

CHAPTER 7

Stocks, Stock Valuation, and Stock Market Equilibrium

The opening chart in Chapter 6 showed General Electric's stock rising by almost eight-fold from 1994 to 2000 but then, from 2000 to 2003, experiencing a sickening fall, losing over half of its value. GE had recovered about half of this decline by 2008, but then it plummeted again and in early 2009 hit a 20-year low.

What led to those wild swings? In a nutshell, risk and expected cash flows. Until 2000, GE was regarded as a low-risk company capable of sustaining fast-growing cash flows. Investors' perceptions of low risk and high expected cash flow growth propelled it up, and investors' subsequent reduced expectations drove it down.

In this chapter we will see how stocks are valued in the marketplace. For the most part, professional security analysts do the work, using the techniques described in this chapter. "Sell side" analysts work for investment banks and brokerages. They write reports that are distributed to investors, generally through brokers. "Buy side" analysts work for mutual funds, hedge funds, pension funds, and other institutional investors. Those institutions obtain information from the buy-side analysts, but they also do their own research and ignore the buy side if they disagree.

The analysts on both sides generally focus on specific industries, and many of them were hired as analysts after working for a time in the industry they cover. Physics PhDs are often electronics analysts, biologists analyze biotech stocks, and so on. The analysts pore over financial statements, but they also go on the road and talk with company officials, companies' customers, and their suppliers. The point of all this work is to try to predict corporate earnings, dividends, and free cash flow—and thus stock prices.

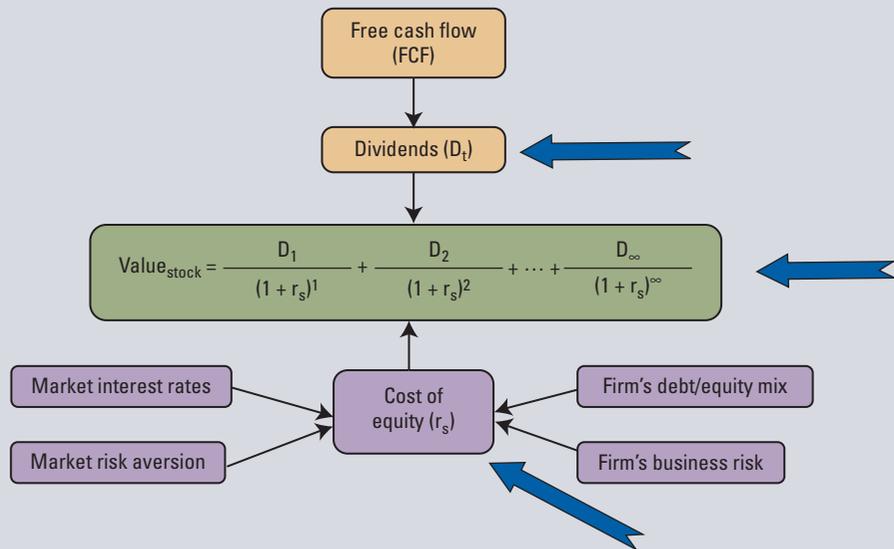
How good are analysts' predictions and hence their ability to forecast stock prices? A look back at the opening chart in Chapter 6 would suggest "not very good"—if they had seen the crash coming then they would have sold before the peaks and bought at the troughs, thus smoothing out the graphs. However, some analysts are better than others, and the material in this chapter can help you be better than average.

Corporate Valuation and Stock Prices

In Chapter 1, we told you that managers should strive to maximize intrinsic value and that the value of a firm is determined by the size, timing, and risk of its free cash flows (FCF). Recall that one use of FCF is to pay dividends. One way to estimate the intrinsic value of stock is to discount the cash flows to stockholders (dividends, D_t) at the

rate of return required by stockholders (r_s). The result is the intrinsic value to stockholders

You may say, “But what about capital gains? Don’t investors buy stocks expecting to realize capital gains?” The answer is “yes,” but we will see that the this equation actually incorporates capital gains.



resource

The textbook's Web site contains an Excel file that will guide you through the chapter's calculations. The file for this chapter is **Ch07 Tool Kit.xls**, and we encourage you to open the file and follow along as you read the chapter.

In Chapter 6 we examined stocks' risks and the factors that affect their required returns. In this chapter we use those findings to estimate the *intrinsic value* of a stock. The concepts and models developed here will also be used when we estimate the cost of capital in Chapter 9 a key concept used in many important decisions, especially decisions to invest or not invest in new assets.

Some companies are so small that their common stocks are not actively traded; they are owned by only a few people, usually the companies' managers. The stock in such firms is said to be closely held. In contrast, the stocks of most large companies are owned by many investors, most of whom are not active in management. These are publicly held stocks. Institutions such as pension plans, mutual funds, hedge funds, foreign investors, and insurance companies hold about half the market value of all stocks and buy and sell relatively actively. As a result, they account for about 75% of all transactions and thus have a heavy influence on the valuation of individual stocks. But before plunging into stock valuation, it is useful to begin with a closer look at what it means to be a stockholder.

7.1 LEGAL RIGHTS AND PRIVILEGES OF COMMON STOCKHOLDERS

The common stockholders are the *owners* of a corporation, and as such they have certain rights and privileges as discussed in this section.

Control of the Firm

A firm's common stockholders have the right to elect its directors, who, in turn, elect the officers who manage the business. In a small firm, the largest stockholder typically serves as president and chairperson of the board. In a large, publicly owned firm, the managers typically have some stock, but their personal holdings are generally insufficient to give them voting control. Thus, the managers of most publicly owned firms can be removed by the stockholders if the management team is not effective.

State and federal laws stipulate how stockholder control is to be exercised. First, corporations must hold periodic elections to select directors, usually once a year, with the vote taken at the annual meeting. Frequently, one-third of the directors are elected each year for a 3-year term. Each share of stock has one vote, so the owner of 1,000 shares has 1,000 votes for each director.¹ Stockholders can appear at the annual meeting and vote in person, but typically they transfer their right to vote to another party by means of a **proxy**. Management always solicits stockholders' proxies and usually gets them. However, if earnings are poor and stockholders are dissatisfied, an outside group may solicit the proxies in an effort to overthrow management and take control of the business. This is known as a **proxy fight**. Proxy fights are discussed in detail in Chapter 13.

The Preemptive Right

Common stockholders often have the right, called the **preemptive right**, to purchase any additional shares sold by the firm. In some states, the preemptive right is automatically included in every corporate charter; in others, it is used only if it is specifically inserted into the charter.

The preemptive right enables current stockholders to maintain control, and it also prevents a transfer of wealth from current stockholders to new stockholders. If it were not for this safeguard, the management of a corporation could issue additional shares at a low price and purchase these shares itself. Management could thereby seize control of the corporation and steal value from the current stockholders. For example, suppose 1,000 shares of common stock, each with a price of \$100, were outstanding, making the total market value of the firm \$100,000. If an additional 1,000 shares were sold at \$50 a share, or for \$50,000, this would raise the total market value to \$150,000. When total market value is divided by new total shares outstanding, a value of \$75 a share is obtained. The old stockholders thus lose \$25 per share, and the new stockholders have an instant profit of \$25 per share. Thus, selling common stock at a price below the market value would dilute its price and transfer wealth from the present stockholders to those who were allowed to purchase the new shares. The preemptive right prevents such occurrences.

Self-Test

What is a proxy fight?

What are the two primary reasons for using preemptive rights?

7.2 TYPES OF COMMON STOCK

Although most firms have only one type of common stock, in some instances **classified stock** is used to meet a company's special needs. Generally, when special

¹In the situation described, a 1,000-share stockholder could cast 1,000 votes for each of three directors if there were three contested seats on the board. An alternative procedure that may be prescribed in the corporate charter calls for *cumulative voting*. Here the 1,000-share stockholder would get 3,000 votes if there were three vacancies, and he or she could cast all of them for one director. Cumulative voting helps minority stockholders (i.e., those who do not own a majority of the shares) get representation on the board.



Note that <http://finance.yahoo.com> provides an easy way to find stocks meeting specified criteria. Under the Investing tab, select Stocks and then Stock Screener. To find the largest companies in terms of market value, for example, choose More Preset Screens, then select Largest Market Cap. You can also create custom screens to find stocks meeting other criteria.

classifications are used, one type is designated *Class A*, another *Class B*, and so on. Small, new companies seeking funds from outside sources frequently use different types of common stock. For example, when Genetic Concepts went public, its Class A stock was sold to the public and paid a dividend, but this stock had no voting rights for 5 years. Its Class B stock, which was retained by the firm's organizers, had full voting rights for 5 years, but the legal terms stated that dividends could not be paid on the Class B stock until the company had established its earning power and built up retained earnings to a designated level. The use of classified stock thus enabled the public to take a position in a conservatively financed growth company without sacrificing income, while the founders retained absolute control during the crucial early stages of the firm's development. At the same time, outside investors were protected against excessive withdrawals of funds by the original owners. As is often the case in such situations, the Class B stock was called **founders' shares**.²

As these examples illustrate, the right to vote is often a distinguishing characteristic between different classes of stock. Suppose two classes of stock differ in only one respect: One class has voting rights but the other does not. As you would expect, the stock with voting rights would be more valuable. In the United States, which has a legal system with fairly strong protection for minority stockholders (that is, noncontrolling stockholders), voting stock typically sells at a price 4% to 6% above that of otherwise similar nonvoting stock. Thus, if a stock with no voting rights sold for \$50, then one with voting rights would probably sell for \$52 to \$53. In countries with legal systems that provide less protection for minority stockholders, the right to vote is far more valuable. For example, voting stock on average sells for 45% more than nonvoting stock in Israel and for 82% more in Italy.

Some companies have multiple lines of business, with each line having very different growth prospects. Because cash flows for all business lines are mingled on financial statements, some companies worry that investors are not able to value the high-growth business lines correctly. To separate the cash flows and to allow separate valuations, occasionally a company will have classes of stock with dividends tied to a particular part of a company. This is called **tracking stock**, or **target stock**. For example, in 2002 Loews Corporation, a holding company with property and casualty insurance, oil and gas drilling, and tobacco subsidiaries, issued Carolina Group tracking stock tied to the performance of its Lorillard tobacco subsidiary.

However, many analysts are skeptical as to whether tracking stock increases a company's total market value. Companies still report consolidated financial statements for the entire company and have considerable leeway in allocating costs, deploying capital, and reporting the financial results for the various divisions, even those with tracking stock. Thus, a tracking stock is far from identical to the stock of an independent, stand-alone company.

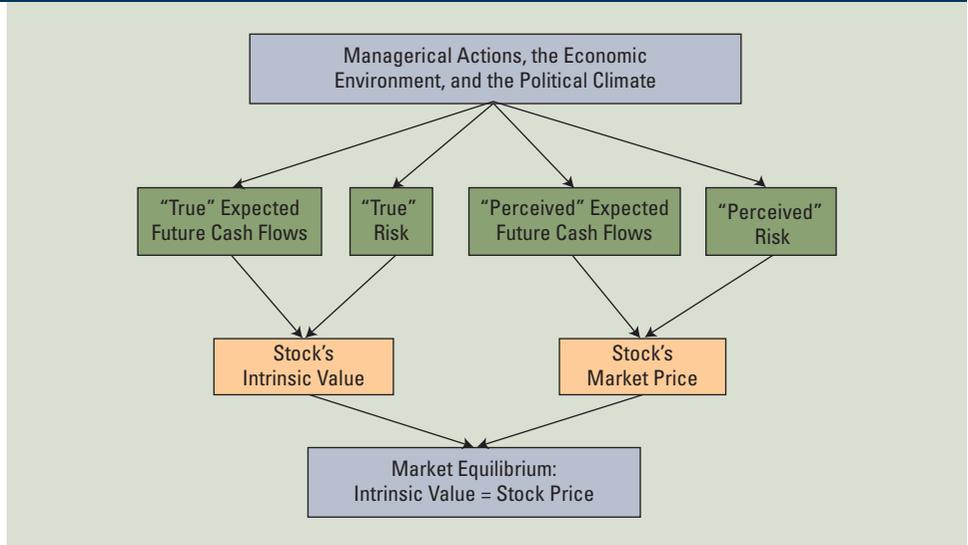
Self-Test

What are some reasons why a company might use classified stock?

7.3 THE MARKET STOCK PRICE VERSUS INTRINSIC VALUE

We saw in Chapter 1 that managers should seek to maximize the value of their firms' stocks. In that chapter, we also emphasized the difference between stock price and intrinsic value. The stock price is simply the current market price, and it is easily observed for publicly traded companies. By contrast, intrinsic value, which represents

²Note that "Class A," "Class B," and so on have no standard meanings. Most firms have no classified shares, but a firm that does could designate its Class B shares as founders' shares and its Class A shares as those sold to the public and another firm might reverse these designations.

FIGURE 7-1 Determinants of Intrinsic Values and Stock Prices

the “true” value of the company’s stock, cannot be directly observed and must instead be estimated. Figure 7-1 illustrates the connection between stock price and intrinsic value.

As the figure suggests, market equilibrium occurs when the stock’s price equals its intrinsic value. If the stock market is reasonably efficient, then gaps between the stock price and intrinsic value should not be very large and they should not persist for very long. However, there are cases when an individual stock price may be much higher or lower than its intrinsic value, and such divergence may persist for quite a while. During several years leading up to the crash of 2008–2009, most of the large investment banks were reporting record profits and selling at record prices. However, much of those earnings were illusory in that they did not reflect the huge risks that existed in the sub-prime mortgages they were buying. So, with hindsight, we now know that the market prices of most financial firms’ stocks exceeded their intrinsic values just prior to 2008. Then, when the market realized what was happening, those stock prices crashed. Citigroup, Merrill Lynch, and others lost over 80% of their value in a few short months, and others suffered even worse declines. It clearly pays to question market prices at times!

Why Do Investors and Companies Care about Intrinsic Value?

The remainder of this chapter focuses primarily on different approaches for estimating a stock’s intrinsic value. Before describing these approaches, it is worth asking why it is important for investors and companies to understand how to estimate intrinsic values.

When investing in common stocks, the goal is to purchase stocks that are undervalued (i.e., the price is below the stock’s intrinsic value) and avoid stocks that are overvalued. Consequently, Wall Street analysts, institutional investors who control mutual funds and pension funds, and even many individual investors are quite interested in finding reliable models that help predict intrinsic value. Investors obviously care about intrinsic value, but managers also must understand how intrinsic value is

estimated. First, managers need to know how alternative actions are likely to affect stock prices, and the models of intrinsic value that we cover help demonstrate the connection between managerial decisions and firm value. Second, managers should consider whether their stock is significantly undervalued or overvalued before making certain decisions. For example, firms should consider carefully the decision to issue new shares if they believe their stock is undervalued, and an estimate of their stock's intrinsic value is the key to such decisions.

Two basic models are used to estimate intrinsic values: the *discounted dividend model* and the *corporate valuation model*. The dividend model focuses on dividends, while the corporate model drills down below dividends and focuses on sales, costs, and free cash flows. We cover the discounted dividend model in this chapter and the corporate valuation model in Chapter 13.

Self-Test

What's the difference between a stock's price and its intrinsic value?
Why do investors and managers need to understand how a firm's intrinsic value is estimated?

7.4 STOCK MARKET REPORTING

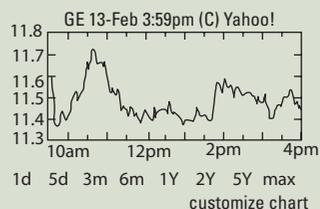
Fifty years ago, investors who wanted real-time information would sit in brokerage firms' offices watching a "ticker tape" go by that displayed prices of stocks as they were traded. Those who did not need current information could find the previous day's prices from the business section of a daily newspaper like *The Wall Street Journal*. Today, though, one can get quotes throughout the day from many different Internet sources, including Yahoo!.³ Figure 7-2 shows the quote for General Electric, which is traded on the NYSE under the symbol GE, on February 13, 2009. GE ended the regular trading day (4 p.m. EST) at \$11.44, down \$0.24, which was a 2.05% decline from the previous day. However, the stock rose by 9 cents in after-hours trading. The data also show that GE opened the day at \$11.55 and traded in a range from \$11.35 to \$11.74. If this quote had been obtained during

FIGURE 7-2 Stock Quote and Other Key Data for GE, February 13, 2009

GEN ELECTRIC CO (NYSE: GE)

After Hours: 11.53 ↑ 0.09 (0.79%) 7:59PM ET

Last Trade:	11.44	Day's Range:	11.35 - 11.74
Trade Time:	Feb 13	52wk Range:	10.66 - 38.52
Change:	↓ 0.24 (2.05%)	Volume:	86,594,997
Prev Close:	11.68	Avg Vol (3m):	119,828,000
Open:	11.55	Market Cap:	119.67B
Bid:	N/A	P/E (ttm):	6.66 x
Ask:	N/A	EPS (ttm):	1.72
1y Target Est:	14.81	Div & Yield:	1.24 (10.80%)



- ➕ Add GE to Your Portfolio
- 🔔 Set Alert for GE
- ⬇️ Download Data
- 📄 Download Annual Report
- ➕ Add Quotes to your Web Site

Source: <http://finance.yahoo.com/>.

³Most free sources actually provide quotes that are delayed by 20 minutes, but if you subscribe to a paid site like the *Online Wall Street Journal*, or if you have a brokerage account, you can generally get online real time quotes.

trading hours, it would also have provided information about the quotes at which the stock could be bought (the Ask quote) or sold (the Bid quote). During the past year, the price hit a high of \$38.52 and a low of \$10.66. A total of 86.59 million GE shares traded that day, which was a little below the average trading volume of 119.8 million shares.

The screen with the stock quote information also gives the total market value of GE's common stock (the Market Cap); the dividend and dividend yield; the most recent "ttm," or "trailing twelve months," EPS and P/E ratios; and a graph showing the stock's performance during the day. (However, the graph can be changed to show the stock's performance over a number of time periods up to and including 5 years.) In addition to this information, the Web page has links to financial statements, research reports, historical ratios, analysts' forecasts of EPS and EPS growth rates, and a wealth of other data.

Self-Test

What information is provided on the Internet in addition to the stock's latest price?

7.5 VALUING COMMON STOCKS

Common stocks are expected to provide a stream of future cash flows, and a stock's value is found the same way as the values of other financial assets—namely, as the present value of its expected future cash flow stream. The expected cash flows consist of two elements: (1) the dividends expected in each year and (2) the price investors expect to receive when they sell the stock. The expected final stock price includes the return of the original investment plus an expected capital gain.

Definitions of Terms Used in Stock Valuation Models

We saw in Chapter 1 that a manager should seek to maximize the intrinsic value of the firm's stock. To do this, a manager needs to know how her actions are likely to affect the stock's price. Therefore, we develop some models in this section to show how the value of a share of stock is determined, and we begin by defining some key terms as follows.

D_t = Dividend the stockholder *expects* to receive at the end of Year t . D_0 is the most recent dividend, which has already been paid; D_1 is the first dividend expected, which will be paid at the end of this year; D_2 is the dividend expected at the end of Year 2; and so forth. D_1 represents the first cash flow that a new purchaser of the stock will receive, because D_0 has just been paid. D_0 is known with certainty, but all future dividends are expected values, so the estimate of D_t may differ among investors.⁴

P_0 = Actual **market price** of the stock today.

⁴Stocks generally pay dividends quarterly, so theoretically we should evaluate them on a quarterly basis. However, in stock valuation, most analysts work on an annual basis because the data generally are not precise enough to warrant refinement to a quarterly model. For additional information on the quarterly model, see Charles M. Linke and J. Kenton Zumwalt, "Estimation Biases in Discounted Cash Flow Analysis of Equity Capital Cost in Rate Regulation," *Financial Management*, Autumn 1984, pp. 15–21. Also see Robert Brooks and Billy Helms, "An N-Stage, Fractional Period, Quarterly Dividend Discount Model," *Financial Review*, November 1990, pp. 651–657.

\hat{P}_t = Expected price of the stock at the end of each Year t (pronounced “P hat t ”). \hat{P}_0 is the **intrinsic, or fundamental, value** of the stock today as seen by the particular investor doing the analysis; \hat{P}_1 is the price expected at the end of one year; and so on. Note that \hat{P}_0 is the intrinsic value of the stock today based on a particular investor’s estimate of the stock’s expected dividend stream and the risk of that stream. Hence, whereas the market price P_0 is fixed and is identical for all investors, \hat{P}_0 could differ among investors depending on how optimistic they are regarding the company. The caret, or “hat,” is used to indicate that \hat{P}_t is an estimated future value. \hat{P}_0 , the individual investor’s estimate of the intrinsic value today, could be above or below P_0 , the current stock price, but an investor would buy the stock only if his estimate of \hat{P}_0 were equal to or greater than P_0 .

Since there are many investors in the market, there can be many values for \hat{P}_0 . However, we can think of a group of “average,” or “marginal,” investors whose actions actually determine the market price. For these marginal investors, P_0 must equal \hat{P}_0 ; otherwise, a disequilibrium would exist, and buying and selling in the market would cause P_0 to change until $P_0 = \hat{P}_0$ as seen by the marginal investor.

D_1/P_0 = Expected **dividend yield** during the coming year. If the stock is expected to pay a dividend of $D_1 = \$1$ during the next 12 months and if its current price is $P_0 = \$10$, then the expected dividend yield is $\$1/\$10 = 0.10 = 10\%$.

$\frac{\hat{P}_1 - P_0}{P_0}$ = Expected **capital gains yield** during the coming year. If the stock sells for $\$10$ today and if it is expected to rise to $\$10.50$ at the end of one year, then the expected capital gain is $\hat{P}_1 - P_0 = \$10.50 - \$10.00 = \$0.50$, and the expected capital gains yield is $\$0.50/\$10 = 0.05 = 5\%$.

g = Expected **growth rate** in dividends as predicted by a marginal investor. If dividends are expected to grow at a constant rate, then g is also the expected rate of growth in earnings and the stock’s price. Different investors may use different values of g to evaluate a firm’s stock, but the market price, P_0 , is set on the basis of g as estimated by the marginal investor.

r_s = Minimum acceptable return, or **required rate of return**, on the stock, considering both its risk and the returns available on other investments. Again, this term generally relates to the marginal investor. The primary determinants of r_s include the real rate of return, expected inflation, and risk.

\hat{r}_s = **Expected rate of return** that an investor who buys the stock expects to receive in the future. \hat{r}_s (pronounced “r hat s”) could be above or below r_s , but one would buy the stock only if $\hat{r}_s \geq r_s$. Note that the expected return (\hat{r}_s) is equal to the expected dividend yield (D_1/P_0) plus the expected capital gains yield ($[(\hat{P}_1 - P_0)/P_0]$). In our example, $\hat{r}_s = 10\% + 5\% = 15\%$.

\bar{r}_s = **Actual, or realized, after-the-fact rate of return**, pronounced “r bar s.” You may *expect* to obtain a return of $\hat{r}_s = 15\%$ if you buy ExxonMobil today, but if the market declines then you may end up next year with an actual realized return that is much lower and perhaps even negative.

Expected Dividends as the Basis for Stock Values

Like all financial assets, the value of a stock is estimated by finding the present value of a stream of expected future cash flows. What are the cash flows that corporations are expected to provide to their stockholders? First, think of yourself as an investor who buys a stock with the intention of holding it (in your family) forever. In this case, all that you (and your heirs) will receive is a stream of dividends, and the value of the stock today is calculated as the present value of an infinite stream of dividends:

$$\begin{aligned}
 \text{Value of stock} &= \hat{P}_0 = \text{PV of expected future dividends} \\
 &= \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_\infty}{(1+r_s)^\infty} \\
 &= \sum_{t=1}^{\infty} \frac{D_t}{(1+r_s)^t}
 \end{aligned}
 \tag{7-1}$$

What about the more typical case, where you expect to hold the stock for a finite period and then sell it—what is the value of \hat{P}_0 in this case? Unless the company is likely to be liquidated or sold and thus to disappear, *the value of the stock is again determined by Equation 7-1*. To see this, recognize that for any individual investor, the expected cash flows consist of expected dividends plus the expected sale price of the stock. However, the sale price a current investor receives will depend on the dividends some future investor expects. Therefore, for all present and future investors in total, expected cash flows must be based on expected future dividends. Put another way, unless a firm is liquidated or sold to another concern, the cash flows it provides to its stockholders will consist only of a stream of dividends. Therefore, the value of a share of its stock must be the present value of that expected dividend stream.

The general validity of Equation 7-1 can also be confirmed by solving the following problem. Suppose I buy a stock and expect to hold it for 1 year. I will receive dividends during the year plus the value \hat{P}_1 when I sell at the end of the year. But what will determine the value of \hat{P}_1 ? The answer is that it will be determined as the present value of the dividends expected during Year 2 plus the stock price at the end of that year, which, in turn, will be determined as the present value of another set of future dividends and an even more distant stock price. This process can be continued ad infinitum, and the ultimate result is Equation 7-1.⁵

Self-Test

What are the two components of most stocks' expected total return?

How does one calculate the capital gains yield and the dividend yield of a stock?

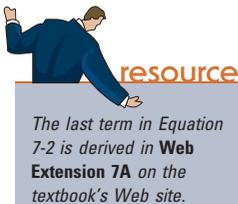
If $D_1 = \$3.00$, $P_0 = \$50$, and $\hat{P}_1 = \$52$, what are the stock's expected dividend yield, expected capital gains yield, and expected total return for the coming year?
(6%, 4%, 10%)

⁵It is ironic that investors periodically lose sight of the long-run nature of stocks as investments and forget that, in order to sell a stock at a profit, one must find a buyer who will pay the higher price. If you analyze a stock's value in accordance with Equation 7-1, conclude that the stock's market price exceeds a reasonable value, and then buy the stock anyway, then you would be following the "bigger fool" theory of investment—you think that you may be a fool to buy the stock at its excessive price, but you think that when you get ready to sell it, you can find someone who is an even bigger fool. The bigger fool theory was widely followed in the spring of 2000, just before the Nasdaq market lost more than one-third of its value.

7.6 VALUING A CONSTANT GROWTH STOCK

Equation 7-1 is a generalized stock valuation model in that the time pattern of D_t can be anything: D_t can be rising, falling, fluctuating randomly, or even zero for several years, yet Equation 7-1 will still hold. With a computer spreadsheet we can easily use this equation to find a stock's intrinsic value for any pattern of dividends.⁶ In practice, the hard part is getting an accurate forecast of the future dividends. However, in many cases the stream of dividends is expected to grow at a constant rate, and if so then Equation 7-1 can be rewritten as follows:

$$\begin{aligned}\hat{P}_0 &= \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \dots + \frac{D_0(1+g)^\infty}{(1+r_s)^\infty} \\ &= D_0 \sum_{t=1}^{\infty} \frac{(1+g)^t}{(1+r_s)^t} \\ &= \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}\end{aligned}\tag{7-2}$$



The last term of Equation 7-2 is called the **constant growth model**, or the **Gordon model**, after Myron J. Gordon, who did much to develop and popularize it.

A necessary condition for the validity of Equation 7-2 is that r_s be greater than g . Look back at the second form of Equation 7-2. If g is larger than r_s , then $(1+g)^t/(1+r_s)^t$ must always be greater than 1. In this case, the second line of Equation 7-2 is the sum of an infinite number of terms, with each term being larger than 1. Therefore, if r_s were constant and greater than g , the resulting stock price would be infinite! Since no company is worth an infinite amount, it is impossible to have a constant growth rate that is greater than r_s forever. Similarly, a student will occasionally plug a value for g that is greater than r_s into the last form of Equation 7-2 and report a negative stock price. This is nonsensical. The last form of Equation 7-2 is valid only when g is less than r_s . *If g is greater than r_s then the constant growth model cannot be used, and the answer you would get from using Equation 7-2 would be wrong and misleading.*

Illustration of a Constant Growth Stock

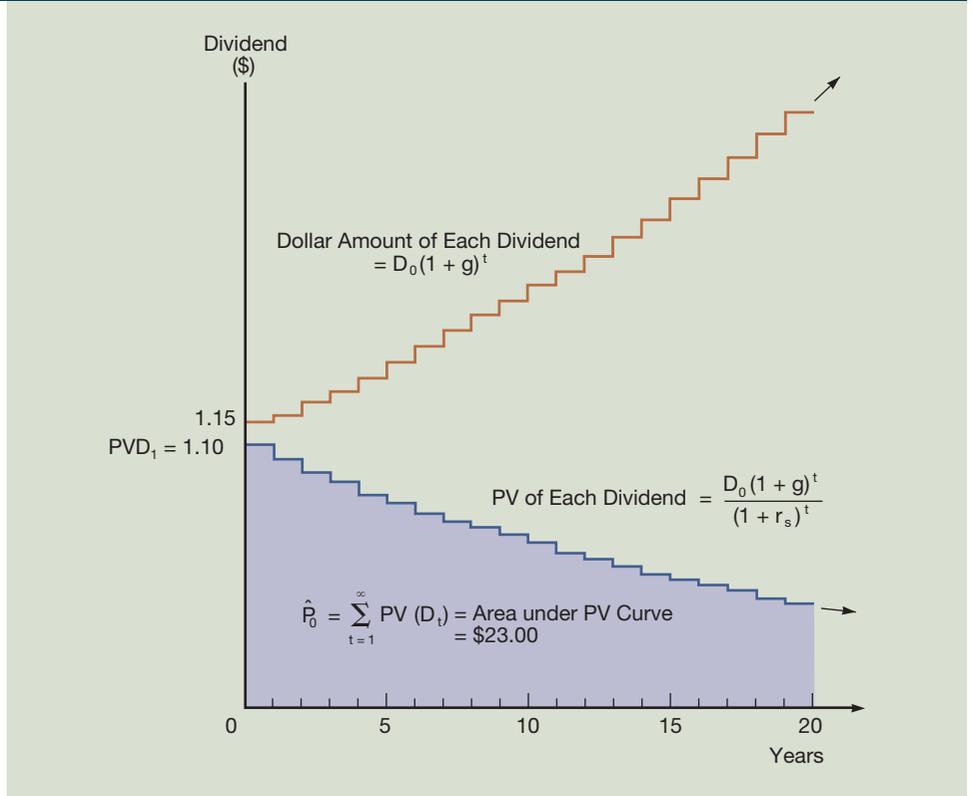
Assume that MicroDrive just paid a dividend of \$1.15 (that is, $D_0 = \$1.15$). Its stock has a required rate of return, r_s , of 13.4%, and investors expect the dividend to grow at a constant 8% rate in the future. The estimated dividend 1 year hence would be $D_1 = \$1.15(1.08) = \1.24 ; D_2 would be \$1.34; and the estimated dividend 5 years hence would be \$1.69:

$$D_t = D_0(1+g)^t = \$1.15(1.08)^5 = \$1.69$$

We could use this procedure to estimate each future dividend and then use Equation 7-1 to determine the current stock value, \hat{P}_0 . In other words, we could find each expected future dividend, calculate its present value, and then sum all the present values to find the intrinsic value of the stock.

Such a process would be time-consuming, but we can take a shortcut—just insert the illustrative data into Equation 7-2 to find the stock's intrinsic value, \$23:

⁶Actually, we can only find an approximate price. However, if we project dividends for 100 or so years, the present value of that finite dividend stream is approximately equal to the present value of the infinite dividend stream.

FIGURE 7-3 Present Value of Dividends of a Constant Growth Stock Where $D_0 = \$1.15$, $g = 8\%$, and $r_s = 13.4\%$


$$\hat{P}_0 = \frac{\$1.15(1.08)}{0.134 - 0.08} = \frac{\$1.242}{0.054} = \$23.00$$

The concept underlying the valuation process for a constant growth stock is graphed in Figure 7-3. Dividends are growing at the rate $g = 8\%$, but because $r_s > g$, the present value of each future dividend is declining. For example, the dividend in Year 1 is $D_1 = D_0(1 + g)^1 = \$1.15(1.08) = \1.242 . However, the present value of this dividend, discounted at 13.4%, is $PV(D_1) = \$1.242/(1.134)^1 = \1.095 . The dividend expected in Year 2 grows to $\$1.242(1.08) = \1.341 , but the present value of this dividend falls to $\$1.043$. Continuing, $D_3 = \$1.449$ and $PV(D_3) = \$0.993$, and so on. Thus, the expected dividends are growing, but the present value of each successive dividend is declining, because the dividend growth rate (8%) is less than the rate used for discounting the dividends to the present (13.4%).

If we summed the present values of each future dividend, this summation would be the value of the stock, \hat{P}_0 . When g is a constant, this summation is equal to $D_1/(r_s - g)$, as shown in Equation 7-2. Therefore, if we extended the lower step-function curve in Figure 7-3 on out to infinity and added up the present values of each future dividend, the summation would be identical to the value given by Equation 7-2, $\$23.00$.

Although Equation 7-2 assumes there are *infinite* time periods, most of the value is based on dividends during a *finite* time period. In our example, 70% of the value is attributed to the first 25 years, 91% to the first 50 years, and 99.4% to the first 100 years. This means that companies don't have to survive forever to justify using the Gordon growth model.

Dividend and Earnings Growth

Because a stock price depends on *all future dividends*, not just next year's dividend, increasing next year's dividend will not have much impact on stock price unless investors expect the dividend increase to be sustainable. Dividends are paid with cash, which means sustainable dividend growth must come from sustainable cash flow growth. The cash flow that is available for distribution to shareholders depends on profitability, investments in operating capital, and the level of debt. Dividends, profitability, capital investments, and capital structure are all interrelated, especially in the long term. A dollar used to pay dividends can't be used for reinvestment in the firm or to pay down debt, so everything else equal, higher dividends must be associated with lower growth or a higher debt level. Growth in dividends can be supported by increasing debt, but to avoid unacceptably high levels of debt, long-term dividend growth must be limited to long-term earnings growth.

Earnings per share (EPS) growth depends on economy-wide factors (such as recessions and inflation), industry-wide factors (such as technological innovations), and firm-specific factors (management skill, brand identity, patent protection, etc.). For a firm to grow faster than the economy, either the industry must become a bigger part of the economy or the firm must take market share from its competitors. In the long run, competition and market saturation will tend to limit EPS growth to the sum of population growth and inflation. And as we just explained, the long-term dividend growth rate cannot exceed the long-term EPS growth rate.

Do Stock Prices Reflect Long-Term or Short-Term Events?

Managers often complain that the stock market is shortsighted and that investors care only about conditions over the next few years. Let's use the constant growth model to test this assertion. MicroDrive's most recent dividend was \$1.15, and it is expected to grow at a rate of 8% per year. Since we know the growth rate, we can forecast the dividends for each of the next 5 years and then find their present values:

$$\begin{aligned}
 PV &= \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \frac{D_0(1+g)^3}{(1+r_s)^3} + \frac{D_0(1+g)^4}{(1+r_s)^4} + \frac{D_0(1+g)^5}{(1+r_s)^5} \\
 &= \frac{\$1.15(1.08)^1}{(1.134)^1} + \frac{\$1.15(1.08)^2}{(1.134)^2} + \frac{\$1.15(1.08)^3}{(1.134)^3} + \frac{\$1.15(1.08)^4}{(1.134)^4} + \frac{\$1.15(1.08)^5}{(1.134)^5} \\
 &= \frac{\$1.242}{(1.134)^1} + \frac{\$1.341}{(1.134)^2} + \frac{\$1.449}{(1.134)^3} + \frac{\$1.565}{(1.134)^4} + \frac{\$1.690}{(1.134)^5} \\
 &= 1.095 + 1.043 + 0.993 + 0.946 + 0.901 \\
 &\approx \$5.00
 \end{aligned}$$

Recall that MicroDrive's stock price is \$23.00. Therefore, only \$5.00, or $\$5/\$23 = 0.22 = 22\%$, of the \$23.00 stock price is attributable to short-term cash flows. This means that MicroDrive's managers will affect the stock price more by working to increase long-term cash flows than by focusing on short-term flows. This situation holds for most companies. Indeed, a number of professors and consulting firms have used actual company data to show that more than 80% of a typical company's stock price is due to cash flows expected farther than 5 years in the future.

This brings up an interesting question. If most of a stock's value is due to long-term cash flows, then why do managers and analysts pay so much attention to quarterly earnings? Part of the answer lies in the information conveyed by short-term earnings.

For example, when actual quarterly earnings are lower than expected not because of fundamental problems but only because a company has increased its research and development (R&D) expenditures, studies have shown that the stock price probably won't decline and may actually increase. This makes sense, because R&D should increase future cash flows. On the other hand, if quarterly earnings are lower than expected because customers don't like the company's new products, then this new information will have negative implications for future values of g , the long-term growth rate. As we show later in this chapter, even small changes in g can lead to large changes in stock prices. Therefore, quarterly earnings themselves might not be that important, but the information they convey about future prospects can be extremely important.

Another reason many managers focus on short-term earnings is that some firms pay managerial bonuses on the basis of current earnings rather than stock prices (which reflect future earnings). For these managers, the concern with quarterly earnings is not due to their effect on stock prices—it's due to their effect on bonuses.⁷

When Can the Constant Growth Model Be Used?

The constant growth model is most appropriate for mature companies with a stable history of growth. Expected growth rates vary somewhat among companies, but dividend growth for most mature firms is generally expected to continue in the future at about the same rate as nominal gross domestic product (real GDP plus inflation). On this basis, one might expect the dividends of an average, or "normal," company to grow at a rate of 5% to 8% a year. Note, though, that the 2008–2009 recession has caused many analysts to lower their expectations for long-run growth, and those lower expectations contributed mightily to the stock market crash.

Note too that Equation 7-2 is sufficiently general to handle the case of a **zero growth stock**, where the dividend is expected to remain constant over time. If $g = 0$, then Equation 7-2 reduces to Equation 7-3:

$$\hat{P}_0 = \frac{D}{r_s} \quad (7-3)$$

This is essentially the equation for a perpetuity, and it is simply the dividend divided by the discount rate.

Self-Test

Write out and explain the valuation formula for a constant growth stock. Are stock prices affected more by long-term or short-term performance? Explain. A stock is expected to pay a dividend of \$2 at the end of the year. The required rate of return is $r_s = 12\%$. What would the stock's price be if the constant growth rate in dividends were 4%? (**\$25.00**) What would the price be if $g = 0\%$? (**\$16.67**)

7.7 EXPECTED RATE OF RETURN ON A CONSTANT GROWTH STOCK

When using Equation 7-2, we first estimated D_0 and r_s , the *required* rate of return on the stock; then we solved for the stock's intrinsic value, which we compared to its actual market price. We can also reverse the process, observing the actual stock price,

⁷Many apparent puzzles in finance can be explained either by managerial compensation systems or by peculiar features of the Tax Code. So, if you can't explain a firm's behavior in terms of economic logic, look to compensation procedures or taxes as possible explanations.

substituting it into Equation 7-2, and solving for the rate of return. In doing so, we are finding the *expected* rate of return, which will also equal the *required* rate of return, $\hat{r}_s = r_s$, if the market is in equilibrium:⁸

$$\begin{aligned}\hat{r}_s &= \text{Expected rate of return} = \text{Expected dividend yield} + \text{Expected capital gains yield} \\ &= \text{Expected dividend yield} + \text{Expected growth rate} \\ &= \frac{D_1}{P_0} + g\end{aligned}\quad (7-4)$$

Thus, if you buy a stock for a price $P_0 = \$23$, and if you expect the stock to pay a dividend $D_1 = \$1.242$ one year from now and to grow at a constant rate $g = 8\%$ in the future, then your expected rate of return will be 13.4%:

$$\hat{r}_s = \frac{\$1.242}{\$23} + 8\% = 5.4\% + 8\% = 13.4\%$$

In this form, we see that \hat{r}_s is the *expected total return* and that it consists of an *expected dividend yield*, $D_1/P_0 = 5.4\%$, plus an *expected growth rate* (which is also the *expected capital gains yield*) of $g = 8\%$.

Suppose that the current price, P_0 , is equal to \$23 and that the Year-1 expected dividend, D_1 , is equal to \$1.242. What is the expected price at the end of the first year, immediately after D_1 has been paid? First, we can estimate the expected Year-2 dividend as $D_2 = D_1(1 + g) = \$1.242(1.08) = \1.3414 . Then we can apply a version of Equation 7-2 that is shifted ahead by 1 year, using D_2 instead of D_1 and solving for \hat{P}_1 instead of \hat{P}_0 :

$$\hat{P}_1 = \frac{D_2}{r_s - g} = \frac{\$1.3414}{0.134 - 0.08} = \$24.84$$

Even easier, notice that \hat{P}_1 must be 8% larger than \$23, the price found 1 year earlier for P_0 :

$$\$23(1.08) = \$24.84$$

Either way, we expect a capital gain of $\$24.84 - \$23.00 = \$1.84$ during the year, which is a capital gains yield of 8%:

$$\text{Capital gains yield} = \frac{\text{Capital gain}}{\text{Beginning price}} = \frac{\$1.84}{\$23.00} = 0.08 = 8\%$$

We could extend the analysis, and in each future year the expected capital gains yield would always equal g , the expected dividend growth rate.

The dividend yield during the year could be estimated as follows:

$$\text{Dividend yield} = \frac{D_2}{\hat{P}_1} = \frac{\$1.3414}{\$24.84} = 0.054 = 5.4\%$$

The dividend yield for the following year could also be calculated, and again it would be 5.4%. Thus, *for a constant growth stock*, the following conditions must hold.

⁸We say that a stock is in *equilibrium* when $r_s = \hat{r}_s$ and $\hat{P}_0 = P_0$. We discuss this in more detail later in the chapter.



The popular Motley Fool Web site <http://www.fool.com/school/introductiontovaluation.htm> provides a good description of some benefits and drawbacks of a few of the more commonly used valuation procedures.

1. The dividend is expected to grow forever at a constant rate, g .
2. The stock price will also grow at this same rate.
3. The expected dividend yield is constant.
4. The expected capital gains yield is also constant and is equal to g , the dividend (and stock price) growth rate.
5. The expected total rate of return, \hat{r}_s , is equal to the expected dividend yield plus the expected growth rate: $\hat{r}_s = \text{dividend yield} + g$.

The term *expected* should be clarified—it means “expected” in a probabilistic sense, as the “statistically expected” outcome. Thus, if we say the growth rate is expected to remain constant at 8%, we mean that the best prediction for the growth rate in any future year is 8%, not that we literally expect the growth rate to be exactly 8% in each future year. In this sense, the constant growth assumption is a reasonable one for many large, mature companies.

Self-Test

What conditions must hold in order for a stock to be evaluated using the constant growth model?

What does the term “expected” mean when we say “expected growth rate”?

If $D_0 = \$4.00$, $r_s = 9\%$, and $g = 5\%$ for a constant growth stock, what are the stock’s expected dividend yield and capital gains yield for the coming year? (**4%, 5%**)

7.8 VALUING NONCONSTANT GROWTH STOCKS

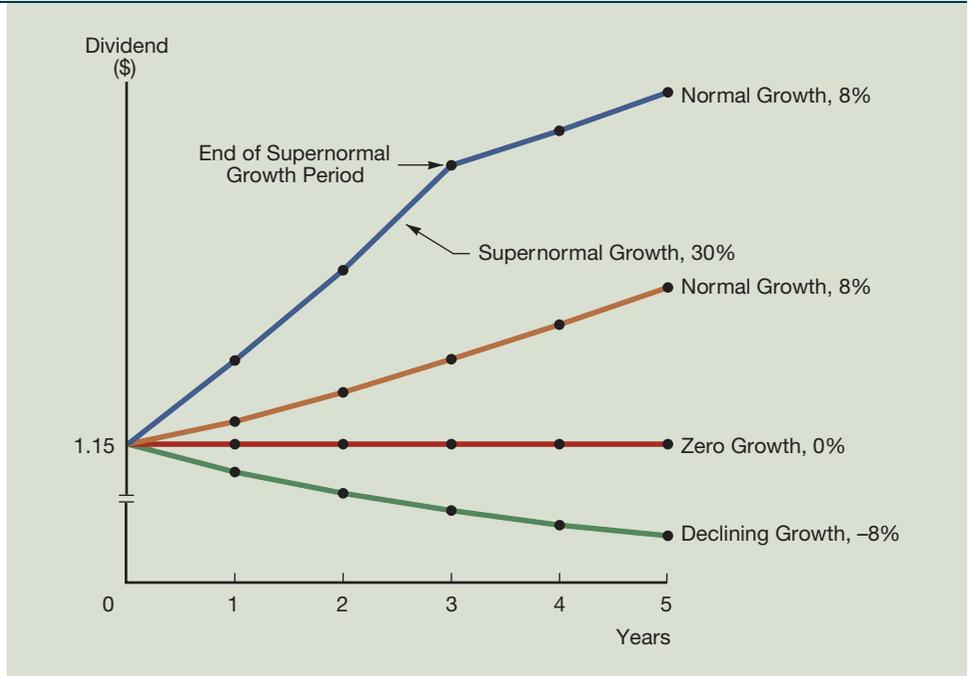
For many companies, it is not appropriate to assume that dividends will grow at a constant rate. Firms typically go through *life cycles*. During their early years, their growth is much faster than that of the economy as a whole; then they match the economy’s growth; and finally their growth is slower than that of the economy.⁹ Automobile manufacturers in the 1920s, software companies such as Microsoft in the 1990s, and technology firms such as Cisco in the 2000s are examples of firms in the early part of the cycle; these firms are called **supernormal**, or **nonconstant, growth** firms. Figure 7-4 illustrates nonconstant growth and also compares it with normal growth, zero growth, and negative growth.¹⁰

In Figure 7-4, the dividends of the supernormal growth firm are expected to grow at a 30% rate for 3 years, after which the growth rate is expected to fall to 8%, the assumed average for the economy. The value of this firm, like any other, is the present value of its expected future dividends as determined by Equation 7-1. When D_t is growing at a constant rate, we simplify Equation 7-1 to $\hat{P}_0 = D_1/(r_s - g)$. In the supernormal case, however, the expected growth rate is not a constant—it declines at the end of the supernormal growth period.

⁹The concept of life cycles could be broadened to *product cycle*, which would include both small start-up companies and large companies like Apple, which periodically introduce new products that give sales and earnings a boost. We should also mention *business cycles*, which alternately depress and boost sales and profits. The growth rate just after a major new product has been introduced, or just after a firm emerges from the depths of a recession, is likely to be much higher than the “expected long-run average growth rate,” which is the number that should be used in a DCF analysis.

¹⁰A negative growth rate indicates a declining company. A mining company whose profits are falling because of a declining ore body is an example. Someone buying such a company would expect its earnings, and consequently its dividends and stock price, to decline each year, and this would lead to capital losses rather than capital gains. Obviously, a declining company’s stock price will be relatively low, and its dividend yield must be high enough to offset the expected capital loss and still produce a competitive total return. Students sometimes argue that they would never be willing to buy a stock whose price was expected to decline. However, if the annual dividends are large enough to *more than offset* the falling stock price, the stock could still provide a good return.

FIGURE 7-4 Illustrative Dividend Growth Rates



Because Equation 7-2 requires a constant growth rate, we obviously cannot use it to value stocks that have nonconstant growth. However, assuming a company currently enjoying supernormal growth will eventually slow down and become a constant growth stock, we can use Equation 7-2 to help find the stock's value. First, we assume that the dividend will grow at a nonconstant rate (generally a relatively high rate) for N periods, after which it will grow at a constant rate, g . Often N is called the **horizon date** or the **terminal date**.

Recall that a stock's current intrinsic value, \hat{P}_0 , is the present value of all dividends after Time 0, discounted back to Time 0. Similarly, the intrinsic value of a stock at Time N is the present value of all dividends beyond Time N , discounted back to Time N . When dividends beyond Time N are expected to grow at a constant rate, we can use a variation of the constant growth formula, Equation 7-2, to estimate the stock's intrinsic value at Time N . The intrinsic value at Time N is often called the **horizon value** or the **terminal value**:

$$\text{Horizon value} = \hat{P}_N = \frac{D_{N+1}}{r_s - g} = \frac{D_N(1 + g)}{r_s - g} \quad (7-5)$$

A stock's intrinsic value today, \hat{P}_0 , is the present value of the dividends during the nonconstant growth period plus the present value of the dividends after the horizon date:

$$\hat{P}_0 = \frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_N}{(1+r_s)^N} + \frac{D_{N+1}}{(1+r_s)^{N+1}} + \cdots + \frac{D_\infty}{(1+r_s)^\infty}$$

$$= \underbrace{\frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_N}{(1+r_s)^N}}_{\text{PV of dividends during the nonconstant growth period } t = 1 \text{ to } N} + \underbrace{\frac{D_{N+1}}{(1+r_s)^{N+1}} + \cdots + \frac{D_\infty}{(1+r_s)^\infty}}_{\text{PV of dividends during the constant growth period } t = N + 1 \text{ to } \infty}$$

The horizon value is the value of all dividends beyond Time N discounted back to Time N. Discounting the horizon value from Time N to Time 0 provides an estimate of the present value of all dividends beyond the nonconstant growth period. Thus, the stock's current intrinsic value is the present value of all dividends during the nonconstant growth period plus the present value of the horizon value:

$$\hat{P}_0 = \left[\frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_N}{(1+r_s)^N} \right] + \frac{\hat{P}_N}{(1+r_s)^N}$$

$$= \left[\frac{D_1}{(1+r_s)^1} + \frac{D_2}{(1+r_s)^2} + \cdots + \frac{D_N}{(1+r_s)^N} \right] + \frac{[(D_{N+1})/(r_s - g)]}{(1+r_s)^N}$$
(7-6)

To implement Equation 7-6, we go through the following three steps.

1. Estimate the expected dividends for each year during the period of nonconstant growth.
2. Find the expected price of the stock at the end of the nonconstant growth period, at which point it has become a constant growth stock.
3. Find the present values of the expected dividends during the nonconstant growth period and the present value of the expected stock price at the end of the nonconstant growth period. Their sum is the intrinsic value of the stock, \hat{P}_0 .

To illustrate the process for valuing nonconstant growth stocks, we make the following assumptions.

r_s = Stockholders' required rate of return = 13.4%. This rate is used to discount all the cash flows.

N = Years of supernormal growth = 3.

g_s = Rate of growth in both earnings and dividends during the supernormal growth period = 30%. This rate is shown directly on the time line. (*Note:* The growth rate during the supernormal growth period could vary from year to year. Also, there could be several different supernormal growth periods—for example, 30% for 3 years, then 20% for 3 years, and then a constant 8%.)

g_L = Rate of normal, constant growth after the supernormal period = 8%. This rate is also shown on the time line, between Periods 3 and 4.

D_0 = Last dividend the company paid = \$1.15.

7.9 STOCK VALUATION BY THE FREE CASH FLOW APPROACH

The box at the beginning of the chapter showed that the value of a firm is the present value of its future expected free cash flows (FCFs) discounted at the weighted average cost of capital (WACC). The following example illustrates how the firm's total value can be used to find the value of its stock.

Suppose Crum Inc. had a free cash flow of \$200 million at the end of the most recent year. Chapter 12 shows how to forecast financial statements and free cash flows, but for now let's assume that Crum's FCFs are expected to grow at a constant rate of 5% per year forever. Chapter 9 explains how to estimate the weighted average cost of capital, but for now let's assume that Crum's WACC is 9%. The present value of the expected future free cash flows is the PV of a growing annuity, so we can use a variation of Equation 7-2, the value of a constantly growing stream of dividends:

$$V = \frac{\text{FCF}(1 + g)}{\text{WACC} - g} = \frac{\$200(1.05)}{0.09 - 0.05} = \$5,250 \text{ million} \quad (7-7)$$

FCF is the cash flow available for distribution to *all* of the firm's investors, bondholders as well as stockholders. Also, the WACC is the average rate of return required by *all* of the firm's investors, not just shareholders. Therefore, V is the value of the entire firm's operations, not just the value of its equity. If the firm had any nonoperating assets, such as short-term investments in marketable securities, then we would add them to V to find the firm's total value. Crum has no nonoperating assets, so its total value is \$5,250 million. To find the value of its equity, subtract the value of claims held by all groups other than common shareholders, such as debtholders and preferred stockholders. If the value of debt plus preferred stock is \$2,000 million, then Crum's common equity has a value of $\$5,250 - \$2,000 = \$3,250$ million. If 325 million shares of stock are outstanding, then the intrinsic value of the stock is $\$3,250/325 = \10 per share. This example should give you the general idea behind the free cash flow approach to stock price valuation, but see Chapter 13 for a more comprehensive example, including a situation in which free cash flows are growing at a nonconstant rate.

Self-Test

Explain how to find a firm's stock price using the free cash flow approach.

7.10 MARKET MULTIPLE ANALYSIS

If a company is publicly traded, then we can simply look up its most recent stock price to get an estimate of the stock's value. However, we must take another approach if the firm is privately owned. We could estimate the firm's cost of equity based on data for a sample of companies, forecast its earnings and dividends, and apply the DCF method to find the value of its stock. However, another method, **market multiple analysis**, can and generally would be used. Here we would take a metric for the firm—say, its EPS—and then multiply by a market-determined multiple such as the average P/E ratio for the S&P 500. This would give us an estimate of the stock's intrinsic value. Market multiples can also be applied to total net income, to sales, to book value, or to number of subscribers for businesses such as cable TV or cellular telephone systems. Whereas the discounted dividend method applies valuation concepts in a precise manner by focusing on expected cash flows, market multiple analysis is more judgmental.

To illustrate the concept, suppose Tapley Products is a privately held firm whose forecasted earnings per share are \$7.70, and suppose the average price/earnings (P/E) ratio for a set of similar publicly traded companies is 12. To estimate the intrinsic value of Tapley's stock we would simply multiply its \$7.70 EPS by the multiple 12, obtaining the value $\$7.70(12) = \92.40 .

Another commonly used metric is *earnings before interest, taxes, depreciation, and amortization (EBITDA)*. The *EBITDA multiple* is the total value of a company (the market value of its equity plus that of its debt) divided by EBITDA. This multiple is based on total value, since EBITDA is used to compensate the firm's stockholders and bondholders. Therefore, it is called an **entity multiple**. The EBITDA market multiple is the average EBITDA multiple for a group of similar publicly traded companies. This procedure gives an estimate of the company's total value, and to find the estimated intrinsic value of the stock we would subtract the value of the debt from total value and then divide by the shares of stock outstanding.

As suggested previously, in some businesses, such as cable TV and cellular telephone, a critical factor is the number of customers the company has. For example, when a telephone company acquires a cellular operator, it might pay a price that is based on the number of customers. Managed care companies such as HMOs have applied similar logic in acquisitions, basing valuations primarily on the number of people insured. Some Internet companies have been valued by the number of "eyeballs," which is the number of hits on the site.

If you examine the prospectus for a firm that is having an IPO, or information regarding the acquisition of one firm by another, you will almost certainly see references to market multiple analysis. Security analysts also use this approach, sometimes as a primary measure and sometimes as a supplement to a DCF analysis, when estimating firms' intrinsic values.

Self-Test

What is market multiple analysis?

What is an entity multiple?

7.11 PREFERRED STOCK

Preferred stock is a *hybrid*—it's similar to bonds in some respects and to common stock in others. Like bonds, preferred stock has a par value, and a fixed amount of dividends must be paid before dividends can be paid on the common stock. However, if the preferred dividend is not earned, the directors can omit (or "pass") it without throwing the company into bankruptcy. So, although preferred stock has a fixed payment like bonds, a failure to make this payment will not lead to bankruptcy.

The dividends on preferred stocks are fixed, and if they are scheduled to go on forever, the issue is a perpetuity whose value is found as follows:

$$V_{ps} = \frac{D_{ps}}{r_{ps}} \quad (7-8)$$

V_{ps} is the value of the preferred stock, D_{ps} is the preferred dividend, and r_{ps} is the required rate of return. MicroDrive has preferred stock outstanding that pays a dividend of \$10 per year. If the required rate of return on this preferred stock is 10%, then its value is \$100:

$$V_{ps} = \frac{\$10.00}{0.10} = \$100.00$$

If we know the current price of a preferred stock and its dividend, we can transpose terms and solve for the expected rate of return as follows:

$$\hat{r}_{ps} = \frac{D_{ps}}{V_{ps}} \quad (7-9)$$

Some preferred stocks have a stated maturity, say, 50 years. If a firm's preferred stock matures in 50 years, pays a \$10 annual dividend, has a par value of \$100, and has a required return of 8%, then we can find its price using a financial calculator: Enter $N = 50$, $I/YR = 8$, $PMT = 10$, and $FV = 100$. Then press PV to find the price, $V_{ps} = \$124.47$. If you know the price of a share of preferred stock, you can solve for I/YR to find the expected rate of return, \hat{r}_{ps} .

Most preferred stocks pay dividends quarterly. This is true for MicroDrive, so we could find the effective rate of return on its preferred stock as follows:

$$EFF\% = EAR = \left(1 + \frac{r_{NOM}}{M}\right)^M - 1 = \left(1 + \frac{0.10}{4}\right)^4 - 1 = 10.38\%$$

If an investor wanted to compare the returns on MicroDrive's bonds and its preferred stock, it would be best to convert the nominal rates on each security to effective rates and then compare these "equivalent annual rates."

Self-Test

Explain the following statement: "Preferred stock is a hybrid security."

Is the equation used to value preferred stock more like the one used to evaluate perpetual bonds or the one used for common stock? Explain.

A preferred stock has an annual dividend of \$5. The required return is 8%. What is the V_{ps} ? (**\$62.50**)

7.12 STOCK MARKET EQUILIBRIUM

Recall that r_i , the required return on Stock i , can be found using the Capital Asset Pricing Model (CAPM) as discussed in Chapter 6:

$$r_i = r_{RF} + (RP_M)b_i$$

If the risk-free rate of return is 8%, the market risk premium, RP_M , is 4%, and Stock i has a beta of 2, then its required rate of return is 16%:

$$\begin{aligned} r_i &= 8\% + (4\%)2.0 \\ &= 16\% \end{aligned}$$

The **marginal investor** will want to buy Stock i if its expected rate of return is more than 16%, will want to sell it if the expected rate of return is less than 16%, and will be indifferent—and hence will hold but not buy or sell it—if the expected rate of return is exactly 16%.

Now suppose a typical investor's portfolio contains Stock i , and suppose she analyzes the stock's prospects and concludes that its earnings, dividends, and price can be expected to grow at a constant rate of 5% per year. The last dividend was $D_0 = \$2.8571$, so the next expected dividend is

$$D_1 = \$2.8571(1.05) = \$3$$

Our investor observes that the present price of the stock, P_0 , is \$30. Should she purchase more of Stock i , sell the stock, or maintain the present position?

The investor can calculate Stock *i*'s *expected rate of return* as follows:

$$\hat{r}_i = \frac{D_1}{P_0} + g = \frac{\$3}{\$30} + 5\% = 15\%$$

Because the expected rate of return, 15%, is less than the required return, 16%, the investor would want to sell the stock, as would most other holders if this one is typical. However, few people would want to buy at the \$30 price, so the present owners would be unable to find buyers unless they cut the price of the stock. Thus, the price would decline, and this decline would continue until the price reached \$27.27, at which point the stock would be in **equilibrium**, defined as the price at which the expected rate of return, 16%, is equal to the required rate of return as seen by the marginal investor:

$$\hat{r}_i = \frac{\$3}{\$27.27} + 5\% = 11\% + 5\% = 16\% = r_i$$

Had the stock initially sold for less than \$27.27, say, for \$25, then events would have been reversed. Investors would have wanted to buy the stock because its expected rate of return would have exceeded its required rate of return, and buy orders would have driven the stock's price up to \$27.27.

To summarize, in equilibrium two related conditions must hold.

1. A stock's expected rate of return as seen by the marginal investor must equal its required rate of return: $\hat{r}_i = r_i$.
2. The actual market price of the stock must equal its intrinsic value as estimated by the marginal investor: $P_0 = \hat{P}_0$.

Of course, some individual investors probably believe that $\hat{r}_i > r_i$ and $\hat{P}_0 > P_0$, hence they would invest in the stock, while other investors have the opposite view and would sell all of their shares. However, it is the marginal investor who establishes the actual market price, and for the marginal investor we must have $\hat{r}_i = r_i$ and $P_0 = \hat{P}_0$. If these conditions do not hold, trading will occur until they do.

Changes in Equilibrium Stock Prices and Market Volatility

Stock prices are not constant—as we demonstrated earlier in this chapter and elsewhere, they undergo violent changes at times. Indeed, many stocks declined by 80% or more during 2008, and a few enjoyed gains of up to 200% or even more. At the risk of understatement, the stock market is volatile!

To see how such changes can occur, assume that Stock *i* is in equilibrium, selling at a price of \$27.27. If all expectations are met exactly, during the next year the price would gradually rise by 5%, to \$28.63. However, many different events could occur to cause a change in the equilibrium price. To illustrate, consider again the set of inputs used to develop Stock *i*'s price of \$27.27, along with a new set of expected inputs:

	Variable Value	
	Original	New
Risk-free rate, r_{RF}	8%	7%
Market risk premium, $r_M - r_{RF}$	4%	3%
Stock <i>i</i> 's beta coefficient, b_i	2.0	1.0
Stock <i>i</i> 's expected growth rate, g_i	5%	6%
D_0	\$ 2.8571	\$2.8571
Price of Stock <i>i</i>	\$27.27	?

Now give yourself a test: Would each of the indicated changes, by itself, lead to an increase, a decrease, or no change in the price, and what is your guess as to the new stock price?

Every change, taken alone, would lead to a higher price. Taken together, the first three would lower r_i from 16% to 10%:

$$\begin{aligned}\text{Original } r_i &= 8\% + 4\%(2.0) = 16\% \\ \text{New } r_i &= 7\% + 3\%(1.0) = 10\%\end{aligned}$$

Using these values together with the new $g = 6\%$, we find that \hat{P}_0 rises from \$27.27 to \$75.71:¹¹

$$\begin{aligned}\text{Original } \hat{P}_0 &= \frac{\$2.8571(1.05)}{0.16 - 0.05} = \frac{\$3}{0.11} = \$27.27 \\ \text{New } \hat{P}_0 &= \frac{\$2.8571(1.06)}{0.10 - 0.06} = \frac{\$3.0285}{0.04} = \$75.71\end{aligned}$$

At the new price, the expected and required rates of return are equal:¹²

$$\hat{r}_i = \frac{\$3.0285}{\$75.71} + 6\% = 10\% = r_i$$

This indicates that the stock is in equilibrium at the new and higher price. As this example illustrates, even small changes in the size of expected future dividends or in their risk, as reflected in the required return, can cause large changes in stock prices as the price moves from one equilibrium condition to another. What might cause investors to change their expectations about future dividends? It could be new information about the company, such as preliminary results for an R&D program, initial sales of a new product, or the discovery of harmful side effects from the use of an existing product. Or new information that will affect many companies could arrive, such as the collapse of the debt markets in 2008. Given the existence of computers and telecommunications networks, new information hits the market on an almost continuous basis, and it causes frequent and sometimes large changes in stock prices. In other words, *ready availability of information causes stock prices to be volatile*.

If a stock's price is stable, this probably means that little new information is arriving. But if you think it's risky to invest in a volatile stock, imagine how risky it would be to invest in a company that rarely releases new information about its sales or operations. It may be bad to see your stock's price jump around, but it would be a lot worse to see a stable quoted price most of the time and then to see huge moves on the rare days when new information is released.¹³ Fortunately, in our economy timely information is readily available, and evidence suggests that stocks—especially those of large companies—adjust

¹¹A price change of this magnitude is by no means rare. The prices of *many* stocks double or halve during any given year. For example, Emergent Biosolutions went up 416% in 2008, even as the market crashed, on the development of a new anthrax vaccine, while Fannie Mae, the government-sponsored mortgage company, lost 98.1% of its value.

¹²It should be obvious by now that *actual realized* rates of return are not necessarily equal to expected and required returns. Thus, an investor might have *expected* to receive a return of 15% if he had bought Emergent Biosolutions stock, but after the fact, the realized return was far above 15% in 2008. On the other hand, the 2008 actual realized return on Fannie Mae stock was far below 15%.

¹³Note, however, that if information came out infrequently, stock prices would probably be stable for a time and then experience large price swings when news did come out. This would be a bit like not having a lot of little earthquakes (frequent new information) that relieve stress along the fault and instead building up stress for a number of years before a massive earthquake.

rapidly to new information. Consequently, equilibrium ordinarily exists for any given stock, and required and expected returns are generally equal. Stock prices certainly change, sometimes violently and rapidly, but this simply reflects changing conditions and expectations.

There are times, of course, when a stock appears to react for several months to favorable or unfavorable developments. However, this does not necessarily signify a long adjustment period; rather, it could simply indicate that, as more new pieces of information about the situation come out, the market adjusts to them. The ability of the market to adjust to new information is discussed in the next section.

Self-Test

What two conditions must hold for a stock to be in equilibrium?

Why doesn't a volatile stock price imply irrational pricing?

7.13 THE EFFICIENT MARKETS HYPOTHESIS

A body of theory called the **Efficient Markets Hypothesis (EMH)** asserts that (1) stocks are always in equilibrium and (2) it is impossible for an investor to “beat the market” and consistently earn a higher rate of return than is justified by the stock’s risk. Those who believe in the EMH note that there are 100,000 or so full-time, highly trained, professional analysts and traders operating in the market, while there are fewer than 3,000 major stocks. Therefore, if each analyst followed 30 stocks (which is about right, as analysts tend to specialize in a specific industry), there would on average be 1,000 analysts following each stock. Furthermore, these analysts work for organizations such as Morgan Stanley, Goldman Sachs, CALPERS, Prudential Financial, and the like, which have billions of dollars available with which to take advantage of bargains. In addition, as a result of SEC disclosure requirements and electronic information networks, as new information about a stock becomes available, these analysts generally receive and evaluate it at the same time. Therefore, the price of a stock will adjust almost immediately to any new development. That, in a nutshell, is the logic behind the efficient markets hypothesis. However, there are variations on the theory, as we discuss next.

Weak-Form Efficiency

Technical analysts believe that past trends or patterns in stock prices can be used to predict future stock prices. In contrast, those who believe in the **weak form** of the EMH argue that all information contained in past price movements is fully reflected in current market prices. If the weak form were true, then information about recent trends in stock prices would be of no use in selecting stocks—the fact that a stock has risen for the past three days, for example, would give us no useful clues as to what it will do today or tomorrow. Those who believe that weak-form efficiency exists also believe that technical analysts, also known as “chartists,” are wasting their time.

To illustrate the arguments, after studying the past history of the stock market, a technical analyst might “discover” the following pattern: If a stock falls for three consecutive days, its price typically rises by 10% the following day. The technician would then conclude that investors could make money by purchasing a stock whose price has fallen three consecutive days.

Weak-form advocates argue that if this pattern truly existed then other investors would soon discover it, and if so, why would anyone be willing to sell a stock after it had fallen for three consecutive days? In other words, why sell if you know that the price is going to increase by 10% the next day? Those who believe in weak-

form efficiency argue that if the stock were really likely to rise to \$44 tomorrow, then its price *today, right now*, would actually rise to somewhere close to \$44, thereby eliminating the trading opportunity. Consequently, weak-form efficiency implies that any information that comes from past stock prices is rapidly incorporated into the current stock price.

Semistrong-Form Efficiency

The **semistrong form** of the EMH states that current market prices reflect all *publicly available* information. Therefore, if semistrong-form efficiency exists, it would do no good to pore over annual reports or other published data because market prices would have adjusted to any good or bad news contained in such reports back when the news came out. With semistrong-form efficiency, investors should expect to earn the returns predicted by the SML, but they should not expect to do any better or worse other than by chance.

Another implication of semistrong-form efficiency is that whenever information is released to the public, stock prices will respond only if the information is different from what had been expected. For example, if a company announces a 30% increase in earnings and if that increase is about what analysts had been expecting, then the announcement should have little or no effect on the company's stock price. On the other hand, the stock price would probably fall if analysts had expected earnings to increase by more than 30%, but it probably would rise if they had expected a smaller increase.

Strong-Form Efficiency

The **strong form** of the EMH states that current market prices reflect all pertinent information, whether publicly available or privately held. If this form holds, even insiders would find it impossible to earn consistently abnormal returns in the stock market.

Is the Stock Market Efficient?

Many empirical studies have been conducted to test the validity of the three forms of market efficiency. Most empirical studies are joint tests of the EMH and an asset pricing model (usually the CAPM or the Fama-French three-factor model). They are joint tests in the sense that they examine whether a particular strategy can beat the market, where “beating the market” means earning a return higher than that predicted by the particular asset pricing model. Most studies suggest that the stock market is highly efficient in the weak form and reasonably efficient in the semistrong form, at least for the larger and more widely followed stocks.¹⁴ The evidence

¹⁴The vast majority of academic studies have shown that no excess returns (defined as returns above those predicted by the CAPM or other asset pricing models) can be earned with technical analysis—that is, using past stock prices to predict future stock prices—especially after considering transactions costs. A possible exception is in the area of long-term reversals, where several studies show that portfolios of stocks with poor past long-term performance tend to do slightly better than average in the future long term, and vice versa. Another possible exception is in the area of momentum, where studies show that stocks with strong performance in the short-term past tend to do slightly better than average in the short-term future, and likewise for weak performance. For example, see N. Jegadeesh and S. Titman, “Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency,” *Journal of Finance*, March 1993, pp. 69–91, and W. F. M. DeBondt and R. H. Thaler, “Does the Stock Market Overreact?” *Journal of Finance*, July 1985, pp. 793–808. However, when a way to “beat” the market becomes known, the actions of investors tend to eliminate it.

suggests that the strong form EMH does not hold, because those who possessed inside information could and did (illegally) make abnormal profits.

However, skeptics of the EMH point to the stock market bubbles that burst in 2000 and 2008 and suggest that, at the height of these booms, the stocks of many companies—especially in the technology sector—vastly exceeded their intrinsic values. These skeptics suggest that investors are not simply machines that rationally process all available information; rather, a variety of psychological and perhaps irrational factors also come into play. Indeed, researchers have begun to incorporate elements of cognitive psychology in an effort to better understand how individuals and entire markets respond to different circumstances. In other words, if people aren't rational in their daily decisions, why should we expect them to be rational in their financial decisions? For example, studies show that investors tend to hold on too long to stocks that have performed poorly in the past (i.e., losers) but that they sell winners too quickly. This field of study is called *behavioral finance*.¹⁵

Keep in mind that the EMH does not assume that all investors are rational. Instead, it assumes that stock market prices track intrinsic values fairly closely. As we described earlier, new information should cause a stock's intrinsic value to move rapidly to a new level that reflects the new information. The EMH also assumes that if stock prices deviate from their intrinsic values, investors will *quickly* take advantage of this mispricing by buying undervalued stocks and selling overvalued stocks. Thus, investors' actions work to drive prices to their new equilibrium level based on new information. Even if some investors behave irrationally, as by holding losers too long and/or selling winners too quickly, this does not imply that the markets are not efficient. Thus, it is possible to have irrational investors in a rational market.

On the other hand, if the market itself is inherently irrational (i.e., if mispricings persist for long periods), then rational investors can lose a lot of money even if they are ultimately proven to be correct. For example, a “rational” investor in mid-1999 might have concluded that the Nasdaq was overvalued when it was trading at 3,000. If such an investor had acted on that assumption and sold stock short, he would have lost a lot of money the following year, when the Nasdaq soared to over 5,000 as “irrational exuberance” pushed the prices of already overvalued stocks to even higher levels. Ultimately, if our “rational investor” had the courage, patience, and financial resources to hold on, he would have been vindicated in the long run, because the Nasdaq subsequently fell from over 5,000 to about 1,300. But as the economist John Maynard Keynes said, “In the long run we are all dead.”

What is the bottom line on market efficiency? Based on our reading of the evidence, we believe that for most stocks, for most of the time, it is generally safe to assume that the market is reasonably efficient in the sense that the intrinsic price is approximately equal to the actual market price ($\hat{P}_0 \approx P_0$). However, major shifts can and do occur periodically, causing most stocks to move strongly up or down. In the early 1980s, inflation was running over 10% per year and interest rates on AAA corporate bonds hit 15%. That knocked most stocks way below their intrinsic

¹⁵Three noteworthy sources for students interested in behavioral finance are: Richard H. Thaler, Editor, *Advances in Behavioral Finance* (New York: Russell Sage Foundation, 1993); Andrei Shleifer, *Inefficient Markets: An Introduction to Behavioral Finance* (New York: Oxford University Press, 2000); and Nicholas Barberis and Richard Thaler, “A Survey of Behavioral Finance,” Chapter 18 in *Handbook of the Economics of Finance*, edited by George Constantinides, Milt Harris, and René Stulz (Amsterdam: Elsevier/North-Holland, 2003). Students interested in learning more about the Efficient Markets Hypothesis should consult Burton G. Malkiel, *A Random Walk Down Wall Street* (New York: W.W. Norton & Company, 2007).

Rational Behavior versus Animal Spirits, Herding, and Anchoring Bias

If investors were completely rational, they would carefully analyze all the available information about stocks and then make well-informed decisions to buy, sell, or hold them. Most academics have argued that investors with enough clout to move the market behave in this manner. However, the stock market bubbles of 2000 and 2008 suggest that something other than pure rationality is alive and well.

The great economist John Maynard Keynes, writing during the 1920s and 1930s, suggested that **animal spirits** influence markets. After a period of rising prosperity and stock prices, Keynes believed that investors begin to think that the good times will last forever, a feeling that is driven by happy talk and high spirits rather than cool reasoning. Indeed, psychologists have demonstrated that many people do in fact anchor too closely on recent events when predicting future events, a phenomenon called **anchoring bias**. Therefore, when the market is performing better than average, they tend to think it will continue to perform better than average. Even worse, when one group of investors does well, other investors begin to emulate them, acting like a herd of sheep following one another merrily down the road. Such **herding behavior** makes it easy for hedge funds to raise enormous sums and for con men like Bernie Madoff to find new marks.

Overinflated markets and bubbles eventually burst, and when they do, the same psychological factors act in reverse, often causing bigger declines than can be explained by rational models. Eventually, though, markets bottom out, and before long the next bubble starts to inflate. Historically, such cycles have existed for as far back as our data go, and these cycles are inconsistent with the idea of rational, data-driven investors. This is the realm of behavioral finance as discussed earlier in the chapter.

How can we reconcile theories that assume investors and decision makers are rational and data-driven with the fact that businesses and the stock market are influenced by people subject to animal spirits and herding instincts? Our conclusion is that there is some truth in both theories—markets are rational to a large extent, but they are also subject to irrational behavior at times. Our advice is to do careful, rational analyses, using the tools and techniques described in this book, but also to recognize that actual prices can differ from intrinsic values—sometimes by large amounts and for long periods. That’s the bad news. The good news is that differences between actual prices and intrinsic values provide wonderful opportunities for those able to capitalize on them.

values, so when inflation fears receded, stock prices roared ahead. A similar situation, but in reverse, may be occurring in 2008 and 2009. Stock prices have fallen sharply, perhaps to a level below their intrinsic values. In other words, we may be in a “reverse bubble.”

Implications of Market Efficiency for Financial Decisions

What bearing does the EMH have on financial decisions? First, many investors have given up trying to beat the market because the professionals who manage mutual fund portfolios, on average, do not outperform the overall stock market as measured by an index like the S&P 500.¹⁶ Indeed, the relatively poor performance of actively managed mutual funds helps explain the growing popularity of index funds, where administrative costs are lower than for actively managed funds. Rather than spending time and money trying to find undervalued stocks, index funds try instead to match overall market returns by buying the basket of stocks that makes up a particular index, such as the S&P 500.

¹⁶For a discussion of the performance of actively managed funds, see Jonathan Clements, “Resisting the Lure of Managed Funds,” *The Wall Street Journal*, February 27, 2001, p. C1.

Second, market efficiency also has important implications for managerial decisions, especially stock issues, stock repurchases, and tender offers. If the market prices stocks fairly, then managerial decisions based on the premise that a stock is undervalued or overvalued might not make sense. Managers may have better information about their own companies than outsiders, but it would be illegal to use this information for their own advantage, and they cannot deliberately defraud investors by knowingly putting out false information.

Self-Test

What is the Efficient Markets Hypothesis (EMH)?

What are the differences among the three forms of the EMH?

What are the implications of the EMH for financial decisions?

Summary

Corporate decisions should be analyzed in terms of how alternative courses of action are likely to affect a firm's value. However, it is necessary to know how stock prices are established before attempting to measure how a given decision will affect a firm's value. This chapter showed how stock values are determined and also how investors go about estimating the rates of return they expect to earn. The key concepts covered are listed below.

- A **proxy** is a document that gives one person the power to act for another, typically the power to vote shares of common stock. A **proxy fight** occurs when an outside group solicits stockholders' proxies in an effort to overthrow the current management.
- A **takeover** occurs when a person or group succeeds in ousting a firm's management and takes control of the company.
- Stockholders often have the right to purchase any additional shares sold by the firm. This right, called the **preemptive right**, protects the present stockholders' control and prevents dilution of their value.
- Although most firms have only one type of common stock, in some instances **classified stock** is used to meet the special needs of the company. One type is **founders' shares**. This is stock owned by the firm's founders that carries sole voting rights but restricted dividends for a specified number of years.
- A **closely held company** is one whose stock is owned by a few individuals who are typically associated with the firm's management.
- A **publicly held company** is one whose stock is owned by a relatively large number of individuals who are not actively involved in the firm's management. Publicly held companies are generally regulated by the SEC or other governmental bodies.
- The **intrinsic value of a share of stock** is calculated as the **present value of the stream of dividends** the stock is expected to provide in the future.
- The equation used to find the **intrinsic, or expected, value of a constant growth stock** is

$$\hat{P}_0 = \frac{D_1}{r_s - g}$$

Web Extension 7A provides a derivation of this formula.

- The **expected total rate of return** from a stock consists of an **expected dividend yield** plus an **expected capital gains yield**. For a constant growth firm, both the dividend yield and the capital gains yield are expected to remain constant in the future.
- The equation for \hat{r}_s , the **expected rate of return on a constant growth stock**, is

$$\hat{r}_s = \frac{D_1}{P_0} + g$$

- A **zero growth stock** is one whose future dividends are not expected to grow at all. A **supernormal growth stock** is one whose earnings and dividends are expected to grow much faster than the economy as a whole over some specified time period and then to grow at the “normal” rate.
- To find the **present value of a supernormal growth stock**, (1) find the dividends expected during the supernormal growth period, (2) find the price of the stock at the end of the supernormal growth period, (3) discount the dividends and the projected price back to the present, and (4) sum these PVs to find the current intrinsic, or expected, value of the stock, \hat{P}_0 .
- The **horizon (terminal) date** is the date when individual dividend forecasts are no longer made because the dividend growth rate is assumed to be constant thereafter.
- The **horizon (terminal) value** is the value at the horizon date of all future dividends after that date:

$$\hat{P}_N = \frac{D_{N+1}}{r_s - g}$$

- **Preferred stock** is a hybrid security having some characteristics of debt and some of equity.
- The **value of a share of perpetual preferred stock** is found as the dividend divided by the required rate of return:

$$V_{ps} = \frac{D_{ps}}{r_{ps}}$$

- **Preferred stock** that has a finite maturity is evaluated with a formula that is identical in form to the bond value formula.
- The **marginal investor** is a representative investor whose actions reflect the beliefs of those people who are currently trading a stock. It is the marginal investor who determines a stock’s price.
- **Equilibrium** is the condition under which the expected return on a security as seen by the marginal investor is just equal to its required return, $\hat{r}_s = r_s$. Also, the stock’s intrinsic value must be equal to its market price, $\hat{P}_0 = P_0$.
- The **Efficient Markets Hypothesis (EMH)** holds that (1) stocks are always in equilibrium and (2) it is impossible for an investor who does not have inside information to consistently “beat the market.” Therefore, according to the EMH, stocks are always fairly valued ($\hat{P}_0 = P_0$) and have a required return equal to their expected return ($r_s = \hat{r}_s$).
- **Animal spirits** refers to the tendency of investors to become excited and let their emotions affect their behavior; **herding instincts** refers to the tendency of investors to follow the crowd, relying on others rather than their own analysis; and **anchoring bias** is the human tendency to “anchor” too closely on recent events when predicting future events. These three factors can interfere with our desire to base decisions on pure rational analysis.

Questions

- (7-1) Define each of the following terms:
- Proxy; proxy fight; takeover; preemptive right; classified stock; founders' shares
 - Closely held stock; publicly owned stock
 - Intrinsic value (\hat{P}_0); market price (P_0)
 - Required rate of return, r_s ; expected rate of return, \hat{r}_s ; actual, or realized, rate of return, \bar{r}_s
 - Capital gains yield; dividend yield; expected total return
 - Normal, or constant, growth; supernormal, or nonconstant, growth; zero growth stock
 - Preferred stock
 - Equilibrium; Efficient Markets Hypothesis (EMH); three forms of EMH
 - Purely rational behavior; animal spirits; herding instincts; anchoring; behavioral finance
- (7-2) Two investors are evaluating General Electric's stock for possible purchase. They agree on the expected value of D_1 and also on the expected future dividend growth rate. Further, they agree on the risk of the stock. However, one investor normally holds stocks for 2 years and the other normally holds stocks for 10 years. On the basis of the type of analysis done in this chapter, they should both be willing to pay the same price for General Electric's stock. True or false? Explain.
- (7-3) A bond that pays interest forever and has no maturity date is a perpetual bond, also called a perpetuity or a consol. In what respect is a perpetual bond similar to (1) a no-growth common stock and (2) a share of preferred stock?
- (7-4) In this chapter and elsewhere we have argued that a stock's market price can deviate from its intrinsic value. Discuss the following question: If all investors attempt to behave in an entirely rational manner, could these differences still exist? In answering this question, think about information that's available to insiders versus outsiders, the fact that historical probabilities of financial events are "fuzzier" than probabilities related to physical items, and the validity of the concepts of animal spirits, herding, and anchoring.

Self-Test Problems

Solutions Appear in Appendix A

- (ST-1) **Constant Growth Stock Valuation**
Ewald Company's current stock price is \$36, and its last dividend was \$2.40. In view of Ewald's strong financial position and its consequent low risk, its required rate of return is only 12%. If dividends are expected to grow at a constant rate g in the future, and if r_s is expected to remain at 12%, then what is Ewald's expected stock price 5 years from now?
- (ST-2) **Supernormal Growth Stock Valuation**
Snyder Computer Chips Inc. is experiencing a period of rapid growth. Earnings and dividends are expected to grow at a rate of 15% during the next 2 years, at 13% in the third year, and at a constant rate of 6% thereafter. Snyder's last dividend was \$1.15, and the required rate of return on the stock is 12%.
- Calculate the value of the stock today.
 - Calculate \hat{P}_1 and \hat{P}_2 .
 - Calculate the dividend yield and capital gains yield for Years 1, 2, and 3.

Problems

Answers Appear in Appendix B

EASY PROBLEMS 1–5

(7–1)

DPS Calculation

Thress Industries just paid a dividend of \$1.50 a share (i.e., $D_0 = \$1.50$). The dividend is expected to grow 5% a year for the next 3 years and then 10% a year thereafter. What is the expected dividend per share for each of the next 5 years?

(7–2)

Constant Growth
Valuation

Boehm Incorporated is expected to pay a \$1.50 per share dividend at the end of this year (i.e., $D_1 = \$1.50$). The dividend is expected to grow at a constant rate of 7% a year. The required rate of return on the stock, r_s , is 15%. What is the value per share of Boehm's stock?

(7–3)

Constant Growth
Valuation

Woidtke Manufacturing's stock currently sells for \$20 a share. The stock just paid a dividend of \$1.00 a share (i.e., $D_0 = \$1.00$), and the dividend is expected to grow forever at a constant rate of 10% a year. What stock price is expected 1 year from now? What is the required rate of return on Woidtke's stock?

(7–4)

Preferred Stock
Valuation

Nick's Enchiladas Incorporated has preferred stock outstanding that pays a dividend of \$5 at the end of each year. The preferred sells for \$50 a share. What is the stock's required rate of return?

(7–5)

Nonconstant Growth
Valuation

A company currently pays a dividend of \$2 per share ($D_0 = \2). It is estimated that the company's dividend will grow at a rate of 20% per year for the next 2 years, then at a constant rate of 7% thereafter. The company's stock has a beta of 1.2, the risk-free rate is 7.5%, and the market risk premium is 4%. What is your estimate of the stock's current price?

INTERMEDIATE

PROBLEMS 6–16

(7–6)

Constant Growth
Rate, g

A stock is trading at \$80 per share. The stock is expected to have a year-end dividend of \$4 per share ($D_1 = \4), and it is expected to grow at some constant rate g throughout time. The stock's required rate of return is 14%. If markets are efficient, what is your forecast of g ?

(7–7)

Constant Growth
Valuation

You are considering an investment in Crisp Cookware's common stock. The stock is expected to pay a dividend of \$2 a share at the end of this year ($D_1 = \$2.00$); its beta is 0.9; the risk-free rate is 5.6%; and the market risk premium is 6%. The dividend is expected to grow at some constant rate g , and the stock currently sells for \$25 a share. Assuming the market is in equilibrium, what does the market believe will be the stock's price at the end of 3 years (i.e., what is \hat{P}_3)?

(7–8)

Preferred Stock
Rate of Return

What is the nominal rate of return on a preferred stock with a \$100 par value, a stated dividend of 8% of par, and a current market price of (a) \$60, (b) \$80, (c) \$100, and (d) \$140?

(7–9)

Declining Growth
Stock Valuation

Brushy Mountain Mining Company's ore reserves are being depleted, so its sales are falling. Also, its pit is getting deeper each year, so its costs are rising. As a result, the company's earnings and dividends are declining at the constant rate of 4% per year. If $D_0 = \$5$ and $r_s = 15\%$, what is the value of Brushy Mountain's stock?

(7–10)

Rates of Return and
Equilibrium

The beta coefficient for Stock C is $b_C = 0.4$ and that for Stock D is $b_D = -0.5$. (Stock D's beta is negative, indicating that its rate of return rises whenever returns on most other stocks fall. There are very few negative-beta stocks, although collection agency and gold mining stocks are sometimes cited as examples.)

- If the risk-free rate is 9% and the expected rate of return on an average stock is 13%, what are the required rates of return on Stocks C and D?
- For Stock C, suppose the current price, P_0 , is \$25; the next expected dividend, D_1 , is \$1.50; and the stock's expected constant growth rate is 4%. Is the stock in equilibrium? Explain, and describe what would happen if the stock were not in equilibrium.

(7-11)
Nonconstant Growth
Stock Valuation

Assume that the average firm in your company's industry is expected to grow at a constant rate of 6% and that its dividend yield is 7%. Your company is about as risky as the average firm in the industry, but it has just successfully completed some R&D work that leads you to expect that its earnings and dividends will grow at a rate of 50% [$D_1 = D_0(1 + g) = D_0(1.50)$] this year and 25% the following year, after which growth should return to the 6% industry average. If the last dividend paid (D_0) was \$1, what is the value per share of your firm's stock?

(7-12)
Nonconstant Growth
Stock Valuation

Simpkins Corporation is expanding rapidly, and it does not pay any dividends because it currently needs to retain all of its earnings. However, investors expect Simpkins to begin paying dividends, with the first dividend of \$1.00 coming 3 years from today. The dividend should grow rapidly—at a rate of 50% per year—during Years 4 and 5. After Year 5, the company should grow at a constant rate of 8% per year. If the required return on the stock is 15%, what is the value of the stock today?

(7-13)
Preferred Stock
Valuation

Several years ago, Rolen Riders issued preferred stock with a stated annual dividend of 10% of its \$100 par value. Preferred stock of this type currently yields 8%. Assume dividends are paid annually.

- What is the value of Rolen's preferred stock?
- Suppose interest rate levels have risen to the point where the preferred stock now yields 12%. What would be the new value of Rolen's preferred stock?

(7-14)
Return on Common
Stock

You buy a share of The Ludwig Corporation stock for \$21.40. You expect it to pay dividends of \$1.07, \$1.1449, and \$1.2250 in Years 1, 2, and 3, respectively, and you expect to sell it at a price of \$26.22 at the end of 3 years.

- Calculate the growth rate in dividends.
- Calculate the expected dividend yield.
- Assuming that the calculated growth rate is expected to continue, you can add the dividend yield to the expected growth rate to obtain the expected total rate of return. What is this stock's expected total rate of return?

(7-15)
Constant Growth Stock
Valuation

Investors require a 15% rate of return on Brooks Sisters's stock ($r_s = 15\%$).

- What would the value of Brooks's stock be if the previous dividend was $D_0 = \$2$ and if investors expect dividends to grow at a constant annual rate of (1) -5%, (2) 0%, (3) 5%, and (4) 10%?
- Using data from part a, what is the Gordon (constant growth) model's value for Brooks Sisters's stock if the required rate of return is 15% and the expected growth rate is (1) 15% or (2) 20%? Are these reasonable results? Explain.
- Is it reasonable to expect that a constant growth stock would have $g > r_s$?

(7-16)
Equilibrium Stock Price

The risk-free rate of return, r_{RF} , is 11%; the required rate of return on the market, r_M , is 14%; and Schuler Company's stock has a beta coefficient of 1.5.

- If the dividend expected during the coming year, D_1 , is \$2.25, and if g is a constant 5%, then at what price should Schuler's stock sell?
- Now suppose that the Federal Reserve Board increases the money supply, causing a fall in the risk-free rate to 9% and in r_M to 12%. How would this affect the price of the stock?
- In addition to the change in part b, suppose investors' risk aversion declines; this fact, combined with the decline in r_{RF} , causes r_M to fall to 11%. At what price would Schuler's stock now sell?
- Suppose Schuler has a change in management. The new group institutes policies that increase the expected constant growth rate to 6%. Also, the new management stabilizes sales and profits and thus causes the beta coefficient to decline from 1.5 to 1.3. Assume that r_{RF} and r_M are equal to the values in part c. After all these changes, what is Schuler's new equilibrium price? (Note: D_1 goes to \$2.27.)

CHALLENGING

PROBLEMS 17–19

(7–17)

Constant Growth Stock Valuation

Suppose a firm's common stock paid a dividend of \$2 *yesterday*. You expect the dividend to grow at the rate of 5% per year for the next 3 years; if you buy the stock, you plan to hold it for 3 years and then sell it.

- Find the expected dividend for each of the next 3 years; in other words, calculate D_1 , D_2 , and D_3 . Note that $D_0 = \$2$.
- Given that the appropriate discount rate is 12% and that the first of these dividend payments will occur 1 year from now, find the present value of the dividend stream; that is, calculate the PV of D_1 , D_2 , and D_3 , and then sum these PVs.
- You expect the price of the stock 3 years from now to be \$34.73 (i.e., you expect $\hat{P}_3 = \$34.73$). Discounted at a 12% rate, what is the present value of this expected future stock price? In other words, calculate the PV of \$34.73.
- If you plan to buy the stock, hold it for 3 years, and then sell it for \$34.73, what is the most you should pay for it?
- Use Equation 7-2 to calculate the present value of this stock. Assume that $g = 5\%$ and is constant.
- Is the value of this stock dependent on how long you plan to hold it? In other words, if your planned holding period were 2 years or 5 years rather than 3 years, would this affect the value of the stock today, \hat{P}_0 ? Explain your answer.

(7–18)

Nonconstant Growth Stock Valuation

Reizenstein Technologies (RT) has just developed a solar panel capable of generating 200% more electricity than any solar panel currently on the market. As a result, RT is expected to experience a 15% annual growth rate for the next 5 years. By the end of 5 years, other firms will have developed comparable technology, and RT's growth rate will slow to 5% per year indefinitely. Stockholders require a return of 12% on RT's stock. The most recent annual dividend (D_0), which was paid yesterday, was \$1.75 per share.

- Calculate RT's expected dividends for $t = 1$, $t = 2$, $t = 3$, $t = 4$, and $t = 5$.
- Calculate the intrinsic value of the stock today, \hat{P}_0 . Proceed by finding the present value of the dividends expected at $t = 1$, $t = 2$, $t = 3$, $t = 4$, and $t = 5$ plus the present value of the stock price that should exist at $t = 5$, \hat{P}_5 . The \hat{P}_5 stock price can be found by using the constant growth equation. Note that to find \hat{P}_5 you use the dividend expected at $t = 6$, which is 5% greater than the $t = 5$ dividend.

- c. Calculate the expected dividend yield (D_1/\hat{P}_0), the capital gains yield expected during the first year, and the expected total return (dividend yield plus capital gains yield) during the first year. (Assume that $\hat{P}_0 = P_0$, and recognize that the capital gains yield is equal to the total return minus the dividend yield.) Also calculate these same three yields for $t = 5$ (e.g., D_6/\hat{P}_5).
- d. If your calculated intrinsic value differed substantially from the current market price, and if your views are consistent with those of most investors (the marginal investor), what would happen in the marketplace? What would happen if your views were *not* consistent with those of the marginal investor and you turned out to be correct?

(7-19)Supernormal Growth
Stock Valuation

Taussig Technologies Corporation (TTC) has been growing at a rate of 20% per year in recent years. This same supernormal growth rate is expected to last for another 2 years ($g_1 = g_2 = 20\%$).

- a. If $D_0 = \$1.60$, $r_s = 10\%$, and $g_L = 6\%$, then what is TTC's stock worth today? What is its expected dividend yield and its capital gains yield at this time?
- b. Now assume that TTC's period of supernormal growth is to last another 5 years rather than 2 years ($g_1 = g_2 = g_3 = g_4 = g_5 = 20\%$). How would this affect its price, dividend yield, and capital gains yield? Answer in words only.
- c. What will TTC's dividend yield and capital gains yield be once its period of supernormal growth ends? (*Hint:* These values will be the same regardless of whether you examine the case of 2 or 5 years of supernormal growth, and the calculations are very easy.)
- d. Of what interest to investors is the relationship over time between dividend yield and capital gains yield?

SPREADSHEET PROBLEM**(7-20)**Build a Model: Super-
normal Growth and
Corporate Valuation

Start with the partial model in the file *Cb07 P20 Build a Model.xls* on the textbook's Web site. Rework parts a, b, and c of Problem 7-19 using a spreadsheet model. For part b, calculate the price, dividend yield, and capital gains yield as called for in the problem.

THOMSON ONE

Business School Edition

Problem

Use the Thomson ONE—Business School Edition online database to work this chapter's questions.

ESTIMATING EXXONMOBIL'S INTRINSIC STOCK VALUE WITH THOMSON ONE—BUSINESS SCHOOL EDITION

In this chapter we described the various factors that influence stock prices and the approaches analysts use to estimate a stock's intrinsic value. By comparing these intrinsic value estimates to the current price, an investor can assess whether it makes sense to buy or sell a particular stock. Stocks trading at a price far below their estimated intrinsic values may be good candidates for purchase, whereas stocks trading at prices far in excess of their intrinsic value may be good stocks to avoid or sell.

Although estimating a stock's intrinsic value is a complex exercise that requires reliable data and good judgment, we can use the data available in Thomson ONE to arrive at a quick “back of the envelope” calculation of intrinsic value.

Thomson ONE—BSE Discussion Questions

1. For purposes of this exercise, let's take a closer look at the stock of ExxonMobil Corporation (XOM). Looking at the COMPANY OVERVIEW, we can immediately see the company's current stock price and its performance relative to the overall market in recent months. What is ExxonMobil's current stock price? How has the stock performed relative to the market over the past few months?
2. Click on the “NEWS” tab to see the recent news stories for the company. Have there been any recent events affecting the company's stock price, or have things been relatively quiet?
3. To provide a starting point for gauging a company's relative valuation, analysts often look at a company's price-to-earnings (P/E) ratio. Returning to the COMPANY OVERVIEW page, you can see XOM's current P/E ratio. To put this number in perspective, it is useful to compare this ratio with other companies in the same industry and to take a look at how this ratio has changed over time. If you want to see how XOM's P/E ratio stacks up to its peers, click on the tab labeled PEERS. Click on FINANCIALS on the next row of tabs and then select KEY FINANCIAL RATIOS. Toward the bottom of the table you should see information on the P/E ratio in the section titled Market Value Ratios. Toward the top, you should see an item that says [CLICK HERE TO SELECT NEW PEER SET](#)—do this if you want to compare XOM to a different set of firms.

For the most part, is XOM's P/E ratio above or below that of its peers? Off the top of your head, can these factors explain why XOM's P/E ratio differs from its peers?

4. To see how XOM's P/E ratio has varied over time, return to the COMPANY OVERVIEW page. Next click FINANCIALS—GROWTH RATIOS and then select WORLDSCOPE—INCOME STATEMENT RATIOS. Is XOM's current P/E ratio well above or well below its historical average? If so, do you have any explanation for why the current P/E deviates from its historical trend? On the basis of this information, does XOM's current P/E suggest that the stock is undervalued or overvalued? Explain.
5. In the text, we discussed using the dividend growth model to estimate a stock's intrinsic value. To keep things as simple as possible, let's assume at first that XOM's dividend is expected to grow at some constant rate over time. Then its intrinsic value would equal $D_1/(r_s - g)$, where D_1 is the expected annual dividend 1 year from now, r_s is the stock's required rate of return, and g is the dividend's constant growth rate. To estimate the dividend growth rate, it's helpful first to look at XOM's dividend history. Staying on the current Web page (WORLDSCOPE—INCOME STATEMENT RATIOS), you should immediately find the company's annual dividend for the past several years. On the basis of this information, what has been the average annual dividend growth rate? Another way to obtain estimates of dividend growth rates is to look at analysts' forecasts for future dividends, which can be found on the ESTIMATES tab. Scrolling down the page, you should see an area marked Consensus Estimates and a tab under Available Measures. Here you click on the down arrow key and select Dividends Per Share (DPS). What is the median year-end dividend forecast? You can use this as an estimate of D_1 in

- your measure of intrinsic value. You can also use this forecast along with the historical data to arrive at a measure of the forecasted dividend growth rate, g .
6. The required return on equity, r_s , is the final input needed to estimate intrinsic value. For our purposes you can either assume a number (say, 8% or 9%) or use the CAPM to calculate an estimated cost of equity using the data available in Thomson ONE. (For more details, take a look at the Thomson ONE exercise for Chapter 2). Having decided on your best estimates for D_1 , r_s , and g , you can then calculate XOM's intrinsic value. How does this estimate compare with the current stock price? Does your preliminary analysis suggest that XOM is undervalued or overvalued? Explain.
 7. Often it is useful to perform a sensitivity analysis, in which you show how your estimate of intrinsic value varies according to different estimates of D_1 , r_s , and g . To do so, recalculate your intrinsic value estimate for a range of different estimates for each of these key inputs. One convenient way to do this is to set up a simple data table in *Excel*. Refer to the *Excel* tutorial accessed through the textbook's Web site for instructions on data tables. On the basis of this analysis, what inputs justify the current stock price?
 8. On the basis of the dividend history you uncovered in question 5 and your assessment of XOM's future dividend payout policies, do you think it is reasonable to assume that the constant growth model is a good proxy for intrinsic value? If not, how would you use the available data in Thomson ONE to estimate intrinsic value using the nonconstant growth model?
 9. Finally, you can also use the information in Thomson ONE to value the entire corporation. This approach requires that you estimate XOM's annual free cash flows. Once you estimate the value of the entire corporation, you subtract the value of debt and preferred stock to arrive at an estimate of the company's equity value. Divide this number by the number of shares of common stock outstanding, which yields an alternative estimate of the stock's intrinsic value. This approach may take some more time and involve more judgment concerning forecasts of future free cash flows, but you can use the financial statements and growth forecasts in Thomson ONE as useful starting points. Go to Worldscope's Cash Flow Ratios Report (which you find by clicking on FINANCIALS, FUNDAMENTAL RATIOS, and WORLDSCOPE RATIOS) to find an estimate of "free cash flow per share." Although this number is useful, Worldscope's definition of free cash flow subtracts out dividends per share; therefore, to make it comparable to the measure used in this text, you must add back dividends. To see Worldscope's definition of free cash flow (or any term), click on SEARCH FOR COMPANIES from the left toolbar and then select the ADVANCED SEARCH tab. In the middle of your screen, on the right-hand side, you will see a dialog box with terms. Use the down arrow to scroll through the terms, highlighting the term for which you would like to see a definition. Then, click on the DEFINITION button immediately below the dialog box.

Mini Case

Sam Strother and Shawna Tibbs are senior vice presidents of Mutual of Seattle. They are co-directors of the company's pension fund management division, with Strother having responsibility for fixed income securities (primarily bonds) and Tibbs responsible for equity investments. A major new client, the Northwestern Municipal Alliance, has requested that Mutual

of Seattle present an investment seminar to the mayors of the cities in the association, and Strother and Tibbs, who will make the actual presentation, have asked you to help them.

To illustrate the common stock valuation process, Strother and Tibbs have asked you to analyze the Temp Force Company, an employment agency that supplies word processor operators and computer programmers to businesses with temporarily heavy workloads. You are to answer the following questions.

- a. Describe briefly the legal rights and privileges of common stockholders.
- b. (1) Write out a formula that can be used to value any stock, regardless of its dividend pattern.
 - (2) What is a constant growth stock? How are constant growth stocks valued?
 - (3) What happens if a company has a constant g that exceeds its r_s ? Will many stocks have expected $g > r_s$ in the short run (i.e., for the next few years)? In the long run (i.e., forever)?
- c. Assume that Temp Force has a beta coefficient of 1.2, that the risk-free rate (the yield on T-bonds) is 7.0%, and that the market risk premium is 5%. What is the required rate of return on the firm's stock?
- d. Assume that Temp Force is a constant growth company whose last dividend (D_0 , which was paid yesterday) was \$2.00 and whose dividend is expected to grow indefinitely at a 6% rate.
 - (1) What is the firm's expected dividend stream over the next 3 years?
 - (2) What is the firm's current intrinsic stock price?
 - (3) What is the stock's expected value 1 year from now?
 - (4) What are the expected dividend yield, the expected capital gains yield, and the expected total return during the first year?
- e. Now assume that the stock is currently selling at \$30.29. What is its expected rate of return?
- f. What would the stock price be if the dividends were expected to have zero growth?
- g. Now assume that Temp Force's dividend is expected to experience supernormal growth of 30% from Year 0 to Year 1, 20% from Year 1 to Year 2, and 10% from Year 2 to Year 3. After Year 3, dividends will grow at a constant rate of 6%. What is the stock's intrinsic value under these conditions? What are the expected dividend yield and capital gains yield during the first year? What are the expected dividend yield and capital gains yield during the fourth year (from Year 3 to Year 4)?
- h. Is the stock price based more on long-term or short-term expectations? Answer this by finding the percentage of Temp Force's current stock price that is based on dividends expected more than 3 years in the future.
- i. Suppose Temp Force is expected to experience zero growth during the first 3 years and then to resume its steady-state growth of 6% in the fourth year. What is the stock's intrinsic value now? What is its expected dividend yield and its capital gains yield in Year 1? In Year 4?
- j. Now suppose that Temp Force's earnings and dividends are expected to decline by a constant 6% per year forever—that is, $g = -6\%$. Why would anyone be willing to buy such a stock, and at what price should it sell? What would be the dividend yield and capital gains yield in each year?
- k. What is market multiple analysis?
 - l. Temp Force recently issued preferred stock that pays an annual dividend of \$5 at a price of \$50 per share. What is the expected return to an investor who buys this preferred stock?
- m. Why do stock prices change? Suppose the expected D_1 is \$2, the growth rate is 5%, and r_s is 10%. Using the constant growth model, what is the stock's price? What is the impact on the stock price if g falls to 4% or rises to 6%? If r_s increases to 9% or to 11%?
- n. What does market equilibrium mean?
- o. If equilibrium does not exist, how will it be established?
- p. What is the Efficient Markets Hypothesis, what are its three forms, and what are its implications?
- q. Assume that all the growth rates used in the preceding answers were averages of the growth rates published by well-known and respected security analysts. Would you then say that your results are based on a purely rational analysis? If not, what factors might have led to "irrational results?"

SELECTED ADDITIONAL CASES

The following cases from Textchoice, Cengage Learning's online library, cover many of the concepts discussed in this chapter and are available at <http://www.textchoice2.com>.

Klein-Brigham Series:

Case 3, "Peachtree Securities, Inc. (B)"; Case 71, "Swan Davis"; Case 78, "Beatrice Peabody"; and Case 101, "TECO Energy."

Brigham-Buzzard Series:

Case 4, "Powerline Network Corporation (Stocks)."