Stock Valuation 6

OPENING CASE

When the stock market closed on February 19, 2016, the common stock of heavy equipment manufacturer Caterpillar was selling for $65.40 per share. On that same day, Marriott International, the well-known hotel company, closed at $65.71 per share, and software company Red Hat closed at $65.90. Since the stock prices of these three companies were so similar, you might expect that they would be offering similar dividends to their stockholders, but you would be wrong. In fact, Caterpillar's annual dividend was $3.01 per share, Marriott's was $.95 per share, and Red Hat paid no dividends at all!

As we will see in this chapter, dividends currently being paid are one of the primary factors we look at when attempting to value common stocks. However, it is obvious from looking at Red Hat that current dividends are not the end of the story. This chapter explores dividends, stock values, and the connection between the two.

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In our previous chapter, we introduced you to bonds and bond valuation. In this chapter, we turn to the other major source of financing for corporations, common and preferred stock. We first describe the cash flows associated with a share of stock and then go on to develop a very famous result, the dividend growth model. From there, we move on to examine various important features of common and preferred stock, focusing on shareholder rights. We close out the chapter with a discussion of how shares of stock are traded and how stock prices and other important information are reported in the financial press.

6.1 THE PRESENT VALUE OF COMMON STOCKS

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Dividends versus Capital Gains

Our goal in this section is to value common stocks. We learned in Chapter 5 that an asset's value is determined by the present value of its future cash flows. Investing in a stock can provide two kinds of cash flows. First, many stocks pay dividends on a regular basis. Second, the stockholder receives the sale price when she sells the stock. Thus, in order to value common stocks, we need to answer an interesting question: Is the value of a stock equal to:

1. The discounted present value of the sum of next period's dividend plus next period's stock price, or
2. The discounted present value of all future dividends?

This is the kind of question that students would love to see on a multiple-choice exam, because both (1) and (2) are right.

To see that (1) and (2) are the same, let's start with an individual who will buy the stock and hold it for one year. In other words, she has a one-year *holding period.* In addition, she is willing to pay P_0 for the stock today. That is, she calculates:

$$P_0 = \frac{\text{Div}_1}{1+R} + \frac{P_1}{1+R} \quad [6.1]$$

Div_1 is the dividend paid at year's end and P_1 is the price at year's end. P_0 is the present value of the common stock investment. The term in the denominator, R, is the appropriate discount rate for the stock.

That seems easy enough, but where does P_1 come from? P_1 is not pulled out of thin air. Rather, there must be a buyer at the end of Year 1 who is willing to purchase the stock for P_1. This buyer determines the price by:

$$P_1 = \frac{\text{Div}_2}{1+R} + \frac{P_2}{1+R} \quad [6.2]$$

Substituting the value of P_1 from Equation 6.2 into Equation 6.1 yields:

$$P_0 = \frac{1}{1+R}\left[\text{Div}_1 + \left(\frac{\text{Div}_2 + P_2}{1+R}\right)\right] \quad [6.3]$$

$$= \frac{\text{Div}_1}{1+R} + \frac{\text{Div}_2}{(1+R)^2} + \frac{P_2}{(1+R)^2}$$

We can ask a similar question for Formula 6.3: Where does P_2 come from? An investor at the end of Year 2 is willing to pay P_2 because of the dividend and stock price at Year 3. This process can be repeated *ad nauseam.*[1] At the end, we are left with:

$$P_0 = \frac{\text{Div}_1}{1+R} + \frac{\text{Div}_2}{(1+R)^2} + \frac{\text{Div}_3}{(1+R)^3} + \ldots = \sum_{t=1}^{\infty} \frac{\text{Div}_t}{(1+R)^t} \quad [6.4]$$

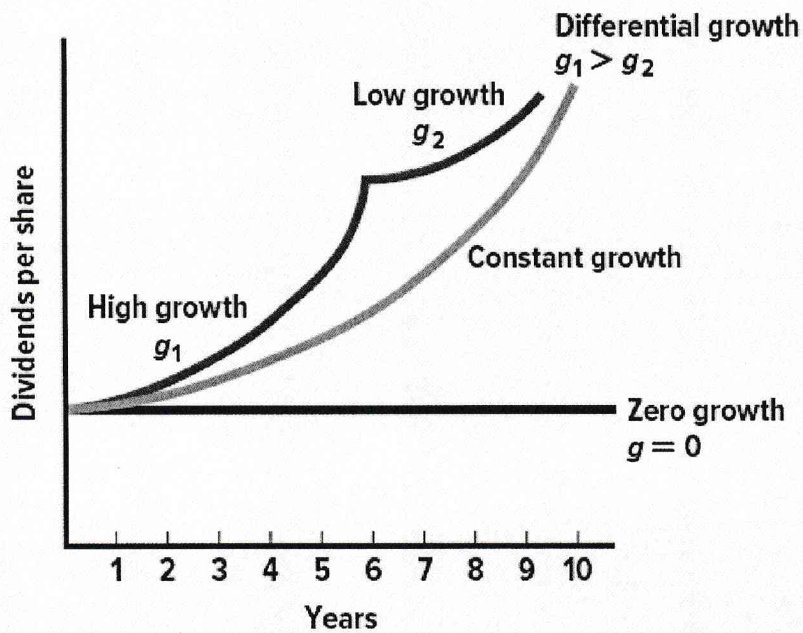
Thus the value of a firm's common stock to the investor is equal to the present value of all of the expected future dividends.

This is a very useful result. A common objection to applying present value analysis to stocks is that investors are too shortsighted to care about the long-run stream of dividends. These critics argue that an investor will generally not look past his or her time horizon. Thus, prices in a market dominated by short-term investors will reflect only near-term dividends. However, our discussion shows that a long-run dividend discount model holds even when investors have short-term time horizons. Although an investor may want to cash out early, she must find another investor who is willing to buy. The price this second investor pays is dependent on dividends *after* his date of purchase.

Valuation of Different Types of Stocks

The above discussion shows that the value of the firm is the present value of its future dividends. How do we apply this idea in practice? Equation 6.4 represents a very general model and is applicable regardless of whether the level of expected dividends is growing, fluctuating, or constant. The general model can be simplified if the firm's dividends are expected to follow some basic patterns: (1) zero growth, (2) constant growth, and (3) differential growth. These cases are illustrated in Figure 6.1.

FIGURE 6.1
Zero Growth, Constant Growth, and Differential Growth Patterns



Dividend growth models

Zero growth: $P_0 = \frac{\text{Div}}{R}$

Constant growth: $P_0 = \frac{\text{Div}}{R - g}$

Differential growth: $P_0 = \sum_{t=1}^{T} \frac{\text{Div}(1 + g_1)^t}{(1 + R)^t} + \frac{\frac{\text{Div}_{T+1}}{R - g_2}}{(1 + R)^T}$

CASE 1 (ZERO GROWTH) The value of a stock with a constant dividend is given by:

$$P_0 = \frac{\text{Div}_1}{1 + R} + \frac{\text{Div}_2}{(1 + R)^2} + \cdots = \frac{\text{Div}}{R}$$

Here it is assumed that $\text{Div}_1 = \text{Div}_2 = \ldots = \text{Div}$. This is just an application of the perpetuity formula from a previous chapter.

CASE 2 (CONSTANT GROWTH) Dividends grow at rate g, as follows:

End of Year	1	2	3	4	
Dividend	Div	Div(1 + g)	Div$(1 + g)^2$	Div$(1 + g)^3$	...

Note that Div is the dividend at the end of the *first* period.

EXAMPLE 6.1

Projected Dividends

Hampshire Products will pay a dividend of $4 per share a year from now. Financial analysts believe that dividends will rise at 6 percent per year for the foreseeable future. What is the dividend per share at the end of each of the first five years?

End of Year	1	2	3	4	5
Dividend	\$4.00	\$4 × (1.06) = \$4.24	\$4 × $(1.06)^2$ = \$4.4944	\$4 × $(1.06)^3$ = \$4.7641	\$4 × $(1.06)^4$ = \$5.0499

The value of a common stock with dividends growing at a constant rate is:

$$P_0 = \frac{\text{Div}}{1+R} + \frac{\text{Div}(1+g)}{(1+R)^2} + \frac{\text{Div}(1+g)^2}{(1+R)^3} + \frac{\text{Div}(1+g)^3}{(1+R)^4} + \cdots = \frac{\text{Div}}{R-g}$$

where g is the growth rate. Div is the dividend on the stock at the end of the first period. This is the formula for the present value of a growing perpetuity, which we derived in a previous chapter.

EXAMPLE 6.2

Stock Valuation

Suppose an investor is considering the purchase of a share of the Utah Mining Company. The stock will pay a $3 dividend a year from today. This dividend is expected to grow at 10 percent per year (*g* = 10%) for the foreseeable future. The investor thinks that the required return (*R*) on this stock is 15 percent, given her assessment of Utah Mining's risk. (We also refer to *R* as the discount rate of the stock.) What is the value of a share of Utah Mining Company's stock?

Using the constant growth formula of Case 2, we assess the value to be $60:

$$\$60 = \frac{\$3}{.15 - .10}$$

P_0 is quite dependent on the value of *g*. If *g* had been estimated to be 12.5 percent, the value of the share would have been:

$$\$120 = \frac{\$3}{.15 - .125}$$

The stock price doubles (from $60 to $120) when *g* only increases 25 percent (from 10 percent to 12.5 percent). Because of P_0's dependency on *g*, one must maintain a healthy sense of skepticism when using this constant growth of dividends model.

Furthermore, note that P_0 is equal to infinity when the growth rate, *g*, equals the discount rate, *R*. Because stock prices do not grow infinitely, an estimate of *g* greater than *R* implies an error in estimation. More will be said of this point later.

The assumption of steady dividend growth might strike you as peculiar. Why would the dividend grow at a constant rate? The reason is that, for many companies, steady growth in dividends is an explicit goal. For example, in 2016, Procter & Gamble, the Cincinnati-based maker of personal care and household products, increased its annual dividend by about 1 percent to $2.68 per share; this increase was notable because it was the 60th in a row. The subject of dividend growth falls under the general heading of dividend policy, so we will defer further discussion of it to a later chapter.

CASE 3 (DIFFERENTIAL GROWTH) In this case, an algebraic formula would be too unwieldy. Instead, we present examples.

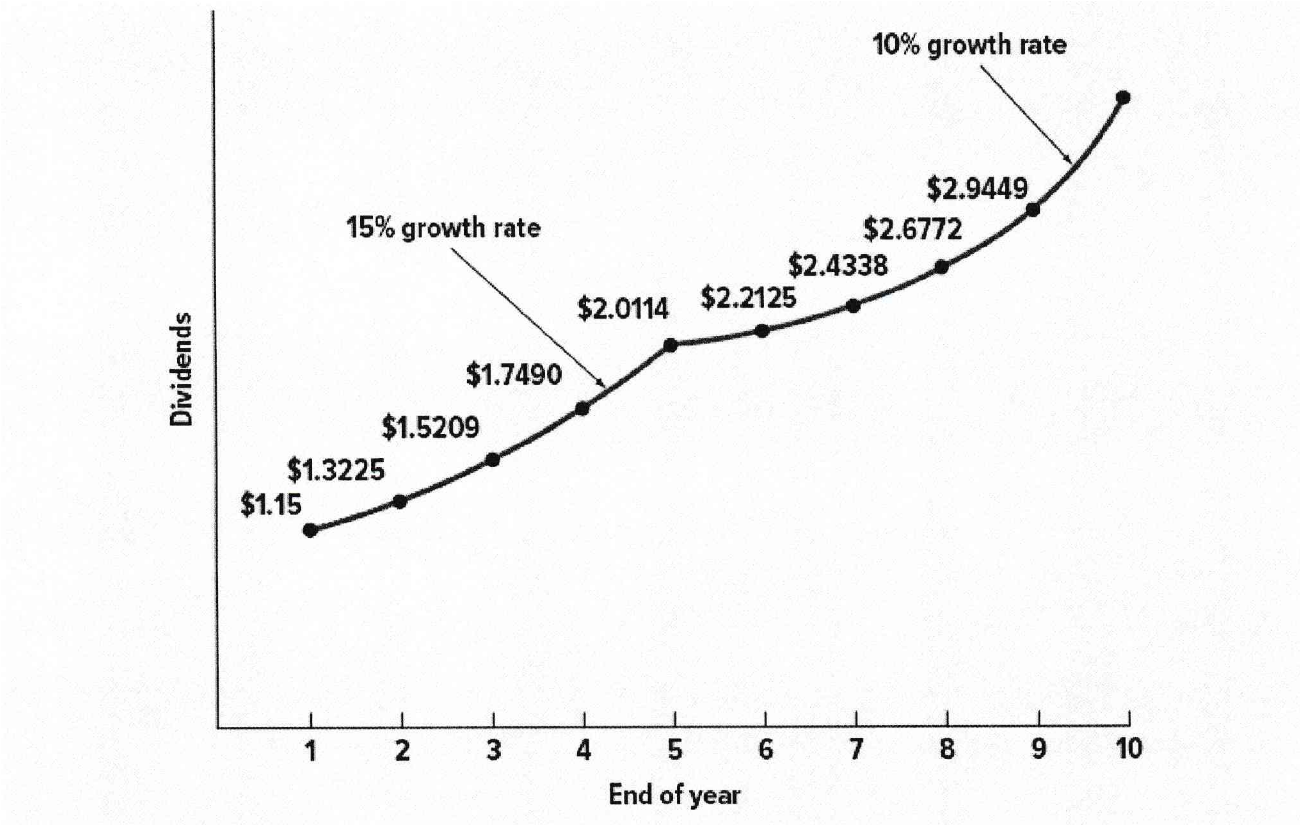
EXAMPLE 6.3

Differential Growth

Consider the stock of Elixir Drug Company, which has a new back-rub ointment and is enjoying rapid growth. The dividend for a share of stock a year from today will be \$1.15. During the next four years, the dividend will grow at 15 percent per year (g_1 = 15%). After that, growth (g_2) will be equal to 10 percent per year. Can you calculate the present value of the stock if the required return (R) is 15 percent?

Figure 6.2 displays the growth in the dividends. We need to apply a two-step process to discount these dividends. We first calculate the present value of the dividends growing at 15 percent per annum. That is, we first calculate the present value of the dividends at the end of each of the first five years. Second, we calculate the present value of the dividends beginning at the end of Year 6.

FIGURE 6.2
Growth in Dividends for Elixir Drug Company



Calculate Present Value of First Five Dividends The present value of dividend payments in Years 1 through 5 is as follows:

FUTURE YEAR	GROWTH RATE (g_1)	EXPECTED DIVIDEND	PRESENT VALUE
1	.15	$1.1500	$1
2	.15	1.3225	1
3	.15	1.5209	1
4	.15	1.7490	1
5	.15	2.0114	1
Years 1–5		The present value of dividends = $5	

The growing annuity formula of the previous chapter could normally be used in this step. However, note that dividends grow at 15 percent, which is also the discount rate. Since $g = R$, the growing annuity formula cannot be used in this example.

Calculate Present Value of Dividends Beginning at End of Year 6 This is the procedure for deferred perpetuities and deferred annuities that we mentioned in a previous chapter. The dividends beginning at the end of Year 6 are:

End of Year	6	7	8	9
Dividend	$Div_5 \times (1 + g_2)$ $2.0114 × 1.10 = $2.2125	$Div_5 \times (1 + g_2)^2$ $2.0114 ×$(1.10)^2$ = $2.4338	$Div_5 \times (1 + g_2)^3$ $2.0114 ×$(1.10)^3$ = $2.6771	$Div_5 \times (1 + g_2)^4$ $2.0114 ×$(1.10)^4$ = $2.9448

As stated in the previous chapter, the growing perpetuity formula calculates present value as of one year prior to the first payment. Because the payment begins at the end of Year 6, the present value formula calculates present value as of the end of Year 5.

The price at the end of Year 5 is given by:

$$P_5 = \frac{Div_6}{R - g_2} = \frac{\$2.2125}{.15 - .10} = \$44.25$$

The present value of P_5 at the end of Year 0 is:

$$\frac{P_5}{(1+R)^5} = \frac{\$44.25}{(1.15)^5} = \$22$$

The present value of *all* dividends as of the end of Year 0 is \$27 (= \$22 + 5).

6.2 ESTIMATES OF PARAMETERS IN THE DIVIDEND DISCOUNT MODEL

The value of the firm is a function of its growth rate, *g*, and its discount rate, *R*. How does one estimate these variables?

Where Does *g* Come From?

The previous discussion on stocks assumed that dividends grow at the rate *g*. We now want to estimate this rate of growth. This section extends the discussion of growth contained in Chapter 3. Consider a business whose earnings next year are expected to be the same as earnings this year unless a *net investment* is made. This situation is likely to occur, because net investment is equal to gross, or total, investment less depreciation. A net investment of zero occurs when *total investment* equals depreciation. If total investment is equal to depreciation, the firm's physical plant is maintained, consistent with no growth in earnings.

Net investment will be positive only if some earnings are not paid out as dividends, that is, only if some earnings are retained.[2] This leads to the following equation:

$$\text{Earnings next year} = \text{Earnings this year} + \underbrace{\text{Retained earnings this year} \times \text{Return on retained earnings}}_{\text{Increase in earnings}} \qquad [6.5]$$

The increase in earnings is a function of both the *retained earnings* and the *return on the retained earnings.*

We now divide both sides of Equation 6.5 by earnings this year, yielding:

$$\frac{\text{Earnings next year}}{\text{Earnings this year}} = \frac{\text{Earnings this year}}{\text{Earnings this year}} + \frac{\text{Retained earnings this year}}{\text{Earnings this year}} \times \text{Return on retained earnings} \qquad [6.6]$$

The left-hand side of Equation 6.6 is one plus the growth rate in earnings, which we write as $1 + g$. The ratio of retained earnings to earnings is called the **retention ratio**. Thus, we can write:

$$1 + g = 1 + \text{Retention ratio} \times \text{Return on retained earnings} \qquad [6.7]$$

It is difficult for a financial analyst to determine the return to be expected on currently retained earnings, because the details on forthcoming projects are not generally public information. However, it is frequently assumed that the projects selected in the current year have an anticipated return equal to returns from projects in other years. Here, we can estimate the anticipated return on current retained earnings by the historical **return on equity** or ROE. After all, ROE is the return on the firm's entire equity, which is the return on the cumulation of all the firm's past projects.

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From Equation 6.7, we have a simple way to estimate growth:

Formula for Firm's Growth Rate:

g = Retention ratio × Return on retained earnings (ROE) **[6.8]**

Previously g referred to growth in dividends. However, the growth in earnings is equal to the growth rate in dividends in this context, because as we will presently see, the ratio of dividends to earnings is held constant. In fact, as you have probably figured out, g is the sustainable growth rate we introduced in Chapter 3.

EXAMPLE 6.4

Earnings Growth

Pagemaster Enterprises just reported earnings of $2 million. It plans to retain 40 percent of its earnings. The historical return on equity (ROE) has been 16 percent, a figure that is expected to continue into the future. How much will earnings grow over the coming year?

We first perform the calculation without reference to Equation 6.8. Then we use [6.8] as a check.

Calculation without Reference to Equation 6.8 The firm will retain $800,000 (= 40% × $2 million). Assuming that historical ROE is an appropriate estimate for future returns, the anticipated increase in earnings is:

$$\$800{,}000 \times .16 = \$128{,}000$$

The percentage growth in earnings is:

$$\frac{\text{Change in earnings}}{\text{Total earnings}} = \frac{\$128{,}000}{\$2\text{ million}} = .064$$

This implies that earnings in one year will be $2,128,000 (= $2,000,000 × 1.064).

Check Using Equation 6.8 We use g = Retention ratio × ROE. We have:

$$g = .4 \times .16 = .064$$

Where Does *R* Come From?

Thus far, we have taken the required return, or discount rate R, as given. We will have quite a bit to say on this subject in later chapters. For now, we want to examine the implications of the dividend growth model for this required return. Earlier, we calculated P_0 as:

$$P_0 = \text{Div}/(R - g)$$

Now let's assume we know P_0. If we rearrange this equation to solve for R, we get:

$$R - g = \text{Div}/P_0$$
$$R = \text{Div}/P_0 + g \qquad [6.9]$$

This tells us that the total return, *R,* has two components. The first of these, Div/P_0, is called the **expected dividend yield**. Because this is calculated as the expected cash dividend divided by the current price, it is conceptually similar to the current yield on a bond.

The second part of the total return is the growth rate, *g.* As we will verify shortly, the dividend growth rate is also the rate at which the stock price grows. Thus, this growth rate can be interpreted as the **capital gains yield**, that is, the rate at which the value of the investment grows.

To illustrate the components of the required return, suppose we observe a stock selling for $20 per share. The next dividend will be $1 per share. You think that the dividend will grow by 10 percent per year more or less indefinitely. What return does this stock offer you if this is correct?

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The dividend growth model calculates total return as:

$$R = \text{Dividend yield} + \text{Capital gains yield}$$
$$R = \quad \text{Div}/P_0 \quad + \quad g$$

In this case, total return works out to be:

$$\begin{aligned} R &= \$1/20 + 10\% \\ &= 5\% + 10\% \\ &= 15\% \end{aligned}$$

This stock, therefore, has an expected return of 15 percent.

We can verify this answer by calculating the price in one year, P_1, using 15 percent as the required return. Based on the dividend growth model, this price is:

$$\begin{aligned} P_1 &= \text{Div} \times (1 + g)/(R - g) \\ &= \$1 \times 1.10/(.15 - .10) \\ &= \$1.10/.05 \end{aligned}$$

Notice that this \$22 is \$20 × 1.1, so the stock price has grown by 10 percent as it should. If you pay \$20 for the stock today, you will get a \$1 dividend at the end of the year, and you will have a \$22 − 20 = \$2 gain. Your dividend yield is thus \$1/20 = 5 percent. Your capital gains yield is \$2/20 = 10 percent, so your total return would be 5 percent + 10 percent = 15 percent.

To get a feel for actual numbers in this context, consider that, according to the 2016 Value Line *Investment Survey*, Procter & Gamble's dividends were expected to grow by 4 percent over the next 5 or so years, compared to a historical growth rate of 8.5 percent over the preceding 5 years and 10 percent over the preceding 10 years. In 2016, the projected dividend for the coming year was given as \$2.75. The stock price at that time was about \$82 per share. What is the return investors require on P&G? Here, the dividend yield is 3.4 percent and the capital gains yield is 4 percent, giving a total required return of 7.4 percent on P&G stock.

EXAMPLE 6.5

Calculating the Required Return

Pagemaster Enterprises, the company examined in the previous example, has 1,000,000 shares of stock outstanding. The stock is selling at \$10. What is the required return on the stock?

Because the retention ratio is 40 percent, the **payout ratio** is 60 percent (= 1 − Retention ratio). The payout ratio is the ratio of dividends/earnings. Because earnings a year from now will be \$2,128,000 (=\$2,000,000 × 1.064), dividends will be \$1,276,800 (=60 × \$2,128,000). Dividends per share will be $1.28 (=$1,276,800/1,000,000). Given our previous result that g =.064, we calculate R from [6.9] as follows:

$$.192 = \frac{\$1.28}{10.00} + .064$$

A Healthy Sense of Skepticism

It is important to emphasize that our approach merely *estimates g;* our approach does not *determine g* precisely. We mentioned earlier that our estimate of g is based on a number of assumptions. For example, we assume that the return on reinvestment of future retained earnings is equal to the firm's past ROE. We assume that the future retention ratio is equal to the past retention ratio. Our estimate for g will be off if these assumptions prove to be wrong. 3D Systems, a 3-D printer manufacturer, is an example of a firm whose historical growth rate will not equal future growth rates. The company had total revenues of about $112.8 million in 2009 compared to about $663 million in 2015. That works out to a growth rate of a remarkable 34.3 percent per year! How likely is it that the company can continue to grow at this rate? If it did, it would have revenues of about $17 trillion in just 11 years, which is about the same as the gross domestic product (GDP) of the United States. Obviously, 3D Systems' growth rate will slow substantially in the next several years.

FINANCE MATTERS

HOW FAST IS TOO FAST

Growth rates are an important tool for evaluating a company and, as we have seen, an important part of valuing a company's stock. When you're thinking about (and calculating) growth rates, a little common sense goes a long way. For example, in 2015, retailing giant Walmart had about 777 million square feet of stores, distribution centers, and so forth in the U.S. The company expected to increase its square footage by about 4 percent over the next year. This doesn't sound too outrageous, but can Walmart grow its square footage at 4 percent indefinitely?

Using the compound growth calculation we discussed in an earlier chapter, see if you agree that if Walmart grows at 4 percent per year over the next 300 years, the company will have more than 100 trillion square feet under roof, which is about the total land mass of the entire United States! In other words, if Walmart keeps growing at 4 percent, the entire country will eventually be one big Walmart. Scary.

What about growth in cash flow? As of its fiscal year-end in September 2015, Apple had grown its operating cash flow at an annual rate of about 41.4 percent for the previous six years. The company generated about $81.3 billion in cash flow for 2015. If the company were to grow its cash flow at that same rate for the next nine years, it would generate over $1.83 trillion per year, which is greater than total amount of U.S. currency in the world.

As these examples show, growth rates shouldn't just be extrapolated into the future. It is fairly easy for a small company to grow very fast. If a company has $100 in sales, it only has to increase sales by another $100 to have a 100 percent increase in sales. If the company's sales are $10 billion, it has to increase sales by another $10 billion to achieve the same 100 percent increase. So, long-term growth rate estimates must be chosen very carefully. As a rule of thumb, for really long-term growth rate estimates, you should probably assume that a company will not grow much faster than the economy as a whole, which is probably noticeably less than 5 percent (inflation adjusted).

Unfortunately, the determination of R is highly dependent on g. In the Pagemaster Enterprises example, if g is estimated to be 0, R equals 12.8 percent (=$1.28/10.00). If g is estimated to be 12 percent, R equals 24.8 percent (=$1.28/10.00 + 12%). Thus, one should view estimates of R with a healthy sense of skepticism.

Because of the preceding, some financial economists generally argue that the estimation error for R for a single security is too large to be practical. Therefore, they suggest calculating the average R for an entire industry. This R would then be used to discount the dividends of a particular stock in the same industry.

One should be particularly skeptical of two polar cases when estimating R for individual securities. First, consider a firm currently paying no dividend. The stock price will be above zero because investors believe that the firm may initiate a dividend at some point or the firm may be acquired at some point. However, when a firm goes from no dividends to a positive number of dividends, the implied growth rate is *infinite.* Thus, Equation 6.9 must be used with extreme caution here, if at all—a point we emphasize later in this chapter.

Second, we mentioned earlier that the value of the firm is infinite when g is equal to R. Because prices for stocks do not grow infinitely, an analyst whose estimate of g for a

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particular firm is equal to or above *R* must have made a mistake. Most likely, the analyst's high estimate for *g* is correct for the next few years. However, firms cannot maintain an abnormally high growth rate *forever*. The analyst's error was to use a short-run estimate of *g* in a model requiring a perpetual growth rate. A nearby *Finance Matters* box discusses the consequences of long-term growth at unrealistic rates.

The No-Payout Firm

Students frequently ask the following question: If the dividend discount model is correct, why aren't no-payout stocks selling at zero? This is a good question and gets at the goals of the firm. A firm with many growth opportunities is faced with a dilemma. The firm can pay out cash now, or it can forgo cash payments now so that it can make investments that will generate even greater payouts in the future.[3] This is often a painful choice, because a strategy of deferment may be optimal yet unpopular among certain stockholders.

Many firms choose to pay no cash to stockholders—and these firms sell at positive prices. For example, many Internet firms, such as Alphabet, pay no cash to stockholders. Rational shareholders believe that they will either receive a payout at some point or they will receive something just as good. That is, the firm will be acquired in a merger, with the stockholders receiving either cash or shares of stock at that time.

Of course, the actual application of the dividend discount model is difficult for firms of this type. Clearly, the model for constant growth of payouts does not exactly apply. Though the differential growth model can work in theory, the difficulties of estimating the date of the first payout, the growth rate of payouts after that date, and the ultimate merger price make application of the model quite difficult in reality.

Empirical evidence suggests that firms with high growth rates are likely to have lower payouts, a result consistent with the above analysis. For example, consider Microsoft Corporation. The company started in 1975 and grew rapidly for many years. It paid its first dividend in 2003, though it was a billion-dollar company (in both sales and market value of stockholders' equity) prior to that date. Why did it wait so long to pay a dividend? It waited because it had so many positive growth opportunities, that is, new software products, to take advantage of.

6.3 COMPARABLES

So far in this chapter, we have valued stocks by discounting dividends (or total payouts). In addition to this approach, practitioners commonly value stocks by comparables. The comparables approach is similar to valuation in real estate. If your neighbor's home just sold for $200,000 and it has similar size and amenities to your home, your home is probably worth around $200,000 also. In the stock market, comparable firms are assumed to have similar *multiples*. To see how the comparables approach works, let's look at perhaps the most common multiple, the price-to-earnings (PE) multiple, or PE ratio.

Price-to-Earnings Ratio

Recall that a stock's price-to-earnings ratio is the ratio of the stock's price to its earnings per share. For example, if the stock of Sun Aerodynamic Systems (SAS) is selling at $27.00 per share and its earnings per share over the last year was $4.50, SAS's PE ratio would be 6 (= $27/4.50).

It is generally assumed that similar firms have similar PE ratios. For example, imagine the average price-to-earnings (PE) ratio across all publicly traded companies in the specialty retail industry is 12 and a particular company in the industry has earnings of $10 million. If this company is judged to be similar to the rest of the industry, one might estimate that company's value to be $120 million (= 12 × $10 million).

Valuation via PE certainly looks easier than valuation via discounted cash flow (DCF), since the DCF approach calls for estimates of future cash flows. But is the PE approach better? That depends on the similarity across comparables.

On February 19, 2016, Alphabet's stock price was $701 and its EPS was $23.59, implying a PE ratio of about 29.7.[4] On the same day, Hewlett-Packard's PE was 10.2, Microsoft's was 36.7, and Apple's was 10.2. Why would stocks in the same industry trade at different PE ratios?

The dividend discount model (in Examples 6.1 and 6.2) implies that the PE ratio is related to growth opportunities.[5] As an example, consider two firms, each having just reported earnings per share of $1. However, one firm has many valuable growth opportunities, while the other firm has no growth opportunities at all. The firm with growth opportunities should sell at a higher price, because an investor is buying both current income of $1 and growth opportunities. Suppose that the firm with growth opportunities sells for $16 and the other firm sells for $8. The $1 earnings per share number appears in the denominator of the PE ratio for both firms. Thus, the PE ratio is 16 for the firm with growth opportunities, but only 8 for the firm without the opportunities.

There are at least two additional factors explaining the PE ratio. The first is the discount rate, *R*. Since *R* appears in the denominator of the dividend discount model, the formula implies that the PE ratio is *negatively* related to the firm's discount rate. We have already suggested that the discount rate is positively related to the stock's risk or variability. Thus, the PE ratio is negatively related to the stock's risk. To see that this is a sensible result, consider two firms, *A* and *B,* behaving as cash cows. The stock market *expects* both firms to have annual earnings of $1 per share forever. However, the earnings of Firm *A* are known with certainty while the earnings of Firm *B* are quite variable. A rational stockholder is likely to pay more for a share of Firm *A* because of the absence of risk. If a share of Firm *A* sells at a higher price and both firms have the same EPS, the PE ratio of Firm *A* must be higher.

The second additional factor concerns the firm's accounting method. As an example, consider two identical firms, *C* and *D.* Firm *C* uses LIFO and reports earnings of $2 per share.[6] Firm *D* uses the less conservative accounting assumptions of FIFO and reports earnings of $3 per share. The market knows that both firms are identical and prices both at $18 per share. The price–earnings ratio is 9 (= $18/2) for Firm *C* and 6 (= $18/3) for Firm *D.* Thus, the firm with the more conservative principles has the higher PE ratio.

In conclusion, we have argued that a stock's PE ratio is likely a function of three factors:

1. *Growth opportunities.* Companies with significant growth opportunities are likely to have high PE ratios.
2. *Risk.* Low-risk stocks are likely to have high PE ratios.
3. *Accounting practices.* Firms following conservative accounting practices will likely have high PE ratios.

Which of these factors is most important in the real world? The consensus among finance professionals is that growth opportunities typically have the biggest impact on PE ratios. For example, high-tech companies generally have higher PE ratios than, say, utilities, because utilities have fewer opportunities for growth, even though utilities typically have lower risk. And, within industries, differences in growth opportunities also generate the biggest differences in PE ratios. In our example at the beginning of this section, Alphabet's high PE is almost certainly due to its growth opportunities, not its low risk or its accounting conservatism. In fact, due to its relative youth, the risk of Alphabet is likely higher than the risk of many of its competitors. Hewlett-Packard's PE is lower than Alphabet's PE because Hewlett-Packard's growth opportunities are a small fraction of its existing business lines. However, Hewlett-Packard had a much higher PE decades ago, when it had huge growth opportunities but little in the way of existing business.

Thus, while multiples such as the PE ratio can be used to price stocks, care must be taken. Firms in the same industry are likely to have different multiples if they have different growth rates, risk levels, and accounting treatments. Average multiples should not be calculated across all firms in any industry. Rather, an average multiple should be calculated only across those firms in an industry with similar characteristics.

Enterprise Value Ratios

The PE ratio is an equity ratio. That is, the numerator is the price per share of *stock* and the denominator is the earnings per share of *stock*. In addition, practitioners often use ratios involving both equity and debt. Perhaps the most common is the enterprise value (EV) to EBITDA ratio. Enterprise value is equal to the market value of the firm's equity plus the market value of the firm's debt minus cash. Recall, EBITDA stands for earnings before interest, taxes, depreciation, and amortization.

For example, imagine that Illinois Food Products Co. (IFPC) has equity worth \$800 million, debt worth \$300 million, and cash of \$100 million. The enterprise value here is \$1 billion (= \$800 + 300 − 100). Further imagine the firm has the following income statement:

ILLINOIS FOOD PRODUCTS CO.
Income Statement (\$ in millions)

Revenue	\$700.00
Cost of goods sold	−500.00
Earnings before interest, taxes, depreciation, and amortization (EBITDA)	\$200.00
Depreciation and amortization	−100.00
Interest	−24.00
Pretax income	76.00
Taxes (@ 30%)	−22.80

Profit after taxes	$53.20

The EV to EBITDA ratio is 5 (= $1 billion/200 million). Note that all the items in the income statement below EBITDA are ignored when calculating this ratio.

As with PE ratios, it is generally assumed that similar firms have similar EV/EBITDA ratios. For example, imagine that the average EV/EBITDA ratio in an industry is 6. If QRT Corporation, a firm in the industry with EBITDA of $50 million, is judged to be similar to the rest of the industry, its enterprise value might be estimated at $300 million (= 6 × $50). Now imagine that QRT has $75 million of debt and $25 million of cash. Given our estimate of QRT's enterprise value, QRT's stock would be worth $250 million (= $300 − 75 + 25).