

# chapter 8

## Stocks, Stock Valuation, and Stock Market Equilibrium

From slightly less than 4,000 in early 1995, the Dow Jones Industrial Average surged to 11,723 in early 2000. To put this remarkable 7,723-point rise in perspective, consider that the Dow first reached 1,000 in 1965, then took another 22 years to hit 2,000, then 4 more years to reach 3,000, and another 4 to get to 4,000 (in 1995). Then, in just over 5 years, it reached 11,723. Thus, in those 5 years investors made almost twice as much in the stock market as they made in the previous 70 years!

That bull market made it possible for many people to take early retirement, buy expensive homes, and afford large expenditures such as college tuition. Encouraged by this performance, more and more investors flocked to the market, and today more than 79 million Americans own stock. Moreover, a rising stock market made it easier and cheaper for corporations to raise equity capital, which facilitated economic growth.

However, some observers were concerned that many investors did not realize just how risky the stock market is. Indeed, the Dow fell all the way to 8,236 in the days following the

terrorist attacks of September 11, 2001. It surged back up to 10,635 in early 2002, but fell to 7,286 by late 2002. In mid-2006, the market stood at about 10,989.

Note too that while all boats may rise with the tide, the same does not hold for stock markets—regardless of the trend, some individual stocks always make huge gains while others suffer substantial losses. Even though the overall market was up 1.7% in 2005, many individual stocks performed much better while others performed worse. For example, Apple Computer rose more than 123%, but GM was down 51.5%. In terms of market value, Genentech added more than \$40 billion to its stockholders' wealth, while Dell's shareholders saw more than \$28 billion of wealth evaporate.

Although it is difficult to predict prices, we are not completely in the dark when it comes to valuing stocks. Indeed, after studying this chapter, you should have a reasonably good understanding of the factors that influence stock prices. With that knowledge—and a little luck—you may be able to find the next Apple or Genentech and avoid future GMs.

In Chapters 6 and 7 we examined risk and required stock returns. In this chapter we will use those results to estimate the intrinsic value of a stock with the dividend growth model. The concepts and models developed here will also be used when we estimate the cost of capital in Chapter 10. In subsequent chapters, we will demonstrate how the cost of capital is used to help make many important decisions, especially the decision to invest or not invest in new assets. Consequently, it is critically important that you understand the basics of stock valuation.

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 larger companies are owned by a large number of investors, most of whom are not active in management. Such stock is called **publicly held stock**. Institutions, such as pension plans, mutual funds, foreign investors, insurance companies, and brokerage firms, buy and sell relatively actively, so they account for about 75% of all transactions. Thus, institutional investors have a heavy influence on the valuation of individual stocks. But before plunging into stock valuation, we begin with a closer look at what it means to be a stockholder.



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The textbook's Web site contains an *Excel* file that will guide you through the chapter's calculations. The file for this chapter is **FM12 Ch 08 Tool Kit.xls**, and we encourage you to open the file and follow along as you read the chapter.

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## 8.1 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 assumes the positions of president and chairperson of the board of directors. 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 managements 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 an election of directors periodically, 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; thus, the owner of 1,000 shares has 1,000 votes for each director.<sup>1</sup> Stockholders can appear at the annual meeting and vote in person, but typically they transfer their right to vote to a second 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 15.

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<sup>1</sup>In 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 small groups get representation on the board.

## Corporate Valuation and Stock Risk

In Chapter 1, we told you that managers should strive to make their firms more valuable and that the value

$$V_{\text{Firm}} = \frac{\text{FCF}_1}{(1 + \text{WACC})^1} + \frac{\text{FCF}_2}{(1 + \text{WACC})^2} + \frac{\text{FCF}_3}{(1 + \text{WACC})^3} + \cdots + \frac{\text{FCF}_\infty}{(1 + \text{WACC})^\infty}.$$

The FCFs are the cash flows available to all investors and the WACC is the return required by all investors, so the present value of the FCFs is the value of the firm to all investors. In Chapter 15 we will use the equation above to estimate the intrinsic value of stock, but in this chapter we use an alternative

of a firm is determined by the size, timing, and risk of its free cash flows (FCF):

approach. Instead of discounting the cash flows to all investors at the rate of return required by all investors, we discount the cash flows to stockholders (dividends,  $D_t$ ) at the rate required by stockholders ( $r_s$ ). The result is the intrinsic value to stockholders:

$$V_{\text{Stock}} = \frac{D_1}{(1 + r_s)^1} + \frac{D_2}{(1 + r_s)^2} + \cdots + \frac{D_\infty}{(1 + r_s)^\infty}.$$

### 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 necessary to insert it specifically into the charter.

The preemptive right enables current stockholders to maintain control and 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 a large number of 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 the existence of the preemptive right?

## 8.2 Types of Common Stock

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. Generally, when special 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 organizers of the company, 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 by building 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**.

Note 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, while another could reverse these designations. Still other firms could use stock classifications for entirely different purposes. For example, when General Motors acquired Hughes Aircraft for \$5 billion, it paid in part with a new Class H common, GMH, which had limited voting rights and whose dividends were tied to Hughes's performance as a GM subsidiary. The reasons for the new stock were reported to be (1) that GM wanted to limit voting privileges on the new classified stock because of management's concern about a possible takeover and (2) that Hughes's employees wanted to be rewarded more directly on Hughes's own performance than would have been possible through regular GM stock.

GM's deal posed a problem for the NYSE, which had a rule against listing a company's common stock if the company had any nonvoting common stock outstanding. GM made it clear that it was willing to delist if the NYSE did not change its rules. The NYSE concluded that such arrangements as GM had made were logical and were likely to be made by other companies in the future, so it changed its rules to accommodate GM. In reality, though, the NYSE had little choice. In recent years, the Nasdaq market has proven that it can provide a deep, liquid market for common stocks, and the defection of GM would have hurt the NYSE much more than GM.

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 but 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.

As we noted above, General Motors created its Class H common stock as a part of its acquisition of Hughes Aircraft. This type of stock, with dividends tied to a particular part of a company, is called **tracking stock**. It also is called **target stock**. Although GM used its tracking stock in an acquisition, other companies are attempting to use such stock to increase shareholder value. For example, in 1995 US West had several business areas with very different growth prospects, ranging from slow-growth local telephone services to high-growth cellular, cable television, and directory services. US West felt that investors were unable to correctly value its



Note that <http://finance.yahoo.com> provides an easy way to find stocks meeting specified criteria. Under the section on Stock Research, select 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.

high-growth lines of business, since cash flows from slow-growth and high-growth businesses were mingled. To separate the cash flows and to allow separate valuations, the company issued tracking stocks. Similarly, Georgia-Pacific Corp. issued tracking stock for its timber business, and 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. Despite this trend, 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 they have considerable leeway in allocating costs and reporting the financial results for the various divisions, even those with tracking stock. Thus, a tracking stock is not the same as the stock of an independent, stand-alone company.

## SELF-TEST

What are some reasons a company might use classified stock?

## 8.3 Stock Market Reporting

Up until a couple of years ago, the best source of stock quotations was the business section of a daily newspaper, such as *The Wall Street Journal*. One problem with newspapers, however, is that they are printed only once a day. Now it is possible to get quotes all during the day from a wide variety of Internet sources.<sup>2</sup> One of the best is provided by Bloomberg at <http://www.bloomberg.com>. Figure 8-1 shows a quote for Abbott Labs, which is traded on the NYSE under the symbol ABT. As Figure 8-1 shows, Abbott Labs' stock ended the day at \$41.95, for a loss of \$0.09, which is a 0.21% decrease from the previous day. The data also show that Abbott opened the current day at \$41.75, reached a high during the day of \$42.20, and fell as low as \$41.56. During the past year, the price has been as high as \$50.00 and as low as \$37.50. More than 3.9 million shares traded during the day. If this quote had been during trading hours, it would also have provided information about the quotes at which the stock could be bought (the Ask quote) or sold (the

Figure 8-1

Stock Quote for Abbott Labs, June 23, 2006

ABT:US Abbott Laboratories						
More on ABT:US <input type="button" value="Detailed Quote"/>						
6/23 11:52 NEW YORK CURRENCY: USD INDUSTRY: Medical-Drugs						
Price 41.950	Change -0.090	% Change -0.214	Bid N.A.	Ask N.A.	Open 41.750	Volume 3,941,700
High 42.200	Low 41.560	52-Week High (7/12/05) 50.00		52-Week Low (11/30/05) 37.50		1-Year Return 12.171%

Source: <http://www.bloomberg.com>.

<sup>2</sup>Most free sources actually provide quotes that are delayed by 20 minutes.

Bid quote). In addition to this information, the Web page has links to research and much more detailed data for Abbott Labs.

## SELF-TEST

What data are often provided in a stock quotation?

## 8.4 Common Stock Valuation

Common stocks provide an expected future cash flow stream, and a stock's value is found in the same manner as the values of other financial assets—namely, as the present value of the 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 managers seek to maximize the values of their firms' stocks. A manager's actions affect both the stream of income to investors and the riskiness of that stream. Therefore, managers need to know how alternative actions are likely to affect stock prices. At this point we develop some models to help show how the value of a share of stock is determined. We begin by defining the following terms:

$D_t$  = 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, and it will be paid at the end of this year;  $D_2$  is the dividend expected at the end of 2 years; and so forth.  $D_1$  represents the first cash flow a new purchaser of the stock will receive. Note that  $D_0$ , the dividend that has just been paid, is known with certainty. However, all future dividends are expected values, so the estimate of  $D_t$  may differ among investors.<sup>3</sup>

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

$\hat{P}_t$  = 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  $P_0$  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 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 or her 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,"

<sup>3</sup>Stocks 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.

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 change  $P_0$  until  $P_0 = \hat{P}_0$  for 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,  $g$  is also equal to the expected rate of growth in earnings and in the stock's price. Different investors may use different  $g$ 's to evaluate a firm's stock, but the market price,  $P_0$ , is set on the basis of the  $g$  estimated by marginal investors.

$r_s$  = Minimum acceptable, or **required, rate of return** on the stock, considering both its riskiness and the returns available on other investments. Again, this term generally relates to marginal investors. 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  $\hat{r}_s$  were equal to or greater than  $r_s$ .  $\hat{r}_s$  is equal to the expected dividend yield ( $D_1/P_0$ ) plus 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 goes down, you may end up next year with an actual realized return that is much lower, perhaps even negative.

## Expected Dividends as the Basis for Stock Values

Like all financial assets, equilibrium stock prices are the present value of a stream of cash flows. What are the cash flows that corporations 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:

$$\begin{aligned} \text{Value of stock} &= \hat{P}_0 = \text{PV of expected future dividends} \\ &= \frac{D_1}{(1 + r_s)^1} + \frac{D_2}{(1 + r_s)^2} + \cdots + \frac{D_\infty}{(1 + r_s)^\infty} \quad (8-1) \\ &= \sum_{t=1}^{\infty} \frac{D_t}{(1 + r_s)^t} \end{aligned}$$

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 8-1*. 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 the 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 8-1 can also be confirmed by asking the following question: 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 out 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 8-1.<sup>4</sup>

### SELF-TEST

What are the two parts 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 is the stock's expected dividend yield, capital gains yield, and total expected return for the coming year? (6%, 4%, 10%)

## 8.5 Constant Growth Stocks

Equation 8-1 is a generalized stock valuation model in the sense that the time pattern of  $D_t$  can be anything:  $D_t$  can be rising, falling, fluctuating randomly, or it can even be zero for several years, and Equation 8-1 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.<sup>5</sup> 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. If this is the case, Equation 8-1 may be rewritten as follows:<sup>6</sup>

$$\begin{aligned}\hat{P}_0 &= \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \dots + \frac{D_0(1+g)^\infty}{(1+r_s)^\infty} \\ &= D_0 \sum_{t=1}^{\infty} \frac{(1+g)^t}{(1+r_s)^t} \\ &= \frac{D_0(1+g)}{r_s - g} = \frac{D_1}{r_s - g}.\end{aligned}\tag{8-2}$$



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The last term in Equation 8-2 is derived in **Web Extension 8A**, available on the textbook's Web site.

<sup>4</sup>We should note 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 8-1, 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 also 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.

<sup>5</sup>Actually, we can find an approximate price. If we project dividends for 100 years or more, the present value of that finite dividend stream is approximately equal to the present value of the infinite dividend stream.

<sup>6</sup>The last term in Equation 8-2 is derived in **Web Extension 8A** at the textbook's Web site.

The last term of Equation 8-2 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 8-2 is that  $r_s$  be greater than  $g$ . Look back at the second form of Equation 8-2. 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 8-2 is the sum of an infinite number of terms, with each term being a number larger than 1. Therefore, if the constant  $g$  were greater than  $r_s$ , the resulting stock price would be infinite! Since no company is worth an infinite price, it is impossible to have a constant growth rate that is greater than  $r_s$ . Occasionally, a student will plug a value for  $g$  greater than  $r_s$  into the last form of Equation 8-2 and report a negative stock price. This is nonsensical. The last form of Equation 8-2 is valid only when  $g$  is less than  $r_s$ . *If  $g$  is greater than  $r_s$ , the constant growth model cannot be used and the answer you would get from using Equation 8-2 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 8-1 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 short cut—just insert the illustrative data into Equation 8-2 to find the stock's intrinsic value, \$23:

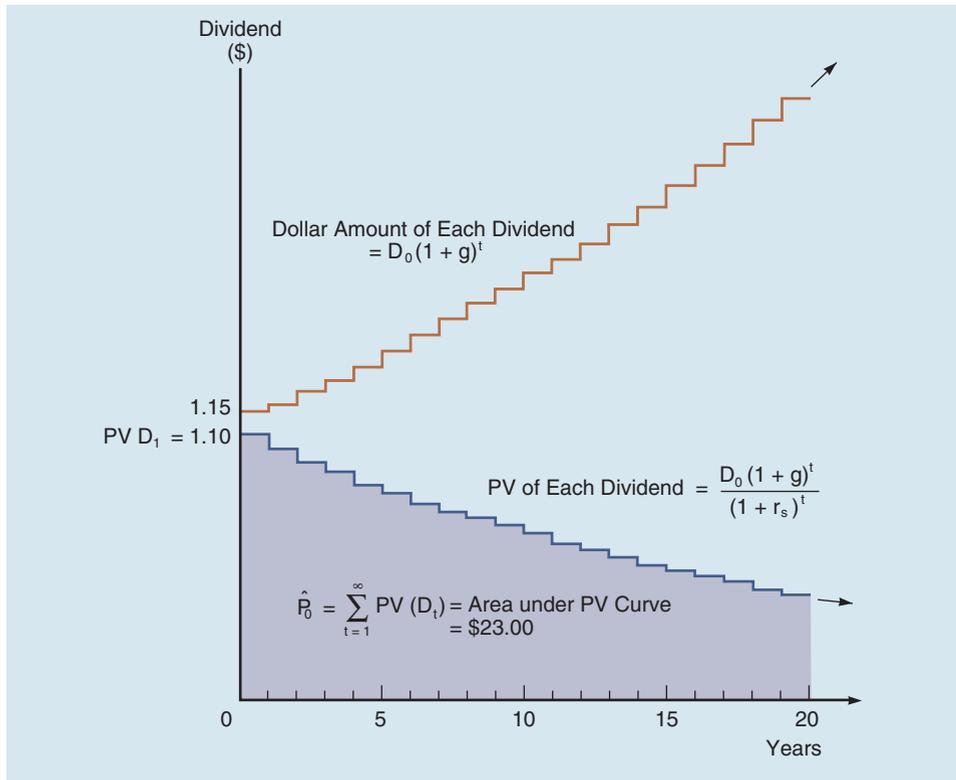
$$\hat{P}_0 = \frac{\$1.15(1.08)}{0.134 - 0.08} = \frac{\$1.242}{0.054} = \$23.00.$$

The concept underlying the valuation process for a constant growth stock is graphed in Figure 8-2. 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 8-2. Therefore, if we extended the lower step function curve in Figure 8-2 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 8-2, \$23.00.

Figure 8-2

Present Value of Dividends of a Constant Growth Stock  
 where  $D_0 = \$1.15$ ,  $g = 8\%$ ,  $r_s = 13.4\%$



Although Equation 8-2 assumes that dividends grow to infinity, most of the value is based on dividends during a relatively short 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. So, companies don't have to live forever for the Gordon growth model to be used.

## Dividend and Earnings Growth

Growth in dividends occurs primarily as a result of growth in *earnings per share (EPS)*. Earnings growth, in turn, results from a number of factors, including (1) inflation, (2) the amount of earnings the company retains and reinvests, and (3) the rate of return the company earns on its equity (ROE). Regarding inflation, if output (in units) is stable, but both sales prices and input costs rise at the inflation rate, then EPS will also grow at the inflation rate. Even without inflation, EPS will also grow as a result of the reinvestment, or plowback, of earnings. If the firm's earnings are not all paid out as dividends (that is, if some fraction of earnings is retained), the dollars of investment behind each share will rise over time, which should lead to growth in earnings and dividends.

Even though a stock's value is derived from expected dividends, this does not necessarily mean that corporations can increase their stock prices by simply raising the current dividend. Shareholders care about *all* dividends, both current and those expected in the future. Moreover, there is a trade-off between current dividends and future dividends. Companies that pay high current dividends necessarily retain

and reinvest less of their earnings in the business, and that reduces future earnings and dividends. So, the issue is this: Do shareholders prefer higher current dividends at the cost of lower future dividends, the reverse, or are stockholders indifferent? There is no simple answer to this question. Shareholders prefer to have the company retain earnings, hence pay less current dividends, if it has highly profitable investment opportunities, but they want the company to pay earnings out if investment opportunities are poor. Taxes also play a role—since dividends and capital gains are taxed differently, dividend policy affects investors' taxes. We will consider dividend policy in detail in Chapter 17.

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

Managers often complain that the stock market is shortsighted, and that it cares only about next quarter's performance. 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 22%, of the \$23.00 stock price is attributable to short-term cash flows. This means that MicroDrive's managers will have a bigger effect on the stock price if they work to increase long-term cash flows rather than focus 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 more 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, 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, if 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 very important, but the information they convey about future prospects can be terribly 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.<sup>7</sup>

## When Can the Constant Growth Model Be Used?

The constant growth model is often 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 too that Equation 8-2 is sufficiently general to handle the case of a **zero growth stock**, where the dividend is expected to remain constant over time. If  $g = 0$ , Equation 8-2 reduces to Equation 8-3:

$$\hat{P}_0 = \frac{D}{r_s} \quad (8-3)$$

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 events?

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%? What would the price be if  $g = 0\%$ ? (**\$25.00; \$16.67**)

## 8.6 Expected Rate of Return on a Constant Growth Stock

We can solve Equation 8-2 for  $r_s$ , again using the hat to indicate that we are dealing with an expected rate of return:<sup>8</sup>

$$\begin{aligned} \text{Expected rate of return} &= \text{Expected dividend yield} + \text{Expected growth rate, or capital gains yield} \\ \hat{r}_s &= \frac{D_1}{P_0} + g \end{aligned} \quad (8-4)$$

<sup>7</sup>Many 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 bonuses or taxes as possible explanations.

<sup>8</sup>The  $r_s$  value in Equation 8-2 is a *required* rate of return, but when we solve for  $r_s$  to obtain Equation 8-4, we are finding an *expected* rate of return. Obviously, the solution requires that  $r_s = \hat{r}_s$ . This equality holds if the stock market is in equilibrium, a condition that will be discussed later in the chapter.

Thus, if you buy a stock for a price  $P_0 = \$23$ , and if you expect the stock to pay a dividend  $D_1 = \$1.242$  1 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 or capital gains yield*,  $g = 8\%$ .

Suppose this analysis had just been conducted, with the current price,  $P_0$ , equal to \$23 and the Year 1 expected dividend,  $D_1$ , equal to \$1.242. What is the expected price at the end of the first year, immediately after  $D_1$  has been paid? We would again apply Equation 8-2, but this time we would use the Year 2 dividend,  $D_2 = D_1(1 + g) = \$1.242(1.08) = \$1.3414$ :

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

Now, note that \$24.84 is 8% larger than  $P_0$ , the \$23 price found 1 year earlier:

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

Thus, we would expect a capital gain of  $\$24.84 - \$23.00 = \$1.84$  during the year, which would provide 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 next year could also be calculated, and again it would be 5.4%. Thus, *for a constant growth stock*, the following conditions must hold:

1. The dividend is expected to grow forever at a constant rate,  $g$ .
2. The stock price is expected to grow at this same rate.
3. The expected dividend yield is constant.
4. The expected capital gains yield is also constant, and it is equal to  $g$ .
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



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

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 if a stock is 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 is the stock’s expected dividend yield and capital gains yield for the coming year? (4%, 5%)

## 8.7 Valuing Stocks That Have a Nonconstant Growth Rate

For many companies, it is inappropriate to assume that dividends will grow at a constant rate. Firms typically go through *life cycles*. During the early part of their lives, 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.<sup>9</sup> Automobile manufacturers in the 1920s, computer software firms 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 8-3 illustrates nonconstant growth and also compares it with normal growth, zero growth, and negative growth.<sup>10</sup>

In the figure, 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 8-1. When  $D_t$  is growing at a constant rate, we simplify Equation 8-1 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 period of supernormal growth.

Because Equation 8-2 requires a constant growth rate, we obviously cannot use it to value stocks that have nonconstant growth. However, assuming that a company currently enjoying supernormal growth will eventually slow down and become a constant growth stock, we can find its 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,  $g$ .  $N$  is often called the **terminal date**, or **horizon date**.

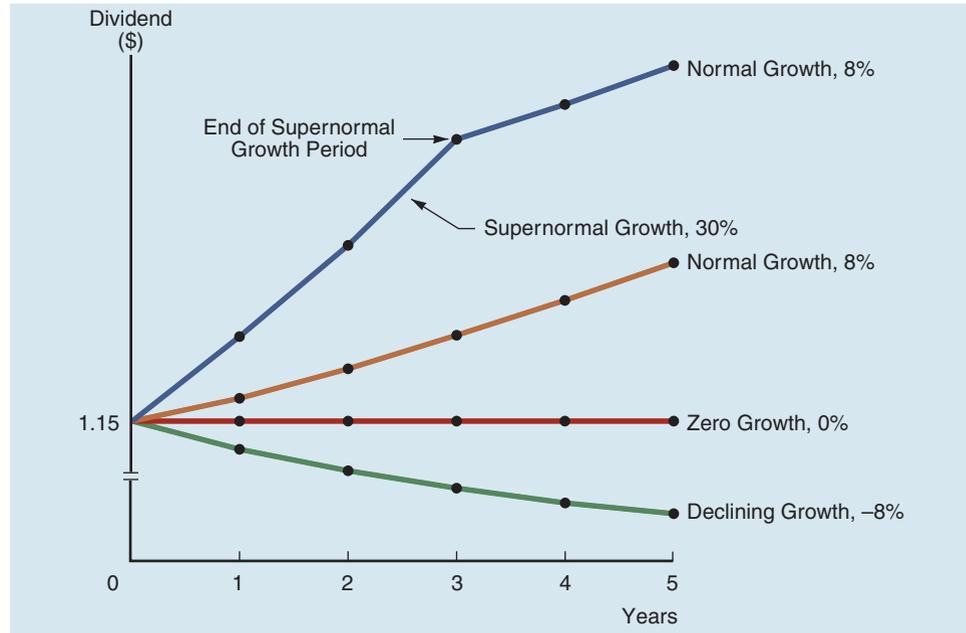
We can use the constant growth formula, Equation 8-2, what the stock’s value will be at period  $N$ , to determine what the stock’s **horizon**, or **terminal, value** will be  $N$  periods from today:

<sup>9</sup>The concept of life cycles could be broadened to *product cycle*, which would include both small start-up companies and large companies like Procter & Gamble, 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 proper number for a DCF analysis.

<sup>10</sup>A 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 8-3

## Illustrative Dividend Growth Rates



$$\text{Horizon value} = \hat{P}_N = \frac{D_{N+1}}{r_s - g} = \frac{D_N(1 + g)}{r_s - g}. \quad (8-5)$$

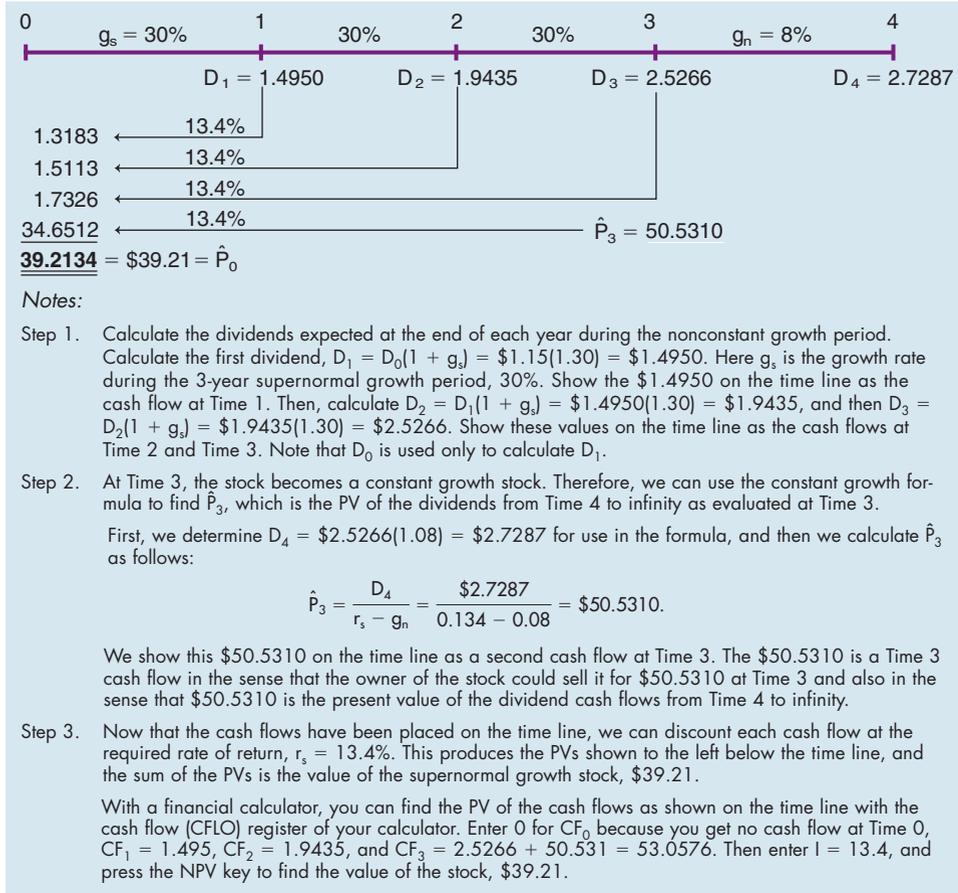
The stock's intrinsic value today,  $\hat{P}_0$ , is the present value of the dividends during the nonconstant growth period plus the present value of the horizon value:

$$\hat{P}_0 = \underbrace{\frac{D_1}{(1 + r_s)^1} + \frac{D_2}{(1 + r_s)^2} + \cdots + \frac{D_N}{(1 + r_s)^N}}_{\substack{\text{PV of dividends during the} \\ \text{nonconstant growth period} \\ t = 1, \dots, N}} + \underbrace{\frac{D_{N+1}}{(1 + r_s)^{N+1}} + \cdots + \frac{D_\infty}{(1 + r_s)^\infty}}_{\substack{\text{PV of dividends during the} \\ \text{constant growth period} \\ t = N + 1, \dots, \infty}}$$

$$\hat{P}_0 = \underbrace{\frac{D_1}{(1 + r_s)^1} + \frac{D_2}{(1 + r_s)^2} + \cdots + \frac{D_N}{(1 + r_s)^N}}_{\substack{\text{PV of dividends during the} \\ \text{nonconstant growth period} \\ t = 1, \dots, N}} + \underbrace{\frac{\hat{P}_N}{(1 + r_s)^N}}_{\substack{\text{PV of horizon} \\ \text{value } \hat{P}_N: \\ \frac{[(D_{N+1})/(r_s - g)]}{(1 + r_s)^N}}}. \quad (8-6)$$

Figure 8-4

## Process for Finding the Value of a Supernormal Growth Stock



e-resource

See **FM12 Ch 08 Tool Kit.xls** at the textbook's Web site for all calculations.

To implement Equation 8-6, 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,  $\hat{P}_0$ .

Figure 8-4 can be used to illustrate the process for valuing nonconstant growth stocks. Here we make the following assumptions:

$r_s$  = Stockholders' required rate of return = 13.4%. This rate is used to discount 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, e.g., 30% for 3 years, then 20% for 3 years, and then a constant 8%.)  
 $g_n$  = 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.

The valuation process as diagrammed in Figure 8-4 is explained in the steps set forth below the time line. The estimated value of the supernormal growth stock is \$39.21.

## SELF-TEST

Explain how one would find the value of a supernormal growth stock.

Explain what is meant by "horizon (terminal) date" and "horizon (terminal) value."

Suppose  $D_0 = \$5.00$  and  $r_s = 9\%$ . The expected growth rate from Year 0 to Year 1 ( $g_{0 \text{ to } 1}$ ) = 20%, the expected growth rate from Year 1 to Year 2 ( $g_{1 \text{ to } 2}$ ) = 10%, and the constant rate beyond Year 2 is  $g_n = 5\%$ . What are the expected dividends for Year 1 and Year 2? What is the expected horizon value price at Year 2 ( $\hat{P}_2$ )? What is  $\hat{P}_0$ ? (\$6.00 and \$6.60; \$138.60; \$125.45)

## 8.8 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). Following is a simple example illustrating this approach to stock valuation.

Suppose a firm had a free cash flow of \$200 million at the end of the most recent year. Chapter 14 shows how to forecast financial statements and free cash flows, but for now let's assume that the firm's FCFs are expected to grow at a constant rate of 5% per year forever. Chapter 10 explains how to estimate the weighted average cost of capital, but for now let's assume that the firm'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 8-2, the value of a constantly growing stream of dividends:

$$V = \frac{FCF(1 + g)}{WACC - g} = \frac{\$200(1.05)}{0.09 - 0.05} = \$5,250 \text{ million.} \quad (8-7)$$

FCFs are the cash flow available for distribution to *all* of the firm's investors, not just the shareholders. 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, we would add them to  $V$  to find the total value. The firm in this example has no nonoperating assets, so its total value is \$5,250 million. To find the value of 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 and preferred stock equals \$2,000 million, then the firm's equity has a value of  $\$5,250 - \$2,000 = \$3,250$  million. If 325 million shares of stock are outstanding, then the intrinsic stock value  $\$3,250/325 = \$10$  per share. This example should give you the general idea behind the free cash flow approach to

stock valuation, but see Chapter 15 for a more comprehensive example, including the situation where free cash flows are growing initially at a nonconstant rate.

### SELF-TEST

Explain how to find the stock price using the free cash flow approach.

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## 8.9 Market Multiple Analysis

Another method of stock valuation is **market multiple analysis**, which applies a market-determined multiple to net income, earnings per share, sales, book value, or, for businesses such as cable TV or cellular telephone systems, the number of subscribers. While the discounted dividend method applies valuation concepts in a precise manner, focusing on expected cash flows, market multiple analysis is more judgmental. To illustrate the concept, suppose that a company's forecasted earnings per share are \$7.70. The average price per share to earnings per share (P/E) ratio for similar publicly traded companies is 12.

To estimate the company's stock value using the market P/E multiple approach, simply multiply its \$7.70 earnings per share by the market multiple of 12 to obtain the value of  $\$7.70(12) = \$92.40$ . This is its estimated stock price per share.

Note that measures other than net income can be used in the market multiple approach. For example, another commonly used measure is *earnings before interest, taxes, depreciation, and amortization (EBITDA)*. The EBITDA multiple is the total value of a company (the market value of equity plus debt) divided by EBITDA. This multiple is based on total value, since EBITDA measures the entire firm's performance. Therefore, it is called an **entity multiple**. The EBITDA market multiple is the average EBITDA multiple for similar publicly traded companies. Multiplying a company's EBITDA by the market multiple gives an estimate of the company's total value. To find the company's estimated stock price per share, subtract debt from total value, and then divide by the number of shares of stock.

As noted above, in some businesses such as cable TV and cellular telephone, an important element in the valuation process is the number of customers a company has. For example, telephone companies have been paying about \$2,000 per customer when acquiring cellular operators. Managed care companies such as HMOs have applied similar logic in acquisitions, basing their valuations 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.

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### SELF-TEST

What is market multiple analysis?  
What is an entity multiple?

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## 8.10 Preferred Stock

Preferred stock is a *hybrid*—it is 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 that 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.

As noted above, a preferred stock entitles its owners to regular, fixed dividend payments. If the payments last forever, the issue is a perpetuity whose value,  $V_{ps}$ , is found as follows:

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

$V_{ps}$  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, found by solving Equation 8-8 as follows:

$$V_{ps} = \frac{\$10.00}{0.103} = \$100.00.$$

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

$$\hat{r}_{ps} = \frac{D_{ps}}{V_{ps}}. \quad (8-8a)$$

Some preferred stocks have a stated maturity date, 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 as follows: Enter  $N = 50$ ,  $I/YR = 8$ ,  $PMT = 10$ , and  $FV = 100$ . Then press  $PV$  to find the price,  $V_{ps} = \$124.47$ . If  $r_{ps} = I = 10\%$ , change  $I = 8$  to  $I = 10$ , and find  $P = V_{ps} = PV = \$100$ . 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 (perpetual or maturing) as follows:

$$EFF\% = EAR_p = \left(1 + \frac{r_{Nom}}{m}\right)^m - 1 = \left(1 + \frac{0.10}{4}\right)^4 - 1 = 10.38\%.$$

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 a perpetual bond or the one used for common stock?

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

## 8.11 Stock Market Equilibrium

Recall that  $r_i$ , the required return on Stock  $i$ , can be found using the Security Market Line (SML) equation as it was developed in our discussion of the Capital Asset Pricing Model (CAPM) back 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 the marginal investor will require a return of 16% on Stock i:

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

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, hence will hold but not buy or sell, if the expected rate of return is exactly 16%. Now suppose the investor's portfolio contains Stock i, and he or 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 marginal investor observes that the present price of the stock,  $P_0$ , is \$30. Should he or 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 is less than the required return of 16%, this marginal investor would want to sell the stock, as would most other holders. 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:

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

Had the stock initially sold for less than \$27.27, say, \$25, 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 may believe that  $\hat{r}_i > r_i$  and  $\hat{P}_0 > P_0$ ; hence they would invest in the stock, while other investors may have an opposite view and would sell all of their shares. However, it is the marginal investor who

establishes the actual market price, and for this 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—they undergo violent changes at times. For example, on September 17, 2001, the first day of trading after the terrorist attacks of September 11, the Dow Jones average dropped 685 points. This was the largest decline ever in the Dow, but not the largest percentage loss, which was  $-24.4\%$  on December 12, 1914. More recently, the Dow fell by  $22.6\%$  on October 19, 1987. The Dow has also had some spectacular increases. In fact, its eighth-largest increase was 368 points on September 24, 2001, shortly after its largest-ever decline. The Dow's largest increase ever was 499 points on April 16, 2000, and its largest percentage gain of  $15.4\%$  occurred on March 15, 1933. 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 were exactly met, during the next year the price would gradually rise to \$28.63, or by  $5\%$ . 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 assumed input variables:

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

Now give yourself a test: How would the indicated change in each variable, by itself, affect the price, and what is your guess as to the new stock price?

Every change, taken alone, would lead to an *increase* in the price. Taken together, the first three changes lower  $r_i$ , which declines from  $16\%$  to  $10\%$ :

$$\text{Original } r_i = 8\% + 4\%(2.0) = 16\%;$$

$$\text{New } r_i = 7\% + 3\%(1.0) = 10\%.$$

Using these values, together with the new  $g$  value, we find that  $\hat{P}_0$  rises from \$27.27 to \$75.71:<sup>11</sup>

<sup>11</sup>A price change of this magnitude is by no means rare for an individual stock. The prices of *many* stocks double or halve during a year. For example, Ciena, a phone equipment maker, fell by  $76.1\%$  in 1998, increased by  $183\%$  in 2000, declined by  $84\%$  in 2001, and declined by another  $64\%$  in 2002. In 2004 alone, Ciena declined by  $79\%$  and then increased by  $102\%$ .

$$\text{Original } \hat{P}_0 = \frac{\$2.8571(1.05)}{0.16 - 0.05} = \frac{\$3}{0.11} = \$27.27;$$

$$\text{New } \hat{P}_0 = \frac{\$2.8571(1.06)}{0.10 - 0.06} = \frac{\$3.0285}{0.04} = \$75.71.$$

At the new price, the expected and required rates of return are equal:<sup>12</sup>

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

As this example illustrates, even small changes in the size or risk of expected future dividends can cause large changes in stock prices. 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 a tightening of interest rates by the Federal Reserve. 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, that 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 released 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 was released. Fortunately, in our economy timely information is readily available, and evidence suggests that stocks, especially those of large companies, adjust 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, of course, times when a stock appears to react for several months to favorable or unfavorable developments. However, this does not signify a long adjustment period; rather, it simply indicates that as more new pieces of information about the situation become available, the market adjusts to them. The ability of the market to adjust to new information is discussed in the next section.

### SELF-TEST

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What two conditions must hold for a stock to be in equilibrium?  
Why doesn't a volatile stock price imply irrational pricing?

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## 8.12 The Efficient Markets Hypothesis

As we briefly discussed in Chapter 7, a body of theory called the **Efficient Markets Hypothesis (EMH)** holds (1) that stocks are always in equilibrium and

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<sup>12</sup>It 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 or she had bought Ciena stock, but after the fact, the realized return was far above 15% in 2000 and was far below in 1998, 2001, and 2002.

(2) that it is impossible for an investor to consistently “beat the market.” Essentially, 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 the stocks in a specific industry), there would on average be 1,000 analysts following each stock. Further, these analysts work for organizations such as Citigroup, Merrill Lynch, Prudential Insurance, 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 1,000 analysts generally receive and evaluate it at about the same time. Therefore, the price of a stock will adjust almost immediately to any new development.

## Weak-Form Efficiency

The **weak form** of the EMH states that all information contained in past price movements is fully reflected in current market prices. If this 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. People who believe that weak-form efficiency exists also believe that “tape watchers” and “chartists” are wasting their time.<sup>13</sup>

For example, after studying the past history of the stock market, a chartist might “discover” the following pattern: If a stock falls three consecutive days, its price typically rises 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.

But if this pattern truly existed, wouldn’t other investors also discover it, and if so, why would anyone be willing to sell a stock after it had fallen three consecutive days if he or she knew its price was going to increase by 10% the next day? In other words, if a stock is selling at \$40 per share after falling three consecutive days, why would investors sell the stock if they expected it to rise to \$44 per share one day later? Those who believe in weak-form efficiency argue that if the stock was really likely to rise to \$44 tomorrow, its price *today* would actually rise to somewhere near \$44 immediately, 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

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<sup>13</sup>Tape watchers focus on the trade-by-trade behavior of stock prices, which used to be reported on a paper tape. Chartists plot past patterns of stock price movements. Both are called “technical analysts,” and both believe that they can tell if something is happening to the stock that will cause its price to move up or down in the near future.

any better unless they have either good luck or access to information that is not publicly available. However, insiders (for example, the presidents of companies) who have information that is not publicly available can earn consistently abnormal returns (returns higher than those predicted by the SML) even under semistrong-form efficiency.

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. If, for example, a company announces a 30% increase in earnings, and if that increase is about what analysts had been expecting, 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 a particular 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 getting 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.<sup>14</sup> The evidence suggests that the strong form EMH does not hold, because those who possessed inside information could and did (illegally) make abnormal profits.

However, many skeptics of the EMH point to the stock market bubble that burst in 2000 and suggest that at the height of the boom the prices of the stocks of many companies, particularly 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

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<sup>14</sup>Virtually no academic studies have shown that excess returns (that is, above those predicted by the CAPM) can be earned by using past stock prices to predict future stock prices. A possible exception is in the area of long-term reversals, where several studies showed that portfolios of stocks with poor past long-term performance tended to do slightly better than average in the long term, and vice versa. Another exception is in the area of momentum, where studies showed that stocks with strong performance in the past short term tended to do slightly better than average in the short term, and vice versa. 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.

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, and Chapter 7 discusses it in more detail.<sup>15</sup>

Keep in mind that the EMH does not assume that all investors are rational. Instead, it assumes that stock market prices reflect intrinsic values. As we described earlier, new information should cause a stock's current intrinsic value to move to a new intrinsic value based on that new information. The EHM further assumes that whenever stock prices deviate from their intrinsic values due to a lag in the incorporation of new information, investors will *quickly* take advantage of 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, such as holding losers too long and selling winners too quickly, that 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 irrational (i.e., consistently mispriced), 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 that investor had acted on that assumption and sold stock short, he or she 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 for the run, he or she would have been vindicated, because the Nasdaq subsequently fell 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 ( $\hat{P}_0 \approx P_0$ ).

## 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.<sup>16</sup> Indeed, the relatively poor performance of actively managed mutual funds helps explain the growing popularity of indexed funds, where administrative costs are relatively low. 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.

Second, market efficiency also has important implications for managerial decisions, especially stock issues, stock repurchases, and tender offers. If the

<sup>15</sup>Three 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, *Handbook of the Economics of Finance*, edited by George Constantinides, Milt Harris, and René Stulz, part of the Handbooks in Economics Series (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, 1999).

<sup>16</sup>For a discussion of the recent performance of actively managed funds, see Jonathan Clements, "Resisting the Lure of Managed Funds," *The Wall Street Journal*, February 27, 2001, C1.

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 they cannot use this information for their own advantage, nor can they deliberately defraud any investors.

## SELF-TEST

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- 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?
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## 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 specific 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 vote a new management team into office.
- 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 control of the present stockholders 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.
- **Closely held stock** is owned by a few individuals who are typically associated with the firm's management.
- **Publicly owned stock** is owned by a relatively large number of individuals who are not actively involved in the firm's management.
- 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

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

- 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 expected dividend yield and the expected capital gains yield are constant.

- The equation for  $\hat{r}_s$ , the **expected rate of return on a constant growth stock**, can be expressed as follows:

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

- A **zero growth stock** is one whose future dividends are not expected to grow at all, while 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.
- The **horizon (terminal) value** is the value at the horizon date of all future dividends after that date.
- **Preferred stock** is a hybrid security having some characteristics of debt and some of equity.
- Most preferred stocks are **perpetuities**, and the value of a share of perpetual preferred stock is found as the dividend divided by the required rate of return:

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

- **Maturing preferred stock** 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 (1) that stocks are always in equilibrium and (2) that 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 ( $\hat{P}_0 = P_0$ ), the required return on a stock is equal to its expected return ( $r_s = \hat{r}_s$ ), and all stocks’ expected returns plot on the SML.

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## Questions

- (8-1) 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 ( $P_0$ )

- d. Required rate of return,  $r_s$ ; expected rate of return,  $\hat{r}_s$ ; actual, or realized, rate of return,  $\bar{r}_s$
- e. Capital gains yield; dividend yield; expected total return
- f. Normal, or constant, growth; supernormal, or nonconstant, growth; zero growth stock
- g. Preferred stock
- h. Equilibrium; Efficient Markets Hypothesis (EMH); three forms of EMH

**(8-2)** Two investors are evaluating General Motors' 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, while 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 Motors' stock. True or false? Explain.

**(8-3)** A bond that pays interest forever and has no maturity date is a perpetual bond. In what respect is a perpetual bond similar to a no-growth common stock, and to a share of preferred stock?

## Self-Test Problems Solutions Appear in Appendix A

**(ST-1)** 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%, what is Ewald's expected stock price 5 years from now?

Constant Growth Stock Valuation

**(ST-2)** 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%.

- a. Calculate the value of the stock today.
- b. Calculate  $\hat{P}_1$  and  $\hat{P}_2$ .
- c. Calculate the dividend yield and capital gains yield for Years 1, 2, and 3.

Supernormal Growth Stock Valuation

## Problems Answers Appear in Appendix B

### Easy Problems 1-5

**(8-1)** 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?

DPS Calculation

**(8-2)** Boehm Incorporated is expected to pay a \$1.50 per share dividend at the end of the 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 the company's stock?

Constant Growth Valuation

**(8-3)** Woidtke Manufacturing's stock currently sells for \$20 a share. The stock just paid a dividend of \$1.00 a share (i.e.,  $D_0 = \$1.00$ ). The dividend is expected to grow 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 the company's stock?

Constant Growth  
Valuation

**(8-4)** Basil Pet Products has preferred stock outstanding which pays a dividend of \$5 at the end of each year. The preferred stock sells for \$50 a share. What is the preferred stock's required rate of return?

Preferred Stock Valuation

**(8-5)** 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 the dividend will grow at a constant rate of 7% thereafter. The company's stock has a beta equal to 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?

Nonconstant Growth  
Valuation

### Intermediate Problems 6–16

**(8-6)** A stock is trading at \$80 per share. The stock is expected to have a year-end dividend of \$4 per share ( $D_1 = \$4$ ), which is expected to grow at some constant rate  $g$  throughout time. The stock's required rate of return is 14%. If you are an analyst who believes in efficient markets, what is your forecast of  $g$ ?

Constant Growth Rate,  $g$

**(8-7)** You are considering an investment in the common stock of Crisp's Cookware. The stock is expected to pay a dividend of \$2 a share at the end of the year ( $D_1 = \$2.00$ ). The stock has a beta equal to 0.9. The risk-free rate is 5.6%, and the market risk premium is 6%. The stock's dividend is expected to grow at some constant rate  $g$ . The stock currently sells for \$25 a share. Assuming the market is in equilibrium, what does the market believe will be the stock price at the end of 3 years? (That is, what is  $\hat{P}_3$ ?)

Constant Growth  
Valuation

**(8-8)** What will be 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?

Preferred Stock Rate of  
Return

**(8-9)** 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?

Declining Growth Stock  
Valuation

**(8-10)** The beta coefficient for Stock C is  $b_C = 0.4$ , whereas 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 stocks are sometimes cited as an example.)

Rates of Return and  
Equilibrium

- 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 will happen if the stock is not in equilibrium.

- (8-11)** 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 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 match the 6% industry average rate. The last dividend paid ( $D_0$ ) was \$1. What is the value per share of your firm's stock?
- (8-12)** Nonconstant Growth Stock Valuation Simpkins Corporation is expanding rapidly, and it currently needs to retain all of its earnings; hence it does not pay any dividends. 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?
- (8-13)** Preferred Stock Valuation Rolen Riders issued preferred stock with a stated dividend of 10% of par. Preferred stock of this type currently yields 8%, and the par value is \$100. Assume dividends are paid annually.
- What is the value of Rolen's preferred stock?
  - Suppose interest rate levels rise to the point where the preferred stock now yields 12%. What would be the value of Rolen's preferred stock?
- (8-14)** 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 get the expected total rate of return. What is this stock's expected total rate of return?
- (8-15)** Constant Growth Stock Valuation Investors require a 15% rate of return on Brooks Sisters' stock ( $r_s = 15\%$ ).
- What will be Brooks Sisters' stock value if the previous dividend was  $D_0 = \$2$  and if investors expect dividends to grow at a constant compound annual rate of (1) -5%, (2) 0%, (3) 5%, and (4) 10%?
  - Using data from part a, what is the Gordon (constant growth) model value for Brooks Sisters' 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  $g > r_s$ ?
- (8-16)** 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  $g =$  a constant 5%, at what price should Schuler's stock sell?
  - Now, suppose the Federal Reserve Board increases the money supply, causing the risk-free rate to drop to 9% and  $r_M$  to fall to 12%. What would this do to 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 sell?

- d. Now, 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

#### (8-17) 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, and, 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; that is, 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; that is, you expect  $\hat{P}_3$  to equal \$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 8-2 to calculate the present value of this stock. Assume that  $g = 5\%$ , and it 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,  $\hat{P}_0$ ?

#### (8-18) Nonconstant Growth Stock Valuation

Reizenstein Trucking (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 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 which should exist at  $t = 5$ ,  $\hat{P}_5$ . The  $\hat{P}_5$  stock price can be found by using the constant growth equation. Notice that to find  $\hat{P}_5$ , you use the dividend expected at  $t = 6$ , which is 5% greater than the  $t = 5$  dividend.
- 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.,  $D_6/\hat{P}_5$ ).

#### (8-19) Supernormal Growth Stock Valuation

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

- If  $D_0 = \$1.60$ ,  $r_s = 10\%$ , and  $g_n = 6\%$ , what is TTC's stock worth today? What are its expected dividend yield and 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. How would this affect its price, dividend yield, and capital gains yield? Answer in words only.
- c. What will be TTC's dividend yield and capital gains yield 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; the calculations are very easy.)
- d. Of what interest to investors is the changing relationship between dividend yield and capital gains yield over time?



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**(8-20)**

Build a Model:  
Supernormal Growth  
and Corporate Valuation

## Spreadsheet Problem

Start with the partial model in the file *FM12 Ch 08 P20 Build a Model.xls* from the textbook's Web site. Rework Problem 8–19, parts a, b, and c, using a spreadsheet model. For part b, calculate the price, dividend yield, and capital gains yield as called for in the problem.



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## Cyberproblem

Please go to the textbook's Web site to access any Cyberproblems.

## 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 represented cities, 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 stock price?
  - (3) What is the stock's expected value 1 year from now?
  - (4) What are the expected dividend yield, the capital gains yield, and the total return during the first year?
- e. Now assume that the stock is currently selling at \$30.29. What is the expected rate of return on the stock?
- f. What would the stock price be if its dividends were expected to have zero growth?
- g. Now assume that Temp Force is expected to experience supernormal growth of 30% for the next 3 years, then to return to its long-run constant growth rate of 6%. What is the stock's value under these conditions? What is its expected dividend yield and capital gains yield in Year 1? In 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 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 value now? What is its expected dividend yield and its capital gains yield in Year 1? In Year 4?
- j. Finally, assume that Temp Force's earnings and dividends are expected to decline by a constant 6% per year, 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. It pays an annual dividend of \$5, and the issue price was \$50 per share. What is the expected return to an investor on 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 price? What is the impact on stock price if  $g$  is 4% or 6%? If  $r_s$  is 9% or 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?

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## Selected Additional Cases

The following cases from Textchoice, Thomson 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)."