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12 Business Valuation

"Nowadays we know the price of everything and the value of nothing."
—Oscar Wilde

Valuing the M&M Mushroom Company

Melissa and Mark were young and in love. They also shared a passion for mushrooms. In fact, they were so passionate about mushrooms they liked to grow them in their basement. They were quite good at it, and often had more mushrooms than they knew what to do with. Then they had the idea of selling their mushrooms to friends and neighbors. This endeavor was successful beyond their wildest dreams and soon they had quite a business going. The expanded out of their basement into dedicated production facilities, incorporated under the name "M&M Mushrooms," and became quite famous in the local area for having the best tasting mushrooms around.

The M&M Mushroom Company grew steadily for ten years, enlarging its sales territory to five states and employing 150 people in three plants. That's when the trouble began. Melissa wanted to keep expending the business, but Mark missed the small, informal operation they used to have years ago. Also, Mark had recently begun taking flying lessons and had developed a close relationship with his flight instructor. Mark and Melissa began spending more and more time apart, and began having more and more disagreements, until it was apparent that everyone would be better off if they went their separate ways.

The divorce was amicable, as Melissa and Mark had no children and the only major assets they owned were their common stock shares in the M&M Mushroom Corporation (Melissa and Mark each owned 50% of the shares outstanding, 500 shares each). Since Melissa wanted to continue managing the business and Mark wanted out, he agreed to sell her his 500 shares. However, they could not agree on a price. Melissa was of the

opinion that the shares were worth in the neighborhood of $1,000 each, making the total value of Mark's 500 shares $500,000. Mark disagreed. Pointing to their steady growth during the past ten years, and current wide area of operations, he maintained the shares were worth at least $2,000 each for a total of $1,000,000.

Melissa and Mark could not settle their differences on their own and soon found themselves facing each other in court. The primary issue before the court was to establish the "fair market value" of the shares in question. Each side engaged an expert to provide an opinion on the value of the shares.

Now suppose you were approached by Melissa or Mark's attorney and asked if you would write a report containing an estimate of the fair market value per share of M&M Mushroom company's stock. How would you go about this task? The stock is privately held, and not traded on any stock exchange, so it would appear that you face a formidable task.

The valuation task is formidable, but it is not impossible. Indeed, professional appraisers do it regularly, not only to support opposing sides in court cases, but also to establish a value when the business is to be used for collateral for a loan, an asking price when the sale of the business is contemplated, or a value for tax purposes when the business is a part of an estate settlement.

The techniques appraisers use to estimate market value vary from case to case, but at their heart they generally involve the calculation of the present value of an assumed set of future cash flows. You are already familiar with this technique from your studies of the time value of money in Chapter 8. In this chapter we show you how to adapt those techniques specifically to the task of valuing stocks, bonds, and complete businesses.

Learning Objectives

After reading this chapter, you should be able to:

1. Explain the importance of business valuation.
2. Discuss the concept of business valuation.
3. Compute the market value and the yield to maturity of a bond.
4. Calculate the market value and expected yield of preferred stock.
5. Compute the market value per share of common stock.
6. Compute the market value of total common equity.
7. Compute the yield on common stock.
8. Compute the value of a complete business.

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Chapter Overview

In this chapter we will discuss how to value businesses in a dynamic marketplace. First, we will investigate the importance of business valuation and introduce a general model that analysts and investors use to value assets. Then we will show how to adapt the model to bonds, preferred stock, and common stock. For common stock, we'll explore additional valuation techniques.

The Importance of Business Valuation

As Chapter 1 explained, the primary financial goal of financial managers is to maximize the market value of their firm. It follows, then, that financial managers need to assess the market value of their firms to gauge progress.

Accurate business valuation is also a concern when a corporation contemplates selling securities to raise long-term funds. Issuers want to raise the most money possible from selling securities. Issuers lose money if they undervalue their businesses. Likewise, would-be purchasers are concerned about businesses' value because they don't want to pay more than what the businesses are worth.

A General Valuation Model

The value of a business depends on its future earning power. To value a business then, we consider three factors that affect future earnings:

- Size of cash flows
- Timing of cash flows
- Risk

These three factors also determine the value of individual assets belonging to a business, or interests in a business, such as those possessed by bondholders and stockholders.

In Chapter 7 we examined how risk factors affect an investor's required rate of return. In Chapter 8 we learned that time value of money calculations can determine an investment's value, given the size and timing of the cash flows. In Chapters 9, 10, and 11 we learned how to evaluate future cash flows.

Financial managers determine the value of a business, a business asset, or an interest in a business by finding the present value of the future cash flows that the owner of the business, asset, or interest could expect to receive. For example, we can calculate a bond's value by taking the sum of the present values of each of the future cash flows from the bond's interest and principal payments. We can calculate a stock's value by taking the sum of the present values of future dividend cash flow payments.

Analysts and investors use a general valuation model to calculate the present value of future cash flows of a business, business asset, or business interest. This model, the **discounted cash flow model (DCF)**, is a basic valuation model for an asset that is expected to generate cash payments in the form of cash earnings, interest and principal payments, or dividends. The DCF equation is shown in Equation 12-1:

The Discounted Cash Flow Valuation Model

$$V_0 = \frac{CF_1}{(1 + k)^1} + \frac{CF_2}{(1 + k)^2} + \frac{CF_3}{(1 + k)^3} + \ldots + \frac{CF_n}{(1 + k)^n} \quad (12\text{-}1)$$

where: V_0 = Present value of the anticipated cash flows from the asset, its current value

$CF_{1, 2, 3, \text{and } n}$ = Cash flows expected to be received one, two, three, and so on up to n periods in the future

k = Discount rate, the required rate of return per period

The DCF model values an asset by calculating the sum of the present values of all expected future cash flows.

The discount rate in Equation 12-1 is the investor's required rate of return per time period, which is a function of the risk of the investment. Recall from Chapter 7 that the riskier the security, the higher the required rate of return.

The discounted cash flow model is easy to use if we know the cash flows and discount rate. For example, suppose you were considering purchasing a security that entitled you to receive payments of $100 in one year, another $100 in two years, and $1,000 in three years. If your required rate of return for securities of this type were 20 percent, then we would calculate the value of the security as follows:

$$V_0 = \frac{\$100}{(1 + .20)^1} + \frac{\$100}{(1 + .20)^2} + \frac{\$1,000}{(1 + .20)^3}$$

$$= \$83.3333 + \$69.4444 + \$578.7037$$

$$= \$731.48$$

The total of the security's three future cash flows at a 20 percent required rate of return yields a present value of $731.48.

In the sections that follow, we'll adapt the discounted cash flow valuation model to apply to businesses and business components.

Applying the General Valuation Model to Businesses

According to the general valuation model, Equation 12-1, the value of a business asset is the present value of the anticipated cash flows from the asset. The value of a complete business, therefore, is the present value of the cash flows expected to be generated by the business. In order to use the general valuation model to estimate the value of a complete business, we must forecast the cash flows expected to be generated by the business and discount them to the present using the required rate of return appropriate for the business. This sounds relatively simple, but in fact it is an extremely complex task requiring the cash flow estimation techniques that you learned in Chapter 11 and the cost of capital estimation techniques that you learned in Chapter 9.

Instead of tackling the value of a complete business all at once, we will begin with the present values of the components of the business, as illustrated in Figure 12-1.

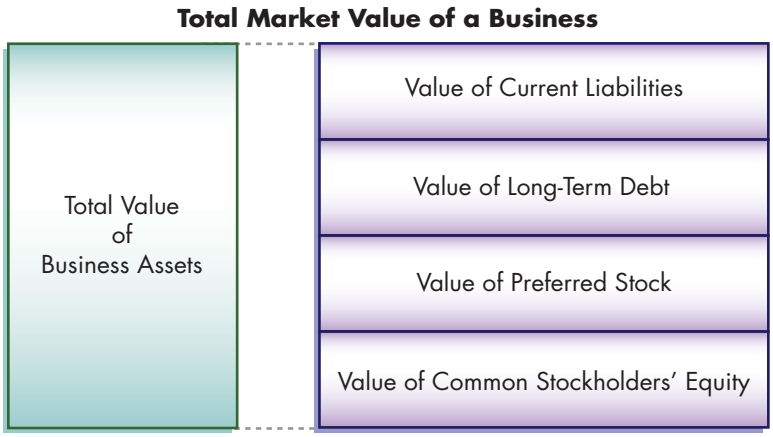


Figure 12-1
Total Market Value of a Business

This figure illustrates how the total market value of a business is the sum of the present values of the components of the business.

As Figure 12-1 shows, the value of all of a businesses assets (that is, the complete business) equals the sum of the present values of its current liabilities, long-term debt, preferred stock, and common stock. In the remainder of this chapter, we will apply this approach, first examining the valuation of current liabilities and long-term debt (corporate bonds), then preferred stock, and finally common stock. Following those individual discussions, we will show how the same techniques can be used to estimate the total value of a business.

Valuing Current Liabilities and Long-Term Debt

Current liabilities are short-term obligations of a company that are fixed by agreement. Accounts payable, for example, represents amounts that the company has purchased from its suppliers and has agreed to pay for in a specified amount of time. Because the time to maturity of these obligations is not lengthy, the market value of current liabilities is most often taken to be equal to their book value. Therefore, when analysts value the current-liability component of a complete business, they normally just read the value of the current liabilities from the firm's balance sheet.

Long-Term Debt A company's long-term obligations may be long-term loans from a commercial bank or a private investor, corporate bonds, or notes issued to the public. In each case the value of the debt is the present value of the future cash flows that would accrue to the owner of the debt, as we have explained previously. In this chapter we will discuss the valuation of long-term debt when it is in the form of bonds.

Bond Valuation

Remember from Chapter 2 that a bond's cash flows are determined by the bond's coupon interest payments, face value, and maturity.

Because coupon interest payments occur at regular intervals throughout the life of the bond, those payments are an annuity. Instead of using several terms representing the individual cash flows from the future coupon interest payments (CF_1, CF_2, and so

on), we adapt Equation 12-1 by using one term to show the annuity. The remaining term represents the future cash flow of the bond's face value, or principal, that is paid at maturity. Equation 12-2 shows the adapted valuation model:

The Bond Valuation Formula (Algebraic Method)

$$V_B = INT \times \left[\frac{1 - \frac{1}{(1 + k_d)^n}}{k_d} \right] + \frac{M}{(1 + k_d)^n} \qquad (12\text{-}2)$$

where: V_B = Current market value of the bond

INT = Dollar amount of each periodic interest payment

n = Number of times the interest payment is received (which is also the number of periods until maturity)

M = Principal payment received at maturity

k_d = Required rate of return per period on the bond debt instrument

The table version of the bond valuation model is shown in Equation 12-3, as follows:

$$V_B = (INT \times PVIFA_{k,n}) + (M \times PVIF_{k,n}) \qquad (12\text{-}3)$$

where: $PVIFA_{k,n}$ = Present Value Interest Factor for an Annuity from Table IV

$PVIF_{k,n}$ = Present Value Interest Factor for a single amount from Table II

To use a calculator to solve for the value of a bond, enter the dollar value of the interest payment as [PMT], the face value payment at maturity as [FV], the number of payments as n, and the required rate of return, k_d depicted as [I/Y] on the TI BAII Plus calculator. Then compute the present value of the bond's cash flows.

Now let's apply the bond valuation model. Suppose Microsoft Corporation issues a 7 percent coupon interest rate bond with a maturity of 20 years. The face value of the bond, payable at maturity, is $1,000.

First, we calculate the dollar amount of the coupon interest payments. At a 7 percent coupon interest rate, each payment is .07 × $1,000 = $70.

Next, we need to choose a required rate of return, k_d. Remember that k_d is the required rate of return that is appropriate for the bond based on its risk, maturity, marketability, and tax treatment. Let's assume that 8 percent is the rate of return the market determines to be appropriate.

Now we have all the factors we need to solve for the value of Microsoft Corporation's bond. We know that k_d is 8 percent, n is 20, the coupon interest payment is $70 per year, and the face value payment at maturity is $1,000. Using Equation 12-2, we calculate the bond's value as follows:

Take Note

The determinants of nominal interest rates, or required rates of return, include the real rate of interest, the inflation premium, the default risk premium, the illiquidity premium, and the maturity premium. Each person evaluating a bond will select an appropriate required rate of return, k_d, for the bond based on these determinants.

$$V_B = \$70 \times \left[\frac{1 - \frac{1}{(1 + .08)^{20}}}{.08}\right] + \frac{\$1,000}{(1 + .08)^{20}}$$

$$= (\$70 \times 9.8181474) + \left(\frac{\$1,000}{4.660957}\right)$$

$$= \$687.270318 + \$214.548214$$

$$= \$901.82$$

Notice that the value of Microsoft Corporation's bond is the sum of the present values of the 20 annual $70 coupon interest payments plus the present value of the one time $1,000 face value to be paid 20 years from now, given a required rate of return of 8 percent.

To find the Microsoft bond's value using present value tables, recall that the bond has a face value of $1,000, a coupon interest payment of $70, a required rate of return of 8 percent, and an n value of 20. We apply Equation 12-3 as shown:

$$V_B = (\$70 \times PVIFA_{8\%,\ 20\ yrs}) + (\$1,000 \times PVIF_{8\%,\ 20\ yrs})$$

$$= (\$70 \times 9.8181) + (\$1,000 \times .2145)$$

$$= \$687.267 + \$214.500$$

$$= \$901.77$$

We see that the sum of the present value of the coupon interest annuity, $687.267, plus the present value of the principal, $214.500, results in a bond value of $901.77. There is a five-cent rounding error in this example when the tables are used.

Here's how to find the bond's value using the TI BAII PLUS financial calculator. Enter the $70 coupon interest payment as PMT, the one-time principal payment of $1,000 as FV, the 20 years until maturity as n (N on the TI BAII PLUS), and the 8 percent required rate of return—depicted as I/Y on the TI BAII Plus. As demonstrated in Chapter 8 calculator solutions, clear the time value of money TVM registers before entering the new data. Skip steps 2 and 3 if you know your calculator is set to one payment per year and is also set for end-of-period payment mode.

TI BAII PLUS Financial Calculator Solution

Step 1: Press 2nd CLR TVM to clear previous values.

Step 2: Press 2nd P/Y 1 ENTER, 2nd BGN 2nd SET 2nd SET repeat 2nd SET until END shows in the display 2nd QUIT to set the annual interest rate mode and to set the annuity payment to end of period mode.

Step 3: Input the values and compute.

1000 FV 8 I/Y 20 N 70 PMT CPT PV **Answer: –901.82**

The $901.82 is negative because it is a cash outflow—the amount an investor would pay to buy the bond today.

We have shown how to value bonds with annual coupon interest payments in this section. Next, we show how to value bonds with semiannual coupon interest payments.

Semiannual Coupon Interest Payments

In the hypothetical bond valuation examples for Microsoft Corporation, we assumed the coupon interest was paid annually. However, most bonds issued in the United States pay interest semiannually (twice per year). With semiannual interest payments, we must adjust the bond valuation model accordingly. If the Microsoft bond paid interest twice per year, the adjustments would look like this:

	Annual Basis	Semiannual Basis
Coupon Interest Payments	$70	÷ 2 = $35 per six-month period
Maturity	20 yrs	× 2 = 40 six-month periods
Required Rate of Return	8%	÷ 2 = 4% semiannual rate

These values can now be used in Equation 12-2, Equation 12-3, or a financial calculator, in the normal manner. For example, if Microsoft's 7 percent coupon, 20-year bond paid interest semiannually, its present value per Equation 12-2 would be

$$V_B = \$35 \times \left[\frac{1 - \frac{1}{(1 + .04)^{40}}}{.04}\right] + \frac{\$1,000}{(1 + .04)^{40}}$$

$$= (\$35 \times 19.792774) + \left(\frac{\$1,000}{4.801021}\right)$$

$$= \$692.74709 + \$208.2890$$

$$= \$901.04$$

The value of our Microsoft bond with semiannual interest and a 4 percent per semiannual period discount rate is $901.04. This compares to a value of $901.82 for the same bond if it pays annual interest and has an 8 percent annual discount rate. Note that a required rate of return of 4 percent per semiannual period is not the same as 8 percent per year. The difference in the frequency of discounting gives a slightly different answer.

The Yield to Maturity of a Bond

Most investors want to know how much return they will earn on a bond to gauge whether the bond meets their expectations. That way, investors can tell whether they should add the bond to their investment portfolio. As a result, investors often calculate a bond's yield to maturity before they buy a bond. **Yield to maturity (YTM)** represents the average rate of return on a bond if all promised interest and principal payments are made on time and if the interest payments are reinvested at the YTM rate given the price paid for the bond.

Calculating a Bond's Yield to Maturity To calculate a bond's YTM, we apply the bond valuation model. However, we apply it differently than we did when solving for a bond's present value (price) because we solve for k_d, the equivalent of YTM.

To compute a bond's YTM, we must know the values of all variables except k_d. We take the market price of the bond, P_B, as the value of a bond, V_B, examining financial sources such as *The Wall Street Journal* for current bond prices.

Once you have all variables except k_d, solving for k_d algebraically is exceedingly difficult because that term appears three times in the valuation equation. Instead, we use the trial-and-error method. In other words, we guess a value for k_d and solve for V_B using that value. When we find a k_d value that results in a bond value that matches the published bond price, P_B, we know that the k_d value is the correct YTM. The YTM is the return that bond investors require to purchase the bond.[1]

Here's an illustration of the trial-and-error method for finding YTM. Suppose that *The Wall Street Journal* reported that the Microsoft bond in our earlier example is currently selling for $1,114.70. What is the bond's YTM if purchased at this price?

Recall the annual coupon interest payments for the Microsoft bond were $70 each, and the bond had a 20-year maturity and a face value of $1,000. Applying the bond valuation model, we solve for the k_d that produces a bond value of $1,114.70.

$$\$1{,}114.70 = \$70 \times \left[\frac{1 - \frac{1}{(1 + k_d)^{20}}}{k_d}\right] + \frac{\$1{,}000}{(1 + k_d)^{20}}$$

Although we can try any k_d value, remember that when k was 8 percent, the bond's calculated value, V_B, was $901.82. Bond prices and yields vary inversely—the higher the YTM, the lower the bond price; and the lower the YTM, the higher the bond price. The bond's current market price of $1,114.70 is higher than $901.82, so we know the YTM must be less than 8 percent. If you pay more than $901.82 to buy the bond, your return will be less than 8 percent.

Because we know that YTM and bond prices are inversely related, let's try 7 percent in our bond valuation model, Equation 12-2. We find that a k_d value of 7 percent results in the following bond value:

$$V_B = \$70 \times \left[\frac{1 - \frac{1}{(1 + .07)^{20}}}{.07}\right] + \frac{\$1{,}000}{(1 + .07)^{20}}$$

$$= (\$70 \times 10.59401425) + \left(\frac{\$1{,}000}{3.86968446}\right)$$

$$= \$741.5809975 + \$258.4190028$$

$$= \$1{,}000.00$$

[1] In Chapter 9 this required rate of return was called the firm's cost of debt capital, which we adjust for taxes. In this chapter, however, our main focus is finding the value of different types of securities, so k_d is referred to as the investor's required rate of return.

At a k_d of 7 percent, the bond's value is $1,000 instead of $1,114.70. We'll need to try again. Our second guess should be lower than 7 percent because at k_d = 7% the bond's calculated value is lower than the market price. Let's try 6 percent. At a k_d of 6 percent, the bond's value is as follows:

$$V_B = \$70 \times \left[\frac{1 - \frac{1}{(1 + .06)^{20}}}{.06}\right] + \frac{\$1,000}{(1 + .06)^{20}}$$

$$= (\$70 \times 11.46992122) + \left(\frac{\$1,000}{3.20713547}\right)$$

$$= \$802.8944853 + \$311.8047269$$

$$= \$1,114.70$$

With a k_d of 6 percent, the bond's value equals the current market price of $1,114.70. We conclude that the bond's YTM is 6 percent.[2]

To use the table method to find the YTM of Microsoft's 7 percent coupon rate, 20-year bond at a price of $1,114.70, use Equation 12-3 as follows:

First guess: k_d = 7%:

$$V_B = (\$70 \times PVIFA_{7\%,\ 20\ periods}) + (\$1,000 \times PVIF_{7\%,\ 20\ periods})$$
$$= (\$70 \times 10.5940) + (\$1,000 \times .2584)$$
$$= \$741.58 + \$258.40$$
$$= \$999.98$$

$999.98 is too low. We must guess again. Let's try k_d = 6%, as follows:

$$V_B = (\$70 \times PVIFA_{6\%,\ 20\ periods}) + (\$1,000 \times PVIF_{6\%,\ 20\ periods})$$
$$= (\$70 \times 11.4699) + (\$1,000 \times .3118)$$
$$= \$802.893 + \$311.80$$
$$= \$1,114.69$$

Close enough (to $1,114.70). The bond's YTM is about 6 percent.

Finding a bond's YTM with a financial calculator avoids the trial-and-error method. Simply plug in the values on the calculator and solve for k_d, as shown:

[2]We were lucky to find the bond's exact YTM in only two guesses. Often the trial-and-error method requires more guesses. In fact, we almost always use a financial calculator to compute the YTM.

TI BAII PLUS Financial Calculator Solution

Step 1: Press 2nd CLR TVM to clear previous values.

Step 2: Press 2nd P/Y 1 ENTER, 2nd BGN 2nd SET 2nd SET repeat 2nd SET until END shows in the display 2nd QUIT to set the annual interest rate mode and to set the annuity payment to end of period mode.

Step 3: Input the values and compute.

1,114.70 +/– PV 1000 FV 20 N 70 PMT CPT I/Y

Answer: 6.00

Using the financial calculator, we find that the YTM of the Microsoft $1,000 face value 20-year bond with a coupon rate of 7 percent and a market price of $1,114.70 is 6 percent.

The Relationship between Bond YTM and Price

A bond's market price depends on its yield to maturity. When a bond has a YTM greater than its coupon rate, it sells at a *discount* from its face value. When the YTM is equal to the coupon rate, the market price equals the face value. When the YTM is less than the coupon rate, the bond sells at a *premium* over face value.

For instance, in our initial calculations of the Microsoft bond, we found that the present value of its future cash flows was $901.82. That price was lower than the bond's $1,000 face value. Because its market price was lower than its face value, the bond sold at a discount (from its face value). A bond will sell at a discount because buyers and sellers have agreed that the appropriate rate of return for the bond should be higher than the bond's coupon interest rate. With the Microsoft bond, investors required an 8 percent rate of return, but the fixed coupon interest rate was only 7 percent. To compensate for a coupon interest rate that is lower than the required rate, investors would be unwilling to pay the $1,000 face value. Instead, they would only be willing to pay $901.82 to buy the bond.

Now recall the trial-and-error calculations for the YTM of the Microsoft 7 percent coupon rate bond in the previous section. We found that when the YTM was 7 percent, the bond's price was $1,000. This was no coincidence. When the YTM is equal to the coupon interest rate—that is, when the bond is selling at *par*—the bond's price is equal to its face value. We saw that when would-be buyers and sellers of Microsoft Corporation's bond agree that the appropriate yield to maturity for the bond is 6 percent instead of 7 percent, the price is above $1,000.

The change from a 7 percent to a 6 percent YTM results in a market value of $1,114.70. That market value for the bond is higher than the $1,000 face value. Because the market price is higher than the bond's face value in our case, the bond sells at a *premium*. Why? Investors pay more to receive "extra" interest because the coupon rate paid is higher than the YTM demanded.

In our example, the calculations show that investors were willing to pay $1,114.70 for a bond with a face value of $1,000 because the coupon interest was one percentage point higher than the required rate of return.

Figure 12-2 shows the relationship between YTM and the price of a bond.

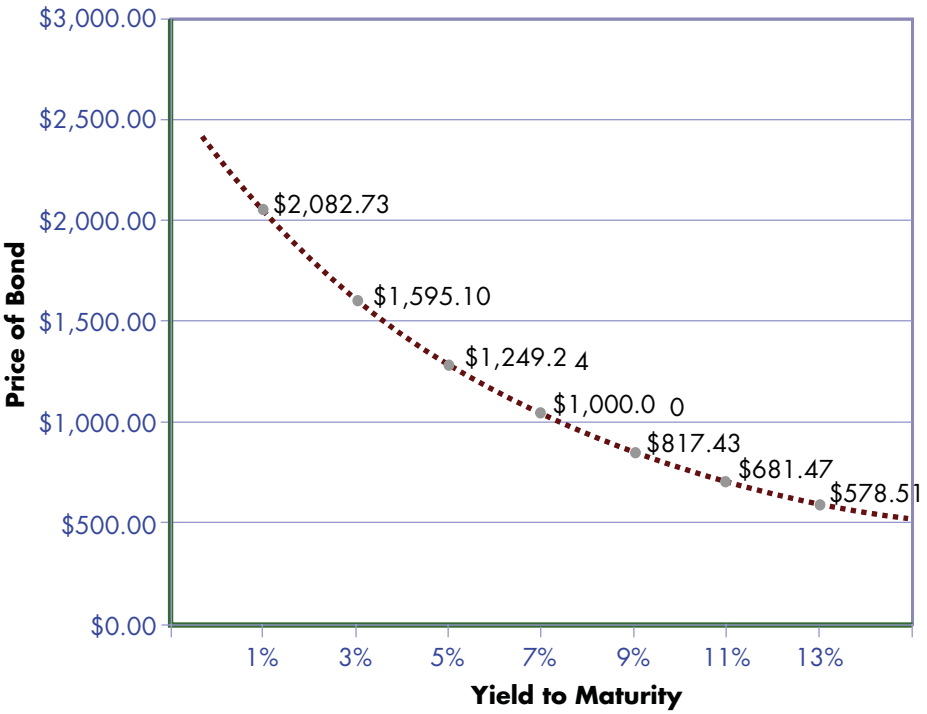


Figure 12-2 Bond YTM versus Bond Price

Figure 12-2 shows the inverse relationship between the price and the YTM for a $1,000 face value, 20-year, 7% coupon interest rate bond that pays annual interest.

The inverse relationship between bond price and YTM is important to bond traders. Why? Because if market YTM interest rates rise, bond prices fall. Conversely, if market YTM interest rates fall, bond prices rise. The suggestion that the Fed might raise interest rates is enough to send the bond market reeling as bond traders unload their holdings.

In this section we examined bond valuation for bonds that pay annual and semiannual interest. We also investigated how to find a bond's yield to maturity and the relationship between a bond's YTM and its price. We turn next to preferred stock valuation.

Preferred Stock Valuation

To value preferred stock, we adapt the discounted cash flow valuation formula, Equation 12-1, to reflect the characteristics of preferred stock. First, recall that the value of any security is the present value of its future cash payments. Second, review the characteristics of preferred stock. Preferred stock has no maturity date, so it has no maturity value. Its future cash payments are dividend payments that are paid to preferred stockholders at regular time intervals for as long as they (or their heirs) own the stock. Cash payments from preferred stock dividends are scheduled to continue forever. To value preferred stock, then, we must adapt the discounted cash flow model to reflect that preferred stock dividends are a perpetuity.

Finding the Present Value of Preferred Stock Dividends

To calculate the value of preferred stock, we need to find the present value of its future cash flows—which are a perpetuity. In Chapter 8 we learned how to find the present

value of a perpetuity. We use the formula for the present value of a perpetuity, Equation 8-5, but adapt the terms to reflect the nature of preferred stock.[3]

The preferred stock valuation calculations require that we find the present value (V_p) of preferred stock dividends (D_p), discounted at required rate of return, k_p. The formula for preferred stock valuation follows:

The Formula for the Present Value of Preferred Stock

$$V_p = \frac{D_p}{k_p} \qquad (12\text{-}4)$$

where: V_p = Current market value of the preferred stock

D_p = Amount of the preferred stock dividend per period

k_p = Required rate of return per period for this issue of preferred stock

Let's apply Equation 12-4 to an example. Suppose investors expect an issue of preferred stock to pay an annual dividend of $2 per share. Investors in the market have evaluated the issuing company and market conditions and have concluded that 10 percent is a fair rate of return on this investment. The present value for one share of this preferred stock, assuming a 10 percent required rate of return follows:

$$V_p = \frac{\$2}{.10}$$

$$= \$20$$

We find that for investors whose required rate of return (k_p) is 10 percent, the value of each share of this issue of preferred stock is $20.

The Yield on Preferred Stock

Take Note

With bonds, an investor's annual percent return on investment is called the *yield to maturity*, or YTM. With preferred and common stocks, an investor's percent return on investment is simply called the yield because preferred and common stock don't have a maturity date.

The yield on preferred stock represents the annual rate of return that investors would realize if they bought the preferred stock for the current market price and then received the promised preferred dividend payments.

Like bond investors, preferred stock investors want to know the percentage yield they can expect if they buy shares of preferred stock at the current market price. That way, investors can compare the yield with the minimum they require to decide whether to invest in the preferred stock.

Fortunately, calculating the yield on preferred stock is considerably easier than calculating the YTM for a bond. To calculate the yield, we rearrange Equation 12-4 so that we solve for k_p. We are not solving for the value of the preferred stock, V_p, but rather are taking the market value as a given and solving for k_p as follows:

Formula for the Yield on Preferred Stock

$$k_p = \frac{D_p}{V_p} \qquad (12\text{-}5)$$

[3] Equation 8-5 is $PV = \frac{PMT}{k}$. In Equation 12-4, V_p substitutes for PV, D_p replaces PMT, and k_p replaces k.

where: k_p = Yield per period on investment that an investor can expect if the shares are purchased at the current market price, P_p, and if the preferred dividend, D_p, is paid forever

D_p = Amount of the preferred stock dividend per period

V_p = Current market value of the preferred stock

To illustrate how to find the yield using Equation 12-5, suppose Sure-Thing Corporation's preferred stock is selling for $25 per share today and the dividend is $3 a share. Now assume you are a potential buyer of Sure-Thing's preferred stock, so you want to find the expected annual percent yield on your investment. You know that the current market value of the stock, V_p, is $25, and the stock dividend, D_p, is $3. Applying Equation 12-5, you calculate the yield as follows:

$$k_P = \frac{\$3}{\$25}$$

$$= .12, \text{ or } 12\%$$

You find that the yield for Sure-Thing's preferred stock is 12 percent. If your minimum required rate of return is less than or equal to 12 percent, you would invest in the Sure-Thing preferred stock. If your required rate of return is greater than 12 percent, you would look for another preferred stock that had a yield of more than 12 percent.

Common Stock Valuation

The valuation of common stock is somewhat different from the valuation of bonds and preferred stock. Common stock valuation is complicated by the fact that common stock dividends are difficult to predict compared with the interest and principal payments on a bond or dividends on preferred stock. Indeed, corporations may pay common stock dividends irregularly or not pay dividends at all. Moreover, because owners of more than 50 percent of a corporation's stock have control over the affairs of the business and can force their will, the value of a controlling interest of common stock is relatively more valuable than the value of one share. This means that different procedures must be used to value controlling interests (or total common stockholders' equity) than are used to value one share. Often, ownership of less than 50 percent of a corporation's common stock can result in control if the percentage owned is significant and if the remaining shares are widely disbursed among investors not working in concert with each other.

In the sections that follow, we examine the most popular methods of valuing individual shares of common stock. We will then illustrate how these methods are applied to the valuation of total common stockholders' equity.

Interactive Module

Go to the Interactive Spreadsheets you downloaded for chapter 12. Follow the instructions there. See how the various input variables affect the estimated value.

Valuing Individual Shares of Common Stock

As with bonds and preferred stock, we value individual shares of common stock by estimating the present value of the expected future cash flows from the common stock. Those future cash flows are the expected future dividends and the expected price of the stock when the stock is sold. The discounted cash flow valuation model, Equation 12-1, adapted for common stock is shown in Equation 12-6:

The DCF Valuation Model Applied to Common Stock

$$P_0 = \frac{D_1}{(1 + k_s)^1} + \frac{D_2}{(1 + k_s)^2} + \frac{D_3}{(1 + k_s)^3} + \ldots + \frac{P_n}{(1 + k_s)^n} \quad (12\text{-}6)$$

where: P_0 = Present value of the expected dividends, the current price of the common stock

D_1, D_2, D_3, etc. = Common stock dividends expected to be received at the end of periods 1, 2, 3, and so on until the stock is sold

P_n = Anticipated selling price of the stock in n periods

k_s = Required rate of return per period on this common stock investment

In practice, however, using Equation 12-6 to value shares of common stock is problematic because an estimate of the future selling price of a share of stock is often speculative. This severely limits the usefulness of the model.

Instead, some analysts use models that are a variation of Equation 12-6 that do not rely on an estimate of a stock's future selling price. We turn to those models next.

The Constant Growth Dividend Model Common stock dividends can grow at different rates. The two growth patterns we examine here are constant growth and nonconstant, or supernormal, growth.

The constant growth dividend model assumes common stock dividends will be paid regularly and grow at a constant rate. The constant growth dividend model (also known as the Gordon growth model because financial economist Myron Gordon helped develop and popularize it) is shown in Equation 12-7:

The Constant Growth Version of the Dividend Valuation Model

$$P_0 = \frac{D_1}{k_s - g} \quad (12\text{-}7)$$

where: P_0 = Current price of the common stock

D_1 = Dollar amount of the common stock dividend expected one period from now

k_s = Required rate of return per period on this common stock investment

g = Expected constant growth rate per period of the company's common stock dividends

Equation 12-7 is easy to use if the stock dividends grow at a constant rate. For example, assume your required rate of return (k_s) for Wendy's common stock is 10 percent. Suppose your research leads you to believe that Wendy's Corporation will pay a $0.25 dividend in one year (D_1), and for every year after the dividend will grow at a constant rate (g) of 8 percent a year. Using Equation 12-7, we calculate the present value of Wendy's common stock dividends as follows:

$$P_0 = \frac{\$0.25}{.10 - .08}$$

$$= \frac{\$0.25}{.02}$$

$$= \$12.50$$

We find that with a common stock dividend in one year of $0.25, a constant growth rate of 8 percent, and a required rate of return of 10 percent, the value of the common stock is $12.50.

In a no-growth situation, g, in the denominator of Equation 12-7 becomes zero. To value stocks that have no growth is particularly easy because the value is simply the expected dividend (D_1) divided by k_s.

The Nonconstant, or Supernormal, Growth Model In addition to the constant growth dividend cash flow pattern that we discussed in the previous section, some companies have very high growth rates, known as supernormal growth of the cash flows. Valuing the common stock of such companies presents a special problem because high growth rates cannot be sustained indefinitely. A young high-technology firm may be able to grow at a 40 percent rate per year for a few years, but that growth must slow down because it is not sustainable given the population and productivity growth rates. In fact, if the firm's growth rate did not slow down, its sales would surpass the gross domestic product of the entire nation over time. Why? The company has a 40 percent growth rate that will compound annually, whereas the gross domestic product may grow at a 4 percent compounded average annual growth rate.

The constant growth dividend model for common stock, Equation 12-7, then, must be adjusted for those cases in which a company's dividend grows at a supernormal rate that will not be sustained over time. We do this by dividing the projected dividend cash flow stream of the common stock into two parts: the initial supernormal growth period and the next period, in which normal and sustainable growth is expected. We then calculate the present value of the dividends during the fast-growth time period first. Then we solve for the present value of the dividends during the constant growth period that are a perpetuity. The sum of these two present values determines the current value of the stock.

To illustrate, suppose Supergrowth Corporation is expected to pay an annual dividend of $2 per share one year from now and that this dividend will grow at a 30 percent annual rate during each of the following four years (taking us to the end of year 5). After this supernormal growth period, the dividend will grow at a sustainable 5 percent rate each year beyond year 5. The cash flows are shown in Figure 12-3.

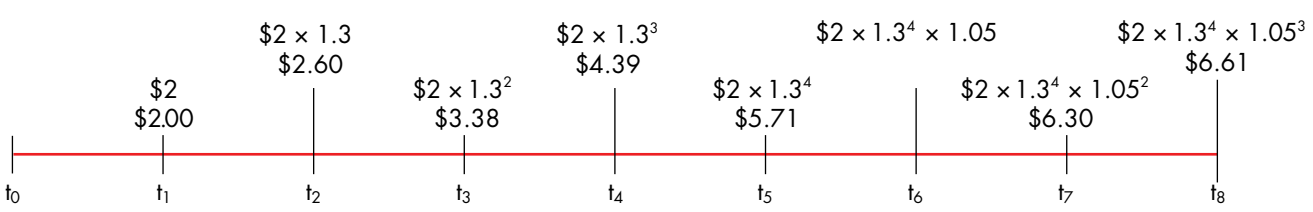


Figure 12-3 Timeline of Supergrowth Common Stock Dividend with Initial Supernormal Growth

The valuation of a share of Supergrowth Corporation's common stock is described in the following three steps.

Step 1: Add the present values of the dividends during the supernormal growth period. Assume that the required rate of return, k_s, is 14 percent.

$$\begin{aligned}
\$2.00 \times 1/1.14^1 &= \$\ 1.75 \\
\$2.60 \times 1/1.14^2 &= \$\ 2.00 \\
\$3.38 \times 1/1.14^3 &= \$\ 2.28 \\
\$4.39 \times 1/1.14^4 &= \$\ 2.60 \\
\$5.71 \times 1/1.14^5 &= \$\ 2.97 \\
\Sigma &= \$11.60
\end{aligned}$$

Step 2: Calculate the sum of the present values of the dividends during the normal growth period, from t_6 through infinity in this case. To do this, pretend for a moment that t_6 is t_1. The present value of the dividend growing at the constant rate of 5 percent to perpetuity could be computed using Equation 12-7.

$$P_0 = \frac{D_1}{k_s - g}$$

Substituting our values we would have:

$$P_0 = \frac{\$6.00}{.14 - .05}$$

$$= \$66.67$$

Because the $6.00 dividend actually occurs at t_6 instead of t_1, the $66.67 figure is not a t_0 value, but rather a t_5 value. Therefore, it needs to be discounted back five years at our required rate of return of 14 percent. This gives us $\$66.67 \times (1/1.14^5) = \$34.63$. The result of $34.63 is the present value of the dividends from the end of year 6 through infinity.

Step 3: Finally we add the present values of the dividends from the supernormal growth period and the normal growth period. In our example we add $11.60 + $34.63 = $46.23. The sum of $46.23 is the appropriate market price of Supergrowth Corporation's common stock, given the projected dividends and the 14 percent required rate of return on those dividends.

The P/E Model Many investment analysts use the price to earnings, or P/E, ratio to value shares of common stock. As we discussed in Chapter 6, the P/E ratio is the price per share of a common stock divided by the company's earnings per share:

$$\text{P / E ratio} = \frac{\text{Price per Share}}{\text{Earnings per Share}}$$

The P/E ratio indicates how much investors are willing to pay for each dollar of a stock's current earnings. So, a P/E ratio of 20 means that investors are willing to pay $20 for $1 of a stock's earnings. A high P/E ratio indicates that investors believe the stock's earnings will increase, or that the risk of the stock is low, or both.

Financial analysts often use a P/E model to estimate common stock value for businesses that are not public. First, analysts compare the P/E ratios of similar companies within an industry to determine an appropriate P/E ratio for companies in that industry. Second, analysts calculate an appropriate stock price for firms in the industry by multiplying each firm's earnings per share (EPS) by the industry average P/E ratio. The P/E model formula, Equation 12-8, follows:

The P/E Model

$$\text{Appropriate Stock Price} = \text{Industry P/E Ratio} \times \text{EPS} \tag{12-8}$$

To illustrate how to apply the P/E model, let's value the common stock of the Zumwalt Corporation. Suppose that Zumwalt Corporation has current earnings per share of $2 and, given the risk and growth prospects of the firm, the analyst has determined that the company's common stock should sell for 15 times current earnings. Applying the P/E model, we calculate the following price for Zumwalt Corporation's common stock:

$$\begin{aligned}\text{Appropriate Stock Price} &= \text{Industry P/E Ratio} \times \text{EPS}\\ &= 15 \times \$2\\ &= \$30\end{aligned}$$

Our P/E model calculations show that $30 per share is the appropriate price for common stock that has a $2 earnings per share and an industry P/E ratio of 15. The industry P/E ratio would be adjusted up or down according to the individual firm's growth prospects and risk relative to the industry norm.

Valuing Total Common Stockholders' Equity

As we said earlier, different procedures must be used to value total common stockholders' equity than are used to value one share of common stock. The primary reason for this is that owners of some large percentage of a corporation's stock have control over the affairs of the business and can force their will on the remaining shareholders. This makes the value of a controlling interest of common stock relatively more valuable than a noncontrolling interest. Therefore, to value controlling interests of common stock, or total stockholders' equity, we must use models that account for this "control premium." In the sections that follow, we examine the most popular methods of valuing total stockholders' equity.

Book Value One of the simplest ways to value total common stockholders' equity is to subtract the value of the firm's liabilities and preferred stock, if any, as recorded on the balance sheet from the value of its assets. The result is the **book value,** or **net worth.**

Book Value of Common Equity

$$\text{Book Value of Common Equity} = \text{Total Assets} - \text{Total Liabilities} - \text{Preferred Stock} \tag{12-9}$$

The book value approach has severe limitations. The asset values recorded on a firm's balance sheet usually reflect what the current owners originally paid for the assets, not the current market value of the assets. Due to these and other limitations, the book value is rarely used to estimate the market value of common equity.

Liquidation Value The liquidation value and book value valuation methods are similar, except that the liquidation method uses the market values of the assets and liabilities, not book values, as in Equation 12-9. The market values of the assets are the amounts the assets would earn on the open market if they were sold (or liquidated). The market values of the liabilities are the amounts of money it would take to pay off the liabilities.

The *liquidation value* is the amount each common stockholder would receive if the firm closed, sold all assets and paid off all liabilities and preferred stock, and distributed the net proceeds to the common stockholders.

Although more reliable than book value, liquidation value is a worst-case valuation assessment. A company's common stock should be worth at least the amount generated at liquidation. Because liquidation value does not consider the earnings and cash flows the firm will generate in the future, it may provide misleading results for companies that have significant future earning potential.

The Free Cash Flow DCF Model

The Free Cash Flow DCF Model is very similar to the nonconstant, or supernormal, dividend growth model discussed earlier, but instead of discounting dividend cash flows, the free cash flow model discounts the total cash flows that would flow to the suppliers of the firm's capital. Once the present value of those cash flows is determined, liabilities and preferred stock (if any) are subtracted to arrive at the present value of common stockholders' equity.

Free Cash Flows Free cash flows represent the total cash flows from business operations that flow to the suppliers of a firm's capital each year. In forecasts, free cash flows are calculated as follows:

Cash Revenues
– Cash Expenses
= Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA)
– Depreciation and Amortization
= Earnings Before Interest and Taxes (EBIT)
– Federal and State Income Taxes
= Net Operating Profit After-Tax (NOPAT)
+ Add Back Depreciation and Amortization
– Capital Expenditures
– New Net Working Capital
= Free Cash Flow

Free cash flow represents those amounts in each operating period that are "free" to be distributed to the suppliers of the firm's capital—that is, the debt holders, the preferred stockholders, and the common stockholders. In the previous calculation, you can see that free cash flow is that amount remaining after cash expenses, income taxes, capital expenditures, and new net working capital are subtracted from cash revenues.

A Real World Example In July 2001, the Abiomed Corporation of Danvers, Massachusetts, received a lot of publicity when the company's AbioCor self-contained artificial heart was implanted in a terminally ill patient, marking the first time that such a device was used on a human being. Let us assume that the time now is April 1, 2006, and that you work for a firm that is interested in acquiring Abiomed. In support of the acquisition analysis, you have been asked to prepare an estimate of the market value of the firm's common equity. The methodology you have chosen is the discounted free cash flow model.

Following a lengthy analysis of the artificial heart market, the medical equipment industry, and Abiomed's financial statements, you produce the discounted free cash flow forecast and valuation shown in Figure 12-4. In the following paragraphs we explain the procedure. The forecasting variables that form the basis for the valuation are listed at the top of Figure 12-4 (these are the product of your lengthy analysis). For convenience, we have numbered each line in the figure at the left-hand side.

The "Actual 2006" column in Figure 12-4 contains Abiomed's operating results for the fiscal year ended March 31, 2006, as recorded on the firm's SEC Form 10-K.[4] The remaining columns contain the forecast for the next 10 years.

Product revenues (line 12) are expected to accelerate from 20 to 50 percent annual growth over four years, with the growth rate decreasing 10 percentage points a year after that until the ninth year of the forecast, when revenue growth settles out at an expected long-term growth rate of 5 percent a year (the growth factor is on line 1). Funded research and development revenue (line 13), on the other hand, is expected to decrease 50 percent a year until it is almost negligible after 10 years (the growth factor is on line 2). These factors produce total revenues (line 14) exceeding $52 million in 2007 and $376 million in 2016.

Direct costs of revenues on line 15 are a function of the expected gross profit margin on line 3. In Abiomed's forecast, 2006's gross margin of 77 percent is extended for each year through 2016. This produces gross profits (see line 16) ranging from just over $40 million in 2007 to over $289 million in 2016. Given the forecasted gross profit figures, direct costs on line 15 are "plugged" by subtracting gross profit from total revenues.

Research and development expenses (line 17) are expected to grow by 10 percent in 2007 and then to decrease by 10 percent a year through 2016. Selling, general, and administrative expenses (line 18) are forecast as a percentage of revenue, starting at 70 percent of revenue in 2007 (the same percentage as in 2006) and declining to 54 percent in 2016. Subtracting these operating expenses from gross profit leaves earnings before interest, taxes, depreciation, and amortization (EBITDA on line 19) of negative $15.176 million in 2007, positive $2.067 million in 2010, and positive $78.966 million in 2016.

Although they are noncash expenses, depreciation and amortization are included in discounted free cash flow forecasts in order to calculate income tax expense. In the case of Abiomed, depreciation and amortization expense (line 20) is forecast to be 6 percent of revenue each year. Subtracting depreciation and amortization expense from EBITDA produces earnings before interest and taxes (EBIT), also known as operating income (see line 21).

As shown in Figure 12-4, line 22, Abiomed has $94.159 million in tax-loss carryforwards at the beginning of FY 2006. Operating income was a negative $16.985 million in 2006, so $94.159 million + $16.985 million = $111.144 million in tax-loss

[4]*Source:* the "Edgar" database at *www.sec.gov.*

Line	Forecasting Variables:	Actual 2006	2007	2008
1	Product revenue growth factor	14%	20%	30%
2	Research revenue growth factor		–10%	–10%
3	Expected gross profit margin	77%	77%	77%
4	R&D expense growth factor		10%	–10%
5	S, G, & A expense % of revenue	71%	71%	70%
6	Depr. & Amort. % of revenue	6%	6%	6%
7	Capital expenditure growth factor		0%	–10%
8	Net working capital to sales ratio		10%	10%
9	Income tax rate	40%		
10	Assumed long-term sustainable growth rate	5%	per year	
11	Discount rate	20%		

	Forecast and Valuation:	Actual 2006	2007	2008
12	Product revenue	$ 43,322	$ 51,986	$ 67,582
13	Funded research and development revenue	348	313	282
14	**Total revenue**	**43,670**	**52,299**	**67,864**
15	Direct costs	10,251	12,029	15,609
16	**Gross profit**	**33,419**	**40,270**	**52,255**
17	Research and development expenses	16,739	18,413	16,572
18	Selling, general and administrative expenses	30,923	37,033	47,574
19	**Earnings before interest, taxes, depr. & amort. (EBITDA)**	**(14,243)**	**(15,176)**	**(11,891)**
20	Depreciation and amortization	2,742	3,138	4,072
21	**Earnings before interest and taxes (EBIT)**	**(16,985)**	**(18,314)**	**(15,963)**
22	Available tax-loss carryforwards	(94,159)	(111,144)	(129,458)
23	Net taxable earnings	(16,985)	(18,314)	(15,963)
24	Federal and state income taxes	0	0	0
25	**Net operating profit after-tax (NOPAT)**	**(16,985)**	**(18,314)**	**(15,963)**
26	Add back depreciation and amortization	2,742	3,138	4,072
27	Subtract capital expenditures	(2,920)	(2,920)	(2,628)
28	Subtract new net working capital	0	(866)	(1,560)
29	**Free cash flow**	**($17,163)**	**($18,962)**	**($16,079)**
30	Terminal value, 2016			
31	Present value of free cash flows @ 20%		(15,802)	(11,166)
32	**Total present value of company operations**	**$100,140**		
33	Plus current assets	46,443*		
34	Less current liabilities	(8,739)*		
35	Less long-term debt	(310)*		
36	Less preferred stock	0*		
37	**Net market value of common equity**	**$137,534**		

*from Abiomed's March 31, 2006 Balance Sheet

Figure 12-4 Discounted Free Cash Flow Forecast and Valuation for Abiomed (in $ thousands)

Years Ending March 31 Forecast							
2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
40%	50%	40%	30%	20%	10%	5%	5%
–10%	–10%	–10%	–10%	–10%	–10%	–10%	–10%
77%	77%	77%	77%	77%	77%	77%	77%
–10%	–10%	–10%	–10%	–10%	–10%	–10%	–10%
68%	66%	64%	62%	60%	58%	56%	54%
6%	6%	6%	6%	6%	6%	6%	6%
–10%	–10%	–10%	–10%	–10%	–10%	–10%	–10%
10%	10%	10%	10%	10%	10%	10%	10%

Years Ending March 31 Forecast							
2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
$94,615	$141,923	$198,692	$258,300	$309,960	$340,956	$358,004	$375,904
254	229	206	185	167	150	135	122
94,869	**142,152**	**198,898**	**258,485**	**310,127**	**341,106**	**358,139**	**376,026**
21,820	32,695	45,747	59,452	71,329	78,454	82,372	86,486
73,049	**109,457**	**153,151**	**199,033**	**238,798**	**262,652**	**275,767**	**289,540**
14,915	13,424	12,082	10,874	9,787	8,808	7,927	7,134
64,608	93,966	127,499	160,526	186,394	198,191	200,925	203,440
(6,474)	**2,067**	**13,570**	**27,633**	**42,617**	**55,653**	**66,915**	**78,966**
5,692	8,529	11,934	15,509	18,608	20,466	21,488	22,562
(12,166)	**(6,462)**	**1,636**	**12,124**	**24,009**	**35,187**	**45,427**	**56,404**
(45,421)	(157,587)	(164,049)	(162,413)	(150,289)	(126,280)	(91,093)	(45,666)
(12,166)	(6,462)	0	0	0	0	0	10,738
0	0	0	0	0	0	0	4,295
(12,166)	**(6,462)**	**1,636**	**12,124**	**24,009**	**35,187**	**45,427**	**52,109**
5,692	8,529	11,934	15,509	18,608	20,466	21,488	22,562
(2,365)	(2,129)	(1,916)	(1,724)	(1,552)	(1,397)	(1,257)	(1,131)
(2,703)	(4,731)	(5,677)	(5,961)	(5,166)	(3,100)	(1,705)	(1,790)
($ 11,542)	**($ 4,793)**	**$ 5,977**	**$ 19,948**	**$ 35,899**	**$ 51,156**	**$ 63,953**	**$ 71,750**
							$502,250
(6,679)	(2,311)	2,402	6,681	10,019	11,897	12,395	92,704

carryforwards are available at the beginning of 2007. This situation continues until 2016, when the carryforwards are finally used up, and Abiomed reports $10.738 million in net taxable earnings. After 2016, operating income is fully taxable.

The forecast assumes a combined federal and state income tax rate of 40 percent (see line 9). Applying this rate to Abiomed's net taxable earnings (line 23) in 2016, and $0 to the earlier years, produces the income tax expenses shown on line 24. Subtracting taxes from EBIT produces the company's net operating profit after tax (NOPAT on line 25), which is negative $18.314 million in 2007 rising to positive $52.109 million in 2016.

Once NOPAT has been determined, three further adjustments are necessary to calculate free cash flow. First, on line 26, depreciation and amortization are added back to NOPAT, because these noncash items were subtracted earlier only for the purpose of calculating income tax expense. Next, on line 27, expected capital expenditures are subtracted. Capital expenditures are amounts expected to be spent to procure new plant and equipment. For this forecast, we assume that your research indicates that Abiomed will need to spend about the same amount on plant and equipment in 2007 than it did in 2006 (see line 7), and that this spending may be decreased 10 percent a year in each year after 2007. The resulting capital expenditure budget, shown in Figure 12-4, line 27, gradually decreases from $2.92 million in 2007 to just over $1.13 million in 2016.

Finally, on line 28, new net working capital investment is subtracted. Net working capital is the difference between current assets and current liabilities that must be financed from long-term capital sources (debt and equity). When businesses grow, they typically need more working capital in the form of cash, inventory, and receivables, and not all of it can be financed spontaneously from current liabilities. For this reason, the company's long-term debt and equity holders must invest additional amounts each year to "take up the slack." In the case of Abiomed, we will assume that your research indicates that the typical ratio of net working capital to sales in the medical equipment industry is 10 percent (see line 8). In other words, for every $10 of new sales a company realizes, $1 of new net working capital will be needed. In Figure 12-4, line 28, this is calculated by multiplying the difference in product revenue each year by .10. In 2007, for example, ($51,986 – $43,322) × .10, and rounded to even thousands = $866,000 of new net working capital is needed. The remaining years are calculated similarly.

After all the calculations have been completed, the resulting figures on line 29 represent amounts that are free to be distributed to the suppliers of Abiomed's capital, either in the form of interest to the debt holders or dividends to the stockholders. These free cash flows range from negative $18.962 million in 2007 to positive $71.750 million in 2016.

In the previous paragraphs, we explicitly forecast the free cash flows for 2007 through 2016. But what about the years after that? After all, Abiomed is not expected to suddenly cease operating at the end of 2016 but to continue operating indefinitely into the future as a going concern.

To forecast the free cash flows in the years beyond 2016, we rely on a variation of the constant growth dividend valuation model, Equation 12-7. After 2016, Abiomed's free cash flows are expected to grow at a constant rate of 5 percent a year indefinitely. We adapt Equation 12-7 to value these constantly growing free cash flows as follows:

Constant Growth Free Cash Flow Valuation Model

$$V_{fcf\,t} = \frac{FCF_1(1+g)}{k-g} \qquad (12\text{-}10)$$

where: $V_{fcf\ t}$ = the value of future free cash flows at time t

FCF_t = free cash flow at time t

k = the discount rate per period

g = the long-term constant growth rate per period of free cash flows

According to Equation 12-10, and assuming a discount rate of 20 percent (see line 11),[5] the value as of the end of 2016 of Abiomed's free cash flows in years 2017 and beyond, in thousands, would be

$$V_{fcf\ 2016} = \frac{\$71,750\ (1 + .05)}{.20 - .05}$$

$$= \$502,250$$

The value of the free cash flows at the end of 2016 and beyond is called the *terminal value* of the company's operations at the end of 2016. The amount is shown in Figure 12-4 on line 30.

On line 31, the present value of the free cash flows is calculated using Equation 8-2a, assuming a discount rate of 20 percent. The present values are then summed up on line 32 to produce the total value of Abiomed's operations on April 1, 2006, which is $100.140 million.

Let us say a few words about this value before proceeding. As we said earlier, the present value of the company's free cash flows ($100.140 million in the case of Abiomed) represents the market value of the firm's core income-producing operations. In the world of finance and investing, this is sometimes called the firm's *enterprise value*. It is NOT the total market value of the entire company, however, or the total market value of the company's assets, because the current, or nonoperating, assets of the company have not yet been accounted for.

We shall have more to say about this issue later in the chapter in the section on valuing complete businesses. For now, just remember that the present value of the company's free cash flows equals the market value of the firm's core income-producing operations (called enterprise value). The relationship is illustrated in Figure 12-5.

In the analysis in Figure 12-4, we have calculated the market value of Abiomed's operating, or income-producing assets, as shown in the lower-left portion of Figure 12-5. Observing Figure 12-5, it is clear that to obtain the value of Abiomed's common stock (which is our ultimate goal), we must take line 32 and add the value of the firm's current assets and then subtract the values of current liabilities, long-term debt, and preferred stock. In Figure 12-4, this is done on lines 33, 34, 35, and 36. The values for current assets, current liabilities, long-term debt, and preferred stock were taken from Abiomed's March 31, 2006, balance sheet.[6]

Line 37 of Figure 12-4 shows the final result after adding Abiomed's current assets ($46.443 million) and subtracting current liabilities ($8.739 million), long-term debt ($.310 million), and preferred stock ($0) from the present value of the firm's operations

Take Note

Do not confuse the market value of Abiomed's common equity, as calculated here, with the actual price of the firm's common stock on the open market. The $137.534 million is what the company's stock is worth to an investor with a required rate of return of 20 percent a year, given the assumptions in the model in Figure 12-4. Stock traders in the market may be making any number of different assumptions about Abiomed and may have different required rates of return. As a result, the actual price of Abiomed's stock in the market may be completely different than the *intrinsic* value shown here.[7]

[5]The discount rate represents the weighted average required rates of return of Abiomed's debt holders and common stockholders. Calculating this weighted average return was discussed in detail in Chapter 9.

[6]To be precise, we should have calculated the market values of Abiomed's current assets, current liabilities, and long-term debt before making the adjustments. In practice, however, the book values from the balance sheet are often used instead, because the process of valuing the items is difficult and the market values often do not differ materially from the book values.

[7]In fact, Abiomed's stock closed at $12.90 on Friday, March 31, 2006, the day before our valuation date. $12.90 per share equates to a total common equity value of $341.438 million, not including a control premium. This is almost $204 million higher than the $137.534 million estimated by our model. Could investors have been overcome by speculative fever on that date? We leave that for you to decide.

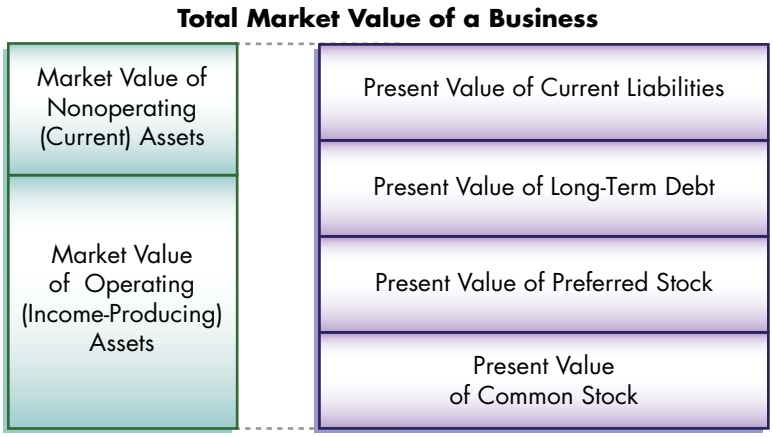


Figure 12-5 Total Market Value of a Business

This figure is an extension of Figure 12-1, showing how total assets are made up of operating (income-producing) assets plus nonoperating (current) assets.

($100.140 million). This final result, $137.534 million, is the total market value of Abiomed's common equity as of April 1, 2006.

The Yield on Common Stock

We calculate the yield for common stock by rearranging the terms in Equation 12-7 to arrive at the constant growth dividend model, as shown in Equation 12-11:

The Yield, or Total Return, on Common Stock

$$k_s = \frac{D_1}{P_0} + g \qquad (12\text{-}11)$$

where: D_1 = Amount of the common stock dividend anticipated in one period

P_0 = Current market price of the common stock

g = Expected constant growth rate of dividends per period

k_s = Expected rate of return per period on this common stock investment

Equation 12-11 is also called the formula for an investor's total rate of return from common stock. The stock's **dividend yield** is the term D_1/P_0.

To demonstrate how Equation 12-11 works, suppose you found that the price of BP common stock today was $52 per share. Then suppose you believe that BP will pay a common stock dividend next year of $4.80 a share, and the dividend will grow each year at a constant annual rate of 4 percent. If you buy one share of BP common stock at the listed price of $52, your expected annual percent yield on your investment will be

$$k_s = \frac{D_1}{P_0} + g$$

$$= \frac{\$4.80}{\$52} + .04$$

$$= .0923 + .04$$

$$= .1323, \text{ or } 13.23\%$$

If your minimum required rate of return for BP common stock, considering its risk, were less than 13.23 percent, you would proceed with the purchase. Otherwise you would look for another stock that had an expected return appropriate for its level of risk.

Valuing Complete Businesses

Up to this point in the chapter, we have dealt with the values of business components as shown in the right-hand "pillar" in Figure 12-1. Now we turn our attention to valuing the complete business all at once, or the total value of the business's assets as shown in the left-hand "pillar" in Figure 12-1.

The Free Cash Flow DCF Model Applied to a Complete Business

As it turns out, using the Free Cash Flow Model to value a complete business is quite straightforward once you have learned how to use it to value common equity. This is because the Free Cash Flow Model values the complete business as a part of the procedure to value common equity. Refer again to Figure 12-5, which shows that the value of a complete business is the sum of the values of the operating, or income-producing, assets plus the value of the nonoperating, or current, assets. All that is necessary to use the Free Cash Flow Model to value a complete business is to add the value of the company's current assets, taken from the most recent balance sheet,[8] to the value of the company's operations, calculated exactly the same way as in Figure 12-4 for Abiomed. Following this procedure, the complete business value for Abiomed would be

Present value of company operations (or enterprise value)	$121.067 million
+ Value of current assets	46.443 million
= Complete business value of Abiomed	$167.510 million
(see Figure 12-4, lines 32 and 33)	

The Replacement Value of Assets Method

The replacement value of assets valuation method is similar to the liquidation model covered earlier in the chapter. According to the concept underlying the model, the market value of a complete business cannot exceed the amount it would take to buy all of the firm's assets on the open market. For example, you would not be willing to pay the owners of Abiomed $167.510 million for the company if you could buy all the assets necessary to duplicate the company for $100 million.

[8] As we said earlier, to be precise, one should use the market value of the current assets, rather than the book value from the balance sheet. However, because estimating the market value of the current assets is time-consuming and the results are often not materially different from the book value, many analysts simply use the book value in their complete business valuations.

Although it is simple in concept, the replacement value of assets method is not often applied to complete business valuations for two reasons:

1. It is frequently very difficult to locate similar assets for sale on the open market.
2. Some of a business's assets are difficult to define and quantify (how do you quantify a business's reputation, for example, or the strength of its brands?).

Although it is difficult to use the replacement value of assets method to value a complete business, the model can be quite useful for estimating the value of individual assets in a business. For example, the value of a company's nonproprietary software can be estimated by listing the various programs in use and then noting the prices of those programs in retail stores, catalogs, and on the Internet. The sum of the lowest prices at which the programs could be obtained is the replacement value of the company's software. In another example, it is possible to estimate the value of a company's machinery and equipment by calculating what it would cost to replace all the machinery and equipment. This is normally done by noting the prices for machinery and equipment of similar age and in similar condition on the open market. Alternatively, analysts sometimes note the prices of new machinery and equipment and adjust those prices to reflect the age and condition of the machinery and equipment belonging to the company.

Individual asset valuations of this type are most often employed when one business buys another and it is necessary to allocate the purchase price among the assets purchased. In such cases, the "fair market value" of the individual assets is estimated (using the replacement value of assets method, the discounted free cash flow method, or some other method), and any amounts remaining are assigned to "goodwill."

What's Next

In this chapter we investigated valuation methods for bonds, preferred stock, common stock, and complete businesses. The valuation methods applied risk and return, and time value of money techniques learned in Chapters 7 and 8, respectively. In the next chapter, we will explore capital structure issues.

Summary

1. Explain the importance of business valuation.

When corporations contemplate selling their businesses, they do not want to undervalue the businesses because they want to raise the most money possible. Likewise, would-be purchasers of businesses use valuation methods to avoid paying more than the businesses are worth.

2. Discuss the concept of business valuation.

To value any business, business asset, or security, we apply risk and return and time value of money techniques. In sum, the value of a business, asset, or security is the present value of the expected future cash flows. Bond cash flows are the periodic interest payments and the principal at maturity. Stock and business cash flows come from the future earnings that the assets produce for the firm, usually leading to cash dividend payments.

To value businesses, assets, and securities, investors and financial managers use a general valuation model to calculate the present value of the expected future cash flows. That model incorporates risk and return, and time value of money concepts.

3. Compute the market value and the yield to maturity of a bond.

The market value of a bond is the sum of the present values of the coupon interest payments plus the present value of the face value to be paid at maturity, given a market's required rate of return.

The yield to maturity of a bond (YTM) is the average annual rate of return that investors realize if they buy a bond for a certain price, receive the promised interest payments and principal on time, and reinvest the interest payments at the YTM rate.

A bond's market price and its YTM vary inversely. That is, when the YTM rises, the market price falls, and vice versa. When a bond has a YTM greater than its coupon rate, it sells at a discount to its face value. When the YTM is equal to the coupon rate, the market price equals the face value. When the YTM is less than the coupon rate, the bond sells at a premium over face value.

4. Compute the market value and expected yield of preferred stock.

The market value of preferred stock is the present value of the stream of preferred stock dividends, discounted at the market's required rate of return for that investment. Because the dividend cash flow stream is a perpetuity, we adapt the present value of a perpetuity formula, Equation 8-5, to value preferred stock.

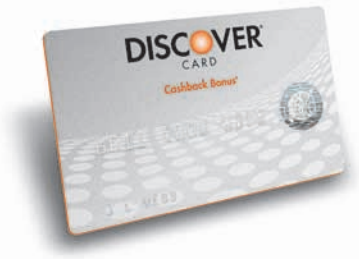
The yield on preferred stock represents the annual rate of return that investors realize if they buy the stock for the current market price and then receive the promised dividend payments on time.

5. Compute the market value per share of common stock.

The market value of common stock is estimated in a number of ways, including (1) finding the present value of all the future dividends the stock is expected to pay, discounted at the market's required rate of return for that stock; and (2) finding the price implied, given the level of earnings per share and the appropriate P/E ratio. The dividend growth model and the P/E valuation approaches assume the firm will be a going concern. That is, the models value the future cash flows that a firm's assets are expected to produce. Two versions of the dividend growth model are commonly used, one for situations in which the future growth of the firm's dividends is expected to be constant, and the other for situations in which the future growth of the firm's dividends is expected to be nonconstant, or supernormal. Supernormal growth implies a period of high growth followed by a settling out at the long-term constant growth rate.

6. Compute the market value of total common equity.

The market value of total common equity is estimated in a number of ways, including (1) estimating common equity value based on the book value of the firm's assets as recorded on the balance sheet, less all liabilities and preferred stock (if any); (2) estimating the value of the firm's assets if they were to be liquidated on the open market and all claims on the firm were to be paid off; and (3) employing a discounted free cash flow model that calculates the present value of expected free cash flows to the suppliers of the firm's capital. The discounted free cash flow model is similar to the nonconstant dividend growth model in that it involves making a forecast of free cash flows during a specified period (usually 7 to 10 years). This is followed by the calculation of the value of the cash flows expected to be received after the forecast period (called the terminal



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value). The present values of the free cash flows and the present value of the terminal value are summed to produce the total present value of the firm's operations. This figure, in turn, is adjusted by adding current assets and subtracting current liabilities, long-term debt, and preferred stock (if any) to produce the total value of common equity.

7. Compute the expected yield of common stock.

The yield on common stock is the percentage return investors can expect if they purchase the stock at the prevailing market price and receive the expected cash flows. It is calculated by solving for k in the constant growth dividend model.

8. Compute the value of a complete business.

The market value of a complete business can be found by applying the discounted free cash flow model used to estimate the value of common equity. In the complete business application, current assets are added to the present value of the firm's operations to produce the value of the complete business. Sometimes the value of complete businesses can also be found by calculating the amount that would be required to replace the firm's assets, but this method is usually more effective when applied to the valuation of individual business assets.

Equations Introduced in This Chapter

Equation 12-1. The Discounted Cash Flow Valuation Model:

$$V_0 = \frac{CF_1}{(1 + k)^1} + \frac{CF_2}{(1 + k)^2} + \frac{CF_3}{(1 + k)^3} + \ldots + \frac{CF_n}{(1 + k)^n}$$

where: V_0 = Present value of the anticipated cash flows from the asset, its current value

$CF_{1, 2, 3, \text{ and } n}$ = Cash flows expected to be received one, two, three, and so on up to n periods in the future

k = Discount rate, the required rate of return per period

Equation 12-2. The Bond Valuation Formula (Algebraic Method):

$$V_B = INT \times \left[\frac{1 - \frac{1}{(1 + k_d)^n}}{k_d} \right] + \frac{M}{(1 + k_d)^n}$$

where: V_B = Current market value of the bond

INT = Dollar amount of each periodic interest payment

n = Number of times the interest payment is received (which is also the number of periods until maturity)

M = Principal payment received at maturity

k_d = Required rate of return per period on the bond debt instrument

Equation 12-3. The Bond Valuation Formula (Table Method):

$$V_B = (INT \times PVIFA_{k,n}) + (M \times PVIF_{k,n})$$

where: $PVIFA_{k,n}$ = Present Value Interest Factor for an Annuity from Table IV

$PVIF_{k,n}$ = Present Value Interest Factor for a single amount from Table II

Equation 12-4. The Formula for the Present Value of Preferred Stock:

$$V_P = \frac{D_p}{k_p}$$

where: V_p = Current market value of the preferred stock

D_p = Amount of the preferred stock dividend per period

k_p = Required rate of return for this issue of preferred stock

Equation 12-5. Formula for the Yield on Preferred Stock:

$$k_p = \frac{D_p}{V_P}$$

where: k_p = Yield per period on investment that an investor can expect if the shares are purchased at the current market price, P_P, and if the preferred dividend, D_p, is paid forever

D_p = Amount of the preferred stock dividend per period

V_p = Current market value of the preferred stock

Equation 12-6. The DCF Valuation Model Applied to Common Stock:

$$P_0 = \frac{D_1}{(1 + k_s)^1} + \frac{D_2}{(1 + k_s)^2} + \frac{D_3}{(1 + k_s)^3} + \ldots + \frac{P_n}{(1 + k_s)^n}$$

where: P_0 = Present value of the expected dividends, the current price of the common stock

D_1, D_2, D_3, etc. = Common stock dividends expected to be received at the end of periods 1, 2, 3, and so on until the stock is sold

P_n = Anticipated selling price of the stock in n periods

k_s = Required rate of return per period on this common stock investment

Equation 12-7. The Constant Growth Version of the Dividend Valuation Model:

$$P_0 = \frac{D_1}{k_s - g}$$

where:
P_0 = Current price of the common stock
D_1 = Dollar amount of the common stock dividend expected one period from now
k_s = Required rate of return per period on this common stock investment
g = Expected constant growth rate per period of the company's common stock dividends

Equation 12-8. The P/E Model for Valuing Common Stock:

Appropriate Stock Price = Industry P/E Ratio × EPS

Equation 12-9. The Book Value of Common Stock:

Book Value of Common Stock = Total Assets – Total Liabilities – Preferred Stock

Equation 12-10. The Constant Growth Free Cash Flow Valuation Model

$$V_{fcf\,t} = \frac{FCF_1(1+g)}{k - g}$$

where:
$V_{fcf\,t}$ = the value of future free cash flows at time t
FCF_t = free cash flow at time t
k = the discount rate per period
g = the long-term constant growth rate per period of free cash flows

Equation 12-11. The Yield, or Total Return, on Common Stock:

$$k_s = \frac{D_1}{P_0} + g$$

where:
D_1 = Amount of the common stock dividend anticipated in one period
P_0 = Current market price of the common stock
g = Expected constant growth rate of dividends per period
k_s = Expected rate of return per period on this common stock investment

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Self-Test

ST-1. The DaimlerChrysler Corporation has issued a 10.95 percent annual coupon rate bond that matures December 31, 2027. The face value is $1,000. If the required rate of return on bonds of similar risk and maturity is 9 percent, and assuming the time now is January 1, 2007, what is the current value of DaimlerChrysler's bond?

ST-2. DaimlerChrysler's 10.95 percent coupon rate, 2027 bond is currently selling for $1,115. At this price, what is the yield to maturity of the bond? Assume the time is January 1, 2007.

ST-3. McDonald's is offering preferred stock that pays a dividend of $1.93 a share. The dividend is expected to continue indefinitely. If your required rate of return for McDonald's preferred stock is 8 percent, what is the value of the stock?

ST-4. Pepsico's next annual dividend is expected to be $1.14 a share. Dividends have been growing at a rate of 6 percent a year, and you expect this rate to continue indefinitely. If your required rate of return for this stock is 9 percent, what is the maximum price you should be willing to pay for it?

ST-5. Goodyear Corporation stock is currently selling for $38. The company's next annual dividend is expected to be $1.00 a share. Dividends have been growing at a rate of 5 percent a year, and you expect this rate to continue indefinitely. If you buy Goodyear at the current price, what will be your yield, or total return?

Review Questions

1. Describe the general pattern of cash flows from a bond with a positive coupon rate.
2. How does the market determine the fair value of a bond?
3. What is the relationship between a bond's market price and its promised yield to maturity? Explain.
4. All other things held constant, how would the market price of a bond be affected if coupon interest payments were made semiannually instead of annually?
5. What is the usual pattern of cash flows for a share of preferred stock? How does the market determine the value of a share of preferred stock, given these promised cash flows?
6. Name two patterns of cash flows for a share of common stock. How does the market determine the value of the most common cash flow pattern for common stock?
7. Define the P/E valuation method. Under what circumstances should a stock be valued using this method?
8. Compare and contrast the book value and liquidation value methods for common stock. Is one method more reliable? Explain.
9. Answer the following questions about the discounted free cash flow model illustrated in Figure 12-4:
   a. What are "free cash flows"?
   b. Explain the terminal-value calculation at the end of the forecast period. Why is it necessary?
   c. Explain the term *present value of the firm's operations* (also known as *enterprise value*). What does this number represent?
   d. Explain the adjustments necessary to translate enterprise value to the total present value of common equity.
10. Explain the difference between the discounted free cash flow model as it is applied to the valuation of common equity and as it is applied to the valuation of complete businesses.
11. Why is the replacement value of assets method not generally used to value complete businesses?

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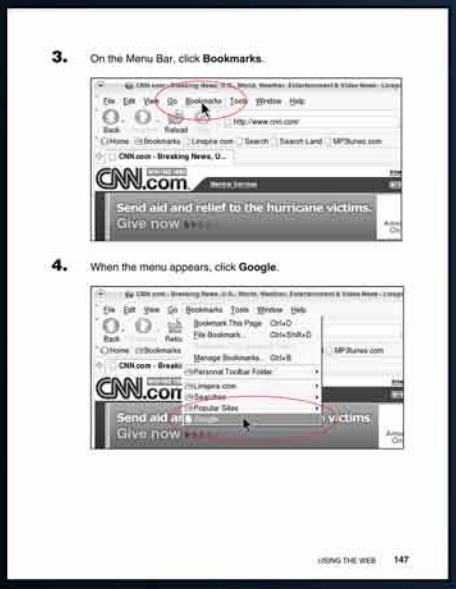

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Build Your Communication Skills

CS-1. Check the current price of Texas Instruments Corporation stock or a stock of your choice in the financial press. Then research financial information from last year predicting how Texas Instruments stock (or the stock you chose) would fare and analyze what valuation methods the analysts used. Next, compare the current price with the analysts' price predictions. Prepare a brief oral report that you present to the class discussing your assessment of the analysts' stock valuation.

CS-2. Choose a stock in the financial press. Check its current price. Then estimate the value of the stock using the dividend growth model, Equation 12-7. Compare the value of the stock with its current price and prepare a short memo in which you explain why the two figures might differ.

Problems

Bond Valuation ☛

12-1. Owen Meany is considering the purchase of a $1,000 Amity Island Municipal Bond. The city is raising funds for a much needed advertising campaign to promote its East Coast resort community. The stated coupon rate is 6 percent, paid annually. The bond will mature in 10 years. The YTM for similar bonds in the market is 8 percent.

a. How much will the annual interest payments be?

b. What is the market price of the bond today?

c. Is the interest received on a municipal bond generally tax free?

Bond Valuation ☛

12-2. Assume Disney Studios is offering a corporate bond with a face value of $1,000 and an annual coupon rate of 12 percent. The maturity period is 15 years. The interest is to be paid annually. The annual YTM for similar bonds in the market is currently 8 percent.

a. What is the amount of interest to be paid annually for each bond?

b. What is the value of this $1,000 bond today?

c. What would be the present value of the interest and principal paid to holders of one of their bonds if the interest payments were made semiannually instead of annually?

Bond Valuation ☛

12-3. After a major earthquake, the San Francisco Opera Company is offering zero coupon bonds to fund the needed structural repairs to its historic building. Buster Norton is considering the purchase of several of these bonds. The bonds have a face value of $2,000 and are scheduled to mature in 10 years. Similar bonds in the market have an annual YTM of 12 percent. If Mr. Norton purchases three of these bonds today, how much money will he receive 10 years from today at maturity?

12-4. Two best friends, Thelma and Louise, are making long-range plans for a road trip vacation to Mexico. They will embark on this adventure in five years and want to invest during the five-year period to earn money for the trip. They decide to purchase a $1,000 Grand Canyon Oil Company bond with an annual coupon rate of 10 percent with interest to be paid semiannually. The bond will mature in five years. The YTM of similar bonds is 8 percent. How much should they be willing to pay for the bond if they purchase it today?

Bonds with Semiannual Interest Payments

12-5. Assume that Intel Corporation's $1,000 face value 9 percent coupon rate bond matures in 10 years and sells for $1,100. If you purchase the bond for $1,100 and hold it to maturity, what will be your average annual rate of return on the investment?

Expected Rate of Return on a Corporate Bond

12-6. Clancy Submarines, Inc. is offering $1,000 par value bonds for sale. The bonds will mature 10 years from today. The annual coupon interest rate is 12 percent, with payments to be made annually. James Hobson just purchased one bond at the current market price of $1,125.

a. Will the YTM of this bond be greater than or less than the coupon interest rate? Answer this part without doing any calculations.

b. To the nearest whole percent, what is the YTM of Mr. Hobson's bond? You'll need to crunch some numbers for this part.

c. What would the YTM have to be to make the market price of the bond equal to the face value? No number crunching is needed to answer.

Bond YTM and Pricing

12-7. A corporate bond has a face value of $1,000 and an annual coupon interest rate of 7 percent. Interest is paid annually. Of the original 20 years to maturity, only 10 years of the life of the bond remain. The current market price of the bond is $872. To the nearest whole percent, what is the YTM of the bond today?

Bond YTM

12-8. The new Shattuck Corporation will offer its preferred stock for sale in the very near future. These shares will have a guaranteed annual dividend of $10 per share. As you research the market, you find that similar preferred stock has an expected rate of return of 12 percent. If this preferred stock could be purchased today, what price per share would you expect to pay for it?

Preferred Stock Valuation

12-9. Lucky Jackson knows that one share of Grand Prix Enterprises preferred stock sells for $20 per share on the open market. From its annual reports, he sees that Grand Prix pays an annual dividend of $1.75 per share on this preferred stock. What is the market's required rate of return on Grand Prix's stock?

Preferred Stock k

Preferred Stock Valuation

12-10. Tiny Shipping Corporation is planning to sell preferred stock that will pay an annual dividend of $8 per share. The current expected rate of return from similar preferred stock issues is 13 percent.

a. What price per share would you expect to have to pay to purchase this stock?

b. If the stock is actually selling for $50 per share, what is the market's required rate of return for this stock?

Common Stock Valuation per Share

12-11. China S. Construction, Inc., is in the business of building electrical power plants in the eastern United States. Jack Godell and the rest of the board members of the firm have just announced a $4 per share dividend on the corporation's common stock to be paid in one year. Because the quality of some of its recent projects is under attack by investigative television reporters, the expected constant dividend growth rate is only estimated to be 1 percent. The required rate of return for similar stocks in this industry is 16 percent.

a. What is the present value of the expected dividends from one share of China S. Construction's common stock?

b. What is the stock's dividend yield (D_1/P_0)?

Yield on Common Stock

12-12. The current listed price per share of a certain common stock is $15. The cash dividend expected from this corporation in one year is $2 per share. All market research indicates that the expected constant growth rate in dividends will be 4 percent per year in future years. What is the rate of return on this investment that an investor can expect if shares are purchased at the current listed price?

Common Stock Valuation per Share

12-13. Golden Manufacturing Company is expected to pay a dividend of $8 per share of common stock in one year. The dollar amount of the dividends is expected to grow at a constant 3 percent per year in future years. The required rate of return from shares of similar common stock in the present environment is 14 percent.

a. What would you expect the current market price of a share of Golden common stock to be?

b. Assuming the cash dividend amount and the growth rate are accurate, what is the annual rate of return on your investment in Golden common stock if you purchased shares at the stock's actual listed price of $65 per share?

Bond Valuation

12-14. Micron issues a 9 percent coupon bond with a maturity of 5 years. The face value of the bond, payable at maturity, is $1,000. What is the value of this bond if your required rate of return is 12 percent?

Bond Valuation (Semiannual Interest)

12-15. Sam wants to purchase a bond that has a par value of $1,000, an annual coupon rate of 7 percent, and a maturity of 10 years. The bond's interest is paid semiannually. Sam's annual required rate of return is 11 percent. What should Sam be willing to pay for this particular bond?

12-16. What is the value of a security that entitles you to receive the following payments if your required rate of return for this type of security is 23 percent?

Discounted Cash Flows (DCF)

$80—end of year 1
$150—end of year 2
$1,500—end of year 3

12-17. Tom expects the issue of InVest preferred stock to pay an annual dividend of $3 per share. He also has researched the company and feels that 12 percent is a fair rate of return for this investment. Calculate the value of each share of stock.

Preferred Stock Valuation

12-18. Analysts forecast that Dixie Chicks, Inc. (DCI) will pay a dividend of $2.20 a share at the end of this year, continuing a long-term growth trend of 9 percent a year. If this trend is expected to continue indefinitely and investors' required rate of return for DCI is 18 percent, what is the market value per share of DCI's common stock?

Common Stock Valuation, Constant Growth

12-19. PepsiCo (NYSE: PEP) paid a dividend of $0.58 per share this year. Dividends at the end of each of the next five years are expected to be as follows:

Common Stock Valuation, Nonconstant Growth

Year 1	$0.70
Year 2	$0.83
Year 3	$0.96
Year 4	$1.09
Year 5	$1.22

After year 5, dividends are expected to grow indefinitely at 10 percent a year.

If your required rate of return for PepsiCo common stock is 12 percent, what is the most that you would pay per share for PepsiCo today?

12-20. Regis knows that CRS stock sells for $82 per share, has a growth rate of 7 percent, and a dividend that was just paid of $3.82. What can Regis expect as an annual percent yield if he purchases a share of CRS stock?

Common Stock Yield

12-21. Gwenyth just purchased a bond for $1,250 that has a maturity of 10 years and a coupon interest rate of 8.5 percent, paid annually. What is the YTM of the $1,000 face value bond that she purchased?

Yield to Maturity (YTM)

12-22. Analysts forecast that free cash flows from Dixie Chicks, Inc. (DCI) will be $2.1 million in the coming year, continuing a long-term growth trend of 9 percent a year. If this trend is expected to continue indefinitely and investors' required rate of return for DCI is 18 percent, what will be the total enterprise value of DCI?

Enterprise Value, Constant Growth

Enterprise Value, Nonconstant Growth

12-23. The free cash flow for PepsiCo (NYSE: PEP) this year was $1,026,600,000. Free cash flows at the end of each of the next five years are expected to be as follows:

Year 1	$1,231,920,000
Year 2	$1,453,665,600
Year 3	$1,686,252,096
Year 4	$1,922,327,389
Year 5	$2,153,006,676

After year 5, free cash flows are expected to grow indefinitely at 10 percent a year.

If the weighted average cost of capital (WACC) for PepsiCo is 12 percent, what is the enterprise value of the company today?

Book Value

12-24. Jack and Frank Baker know their piano renditions of lounge songs have limited appeal on the night club circuit, so they work part-time as investment consultants. They are researching relatively unknown corporations, one of which is Susie Diamond Enterprises. To get a quick idea of the value of SDE's common stock, they have taken the following numbers from the most recent financial statements.

Total Assets	$675,000
Total Liabilities	$120,000
250,000 Shares of Common Stock Issued	
100,000 Shares of Common Stock Outstanding	

What is the book value (net worth) of Susie Diamond Enterprises?

Book Value Liquidation Value, and P/E Methods

12-25. The most recent balance sheet of Free Enterprise, Inc., follows.

Free Enterprise, Inc., Balance Sheet December 31, 2006 (thousands of dollars)

Assets		Liabilities + Equity	
Cash	$ 4,000	Accounts Payable	$ 4,400
Accounts Receivable	10,000	Notes Payable	4,000
Inventory	13,000	Accrued Expenses	5,000
Prepaid Expenses	400	Total Current Liabilities	13,400
Total Current Assets	27,400	Bonds Payable	6,000
Fixed Assets	11,000	Common Equity	19,000
Total Assets	$ 38,400	Total Liabilities + Equity	$38,400

a. What was Free Enterprise's book value (net worth) at the beginning of 2007?

b. If the company had 750,000 shares of common stock authorized and 500,000 shares outstanding, what was the book value per share of common stock at the beginning of 2007?

c. Net income of Free Enterprise, Inc. was $5,610,000 in 2006. Calculate the earnings per share of Free Enterprise's common stock.

d. The P/E ratio for a typical company in Free Enterprise, Inc.'s industry is estimated to be 6. Using the EPS from part c) above, calculate the price of one share of common stock at the beginning of 2007, assuming that Free Enterprise commands a P/E ratio value equal to that of an average company in its industry.

e. What would you infer about the company's total assets shown on the balance sheet when comparing this calculated stock price with the company's book value per share?

f. Calculate the liquidation value of Free Enterprise's common stock assuming the market value of the total assets is $50 million and the market value of total liabilities is $20 million, as estimated by your analyst.

12-26. Lucky Jackson is trying to choose from among the best of the three investment alternatives recommended to him by his full-service investment broker. The alternatives are

Comprehensive Problem

a. The corporate bond of Star Mining Company has a face value of $1,000 and an annual coupon interest rate of 13 percent. The bond is selling in the market at $1,147.58. Of the original 20 years to maturity, only 16 years of the life of the bond remain.

b. The preferred stock of Supernova Minerals Company has a par value of $100 per share and it offers an annual dividend of $14 per share. The market price of the stock is $140 per share.

c. The common stock of White Dwarf Ores Company sells in the market at $300 per share. The company paid a dividend of $39 per share yesterday. The company is expected to grow at 3 percent per annum in the future.

Which of the three alternatives should Lucky choose? Remember the priority of claims for bondholders, preferred stockholders, and common stockholders from Chapters 1 and 4.

12-27. Suppose Flash in the Pan Corporation is expected to pay an annual dividend of $3 per share one year from now and that this dividend will grow at the following rates during each of the following four years (to the end of year 5): Year 2, 20 percent; Year 3, 30 percent; Year 4, 20 percent; Year 5, 10 percent. After this supernormal growth period, the dividend will grow at a sustainable 5 percent rate each year beyond year 5.

Nonconstant Dividend Growth Model

a. What is the present value of the dividends to be paid during the supernormal growth period? Assume that the required rate of return, k_s, is 15 percent.

b. What is the present value of the dividends to be paid during the normal growth period (from year 6 through infinity)?

c. What is the total present value of one share of Flash in the Pan's common stock?

Discounted Free Cash Flow Model for Total Common Equity (Challenge Problem)

12-28. Assume that you are the owner of a pet foods company and you are interested in acquiring the stock of Hardi-Pets, an up-and-coming company that markets a new type of dog food that causes pets that eat it to never get sick and to never need shots. Selected financial data for Hardi-Pets is shown.

Hardi-Pets, Inc., Selected Financial Data for 2006

Total Revenue	$1,000,000
Cost of Goods Sold	500,000
Gross Profit	500,000
Selling, General and Administrative Expenses	200,000
Earnings before Interest, Taxes, Depr. & Amort. (EBITDA)	300,000
Depreciation and Amortization	100,000
Earnings before Interest and Taxes (EBIT)	200,000
Capital Expenditures	$ 15,000
Combined Federal and State Income Tax Rate	40%
Current Assets, Dec. 31, 2006	$ 100,000
Current Liabilities, Dec. 31, 2006	80,000
Long-Term Debt, Dec. 31, 2006	500,000
Preferred Stock Outstanding, Dec. 31, 2006	0

Prepare a valuation analysis of Hardi-Pets total common equity using the discounted free cash flow model. Use a spreadsheet format similar to the example shown in Figure 12-4. The following forecasting variables apply. Assume that the time now is January 1, 2007.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue Growth Factor	10%	15%	20%	25%	30%	25%	20%	15%	10%	5%
Expected Gross Profit Margin	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
S, G, & A Exp % of Revenue	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
Depr. & Amort. % of Revenue	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Capital Expend. Growth Factor	10%	10%	10%	10%	–10%	–10%	–10%	–10%	–10%	–10%
Net Working Cap to Sales Ratio	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

Income tax rate = 40%

Assumed long-term sustainable growth rate = 5% per year after 2016

Discount rate = 20%

Discounted Free Cash Flow Model for Complete Business Valuation (Challenge Problem)

12-29. The Great Expectations Company just finished its first year of operations in which the company realized $2 million in revenue. Company managers are looking forward to a number of years of rapid growth ahead, and to this end they are seeking $10 million in long-term debt financing from the Capital 4 U Financing Company. However, before the loan can be approved, an independent appraisal of Great Expectations is required to establish the fair market value of the company.

Assume that you are a financial analyst working for Value Plus, Independent Appraisers. Capital 4 U has engaged your firm to estimate the fair market value of Great Expectations as a complete business. Selected financial data for Great Expectations is shown.

Great Expectations, Inc., Selected Financial Data for 2006

Total Revenue	$2,000,000
Cost of Goods Sold	1,200,000
Gross Profit	800,000
Selling, General and Administrative Expenses	1,200,000
Earnings before Interest, Taxes, Depr. & Amort. (EBITDA)	(400,000)
Depreciation and Amortization	200,000
Earnings before Interest and Taxes (EBIT)	(600,000)
Capital Expenditures	$1,000,000
Combined Federal and State Income Tax Rate	40%
Current Assets, Dec. 31, 2006	$ 500,000

Prepare a valuation analysis of Great Expectations as a complete business using the discounted free cash flow model. Use a spreadsheet format similar to the example shown in Figure 12-4, modified for a complete business. The following forecasting variables apply. Assume that the time now is January 1, 2007.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Revenue Growth Factor	20%	30%	40%	50%	60%	50%	40%	30%	20%	10%
Expected Gross Profit Margin	50%	51%	52%	53%	54%	55%	56%	57%	58%	59%
S, G, & A Exp % of Revenue	50%	40%	30%	29%	28%	27%	26%	25%	24%	23%
Depr. & Amort. % of Revenue	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%
Capital Expend. Growth Factor	40%	35%	30%	25%	20%	–10%	–15%	–20%	–25%	–30%
Net Working Cap to Sales Ratio	19%	18%	17%	16%	15%	14%	13%	12%	11%	10%

Income tax rate = 40%

Assumed long-term sustainable growth rate = 5% per year after 2016

Discount rate = 20%

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Answers to Self-Test

ST-1. The present value of DaimlerChrysler's 10.95 percent 2027 bond can be found using Equation 12-2:

$$V_B = INT \times \left[\frac{1 - \frac{1}{(1 + k_d)^n}}{k_d}\right] + \frac{M}{(1 + k_d)^n}$$

Face value is $1,000

The coupon interest payment is 10.95 percent of $1,000, or $109.50.

n = 21

k_d = 9%

$$V_B = \$109.50 \times \left[\frac{1 - \frac{1}{(1 + .09)^{21}}}{.09}\right] + \frac{\$1,000}{(1 + .09)^{21}}$$

$$= (\$109.50 \times 9.29224) + \left(\frac{\$1,000}{6.108801}\right)$$

$$= \$1,017.50 + \$163.70$$

$$= \$1,181.20$$

So the present value of the bond is $1,181.20.

ST-2. The bond's YTM is found by trial and error. We know that the bond has a price of $1,115; face value of $1,000; coupon interest payment of $109.50 (10.95% of $1,000); and matures in 21 years. Now we can find that value of k_d that produces a V_B of $1,115. Use Equation 12-2 and solve for V_B.

First try k_d = 9%:

$$V_B = \$109.50 \times \left[\frac{1 - \frac{1}{(1 + .09)^{21}}}{.09}\right] + \frac{\$1,000}{(1 + .09)^{21}}$$

$$= (\$109.50 \times 9.29224) + \left(\frac{\$1,000}{6.108801}\right)$$

$$= \$1,017.50 + \$163.70$$

$$= \$1,181.20 > \$1,115$$

$1,181.20 is too high. Try again using a higher yield (remember, bond prices and yields vary inversely).

Second try at $k_d = 10\%$:

$$V_B = \$109.50 \times \left[\frac{1 - \frac{1}{(1 + .10)^{21}}}{.10}\right] + \frac{\$1,000}{(1 + .10)^{21}}$$

$$= (\$109.50 \times 8.64869) + \left(\frac{\$1,000}{7.40025}\right)$$

$$= \$947.03 + \$135.13$$

$$= \$1,082.16 < \$1,115$$

$1,082.16 is too low. Try again using a lower yield.

Third try at $k_d = 9.65\%$:

$$V_B = \$109.50 \times \left[\frac{1 - \frac{1}{(1 + .0965)^{21}}}{.0965}\right] + \frac{\$1,000}{(1 + .0965)^{21}}$$

$$= (\$109.50 \times 8.86545) + \left(\frac{\$1,000}{6.92120}\right)$$

$$= \$970.77 + \$144.48$$

$$= \$1,115.25$$

At $k_d = 9.65\%$ the calculated value of V_B is within $.25 of the current market price. We conclude the bond's YTM is 9.65 percent.[9]

ST-3. Equation 12-5 is used to find the value of preferred stock as follows:

$$V_P = \frac{D_p}{k_p}$$

D_p is $1.93 and k_p is 8 percent.

$$V_P = \frac{\$1.93}{.08}$$

$$= \$24.125$$

[9]The exact YTM, found using a financial calculator or Excel's RATE function, is 9.652590645 percent.

ST-4. The maximum price you are willing to pay for Pepsico is what it is worth to you, or its value. Because the characteristics of the stock fit the constant dividend growth model, use Equation 12-7 to compute the value.

$$P_0 = \frac{D_1}{k_s - g}$$

D_1 is \$1.14, k_s is 9 percent, and g is 6 percent.

Given these conditions, the value of Quaker Oats stock is

$$P_0 = \frac{\$1.14}{.09 - .06}$$

$$= \frac{\$1.14}{.03}$$

$$= \$38$$

ST-5. The yield on common stock can be found using Equation 12-11.

$$k_s = \frac{D_1}{P_0} + g$$

D_1 is \$1.00, P_0 is \$38, and g is 5 percent. Given these conditions, the yield on Goodyear common stock is as follows:

$$k_s = \frac{\$1.00}{\$38} + .05$$

$$= .0263 + .05$$

$$= .0763, \text{ or } 7.63\%$$

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