34]By this we mean that the study looked at the change in the shareholders' wealth. A decline in the price of Chaste Manhattan stock from $210 to $70 at the time of the split would not affect shareholders' wealth.

[35]See P. Asquith, P. Healy, and K. Palepu, "Earnings and Stock Splits," *Accounting Review* 64 (July 1989), pp. 387–403.

go to this trouble because management believes that stockholders take the figures at face value.[36]

One way that companies can affect their reported earnings is through the way that they cost the goods taken out of inventory. Companies can choose between two methods. Under the FIFO (first-in, first-out) method, the firm deducts the cost of the first goods to have been placed in inventory. Under the LIFO (last-in, first-out) method companies deduct the cost of the latest goods to arrive in the warehouse. When inflation is high, the cost of the goods that were bought first is likely to be lower than the cost of those that were bought last. So earnings calculated under FIFO appear higher than those calculated under LIFO.

Now, if it were just a matter of presentation, there would be no harm in switching from LIFO to FIFO. But the IRS insists that the same method that is used to report to shareholders also be used to calculate the firm's taxes. So the lower immediate tax payments from using the LIFO method also bring lower apparent earnings.

If markets are efficient, investors should welcome a change to LIFO accounting, even though it reduces earnings. Biddle and Lindahl, who studied the matter, concluded that this is exactly what happens, so that the move to LIFO is associated with an abnormal rise in the stock price.[37] It seems that shareholders look behind the figures and focus on the amount of the tax savings.

Lesson 5: The Do-It-Yourself Alternative

In an efficient market investors will not pay others for what they can do equally well themselves. As we shall see, many of the controversies in corporate financing center on how well individuals can replicate corporate financial decisions. For example, companies often justify mergers on the grounds that they produce a more diversified and hence more stable firm. But if investors can hold the stocks of both companies why should they thank the companies for diversifying? It is much easier and cheaper for them to diversify than it is for the firm.

The financial manager needs to ask the same question when considering whether it is better to issue debt or common stock. If the firm issues debt, it will create financial leverage. As a result, the stock will be more risky and it will offer a higher expected return. But stockholders can obtain financial leverage without the firm's issuing debt; they can borrow on their own accounts. The problem for the financial manager is, therefore, to decide whether the company can issue debt more cheaply than the individual shareholder.

Lesson 6: Seen One Stock, Seen Them All

The elasticity of demand for any article measures the percentage change in the quantity demanded for each percentage addition to the price. If the article has close substitutes, the elasticity will be strongly negative; if not, it will be near zero. For example, coffee, which is a staple commodity, has a demand elasticity of about $-.2$. This means that a 5 percent increase in the price of coffee changes sales by $-.2 \times .05 = -.01$; in other words, it reduces demand by only 1 percent. Consumers are likely to regard

[36]For a discussion of the evidence that investors are not fooled by earnings manipulation, see R. Watts, "Does It Pay to Manipulate EPS?" in J. M. Stern and D. H. Chew, Jr. (eds.), *The Revolution in Corporate Finance*, Oxford, Basil Blackwell, 1986.

[37]G. C. Biddle and F. W. Lindahl, "Stock Price Reactions to LIFO Adoptions: The Association between Excess Returns and LIFO Tax Savings," *Journal of Accounting Research* 20 (Autumn 1982, Part 2), pp. 551–588.

different *brands* of coffee as much closer substitutes for each other. Therefore, the demand elasticity for a particular brand could be in the region of, say, −2.0. A 5 percent increase in the price of Maxwell House relative to that of Folgers would in this case reduce demand by 10 percent.

Investors don't buy a stock for its unique qualities; they buy it because it offers the prospect of a fair return for its risk. This means that stocks should be like *very* similar brands of coffee, almost perfect substitutes. Therefore, the demand for a company's stock should be highly elastic. If its prospective return is too low relative to its risk, *nobody* will want to hold that stock. If the reverse is true, *everybody* will scramble to buy.

Suppose that you want to sell a large block of stock. Since demand is elastic, you naturally conclude that you need only to cut the offering price very slightly to sell your stock. Unfortunately, that doesn't necessarily follow. When you come to sell your stock, other investors may suspect that you want to get rid of it because you know something they don't. Therefore, they will revise their assessment of the stock's value downward. Demand is still elastic, but the whole demand curve moves down. Elastic demand does not imply that stock prices never change when a large sale or purchase occurs; it *does* imply that you can sell large blocks of stock at close to the market price *as long as you can convince other investors that you have no private information.*

Here is one case that supports this view: In June 1977 the Bank of England offered its holding of BP shares for sale at 845 pence each. The bank owned nearly 67 million shares of BP, so the total value of the holding was £564 million, or about $970 million. It was a huge sum to ask the public to find.

Anyone who wished to apply for BP stock had nearly two weeks within which to do so. Just before the Bank's announcement the price of BP stock was 912 pence. Over the next two weeks the price drifted down to 898 pence, largely in line with the British equity market. Therefore, by the final application date, the discount being offered by the Bank was only 6 percent. In return for this discount, any applicant had to raise the necessary cash, taking the risk that the price of BP would decline before the result of the application was known, and had to pass over to the Bank of England the next dividend on BP.

If Maxwell House coffee is offered at a discount of 6 percent, the demand is unlikely to be overwhelming. But the discount on BP stock was enough to bring in applications for $4.6 billion worth of stock, 4.7 times the amount on offer.

We admit that this case was unusual in some respects, but an important study by Myron Scholes of a large sample of secondary offerings confirmed the ability of the market to absorb blocks of stock. The average effect of the offerings was a slight reduction in the stock price, but the decline was almost independent of the amount offered. Scholes's estimate of the demand elasticity for a company's stock was −3,000. Of course, this figure was not meant to be precise, and some researchers have argued that demand is not as elastic as Scholes's study suggests.[38] However, there seems to be widespread agreement with the general point that you can sell large quantities of stock at close to the market price as long as other investors do not deduce that you have some private information.

[38]For example, see W. H. Mikkelson and M. M. Partch, "Stock Price Effects and Costs of Secondary Distributions," *Journal of Financial Economics* 14 (June 1985), pp. 165–194. Scholes's study is M. S. Scholes, "The Market for Securities: Substitution versus Price Pressure and the Effects of Information on Share Prices," *Journal of Business* 45 (April 1972), pp. 179–211.

Here again we encounter an apparent contradiction with practice. Many corporations seem to believe not only that the demand elasticity is low but also that it varies with the stock price, so that when the price is relatively low, new stock can be sold only at a substantial discount. State and federal regulatory commissions, which set the prices charged by local telephone companies, electric companies, and other utilities, have sometimes allowed significantly higher earnings to compensate the firm for price "pressure." This pressure is the decline in the firm's stock price that is supposed to occur when new shares are offered to investors. Yet Paul Asquith and David Mullins, who searched for evidence of pressure, found that new stock issues by utilities drove down their stock prices on average by only .9 percent.[39] We will come back to the subject of pressure when we discuss stock issues in Chapter 15.

[39]See P. Asquith and D. W. Mullins, "Equity Issues and Offering Dilution," *Journal of Financial Economics* 15 (January–February 1986), pp. 61–89.

SUMMARY

The patron saint of the Bolsa (stock exchange) in Barcelona, Spain, is Nuestra Senora de la Esperanza—Our Lady of Hope. She is the perfect patroness, for we all hope for superior returns when we invest. But competition between investors will tend to produce an efficient market. In such a market, prices will rapidly impound any new information, and it will be difficult to make consistently superior returns. We may indeed hope, but all we can rationally *expect* in an efficient market is a return just sufficient to compensate us for the time value of money and for the risks we bear.

The efficient-market hypothesis comes in three different flavors. The weak form of the hypothesis states that prices efficiently reflect all the information in the past series of stock prices. In this case it is impossible to earn superior returns simply by looking for patterns in stock prices; in other words, price changes are random. The semistrong form of the hypothesis states that prices reflect all published information. That means it is impossible to make consistently superior returns just by reading the newspaper, looking at the company's annual accounts, and so on. The strong form of the hypothesis states that stock prices effectively impound all available information. It tells us that superior information is hard to find because in pursuing it you are in competition with thousands, perhaps millions, of active, intelligent, and greedy investors. The best you can do in this case is to assume that securities are fairly priced and to hope that one day Nuestra Senora will reward your humility.

While there remain plenty of unsolved puzzles, there seems to be widespread agreement that consistently superior returns are hard to attain. Thirty years ago any suggestion that security investment is a fair game was generally regarded as bizarre. Today it is not only widely discussed in business schools but also permeates investment practice and government policy toward the securities markets.

For the corporate treasurer who is concerned with issuing or purchasing securities, the efficient-market theory has obvious implications. In one sense, however, it raises more questions than it answers. The existence of efficient markets does not mean that the financial manager can let financing take care of itself. It provides only a starting point for analysis. It is time to get down to details about securities and issue procedures. We start in Chapter 14.

FURTHER READING

The classic review articles on market efficiency are:

E. F. Fama: "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance,* 25:383–417 (May 1970).

E. F. Fama: "Efficient Capital Markets: II," *Journal of Finance,* 46:1575–1617 (December 1991).

For evidence on possible exceptions to the efficient-market theory, we suggest:

G. Hawawini and D. B. Keim: "On the Predictability of Common Stock Returns: World-Wide Evidence," in R. A. Jarrow, V. Maksimovic, and W. T. Ziemba (eds.), *Finance,* North-Holland, Amsterdam, Netherlands, 1994.

Martin Gruber's Presidential Address to the American Finance Association is an interesting overview of the performance of mutual fund managers.

M. Gruber: "Another Puzzle: The Growth in Actively Managed Mutual Funds," *Journal of Finance,* 51:783–810 (July 1996).

Andre Shleifer's book and Robert Shiller's paper provide a good introduction to behavioral finance. A useful collection of papers on behavioral explanations for market anomalies is provided in Richard Thaler's book of readings, while Eugene Fama's paper offers a more skeptical view of these behavioral theories.

A. Shleifer: *Inefficient Markets: An Introduction to Behavioral Finance,* Oxford University Press, Oxford, 2000.

R. J. Shiller: "Human Behavior and the Efficiency of the Financial System," in J. B. Taylor and M. Woodford (eds.), *Handbook of Macroeconomics,* North-Holland, Amsterdam, 1999.

R. H. Thaler (ed.): *Advances in Behavioral Finance,* Russell Sage Foundation, New York, 1993.

E. F. Fama: "Market Efficiency, Long-Term Returns, and Behavioral Finance," *Journal of Financial Economics,* 49:283–306 (September 1998).

The following book contains an interesting collection of articles on the crash of 1987:

R. W. Kamphuis, Jr., et al. (eds.): *Black Monday and the Future of Financial Markets,* Dow-Jones Irwin, Inc., Homewood, IL, 1989.

QUIZ

1. Which (if any) of these statements are true? Stock prices appear to behave as though successive values **(a)** are random numbers, **(b)** follow regular cycles, **(c)** differ by a random number.
2. Supply the missing words:

   "There are three forms of the efficient-market hypothesis. Tests of randomness in stock returns provide evidence for the _____ form of the hypothesis. Tests of stock price reaction to well-publicized news provide evidence for the _____ form, and tests of the performance of professionally managed funds provide evidence for the _____ form. Market efficiency results from competition between investors. Many investors search for new information about the company's business that would help them to value the stock more accurately. Such research helps to ensure that prices reflect all available information; in other words, it helps to keep the market efficient in the _____ form. Other investors study past stock prices for recurrent patterns that would allow them to make superior profits. Such research helps to ensure that prices reflect all the information contained in past stock prices; in other words, it helps to keep the market efficient in the _____ form."
3. True or false? The efficient-market hypothesis assumes that
   a. There are no taxes.
   b. There is perfect foresight.
   c. Successive price changes are independent.
   d. Investors are irrational.

e. There are no transaction costs.
f. Forecasts are unbiased.

4. The stock of United Boot is priced at $400 and offers a dividend yield of 2 percent. The company has a 2-for-1 stock split.
   a. Other things equal, what would you expect to happen to the stock price?
   b. In practice would you expect the stock price to fall by more or less than this amount?
   c. Suppose that a few months later United Boot announces a rise in dividends that is exactly in line with that of other companies. Would you expect the announcement to lead to a slight abnormal rise in the stock price, a slight abnormal fall, or no change?
5. True or false?
   a. Financing decisions are less easily reversed than investment decisions.
   b. Financing decisions don't affect the total size of the cash flows; they just affect who receives the flows.
   c. Tests have shown that there is almost perfect negative correlation between successive price changes.
   d. The semistrong form of the efficient-market hypothesis states that prices reflect all publicly available information.
   e. In efficient markets the expected return on each stock is the same.
   f. Myron Scholes's study of the effect of secondary distributions provided evidence that the demand schedule for a single company's shares is highly elastic.
6. Analysis of 60 monthly rates of return on United Futon common stock indicates a beta of 1.45 and an alpha of −.2 percent per month. A month later, the market is up by 5 percent, and United Futon is up by 6 percent. What is Futon's abnormal rate of return?
7. True or false?
   a. Analysis by security analysts and investors helps keep markets efficient.
   b. Psychologists have found that, once people have suffered a loss, they are more relaxed about the possibility of incurring further losses.
   c. Psychologists have observed that people tend to regard recent events as representative of what might happen in the future.
   d. If the efficient-market hypothesis is correct, managers will not be able to increase stock prices by creative accounting that boosts reported earnings.
8. Geothermal Corporation has just received good news: its earnings increased by 20 percent from last year's value. Most investors are anticipating an increase of 25 percent. Will Geothermal's stock price increase or decrease when the announcement is made?
9. Here again are the six lessons of market efficiency. For each lesson give an example showing the lesson's relevance to financial managers.
   a. Markets have no memory.
   b. Trust market prices.
   c. Read the entrails.
   d. There are no financial illusions.
   e. The do-it-yourself alternative.
   f. Seen one stock, seen them all.

PRACTICE QUESTIONS

1. How would you respond to the following comments?
   a. "Efficient market, my eye! I know lots of investors who do crazy things."
   b. "Efficient market? Balderdash! I know at least a dozen people who have made a bundle in the stock market."
   c. "The trouble with the efficient-market theory is that it ignores investors' psychology."

d. "Despite all the limitations, the best guide to a company's value is its written-down book value. It is much more stable than market value, which depends on temporary fashions."

2. Respond to the following comments:
a. "The random-walk theory, with its implication that investing in stocks is like playing roulette, is a powerful indictment of our capital markets."
b. "If everyone believes you can make money by charting stock prices, then price changes won't be random."
c. "The random-walk theory implies that events are random, but many events are not random. If it rains today, there's a fair bet that it will rain again tomorrow."

3. Which of the following observations *appear* to indicate market inefficiency? Explain whether the observation appears to contradict the weak, semistrong, or strong form of the efficient-market hypothesis.
a. Tax-exempt municipal bonds offer lower pretax returns than taxable government bonds.
b. Managers make superior returns on their purchases of their company's stock.
c. There is a positive relationship between the return on the market in one quarter and the change in aggregate profits in the next quarter.
d. There is disputed evidence that stocks which have appreciated unusually in the recent past continue to do so in the future.
e. The stock of an acquired firm tends to appreciate in the period before the merger announcement.
f. Stocks of companies with unexpectedly high earnings *appear* to offer high returns for several months after the earnings announcement.
g. Very risky stocks on average give higher returns than safe stocks.

4. Look again at Figure 13.9.
a. Is the steady rise in the stock price before the split evidence of market inefficiency?
b. How do you think those stocks performed that did *not* increase their dividends by an above-average amount?

5. Stock splits are important because they convey information. Can you suggest some other financial decisions that do so?

6. Here are alphas and betas for Intel and Conagra for the 60 months ending October 2001. Alpha is expressed as a percent per month.

	Alpha	Beta
Intel	.77	1.61
Conagra	.17	.47

Explain how these estimates would be used to calculate an abnormal return.

7. It is sometimes suggested that stocks with low price–earnings ratios tend to be underpriced. Describe a possible test of this view. Be as precise as possible.

8. "If the efficient-market hypothesis is true, then it makes no difference what securities a company issues. All are fairly priced." Does this follow?

9. "If the efficient-market hypothesis is true, the pension fund manager might as well select a portfolio with a pin." Explain why this is not so.

10. The bottom graph in Figure 13.1 shows the actual performance of the Standard and Poor's 500 Index for a five-year period. Two financial managers, Alpha and Beta, are contemplating this chart. Each manager's company needs to issue new shares of common stock sometime in the next year.

Alpha: My company's going to issue right away. The stock market cycle has obviously topped out, and the next move is almost surely down. Better to issue now and get a decent price for the shares.

Beta: You're too nervous; we're waiting. It's true that the market's been going nowhere for the past year or so, but the figure clearly shows a basic upward trend. The market's on the way up to a new plateau.

What would you say to Alpha and Beta?

11. What does the efficient-market hypothesis have to say about these two statements?
a. "I notice that short-term interest rates are about 1 percent below long-term rates. We should borrow short-term."
b. "I notice that interest rates in Japan are lower than rates in the United States. We would do better to borrow Japanese yen rather than U.S. dollars."

12. We suggested that there are three possible interpretations of the small-firm effect: a required return for some unidentified risk factor, a coincidence, or market inefficiency. Write three brief memos, arguing each point of view.

13. "It may be true that in an efficient market there *should* be no patterns in stock prices, but, if everyone believes that they *do* exist, then this belief will be self-fulfilling." Discuss.

14. Column (a) in Table 13.1 shows the monthly return on the British FTSE 100 index from August 1999 through July 2001. Columns (b) and (c) show the returns on the stocks of two firms. Both announced dividend increases during this period—Executive Cheese

TABLE 13.1

See practice question 14. Rates of return in percent per month.

Month	(A) Market Return	(B) Executive Cheese Return	(C) Paddington Beer Return
1999:			
Aug.	.2	−1.9	−.5
Sept.	−3.5	−10.1	−6.1
Oct.	3.7	8.1	9.8
Nov.	5.5	7.5	16.5
Dec.	5.0	4.3	6.7
2000:			
Jan.	−9.5	−5.3	−11.1
Feb.	−.6	5.7	−7.3
Mar.	4.9	−9.7	4.5
Apr.	−3.3	−4.7	−14.8
May	.5	−10.0	−1.1
June	−.7	−2.7	−1.2
July	.8	.1	−2.6
Aug.	4.8	3.4	12.4
Sept.	−5.7	5.6	−7.9
Oct.	2.3	−2.2	11.5
Nov.	−4.6	−6.5	−14.4
Dec.	1.3	−.2	3.4
2001:			
Jan.	1.2	−3.7	4.1
Feb.	−6.0	−9.0	−14.1
Mar.	−4.8	7.3	−6.5
Apr.	5.9	4.7	12.6
May	−2.9	−7.1	−.7
June	−2.7	0.5	−14.5
July	−2.0	−0.5	−11.4

in September 2000 and Paddington Beer in January 2000. Calculate the average abnormal return of the two stocks during the month of the dividend announcement.

15. On May 15, 1997, the government of Kuwait offered to sell 170 million BP shares, worth about $2 billion. Goldman Sachs was contacted after the stock market closed in London and given one hour to decide whether to bid on the stock. They decided to offer 710.5 pence ($11.59) per share, and Kuwait accepted. Then Goldman Sachs went looking for buyers. They lined up 500 institutional and individual investors worldwide, and resold all the shares at 716 pence ($11.70). The resale was complete before the London Stock Exchange opened the next morning. Goldman Sachs made $15 million overnight.[40]

What does this deal say about market efficiency? Discuss.

CHALLENGE QUESTIONS

1. Bond dealers buy and sell bonds at very low spreads. In other words, they are willing to sell at a price only slightly higher than the price at which they buy. Used-car dealers buy and sell cars at very wide spreads. What has this got to do with the strong form of the efficient-market hypothesis?

2. "An analysis of the behavior of exchange rates and bond prices around the time of international assistance for countries in balance of payments difficulties suggests that on average prices decline sharply for a number of months before the announcement of the assistance and are largely stable after the announcement. This suggests that the assistance is effective but comes too late." Does this follow?

3. Use either the Market Insight database (**www.mhhe.com/edumarketinsight**) or (**www.finance.yahoo.com**) to download daily prices for 5 U.S. stocks for a recent 12-month period. For each stock construct a scatter diagram of successive returns as in Figure 13.2. Then calculate the correlation between the returns on successive days. Do you find any consistent patterns?

[40] "Goldman Sachs Earns a Quick $15 Million Sale of BP Shares," *The Wall Street Journal,* May 16, 1997, p. A4.