

The Valuation and Characteristics of Bonds

Learning Objectives

 1 Distinguish between different kinds of bonds.	Types of Bonds
 2 Explain the more popular features of bonds.	Terminology and Characteristics of Bonds
 3 Define the term <i>value</i> as used for several different purposes.	Defining Value
 4 Explain the factors that determine value.	What Determines Value?
 5 Describe the basic process for valuing assets.	Valuation: The Basic Process
 6 Estimate the value of a bond.	Valuing Bonds
 7 Compute a bond's expected rate of return and its current yield.	Bond Yields
 8 Explain three important relationships that exist in bond valuation.	Bond Valuation: Three Important Relationships

On August 16, 2011, the headlines read, "AT&T Sells \$5 Billion of Bonds to Help Refinance Maturing Debt." Bonds are a form of long-term debt issued by companies needing financing for a variety of reasons, including the need to repay debt that is coming due, as was the case for AT&T when it issued the \$5 billion in new bonds. Some of the bonds matured in 5 years, some in 10 years, and others not until 30 years. Just 3 months earlier the company had issued \$3 billion in bonds. Then in June 2012 the company decided to issue more bonds in the amount of \$2 billion. Although few companies could begin to issue billions of dollars in bonds as AT&T does, this form of debt is an important source of financing for many publicly traded companies. Companies were particularly tempted to issue bonds in 2011 and

2012 when interest rates were at all-time lows. AT&T, for example, only had to pay about 3 percent in interest on bonds that were being issued in 2011 and 2012.

When AT&T's management was deciding to issue bonds, there were a number of decisions that had to be made, such as the type of bond—not all bonds are the same—and the terms to be offered to the investors. Then there is always the issue of valuing the bond.

Understanding how to value financial securities is essential if managers are to meet the objective of maximizing the value of the firm. If they are to maximize the investors' value, they must know what drives the value of an asset. Specifically, they need to understand how bonds and stocks are valued in the marketplace; otherwise, they cannot act in the best interest of the firm's investors.

In this chapter, we begin by identifying the different kinds of bonds. We next look at the features or characteristics of most bonds. We then examine the concepts of and procedures for valuing an asset and apply these ideas to valuing bonds.

We now begin our study by considering the different kinds of bonds.

Types of Bonds

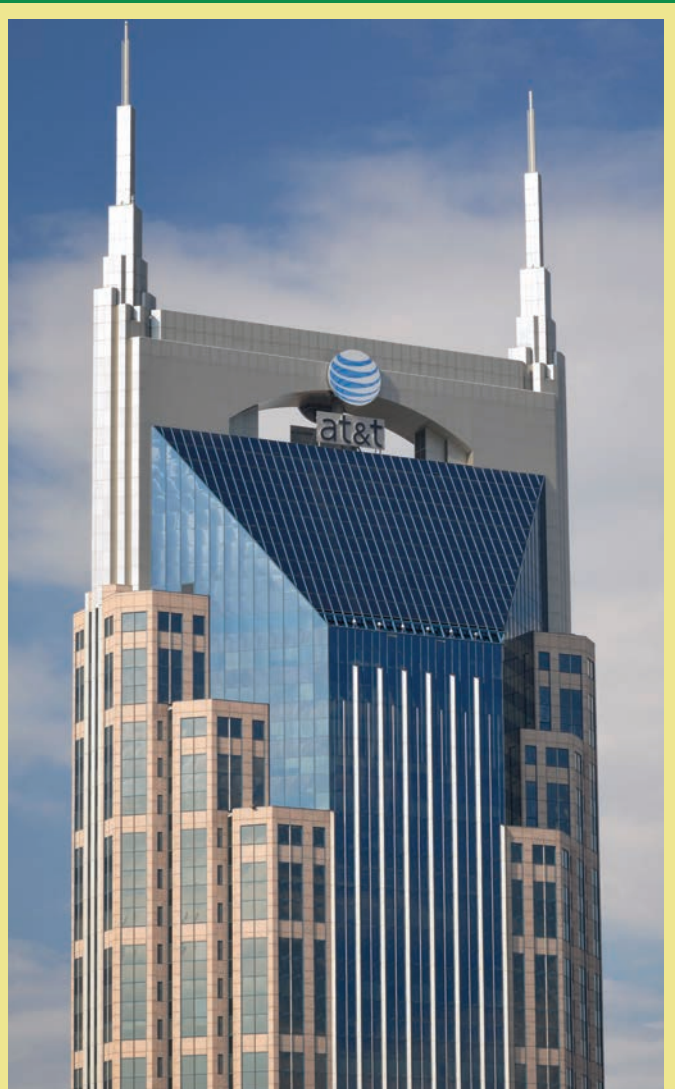
A **bond** is a *type of debt or long-term promissory note, issued by the borrower, promising to pay its holder a predetermined and fixed amount of interest per year and the face value of the bond at maturity*. However, there is a wide variety of such creatures. Just to mention a few, we have

Debentures	Eurobonds
Subordinated debentures	Convertible bonds
Mortgage bonds	

The following sections briefly explain each of these types of bonds.

Debentures

The term **debenture** applies to *any unsecured long-term debt*. Because these bonds are unsecured, the earning ability of the issuing corporation is of great concern to the bondholder. They are also viewed as being more risky than secured bonds and, as a result, must provide investors with a higher yield than secured bonds provide. Often the firm issuing debentures attempts to provide some protection to the holder of the debenture by agreeing not to issue more secured long-term debt that would further tie up the firm's assets. To the issuing firm, the major advantage of debentures is that no property has to be secured by them. This allows the firm to issue debt and still preserve some future borrowing power.



bond Distinguish between different kinds of bonds.

bond a long-term (10-year or more) promissory note issued by the borrower, promising to pay the owner of the security a predetermined, fixed amount of interest each year.

debenture any unsecured long-term debt.

subordinated debenture a debenture that is subordinated to other debentures in terms of its payments in case of insolvency.

mortgage bond a bond secured by a lien on real property.

Eurobond a bond issued in a country different from the one in which the currency of the bond is denominated; for example, a bond issued in Europe or Asia by an American company that pays interest and principal to the lender in U.S. dollars.

convertible bond a debt security that can be converted into a firm's stock at a prespecified price.

Subordinated Debentures

Many firms have more than one issue of debentures outstanding. In this case a hierarchy may be specified, in which some debentures are given *subordinated standing in case of insolvency*. The claims of the **subordinated debentures** are honored only after the claims of secured debt and unsubordinated debentures have been satisfied.

Mortgage Bonds

A **mortgage bond** is a *bond secured by a lien on real property*. Typically, the value of the real property is greater than that of the mortgage bonds issued. This provides the mortgage bondholders with a margin of safety in the event the market value of the secured property declines. In the case of foreclosure, *trustees*, who represent the bondholders and act on their behalf, have the power to sell the secured property and use the proceeds to pay the bondholders. The bond trustee, usually a banking institution or trust company, oversees the relationship between the bondholder and the issuing firm, protecting the bondholder and seeing that the terms of the indenture are carried out. In the event that the proceeds from this sale do not cover the bonds, the bondholders become general creditors, similar to debenture bondholders, for the unpaid portion of the debt.

Eurobonds

Eurobonds are not so much a different type of security. They are simply securities, in this case *bonds, issued in a country different from the one in which the currency of the bond is denominated*. For example, a bond that is issued in Europe or in Asia by an American company and that pays interest and principal to the lender in U.S. dollars would be considered a Eurobond. Thus, even if the bond is not issued in Europe, it merely needs to be sold in a country different from the one in which the bond's currency is denominated to be considered a Eurobond.

The primary attractions of Eurobonds to borrowers, aside from favorable rates, are the relative lack of regulation (Eurobonds are not registered with the Securities and Exchange Commission [SEC]), less-rigorous disclosure requirements than those of the SEC, and the speed with which they can be issued. Interestingly, not only are Eurobonds not registered with the SEC, but they may not be offered to U.S. citizens and residents.

Convertible Bonds

Convertible bonds are debt securities that can be converted into a firm's stock at a pre-specified price. For instance, you might have a convertible bond with a face, or par, value of \$1,000 that pays 6 percent interest, or \$60, each year. The bond matures in 5 years, at which time the company must pay the \$1,000 par value to the bondholder. However, at the time the bond was issued, the firm gave the bondholder the option of either collecting the \$1,000 or receiving shares of the firm's stock at a conversion price of \$50. In other words, the bondholder would receive 20 shares ($20 = \$1,000 \text{ par value} \div \$50 \text{ conversion price}$). What would you do if you were the bondholder? If the stock were selling for more than \$50, then you would want to give up the \$1,000 par value and take the stock. Thus, it's the investor's choice either to take the \$1,000 promised when the bond was issued or to convert the bond into the firm's stock.

Consider Ingersoll Rand Company, a diversified equipment manufacturer. In 2009, the firm issued \$300 million of 5 percent convertible debt. The bonds can be converted at any time into Ingersoll Rand common stock at a conversion price of \$17.94 per share. Because the par value for each bond is \$1,000, a bondholder can convert one bond into 55.74 shares ($55.74 \text{ shares} = \$1,000 \div \$17.94 \text{ price per share}$). This option allows the investor to be repaid the \$1,000 par value or to convert into stock if the total value of the stock exceeds \$1,000. Thus, with convertible bonds, the investor gets to participate in the upside if the company does well. For instance, 3 months after the bonds were issued, the firm's stock was selling for \$27. If you had been an investor, you could have converted the bonds into 55.74 shares of stock, which would be worth about \$1,500. Not bad for 3 months.

Now that you have an understanding of the kinds of bonds firms might issue, let's look at some of the characteristics and terminology of bonds.

Concept Check

1. How do debentures, subordinated debentures, and mortgage bonds differ with regard to their risk? How would investors respond to the varying types of risk?
2. How is a Eurobond different from a bond issued in Asia that is denominated in dollars?
3. Why would a convertible bond increase much more in value than a bond that is not convertible?

Terminology and Characteristics of Bonds

Before valuing bonds, we first need to understand the terminology related to bonds. Then we will be better prepared to determine the value of a bond.

When a firm or nonprofit institution needs financing, one source is bonds. As already noted, this type of financing instrument is simply a long-term promissory note, issued by the borrower, promising to pay its holder a predetermined and fixed amount of interest each year. Some of the more important terms and characteristics that you might hear about bonds are as follows:

Claims on assets and income	Call provision
Par value	Indenture
Coupon interest rate	Bond ratings
Maturity	

Let's consider each in turn.

Claims on Assets and Income

In the case of insolvency, claims of debt, including bonds, are generally honored before those of both common stock and preferred stock. In general, if the interest on bonds is not paid, the bond trustees can classify the firm as insolvent and force it into bankruptcy. Thus, the bondholders' claim on income is more likely to be honored than that of the common stockholders, whose dividends are paid at the discretion of the firm's management. However, different types of debt can have a hierarchy among themselves as to the order of their claims on assets.

Par Value

The **par value** of a bond is its *face value, which is returned to the bondholder at maturity*. In general, corporate bonds are issued in denominations of \$1,000, although there are some exceptions to this rule. Also, when bond prices are quoted, either by financial managers or in the financial press, prices are generally expressed as a percentage of the bond's par value. For example, a Morgan Stanley bond was recently quoted as selling for \$103.83. That does not mean you can buy the bond for \$103.83. It means that this bond is selling for 103.83 percent of its par value of \$1,000. Hence, the market price of this bond is actually \$1,038.30. At maturity in 2017, the bondholder will receive \$1,000.

 Explain the more popular features of bonds.

par value on the face of a bond, the stated amount that the firm is to repay upon the maturity date.

Coupon Interest Rate

The **coupon interest rate** on a bond indicates the *percentage of the par value of the bond that will be paid out annually in the form of interest*. Thus, regardless of what happens to the price of a bond with a 5 percent coupon interest rate and a \$1,000 par value, it will pay out \$50 annually in interest until maturity ($0.05 \times \$1,000 = \50). For the Morgan Stanley bonds, the coupon rate is 5.95 percent; thus an investor owning the bonds would receive 5.95 percent of its par value of \$1,000, or \$59.50 ($\$59.50 = 0.0595 \times \$1,000$) per year. The investor receives a fixed dollar income each year from the interest; thus, these bonds are called **fixed-rate bonds**.

coupon interest rate the interest rate contractually owed on a bond as a percent of its par value.

fixed-rate bond a bond that pays a fixed amount of interest to the investor each year.

zero coupon bond a bond issued at a substantial discount from its \$1,000 face value and that pays little or no interest.

maturity the length of time until the bond issuer returns the par value to the bondholder and terminates the bond.

callable bond (redeemable bond) an option available to a company issuing a bond whereby the issuer can call (redeem) the bond before it matures. This is usually done if interest rates decline below what the firm is paying on the bond.

call protection period a prespecified time period during which a company cannot recall a bond.

indenture the legal agreement between the firm issuing bonds and the bond trustee who represents the bondholders, providing the specific terms of the loan agreement.

Occasionally, a firm will issue bonds that have zero or very low coupon rates, thus the name **zero coupon bonds**. Instead of paying interest, the company sells the bonds at a substantial discount below the \$1,000 par or face value. Thus, the investor receives a large part (or all with zero coupon bonds) of the return from the appreciation of the bond value as it moves in time to maturity. For example, Amgen, the biotech company, issued \$3.95 billion face value bonds with a coupon rate of only 1/8th of 1 percent. Thus, the investors would hardly receive any interest income. But the bonds were issued to the investors at \$500 for each \$1,000 face value bond. Investors who purchased these bonds for \$500 could hold them until they mature and would then receive the \$1,000 par value.

Maturity

The **maturity** of a bond indicates *the length of time until the bond issuer returns the par value to the bondholder and terminates or redeems the bond*.

Call Provision

If a company issues bonds and then later the prevailing interest rate declines, the firm may want to pay off the bonds early and then issue new bonds with a lower interest rate. To do so, the bond must be **callable**, or **redeemable**; otherwise, the firm cannot force the bondholder to accept early payment. The issuer, however, usually must pay the bondholders a premium, such as 1 year's interest. Also, there frequently is a **call protection period** where the firm cannot call the bond for a prespecified time period.

Indenture

An **indenture** is the *legal agreement between the firm issuing the bonds and the trustee who represents the bondholders*. The indenture provides the specific terms of the loan agreement, including a description of the bonds, the rights of the bondholders, the rights of the issuing firm, and the responsibilities of the trustee. This legal document may run 100 pages or more in length, with the majority of it devoted to defining protective provisions for the bondholder.

Typically, the restrictive provisions included in the indenture attempt to protect the bondholders' financial position relative to that of other outstanding securities. Common provisions involve (1) prohibiting the sale of the firm's accounts receivable, (2) limiting common stock dividends, (3) restricting the purchase or sale of the firm's fixed assets, and (4) setting limits on additional borrowing by the firm. Not allowing the sale of accounts receivable is specified because such sales would benefit the firm's short-run liquidity position at the expense of its future liquidity position. Common stock dividends may not be allowed if the firm's liquidity falls below a specified level, or the maximum dividend payout might be limited to some fraction, say, 50 or 60 percent of earnings. Fixed-asset restrictions generally require permission before they can be liquidated or used as collateral on new loans. Constraints on additional borrowing usually involve limiting the amount and type of additional long-term debt that can be issued. All these restrictions have one thing in common: They attempt to prohibit actions that would improve the status of other securities at the expense of bonds and to protect the status of bonds from being weakened by any managerial action.

Bond Ratings

John Moody first began to rate bonds in 1909. Since that time three rating agencies—Moody's, Standard & Poor's, and Fitch Investor Services—have provided ratings on corporate bonds. These ratings involve a judgment about the future risk potential of the bonds. Although they deal with expectations, several historical factors seem to play a significant role in their determination. Bond ratings are favorably affected by (1) a greater reliance on equity as opposed to debt in financing the firm, (2) profitable operations, (3) a low variability in past earnings, (4) large firm



REMEMBER YOUR PRINCIPLES

When we say that a lower bond rating means a higher interest rate charged by the investors (bondholders), we are observing an application of **Principle 3: Risk Requires a Reward**.

TABLE 7-1 Standard & Poor's Corporate Bond Ratings

AAA	This is the highest rating assigned by Standard & Poor's for debt obligation and indicates an extremely strong capacity to pay principal and interest.
AA	Bonds rated AA also qualify as high-quality debt obligations. Their capacity to pay principal and interest is very strong; in the majority of instances, they differ from AAA issues only by a small degree.
A	Bonds rated A have a strong capacity to pay principal and interest, although they are somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions.
BBB	Bonds rated BBB are regarded as having an adequate capacity to pay principal and interest. Whereas they normally exhibit adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay principal and interest for bonds in this category than for bonds in the A category.
BB B CCC CC	Bonds rated BB, B, CCC, and CC are regarded, on balance, as predominantly speculative with respect to the issuer's capacity to pay interest and repay principal in accordance with the terms of the obligation. BB indicates the lowest degree of speculation and CC the highest. Although such bonds will likely have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions.
C	The rating C is reserved for income bonds on which no interest is being paid.
D	Bonds rated D are in default, and payment of principal and/or interest is in arrears.
Plus (+) or Minus (–): To provide more detailed indications of credit quality, the ratings from AA to BB may be modified by the addition of a plus or minus sign to show relative standing within the major rating categories.	

Source: Adapted from www.standardandpoors.com, December 2005.

size, and (5) little use of subordinated debt. In turn, the rating a bond receives affects the interest rate demanded on the bond by the investors. The poorer the bond rating, the higher the interest rate demanded by investors. (Table 7-1 describes these ratings.) Thus, bond ratings are extremely important for the financial manager. They provide an indicator of default risk that in turn affects the interest rate that must be paid on borrowed funds.

Toward the bottom end of the rating spectrum, we have **junk bonds**, which are high-risk debt with *ratings of BB or below* by Moody's and Standard & Poor's. The lower the rating, the higher the chance of default. The lowest rating is CC for Standard & Poor's

junk bond any bond rated BB or below.

FINANCE AT WORK

J.C. PENNEY CREDIT RATING REDUCED TO JUNK

In March 2012, J.C. Penney reported that it had a net loss of \$163 million in the first quarter of the year, mainly due to the firm's new pricing strategy for its products. The plan eliminated Penney's practice of frequent sales in favor of everyday prices that were 40 percent below the sales prices the year before. Penney's customers, accustomed to big markdowns and coupons, resisted the new approach. The outcome was a 20-percent reduction in revenues.

As a consequence, in May Standard & Poor's announced it was cutting Penney's credit rating from BB+ to BB, which is a rating category for junk bonds. Fitch, another rating agency, also lowered the firm's credit ratings to junk.

The two rating agencies attributed the cut to poor performance in the first quarter of the year. In addition, S&P placed all of Penney's bonds on CreditWatch "with negative implications." The CreditWatch indicates that the rating was vulnerable to a further downgrade after Standard & Poor's reassessed the company's business and financial strategies.

Then in June, Mike Francis, the new president and a former Target executive, left the company unexpectedly. Francis was in charge of marketing the new pricing strategy.

One month later in July, Standard & Poor's further lowered Penney's credit rating from BB to B+, which means that the rating agency believes that the firm may have difficulty not only in paying interest, but also repaying the debt principal as it comes due. An even bigger issue was the growing concern that management may not be able to turn the business around.

In the meantime, Penney's stock fell by half in a mere five months. Only time will tell if the business can be saved.

Sources: Lance Murray, "J.C. Penney's Credit Rating Cut Again by S&P," *Dallas Business Journal*, <http://cxa.gtm.idmanagedsolutions.com/finra/BondCenter/BondDetail.aspx?ID=NTk0OTE4QU02>, accessed June 26, 2012; "S&P Cuts J.C. Penney Rating to 'BB'," Reuters, <http://www.reuters.com/article/2012/05/17/idUSWNA755420120517>, accessed June 26, 2012; and Melodie Warner, "S&P Cuts J.C. Penney Rating to Junk," Market Watch, *Wall Street Journal*, <http://www.marketwatch.com/story/sp-cuts-jc-penney-rating-to-junk-2012-03-07>, accessed June 26, 2012, and <http://www.kansascity.com/2012/07/11/3701158/sp-cuts-jc-penney-credit-rating.html#storylink=cpy>, accessed August 15, 2012.

high-yield bond see junk bond.

and Ca for Moody's. Originally, the term *junk bonds* was used to describe firms with sound financial histories that were facing severe financial problems and suffering from poor credit ratings. Junk bonds are also called **high-yield bonds** because of the high interest rates they pay the investor. Typically, they have an interest rate between 3 and 5 percent more than AAA-grade long-term debt.

Until the early 1970s, credit-rating agencies were paid by the investors who wanted impartial information about a firm's creditworthiness. But beginning in the 1970s, the firms issuing bonds began paying the agencies for their services. This arrangement has frequently raised a concern that the agencies have a conflict of interest, where the company being evaluated is also their client. This criticism became particularly loud during the financial crisis beginning in 2007. The agencies gave some types of debt securities high ratings, only for them to default when the borrower could no longer pay on the loan.

We are now ready to think about bond valuation. To begin, we must first clarify precisely what we mean by *value*. Next, we need to understand the basic concepts of valuation and the process for valuing an asset. Then we may apply these concepts to valuing a bond, and in Chapter 8, to valuing stocks.



REMEMBER YOUR PRINCIPLES

Some have thought junk bonds were fundamentally different from other securities, but they are not. They are bonds with a great amount of risk and, therefore, promise high expected returns. Thus, **Principle 3: Risk Requires a Reward.**

Concept Check

1. What are some important features of a bond? Which features determine the cash flows associated with a bond?
2. What restrictions are typically included in an indenture in order to protect the bondholder?
3. How does the bond rating affect an investor's required rate of return? What actions could a firm take to receive a more favorable rating?

b³ Define the term *value* as used for several different purposes.

book value (1) the value of an asset as shown on the firm's balance sheet. It represents the historical cost of the asset rather than its current market value or replacement cost. (2) The depreciated value of a company's assets (original cost less accumulated depreciation) less outstanding liabilities.

liquidation value the dollar sum that could be realized if an asset were sold.

market value the value observed in the marketplace.

intrinsic, or economic, value the present value of an asset's expected future cash flows. This value is the amount the investor considers to be fair value, given the amount, timing, and riskiness of future cash flows.

fair value the present value of an asset's expected future cash flows.

Defining Value

The term *value* is often used in different contexts, depending on its application. **Book value** is the *value of an asset as shown on a firm's balance sheet*. It represents the historical cost of the asset rather than its current worth. For instance, the book value of a company's common stock is the amount the investors originally paid for the stock and, therefore, the amount the firm received when the stock was issued.

Liquidation value is the *dollar sum that could be realized if an asset were sold individually and not as part of a going concern*. For example, if a firm's operations were discontinued and its assets were divided up and sold, the sales price would represent the asset's liquidation value.

The **market value** of an asset is the *observed value for the asset in the marketplace*. This value is determined by supply and demand forces working together in the marketplace, whereby buyers and sellers negotiate a mutually acceptable price for the asset. For instance, the market price for Harley-Davidson's common stock on June 20, 2012, was \$50 per share. This price was reached by a large number of buyers and sellers working through the New York Stock Exchange. In theory, a market price exists for all assets. However, many assets have no readily observable market price because trading seldom occurs. For instance, the market price for the common stock of Liberty Capital Bank, a new bank in Dallas, Texas, would be more difficult to establish than the market value of Harley-Davidson's common stock.

The **intrinsic, or economic, value** of an asset—also called the **fair value**—is the *present value of the asset's expected future cash flows*. This value is the amount an investor should be willing to pay for the asset given the amount, timing, and riskiness of its future cash flows. Once the investor has estimated the intrinsic value of a security, this value could be compared with its market value when available. If the intrinsic value is greater than the market value, then the security is undervalued in the eyes of the investor. Should the market value exceed the investor's intrinsic value, then the security is overvalued.

We hasten to add that if the securities market is working efficiently, the market value and the intrinsic value of a security will be equal. Whenever a security's intrinsic value differs from its current market price, the competition among investors seeking opportunities to make a profit will quickly drive the market price back to its intrinsic value. Thus, we may define an **efficient market** as one in which *the values of all securities at any instant fully reflect all available public information*, which results in the market value and the intrinsic value being the same. If the markets are efficient, it is extremely difficult for an investor to make extra profits from an ability to predict prices.

efficient market market where the values of all securities fully recognize all available public information.

Should we expect markets to be efficient or inefficient? For a market to be inefficient, there would need to be a trading strategy that allows investors to make money without assuming a proportionate amount of risk. But for that to happen, there must be traders who are willing to sell underpriced stocks to you and buy overpriced stocks from you. Instead, if you buy a stock because you believe it to be underpriced, the investor selling the stock must believe it is overpriced. Furthermore, if there were a strategy that allowed you to make profits without assuming risk, then other investors would adopt the strategy until the opportunity to make excess profits would disappear.

The market could be inefficient because investors act irrationally. For this reason, financial economists have been interested in studying to see if investors are rational in their investment behavior. Competitive markets assume that investors act rationally in their decisions. Thus, the field of **behavioral finance** studies the rationality of investors when making decisions. For example, they suggest that some investors may be overconfident in their own opinions when making investments and ignore information that becomes available if it does not support their own opinion.

behavioral finance the field of study examining when investors act rationally or irrationally when making investment decisions.

What does the evidence suggest about market efficiency? There have been thousands of studies testing for market efficiency over the past several decades. Some of the studies found evidence that the markets have at times been somewhat inefficient. However, with time these anomalies have been largely eliminated by professional investors who seek out such opportunities. Thus, we would agree that the markets are certainly not perfectly efficient, but any such inefficiencies probably only provide enough return to cover the cost of implementing a given strategy. But no doubt this issue will continue to cause debate in the years ahead.

REMEMBER YOUR PRINCIPLES
Principle The fact that investors have difficulty identifying stocks that are undervalued relates to **Principle 4: Market Prices Are Generally Right**. In an efficient market, the price reflects all available public information about the security and, therefore, it is priced fairly.

Concept Check

1. Explain the different types of value.
2. Why should the market value equal the intrinsic value?

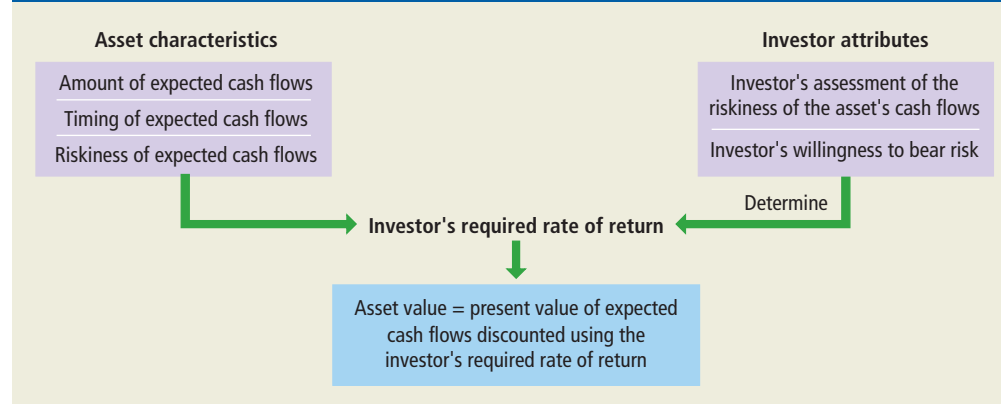
What Determines Value?

For our purposes, *the value of an asset is its intrinsic value or the present value of its expected future cash flows*, when these cash flows are discounted back to the present using the investor's required rate of return. This statement is true for valuing all assets, and it serves as the basis of almost all that we do in finance. Thus, value is affected by three elements:

1. The amount and timing of the asset's expected cash flows
2. The riskiness of these cash flows
3. The investor's required rate of return for undertaking the investment

The first two factors are characteristics of the asset. The third one, the required rate of return, is the minimum rate of return necessary to attract an investor to purchase or hold a security. This rate of return is determined by *the rates of return available on similar investments*, or what we learned in Chapter 2 is called the opportunity cost of funds. This rate must be high enough to compensate the investor for risk perceived in the asset's future cash flows. (The required rate of return was explained in Chapter 6.)

b4 Explain the factors that determine value.

FIGURE 7-1 Basic Factors Determining an Asset's Value

REMEMBER YOUR PRINCIPLES

Principle Our discussions should remind us of three of our principles that help us understand finance:

Principle 1: Cash Flow Is What Matters.

Principle 2: Money Has a Time Value.

Principle 3: Risk Requires a Reward.

Determining the economic worth or value of an asset always relies on these three principles. Without them, we would have no basis for explaining value. With them, we can know that the amount and timing of cash, not earnings, drive value. Also, we must be rewarded for taking risk; otherwise, we will not invest.

Figure 7-1 depicts the basic factors involved in valuation. As the figure shows, finding the value of an asset involves the following steps:

1. Assessing the asset's characteristics, which include the amount and timing of the expected cash flows and the riskiness of these cash flows
2. Determining the investor's required rate of return, which embodies the investor's attitude about assuming risk and the investor's perception of the riskiness of the asset
3. Discounting the expected cash flows back to the present, using the investor's required rate of return as the discount rate

Thus, intrinsic value is a function of the cash flows yet to be received, the riskiness of these cash flows, and the investor's required rate of return.

Concept Check

1. What are the three important elements of asset valuation?

5 Describe the basic process for valuing assets.

Valuation: The Basic Process

The valuation process can be described as follows: It is assigning value to an asset by calculating the present value of its expected future cash flows using the investor's required rate of return as the discount rate. The investor's required rate of return, r , is determined by the level of the risk-free rate of interest and risk premium that the investor feels is necessary compensation. Therefore, a basic asset valuation model can be defined mathematically as follows:

$$\text{Asset value} = \frac{\text{cash flow in year 1}}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^1} + \frac{\text{cash flow in year 2}}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^2} + \cdots + \frac{\text{cash flow in year } n}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^n} \quad (7-1a)$$

Or stated in symbols, we have:

$$V = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_n}{(1+r)^n} \quad (7-1b)$$

CAN YOU DO IT?

COMPUTING AN ASSET'S VALUE

You purchased an asset that is expected to provide \$5,000 cash flow per year for 4 years. If you have a 6 percent required rate of return, what is the value of the asset for you?
(The solution can be found on page 231.)

where V = the intrinsic value, or present value, of an asset producing expected future cash flows, C_t , in years 1 through n

C_t = cash flow to be received at time t

r = the investor's required rate of return

Using equation (7-1), there are three basic steps in the valuation process:

STEP 1 Estimate the C_t in equation (7-1), which is the amount and timing of the future cash flows the security is expected to provide.

STEP 2 Determine r , the investor's required rate of return.

STEP 3 Calculate the intrinsic value, V , as the present value of expected future cash flows discounted at the investor's required rate of return.

Equation (7-1), which measures the present value of future cash flows, is the basis of the valuation process. It is the most important equation in this chapter because all the remaining equations in this chapter and in Chapter 8 are merely reformulations of this one equation. If we understand equation (7-1), all the valuation work we do, and a host of other topics as well, will be much clearer in our minds.

With the foregoing principles of valuation as our foundation, let's now look at how bonds are valued.

Valuing Bonds

The value of a bond is the present value of both the future interest to be received and the par or maturity value of the bond. It's that simple.

The process for valuing a bond, as depicted in Figure 7-2, requires knowing three essential elements: (1) the amount and timing of the cash flows to be received by the investor, (2) the time to maturity of the bond, and (3) the investor's required rate of return. The amount of cash flows is dictated by the periodic interest to be received and by the par value to be paid at maturity. Given these elements, we can compute the value of the bond, or the present value.

To illustrate the process for valuing a bond, consider a bond issued by Pioneer Natural Resources with a maturity date of 2016 and a stated annual coupon rate of 5.875 percent.¹

 **6** Estimate the value of a bond.

FIGURE 7-2 Data Requirements for Bond Valuation

(A) Cash flow information	Periodic interest payments. For example, \$65 per year. Principal amount or par value. For example, \$1,000.
(B) Term to maturity	For example, 12 years.
(C) Investor's required rate of return	For example, 4%.

¹Pioneer Natural Resources pays interest to its bondholders on a semiannual basis on June 15 and December 15. However, for the moment, assume the interest is to be received annually. The effect of semiannual payments is examined shortly.

In 2012, with 4 years left to maturity, investors owning the bonds were requiring a 4.16 percent rate of return. We can calculate the value of the bonds to these investors using the following three-step valuation procedure:

- STEP 1** Estimate the amount and timing of the expected future cash flows. Two types of cash flows are received by the bondholder:
- Annual interest payments equal to the coupon rate of interest times the face value of the bond. In this example, the bond's coupon interest rate is 5.875 percent; thus, the annual interest payment is \$58.75 (\$58.75 = .05875 × \$1,000). Assuming that 2012 interest payments have already been made, these cash flows will be received by the bondholder in each of the 4 years before the bond matures (2013 through 2016 = 4 years).
 - The face value of \$1,000 to be received in 2016.

To summarize, the cash flows received by the bondholder are as follows:

2013	2014	2015	2016
\$58.75	\$58.75	\$58.75	\$ 58.75
			<u>\$1,000.00</u>
			\$1,058.75

- STEP 2** Determine the investor's required rate of return by evaluating the riskiness of the bond's future cash flows. A 4.16 percent required rate of return for the bondholders is given. However, we should recall from Chapter 6 that an investor's required rate of return is equal to a rate earned on a risk-free security plus a risk premium for assuming risk.

In this case, the Pioneer Natural Resources bonds are rated BBB by Standard & Poor's, which indicates that the bonds are not considered high-risk bonds (junk bonds), but neither are they AAA investment grade. Thus, S&P believes the company has the capacity to make interest and principal payments, provided that circumstances do not change adversely.

- STEP 3** Calculate the intrinsic value of the bond as the present value of the expected future interest and principal payments discounted at the investor's required rate of return.

In general, the present value of a bond is found as follows:

$$\begin{aligned}
 \text{Bond value} = V_b = & \frac{\$ \text{ interest in year 1}}{(1 + \text{required rate of return})^1} \\
 & + \frac{\$ \text{ interest in year 2}}{(1 + \text{required rate of return})^2} \\
 & + \frac{\$ \text{ interest in year 3}}{(1 + \text{required rate of return})^3} \\
 & + \cdots \\
 & + \frac{\$ \text{ interest in year } n}{(1 + \text{required rate of return})^n} \\
 & + \frac{\$ \text{ maturity value of bond}}{(1 + \text{required rate of return})^n}
 \end{aligned} \tag{7-2a}$$

Using I_t to represent the interest payment in year t , M to represent the bond's maturity (or par) value, and r_b to equal the bondholder's required rate of return, we can express the value of a bond maturing in year n as follows:

$$V_b = \frac{\$I_1}{(1 + r_b)^1} + \frac{\$I_2}{(1 + r_b)^2} + \frac{\$I_3}{(1 + r_b)^3} + \cdots + \frac{\$I_n}{(1 + r_b)^n} + \frac{\$M}{(1 + r_b)^n} \tag{7-2b}$$

DID YOU GET IT?

COMPUTING AN ASSET'S VALUE

The value of an asset generating \$5,000 per year for 4 years, given a 6 percent required rate of return, would be \$17,325.53. Using a TI BA II Plus calculator, we find the answer as follows:

CALCULATOR SOLUTION

Data Input	Function Key
6	I/Y
4	N
-5,000	+/- PMT
0	FV
Function Key	Answer
CPT	
PV	\$17,325.53

If an investor owns an asset that pays \$1,062.02 in cash flows each year for 4 years, he would earn exactly his required rate of return of 6 percent if he paid \$17,325.53 today.

Notice that equation (7-2b) is a restatement of equation (7-1), where now the cash flows are represented by the interest received each period and the par value of the bond when it matures. In either equation, the value of an asset is the present value of its future cash flows.

The equation for finding the value of the Pioneer bonds would be as follows:

$$V_b = \frac{\$58.75}{(1 + 0.0416)^1} + \frac{\$58.75}{(1 + 0.0416)^2} + \frac{\$58.75}{(1 + 0.0416)^3} + \frac{\$58.75}{(1 + 0.0416)^4} + \frac{\$1,000}{(1 + 0.0416)^4}$$

Finding the value of the Pioneer bonds can be represented graphically as follows:

YEAR	0	2013	2014	2015	2016
Dollars received at end of year		\$58.75	\$58.75	\$58.75	\$ 58.75
					+ \$1,000.00
					\$1,058.75
Present value	\$1,062.02				

Using a TI BA II Plus financial calculator, we find the value of the bond to be \$1,062.02, as calculated in the margin.² Thus, if investors consider 4.16 percent to be an appropriate required rate of return in view of the risk level associated with Pioneer bonds, paying a price of \$1,062.02 would satisfy their return requirement.

We can also solve for the value of Pioneer's bonds using a spreadsheet. The solution using Excel appears as follows:

	A	B	C	D	E
1	Required rate of return	Rate	4.16%		
2	Years left to maturity	Nper	4		
3	Annual interest payment	Pmt	-58.75		
4	Future value	FV	-1,000		
5	Present value	PV	1,062.02		
6					
7					
8					
9					
10					
11					

Equation:
=PV(Rate,Nper,Pmt,FV) = PV(C1,C2,C3,C4)

CALCULATOR SOLUTION

Data Input	Function Key
4	N
4.16	I/Y
58.75	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
PV	1,062.02

²As noted in Chapter 5, we are using the TI BA II Plus. You may want to return to the Chapter 5 section "Moving Money Through Time with the Aid of a Financial Calculator" or Appendix A at www.pearsonhighered.com/keown, to see a more complete explanation of using the TI BA II Plus.

EXAMPLE 7.1**Valuing a bond**

Verso Paper Holdings, a producer of coated papers, has a bond outstanding with a coupon interest rate of 8.75 percent that will mature in 7 years. The investors who have purchased the bonds are requiring a really high rate of return of 25.34 percent! Compute the value of the bonds for the current investors. Earning a 25 percent rate of return is fantastic—sure beats government Treasury bond rates. So why would many investors choose not to invest in these bonds, in spite of the high rate of return?

STEP 1: FORMULATE A SOLUTION STRATEGY

The formula for valuing a bond is shown below:

$$\begin{aligned} \text{Bond value} = V_b = & \frac{\$ \text{ interest in year 1}}{(1 + \text{required rate of return})^1} \\ & + \frac{\$ \text{ interest in year 2}}{(1 + \text{required rate of return})^2} \\ & + \frac{\$ \text{ interest in year 3}}{(1 + \text{required rate of return})^3} \\ & + \cdots \\ & + \frac{\$ \text{ interest in year } n}{(1 + \text{required rate of return})^n} \\ & + \frac{\$ \text{ maturity value of bond}}{(1 + \text{required rate of return})^n} \end{aligned}$$

STEP 2: CRUNCH THE NUMBERS

The value of the Verso bonds can be computed by using either a financial calculator or a spreadsheet. But first we must determine the annual interest payment, which is \$87.50 (\$87.50 = 0.0875 coupon interest rate × \$1,000 par value). As shown below, the value of the bond is \$480.02.

Using a financial calculator:

CALCULATOR SOLUTION

Data Input	Function Key
7	N
25.34	I/Y
87.50	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
PV	480.02

Then, using a spreadsheet:

	A	B	C	D
1	Required rate of return	Rate	25.34%	
2	Years left to maturity	Nper	7	
3	Annual interest payment	Pmt	- 87.50	
4	Future value (par value)	FV	- 1,000	
5				
6	Solve for present value (bond value)	PV	\$480.02	
7				
8				
9				
10				

Equation:
 =PV(Rate,Nper,Pmt,FV) = PV(C1,C2,C3,C4)

STEP 3: ANALYZE YOUR RESULTS

Only by buying the bond at a low price compared to the bond's par value, \$480.02, relative to \$1,000 (par value) can the investors earn such a high rate of return of 25.34 percent. Furthermore, for a bond to sell at such a large discount and thereby provide a high rate of return indicates that investors perceive there to be a high likelihood of default. In other words, the 25.34 percent is not the true *expected* rate of return, but rather the rate that will be earned if Verso does not default on interest or principal payments. There is certainly the possibility that the investors will receive the high return, but there is apparently considerable risk that the company will default. So only investors who are prepared to accept a large dose of risk will be interested in buying the bond.

To this point we have provided the basic present-value equation to determine the value of an asset based on its expected future cash flows. This same equation was then applied to valuing a bond. These two equations served as the financial tools for valuing an asset and are represented as follows:

FINANCIAL DECISION TOOLS				
Name of Tool	Formula			What It Tells You
Asset value	$\text{Asset value} = \frac{\text{cash flow in year 1}}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^1} + \frac{\text{cash flow in year 2}}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^2} + \cdots + \frac{\text{cash flow in year } n}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^n}$			Indicates that the value of an asset, be it a security or an investment in plant and equipment, is equal to the present value of future cash flows expected to be received from the investment.
Bond value	$\text{Bond value} = V_b = \frac{\$ \text{ interest in year 1}}{(1 + \text{required rate of return})^1} + \frac{\$ \text{ interest in year 2}}{(1 + \text{required rate of return})^2} + \frac{\$ \text{ interest in year 3}}{(1 + \text{required rate of return})^3} + \cdots + \frac{\$ \text{ interest in year } n}{(1 + \text{required rate of return})^n} + \frac{\$ \text{ maturity value of bond}}{(1 + \text{required rate of return})^n} \text{ and}$ $V_b = \frac{\$I_1}{(1 + r_b)^1} + \frac{\$I_2}{(1 + r_b)^2} + \frac{\$I_3}{(1 + r_b)^3} + \cdots + \frac{\$I_n}{(1 + r_b)^n} + \frac{\$M}{(1 + r_b)^n}$			Calculates the value of a bond as the present value both of future interest payments and the par value of the bond to be received at maturity.

Concept Check

1. What two factors determine an investor's required rate of return?
2. How does the required rate of return affect a bond's value?

CAN YOU DO IT?**COMPUTING A BOND'S VALUE**

La Fiesta Restaurants issued bonds that have a 6 percent coupon interest rate. Interest is paid annually. The bonds mature in 12 years. If your required rate of return is 8 percent, what is the value of a bond to you? (The solution can be found on page 235.)

In the preceding illustration using Pioneer Natural Resources, the interest payments were assumed to be paid annually. However, companies typically pay interest to bondholders semiannually. For example, Pioneer actually pays a total of \$58.75 for each bond per year, but disburses the interest semiannually (\$29.375 each June 15 and December 15).

Several steps are involved in adapting equation (7-2b) for semiannual interest payments.³ First, thinking in terms of *periods* instead of years, a bond with a life of n years paying interest semiannually has a life of $2n$ periods. In other words, a 4-year bond ($n = 4$) that remits its interest on a semiannual basis actually makes 8 payments. Although the number of periods has doubled, the *dollar* amount of interest being sent to the investors for each period and the bondholders' required rate of return are half of the equivalent annual figures. I_t becomes $I_t/2$ and r_b is changed to $r_b/2$; thus, for semiannual compounding, equation (7-2b) becomes

$$V_b = \frac{\$I_1/2}{\left(1 + \frac{r_b}{2}\right)^1} + \frac{\$I_2/2}{\left(1 + \frac{r_b}{2}\right)^2} + \frac{\$I_3/2}{\left(1 + \frac{r_b}{2}\right)^3} + \cdots + \frac{\$I_{2n}/2}{\left(1 + \frac{r_b}{2}\right)^{2n}} + \frac{\$M}{\left(1 + \frac{r_b}{2}\right)^{2n}} \quad (7-3)$$

CALCULATOR SOLUTION

Data Input	Function Key
$2n \rightarrow 2 \times 4 \rightarrow 8$	N
$4.16 \div 2 \rightarrow 2.08$	I/Y
29.375	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
PV	1,062.60

We can now compute the value of the Pioneer bonds, recognizing that interest is being paid semiannually. We simply change the number of periods from 4 years to 8 semiannual periods and the required rate of return from 4.16 percent annually to 2.08 percent per semiannual period and divide interest payment by 2 to get \$29.375. The value of the bond would now be \$1,062.60. Not a big change, but just more accurate when interest is paid semiannually.

This solution can be found using a calculator as shown in the margin or a spreadsheet that would look as follows:

	A	B	C	D	E
1	Required rate of return	Rate	2.08%		
2	Years left to maturity	Nper	8		
3	Annual interest payment	Pmt	-29.375		
4	Future value	FV	-1,000		
5	Present value	PV	1,062.60		
6	Equation: =PV(Rate,Nper,Pmt,FV) = PV(C1,C2,C3,C4)				
7					
8					
9					
10					
11					

To conclude, we previously valued bonds assuming that interest was paid to the investors on an annual basis. However, since bonds typically pay interest semiannually, we need a slightly revised financial tools shown as follows:

FINANCIAL DECISION TOOLS

Name of Tool	Formula	What It Tells You
Bond value when interest is paid semiannually	$V_b = \frac{\$I_1/2}{\left(1 + \frac{r_b}{2}\right)^1} + \frac{\$I_2/2}{\left(1 + \frac{r_b}{2}\right)^2} + \frac{\$I_3/2}{\left(1 + \frac{r_b}{2}\right)^3} + \cdots + \frac{\$I_{2n}/2}{\left(1 + \frac{r_b}{2}\right)^{2n}} + \frac{\$M}{\left(1 + \frac{r_b}{2}\right)^{2n}}$	Calculates the value of a bond as the present value both of future interest payments received semiannually and the par value of the bond to be received at maturity.

³The logic for calculating the value of a bond that pays interest semiannually is similar to the material presented in Chapter 5, where compound interest with nonannual periods was discussed.

DID YOU GET IT?

COMPUTING A BOND'S VALUE

The La Fiesta bond with a 6 percent coupon rate pays \$60 in interest per year (\$60 = 0.06 coupon rate × \$1,000 par value). Thus, you would receive \$60 per year for 12 years plus the \$1,000 in par value in year 12. Assuming an 8 percent required rate of return, the value of the bond would be \$849.28.

CALCULATOR SOLUTION

Data Input	Function Key
8	I/Y
12	N
60	+/- PMT
1,000	+/- FV
Function	Key Answer
CPT	
PV	849.28

If an investor owns a bond that pays \$60 in interest each year for 12 years, she would earn exactly her required rate of return of 8 percent if she paid \$849.28 today.

Concept Check

1. How do semiannual interest payments affect the asset valuation equation?

Now that we know how to value a bond, we will next examine a bondholder's rate of return from investing in a bond, or what is called bond yields.

Bond Yields

There are two calculations used to measure the rate of return a bondholder receives from owning a bond: the yield to maturity and the current yield.

Yield to Maturity

Theoretically, each bondholder could have a different required rate of return for a particular bond. However, the financial manager is interested only in the expected rate of return that is implied by the market prices of the firm's bonds, or what we call the yield to maturity.

To measure the bondholder's **expected rate of return**, $\bar{r}_b$, we would find the *discount rate that equates the present value of the future cash flows (interest and maturity value) with the current market price of the bond*.⁴ It is also the *rate of return the investor will earn if the bond is held to maturity*, thus the name **yield to maturity**. So, when referring to bonds, the terms *expected rate of return* and *yield to maturity* are often used interchangeably.

To solve for the expected rate of return for a bond, we would use the following equation:

$$\begin{aligned} \text{Market price} = P_0 = & \frac{\$ \text{ interest in year 1}}{(1 + \text{expected rate of return})^1} \\ & + \frac{\$ \text{ interest in year 2}}{(1 + \text{expected rate of return})^2} \\ & + \frac{\$ \text{ interest in year 3}}{(1 + \text{expected rate of return})^3} \\ & + \dots \\ & + \frac{\$ \text{ interest in year } n}{(1 + \text{expected rate of return})^n} \\ & + \frac{\$ \text{ maturity value of bond}}{(1 + \text{expected rate of return})^n} \end{aligned} \quad (7-4)$$



Compute a bond's expected rate of return and its current yield.

expected rate of return (1) the discount rate that equates the present value of the future cash flows (interest and maturity value) of a bond with its current market price. It is the rate of return an investor will earn if the bond is held to maturity. (2) The rate of return the investor expects to receive on an investment by paying the existing market price of the security.

yield to maturity The rate of return a bondholder will receive if the bond is held to maturity. (It is equivalent to the expected rate of return.)

⁴When we speak of computing an expected rate of return, we are not describing the situation very accurately. Expected rates of return are ex ante (before the fact) and are based on "expected and unobservable future cash flows" and, therefore, can only be "estimated."

CALCULATOR SOLUTION

Data Input	Function Key
10	N
1,100	+/- PV
60	PMT
1,000	FV
Function Key	Answer
CPT	
I/Y	4.72

To illustrate this concept, consider the Brister Corporation's bonds, which are selling for \$1,100. The bonds carry a coupon interest rate of 6 percent and mature in 10 years. (Remember, the coupon rate determines the interest payment—coupon rate $\times$ par value.)

To determine the expected rate of return ($\bar{r}_b$) implicit in the current market price, we need to find the rate that discounts the anticipated cash flows back to a present value of \$1,100, the current market price (P_0) for the bond.

The expected return for the Brister Corporation bondholders is 4.72 percent, which can be found as presented in the margin by using the TI BA II Plus calculator, or by using a computer spreadsheet, as follows:

	A	B	C	D	E
1	Years left to maturity	Nper	10		
2	Annual interest payment	Pmt	60		
3	Present value	PV	-1,100		
4	Future value	FV	1,000		
5	Required rate of return	Rate	4.72%		
6					
7					
8					
9					
10					

Equation:
 =RATE(Nper,Pmt,PV,FV) = RATE(C1,C2,C3,C4)

EXAMPLE 7.2**Solving for the yield to maturity (expected rate of return)**

In Example 7.1 you were asked to calculate the value of bonds issued by Verso Paper Holdings, where the coupon interest rate was 8.75 percent, which indicated an interest payment of \$87.50, and the maturity date was 7 years. The investors who had purchased the bonds were requiring a rate of return of 25.34 percent. Given this information, we found the bond value to be \$480.02; if you had gone to www.finance.yahoo.com, on June 28, 2012, you would have found that the market price for the bonds was indeed \$480. But what if investors changed their required rates of return to the point that the bonds were selling for \$700? In that case, what would be the expected rate of return, or yield to maturity, if you purchased the bonds at the higher value? Explain what happened.

STEP 1: FORMULATE A SOLUTION STRATEGY

The formula for computing the expected rate of return (yield to maturity) for the Verso bonds at a market price of \$700 is shown below:

$$\begin{aligned}
 \text{Market price} = P_0 = & \frac{\$ \text{ interest in year 1}}{(1 + \text{expected rate of return})^1} \\
 & + \frac{\$ \text{ interest in year 2}}{(1 + \text{expected rate of return})^2} \\
 & + \frac{\$ \text{ interest in year 3}}{(1 + \text{expected rate of return})^3} \\
 & + \dots \\
 & + \frac{\$ \text{ interest in year } n}{(1 + \text{expected rate of return})^n} \\
 & + \frac{\$ \text{ maturity value of bond}}{(1 + \text{expected rate of return})^n}
 \end{aligned}$$

where we are solving for the expected rate of return in the equation.

STEP 2: CRUNCH THE NUMBERS

The expected rate of return (yield to maturity) for the Verso bonds can be computed by using either a financial calculator or a spreadsheet.

Using a TI BA II Plus financial calculator, the expected rate of return is found to be 16.23 percent:

CALCULATOR SOLUTION

Data Input	Function Key
7	N
700	+/- PV
87.50	PMT
1,000	FV
Function Key	Answer
CPT	
I/Y	16.23

Then using a spreadsheet:

	A	B	C	D	E
1	Years left to maturity	Nper	7		
2	Annual interest payment	Pmt	87.50		
3	Present value	PV	-700		
4	Future value	FV	1,000		
5	Expected rate of return	Rate	16.23%		
6					
7					
8					
9					
10					
11					

Equation:
=RATE(Nper,Pmt,PV,FV) = RATE(C1,C2,C3,C4)

STEP 3: ANALYZE YOUR RESULTS

If you are willing to pay the higher price of \$700 for the Verso bonds, it means that you are prepared to accept a lower yield to maturity (expected rate of return) on your investment. In other words, you are willing to accept the riskiness of the investment and receive a smaller expected return. Thus, as rates of return decrease, the value of a security of a security will always increase.

Current Yield

The **current yield** on a bond refers to the *ratio of the annual interest payment to the bond's current market price*. If, for example, we have a bond with a 4 percent coupon interest rate, a par value of \$1,000, and a market price of \$920, it would have a current yield of 4.35 percent:

$$\text{Current yield} = \frac{\text{annual interest payment}}{\text{current market price of the bond}} \quad (7-5)$$

In our example

$$\text{Current yield} = \frac{0.04 \times \$1,000}{\$920} = \frac{\$40}{\$920} = 0.0435 = 4.35\%$$

We should understand that the current yield, although frequently quoted in the popular press, is an incomplete picture of the expected rate of return from holding a bond. The current yield indicates the cash income that results from holding a bond in a given year, but it fails to recognize the capital gain or loss that will occur if the bond is held to maturity. As such, it is not an accurate measure of the bondholder's expected rate of return.

We now have financial tools to determine the rate of return a bondholder can expect to earn: (1) if the bond is held until it matures when the bondholder receives the

current yield the ratio of a bond's annual interest payment to its market price.

par value of the bond, and (2) if we only consider the interest payment being received relative to the current market price of the bond. These two financial tools are stated as follows:

FINANCIAL DECISION TOOLS		
Name of Tool	Formula	What It Tells You
Market price	$P_0 = \frac{\$ \text{ interest in year 1}}{(1 + \text{expected rate of return})^1} + \frac{\$ \text{ interest in year 2}}{(1 + \text{expected rate of return})^2} + \frac{\$ \text{ interest in year 3}}{(1 + \text{expected rate of return})^3} + \dots + \frac{\$ \text{ interest in year } n}{(1 + \text{expected rate of return})^n} + \frac{\$ \text{ maturity value of bond}}{(1 + \text{expected rate of return})^n}$	The expected rate of return (yield to maturity) of a bond if held until maturity, given its current market price.
Yield to maturity or expected rate of return		
Current yield	$\text{Current yield} = \frac{\text{annual interest payment}}{\text{current market price of the bond}}$	The yield today determined by dividing the interest payment by the current market price.

Concept Check

- 1. What assumption is being made about the length of time a bond is held when computing the yield to maturity?
- 2. What does the current yield tell us?
- 3. How are the yield to maturity and the current yield different?

b8 Explain three important relationships that exist in bond valuation.

Bond Valuation: Three Important Relationships

We have now learned to find the value of a bond (V_b), given (1) the amount of interest payments (I_t), (2) the maturity value (M), (3) the length of time to maturity (n periods), and (4) the investor’s required rate of return, r_b . We also know how to compute the expected rate of return ($\bar{r}_b$), which also happens to be the current interest rate on the bond, given (1) the current market value (P_0), (2) the amount of interest payments (I_t), (3) the maturity value (M), and (4) the length of time to maturity (n periods). We now have the basics. But let’s go further in our understanding of bond valuation by studying several important relationships:

◆ **Relationship 1.** The value of a bond is inversely related to changes in the investor’s present required rate of return. In other words, as interest rates increase (decrease), the value of the bond decreases (increases).

To illustrate, assume that an investor’s required rate of return for a given bond is 5 percent. The bond has a par value of \$1,000 and annual interest payments of \$50, indicating a 5 percent coupon interest rate ($\$50 \div \$1,000 = 5\%$). Assuming a 5-year maturity date, the bond would be worth \$1,000, computed as follows:

$$V_b = \frac{\$I_1}{(1 + r_b)^1} + \dots + \frac{\$I_n}{(1 + r_b)^n} + \frac{\$M}{(1 + r_b)^n}$$

CAN YOU DO IT?

COMPUTING THE YIELD TO MATURITY AND CURRENT YIELD

The Argon Corporation bonds are selling for \$1,100. They have a 5 percent coupon interest rate paid annually and mature in 8 years. What is the yield to maturity for the bonds if an investor buys them at the \$1,100 market price? What is the current yield? (The solution can be found on page 240.)

In our example,

$$V_b = \frac{\$50}{(1 + 0.05)^1} + \frac{\$50}{(1 + 0.05)^2} + \frac{\$50}{(1 + 0.05)^3} + \frac{\$50}{(1 + 0.05)^4} + \frac{\$50}{(1 + 0.05)^5} + \frac{\$1,000}{(1 + 0.05)^5}$$

Using a calculator, we find the value of the bond to be \$1,000.

CALCULATOR SOLUTION

Data Input	Function Key
5	I/Y
5	N
50	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
PV	1,000

If, however, the investors' required rate of return increases from 5 percent to 8 percent, the value of the bond would decrease to \$880.22, computed as follows:

CALCULATOR SOLUTION

Data Input	Function Key
8	I/Y
5	N
50	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
PV	880.22

On the other hand, if the investor's required rate of return decreases to 2 percent, the bond would increase in value to \$1,141.40.

CALCULATOR SOLUTION

Data Input	Function Key
2	I/Y
5	N
50	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
PV	\$1,141.40

This inverse relationship between the investor's required rate of return and the value of a bond is presented in Figure 7-3. Clearly, as investors demand a higher rate of return, the value of a bond decreases: The higher rate of return can be achieved only by paying less for the bond. Conversely, a lower required rate of return yields a higher market value for the bond.

DID YOU GET IT?

COMPUTING THE YIELD TO MATURITY AND CURRENT YIELD

The Argon bonds pay \$50 in interest per year (\$50 = 0.05 coupon rate $\times$ \$1,000 par value) for the duration of the bond, or for 8 years. The investor will then receive \$1,000 at the bond's maturity. Given a market price of \$1,100 the yield to maturity would be 3.54 percent.

CALCULATOR SOLUTION

Data Input	Function Key
8	N
1,100	PV
50	+/- PMT
1,000	+/- FV
Function Key	Answer
CPT	
I/Y	3.54

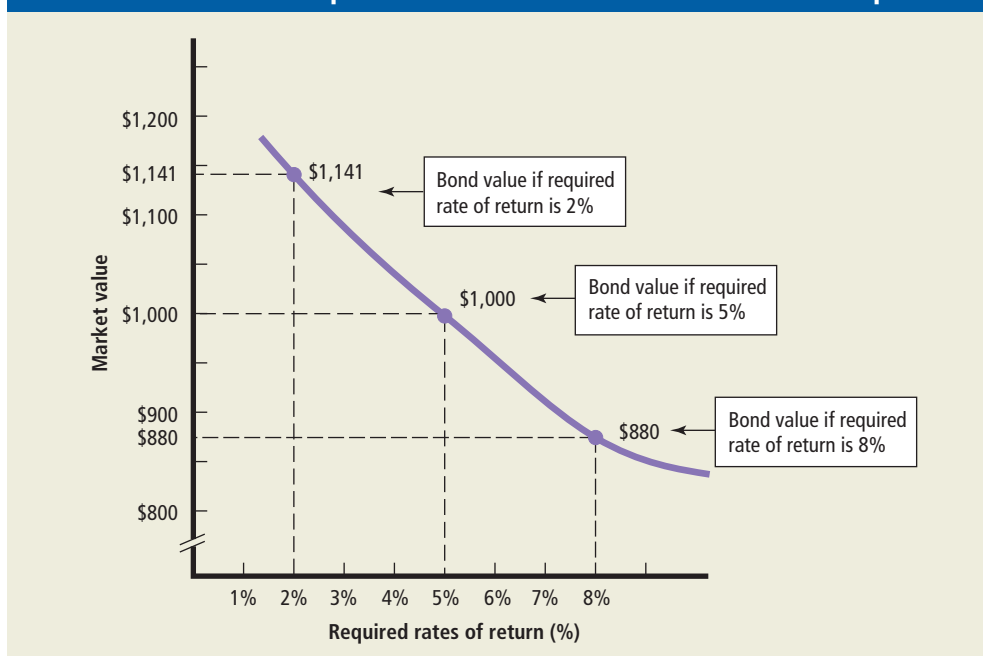
$$\begin{aligned}\text{Current yield} &= \frac{\text{annual interest payment}}{\text{current market price of the bond}} \\ &= \frac{\$50}{\$1,100} = 0.0455 = 4.55\%\end{aligned}$$

If an investor paid \$1,100 for a bond that pays \$50 in interest each year for 8 years, along with the \$1,000 par value in the eighth year, he would earn exactly 3.54 percent on the investment.

interest rate risk the variability in a bond's value caused by changing interest rates.

Changes in bond prices represent an element of uncertainty for the bond investor. If the current interest rate (required rate of return) changes, the price of a bond also fluctuates. An increase in interest rates causes the bondholder to incur a loss in market value. Because future interest rates and the resulting bond value cannot be predicted with certainty, a bond investor is exposed to the *risk of changing values as interest rates vary*. This risk has come to be known as **interest rate risk**.

FIGURE 7-3 Value and Required Rates for a 5-Year Bond at a 5 Percent Coupon Rate



- ◆ **Relationship 2.** The market value of a bond will be less than the par value if the required rate of return of investors is above the coupon interest rate; but it will be valued above par value if the required rate of return of investors is below the coupon interest rate.

Using the previous example, we observed that

- The bond has a *market value* of \$1,000, equal to the par, or maturity, value, when the required rate of return demanded by investors equals the 5 percent coupon interest rate. In other words, if

required rate = coupon rate, then market value = par value

$$5\% = 5\%, \quad \text{then} \quad \$1,000 = \$1,000$$

- When the required rate is 8 percent, which exceeds the 5 percent coupon rate, the market value of the bond falls below par value to \$880.22; that is, if

required rate > coupon rate, then market value < par value

$$8\% > 5\%, \quad \text{then} \quad \$880.22 < \$1,000$$

In this case the *bond sells at a discount below par value*; thus, it is called a **discount bond**.

discount bond a bond that sells at a discount, or below par value.

- When the required rate is only 2 percent, or less than the 5 percent coupon rate, the market value, \$1,141.40, exceeds the bond's par value. In this instance, if

required rate < coupon rate, then market value > par value

$$2\% < 5\%, \quad \text{then} \quad \$1,141.40 > \$1,000$$

The *bond is now selling at a premium above par value*; thus, it is a **premium bond**.

premium bond a bond that is selling above its par value.

- ◆ **Relationship 3.** Long-term bonds have greater interest rate risk than do short-term bonds.

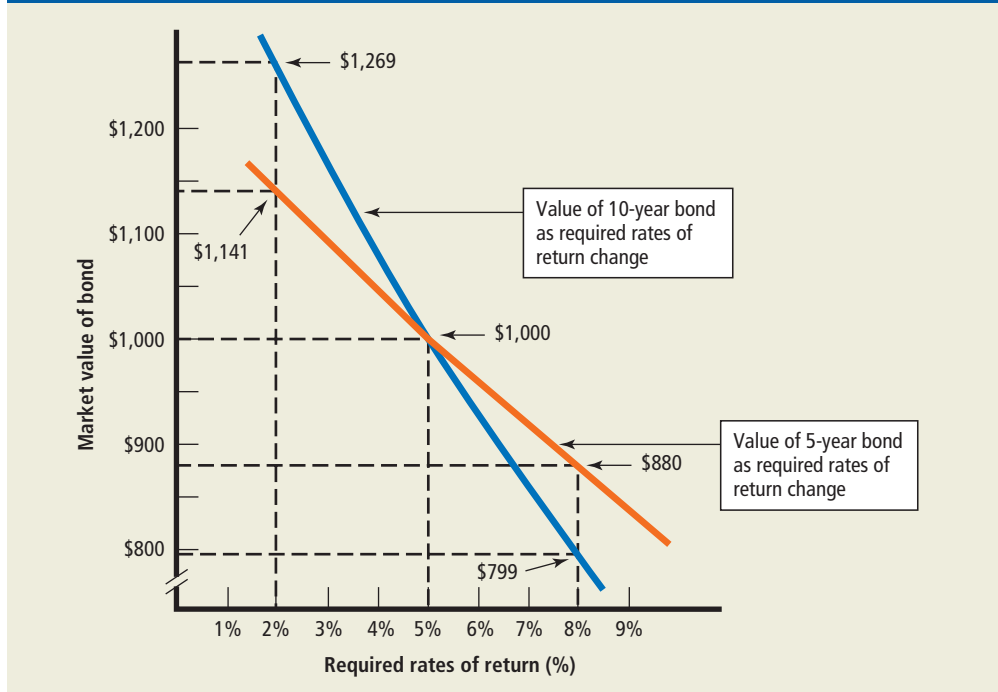
As already noted, a change in current interest rates (the required rate of return) causes an inverse change in the market value of a bond. However, the impact on value is greater for long-term bonds than it is for short-term bonds.

In Figure 7-3 we observed the effect of interest rate changes on a 5-year bond paying a 5 percent coupon interest rate. What if the bond did not mature until 10 years from today instead of 5 years? Would the changes in market value be the same? Absolutely not. The changes in value would be more significant for the 10-year bond. For example, what if the current interest rates increase from 2 percent to 5 percent and then to 8 percent? In this case, a 10-year bond's value would drop more sharply than a 5-year bond's value would. The values for both the 5-year and the 10-year bonds are shown here.

MARKET VALUE FOR A 5% COUPON-RATE BOND MATURING IN		
REQUIRED RATE	5 YEARS	10 YEARS
2%	\$1,141.40	\$1,269.48
5%	1,000.00	1,000.00
8%	880.22	798.70

The reason long-term bond prices fluctuate more than short-term bond prices in response to interest rate changes is simple. Assume an investor bought a 10-year bond yielding a 5 percent interest rate. If the current interest rate for bonds of similar risk increased to 8 percent, the investor would be locked into the lower rate for 10 years. If, on the other hand, a shorter-term bond had been purchased—say, one maturing in 2 years—the investor would have to accept the lower return for only 2 years and not the full 10 years. At the end of year 2, the investor would receive the maturity value of \$1,000 and could buy a bond offering the higher 8 percent rate for the remaining 8 years. Thus, interest rate risk is determined, at least in part, by the length of time an investor is required to commit to an investment.

FIGURE 7-4 The Market Values of a 5-Year and a 10-Year Bond at Different Required Rates of Return



Using these values and the required rates, we can graph the changes in values for the two bonds relative to different interest rates. These comparisons are provided in Figure 7-4. The figure clearly illustrates that the price of a long-term bond (say, 10 years) is more responsive or sensitive to interest rate changes than the price of a short-term bond (say, 5 years). However, the holder of a long-term bond can take some comfort from the fact that long-term interest rates are usually not as volatile as short-term rates.

Concept Check

1. Why does a bond sell at a discount when the coupon rate is lower than the required rate of return and vice versa?
2. As interest rates increase, why does the price of a long-term bond decrease more than that of a short-term bond?

Chapter Summaries



Distinguish between different kinds of bonds. (pgs 221–223)

SUMMARY: There is a variety of types of bonds, including:

Debentures
Subordinated debentures
Mortgage bonds

Eurobonds
Convertible bonds

KEY TERMS

Bond, page 221 A long-term (10-year or more) promissory note issued by the borrower, promising to pay the owner of the security a predetermined, fixed amount of interest each year.

Debenture, page 221 Any unsecured long-term debt.

Subordinated debenture, page 222 A debenture that is subordinated to other debentures in terms of its payments in case of insolvency.

Mortgage bond, page 222 A bond secured by a lien on real property.

Eurobond, page 222 A bond issued in a country different from the one in which the currency of the bond is denominated; for example, a bond issued in Europe or Asia by an American company that pays interest and principal to the lender in U.S. dollars.

Convertible bond, page 222 A debt security that can be converted into a firm's stock at a prespecified price.

Explain the more popular features of bonds. (pgs 223–226)

SUMMARY: Some of the more popular terms and characteristics used to describe bonds include the following:

Claims on assets and income	Call provision
Par value	Indenture
Coupon interest rate	Bond ratings
Maturity	

KEY TERMS

Par value, page 223 On the face of a bond, the stated amount that the firm is to repay upon the maturity date.

Coupon interest rate, page 223 The interest rate contractually owed on a bond as a percent of its par value.

Fixed-rate bond, page 223 A bond that pays a fixed amount of interest to the investor each year.

Zero coupon bond, page 224 A bond issued at a substantial discount from its \$1,000 face value and that pays little or no interest.

Maturity, page 224 The length of time until the bond issuer returns the par value to the bondholder and terminates the bond.

Callable bond (redeemable bond), page 224 An option available to a company issuing a bond whereby the issuer can call (redeem) the bond before it matures. This is usually done if interest rates decline below what the firm is paying on the bond.

Call protection period, page 224 A prespecified time period during which a company cannot recall a bond.

Indenture, page 224 The legal agreement between the firm issuing bonds and the bond trustee who represents the bondholders, providing the specific terms of the loan agreement.

Junk bond, page 225 Any bond rated BB or below.

High-yield bond, page 226 See junk bond.

Define the term *value* as used for several different purposes. (pgs 226–227)

SUMMARY: Value is defined differently depending on the context. But for us, value is the present value of future cash flows expected to be received from an investment, discounted at the investor's required rate of return.

KEY TERMS

Book value, page 226 (1) The value of an asset as shown on the firm's balance sheet. It represents the historical cost of the asset rather than its current market value or replacement cost. (2) The depreciated value of a company's assets (original cost less accumulated depreciation) less outstanding liabilities.

Liquidation value, page 226 The dollar sum that could be realized if an asset were sold.

Market value, page 226 The value observed in the marketplace.

Intrinsic, or economic, value, page 226 The present value of an asset's expected future cash flows. This value is the amount the investor considers to be fair value, given the amount, timing, and riskiness of future cash flows.

Fair value, page 226 The present value of an asset's expected future cash flows.

Efficient market, page 227 Market where the values of all securities fully recognize all available public information.

Behavioral finance, page 227 The field of study examining when investors act rationally or irrationally when making investment decisions.

4 Explain the factors that determine value. (pgs 227–228)

SUMMARY: Three basic factors determine an asset's value: (1) the amount and timing of future cash flows, (2) the riskiness of the cash flows, and (3) the investor's attitude about the risk.

5 Describe the basic process for valuing assets. (pgs 228–229)

SUMMARY: The valuation process can be described as follows: It is assigning value to an asset by calculating the present value of its expected future cash flows using the investor's required rate of return as the discount rate. The investor's required rate of return, r , equals the risk-free rate of interest plus a risk premium to compensate the investor for assuming risk.

KEY EQUATIONS

$$\text{Asset value} = \frac{\text{cash flow in year 1}}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^1} + \frac{\text{cash flow in year 2}}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^2} + \cdots + \frac{\text{cash flow in year } n}{\left(1 + \frac{\text{required rate of return}}{\text{rate of return}}\right)^n}$$

$$V = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \cdots + \frac{C_n}{(1+r)^n}$$

6 Estimate the value of a bond. (pgs 229–235)

SUMMARY: The value of a bond is the present value of both future interest to be received and the par or maturity value of the bond.

KEY EQUATIONS

$$\begin{aligned} \text{Bond value} = V_b &= \frac{\$ \text{ interest in year 1}}{(1 + \text{required rate of return})^1} \\ &+ \frac{\$ \text{ interest in year 2}}{(1 + \text{required rate of return})^2} \\ &+ \frac{\$ \text{ interest in year 3}}{(1 + \text{required rate of return})^3} \\ &+ \cdots \\ &+ \frac{\$ \text{ interest in year } n}{(1 + \text{required rate of return})^n} \\ &+ \frac{\$ \text{ maturity value of bond}}{(1 + \text{required rate of return})^n} \\ V_b &= \frac{\$I_1}{(1+r_b)^1} + \frac{\$I_2}{(1+r_b)^2} + \frac{\$I_3}{(1+r_b)^3} + \cdots + \frac{\$I_n}{(1+r_b)^n} + \frac{\$M}{(1+r_b)^n} \\ V_b &= \frac{\$I_1/2}{\left(1 + \frac{r_b}{2}\right)^1} + \frac{\$I_2/2}{\left(1 + \frac{r_b}{2}\right)^2} + \frac{\$I_3/2}{\left(1 + \frac{r_b}{2}\right)^3} + \cdots + \frac{\$I_n/2}{\left(1 + \frac{r_b}{2}\right)^{2n}} + \frac{\$M}{\left(1 + \frac{r_b}{2}\right)^{2n}} \end{aligned}$$

Compute a bond's expected rate of return and its current yield. (pgs 235–238)

SUMMARY: To measure bondholder's expected rate of return, we find the discount rate that equates the present value of the future cash flows (interest and maturity value) with the current market price of the bond. The expected rate of return for a bond is also the rate of return the investor will earn if the bond is held to maturity, or the yield to maturity. We may also compute the current yield as the annual interest payment divided by the bond's current market price, but this is not an accurate measure of a bondholder's expected rate of return.

KEY TERMS

Expected rate of return, page 235 (1) The discount rate that equates the present value of the future cash flows (interest and maturity value) of a bond with its current market price. It is the rate of return an investor will earn if the bond is held to maturity. (2) The rate of return the investor expects to receive on an investment by paying the existing market price of the security.

Yield to maturity, page 235 The rate of return a bondholder will receive if the bond is held to maturity. (It is equivalent to the expected rate of return.)

Current yield, page 237 The ratio of a bond's annual interest payment to its market price.

KEY EQUATIONS

$$\begin{aligned} \text{Market price} = P_0 = & \frac{\$ \text{ interest in year 1}}{(1 + \text{expected rate of return})^1} \\ & + \frac{\$ \text{ interest in year 2}}{(1 + \text{expected rate of return})^2} \\ & + \frac{\$ \text{ interest in year 3}}{(1 + \text{expected rate of return})^3} \\ & + \dots \\ & + \frac{\$ \text{ interest in year } n}{(1 + \text{expected rate of return})^n} \\ & + \frac{\$ \text{ maturity value of bond}}{(1 + \text{expected rate of return})^n} \end{aligned}$$

$$\text{Current yield} = \frac{\text{annual interest payment}}{\text{current market price of the bond}}$$

Explain three important relationships that exist in bond valuation. (pgs 238–242)

SUMMARY: Certain key relationships exist in bond valuation, these being:

1. A decrease in interest rates (the required rates of return) will cause the value of a bond to increase; by contrast, an interest rate increase will cause a decrease in value. The change in value caused by changing interest rates is called interest rate risk.
2. If the required rate of return (current interest rate):
 - a. Equals the coupon interest rate, the bond will sell at par, or maturity value.
 - b. Exceeds the bond's coupon rate, the bond will sell below par value, or at a discount.
 - c. Is less than the bond's coupon rate, the bond will sell above par value, or at a premium.
3. A bondholder owning a long-term bond is exposed to greater interest rate risk than one owning a short-term bond.

KEY TERMS

Interest rate risk, page 240 The variability in a bond's value caused by changing interest rates.

Premium bond, page 241 A bond that is selling above its par value.

Discount bond, page 241 A bond that sells at a discount, or below par value.

Review Questions

All Review Questions are available in [MyFinanceLab](#).

- 7-1. Distinguish between debentures and mortgage bonds.
- 7-2. Define (a) Eurobonds, (b) zero coupon bonds, and (c) junk bonds.
- 7-3. Describe the bondholder's claim on the firm's assets and income.
- 7-4. a. How does a bond's par value differ from its market value?
b. Explain the difference between a bond's coupon interest rate, current yield, and required rate of return.
- 7-5. What factors determine a bond's rating? Why is the rating important to the firm's manager?
- 7-6. What are the basic differences between book value, liquidation value, market value, and intrinsic value?
- 7-7. What is a general definition of the intrinsic value of an asset?
- 7-8. Explain the three factors that determine the intrinsic, or economic, value of an asset.
- 7-9. Explain the relationship between the required rate of return and the value of a security.
- 7-10. Define the expected rate of return to bondholders.

Study Problems

All Study Problems are available in [MyFinanceLab](#).



- 7-1. (*Bond valuation*) Trico bonds have an annual coupon rate of 8 percent and a par value of \$1,000 and will mature in 20 years. If you require a return of 7 percent, what price would you be willing to pay for the bond? What happens if you pay *more* for the bond? What happens if you pay *less* for the bond?
- 7-2. (*Bond valuation*) Sunn Co.'s bonds, maturing in 7 years, pay 4 percent interest on a \$1,000 face value. However, interest is paid semiannually. If your required rate of return is 5 percent, what is the value of the bond? How would your answer change if the interest were paid annually?
- 7-3. (*Bond valuation*) You own a 20-year, \$1,000 par value bond paying 7 percent interest annually. The market price of the bond is \$875, and your required rate of return is 10 percent.
 - a. Compute the bond's expected rate of return.
 - b. Determine the value of the bond to you, given your required rate of return.
 - c. Should you sell the bond or continue to own it?
- 7-4. (*Bond valuation*) Calculate the value of a bond that will mature in 14 years and has a \$1,000 face value. The annual coupon interest rate is 5 percent, and the investor's required rate of return is 7 percent.
- 7-5. (*Bond valuation*) At the beginning of the year, you bought a \$1,000 par value corporate bond with a 6 percent annual coupon rate and a 10-year maturity date. When you bought the bond, it had an expected yield to maturity of 8 percent. Today the bond sells for \$1,060.
 - a. What did you pay for the bond?
 - b. If you sold the bond at the end of the year, what would be your one-period return on the investment?
- 7-6. (*Bond valuation*) Shelly Inc. bonds have a 6 percent coupon rate. The interest is paid semiannually, and the bonds mature in 8 years. Their par value is \$1,000. If your required rate of return is 4 percent, what is the value of the bond? What is the value if the interest is paid annually?
- 7-7. (*Bond relationship*) Crawford Inc. has two bond issues outstanding, both paying the same annual interest of \$55, called Series A and Series B. Series A has a maturity of 12 years, whereas Series B has a maturity of 1 year.
 - a. What would be the value of each of these bonds when the going interest rate is (1) 4 percent, (2) 7 percent, and (3) 10 percent? Assume that there is only one more interest payment to be made on the Series B bonds.
 - b. Why does the longer-term (12-year) bond fluctuate more when interest rates change than does the shorter-term (1-year) bond?

7-8. (Bond valuation) ExxonMobil 20-year bonds pay 6 percent interest annually on a \$1,000 par value. If bonds sell at \$945, what is the bonds' expected rate of return?

7-9. (Bond valuation) National Steel 15-year, \$1,000 par value bonds pay 5.5 percent interest annually. The market price of the bonds is \$1,085, and your required rate of return is 7 percent.

- Compute the bond's expected rate of return.
- Determine the value of the bond to you, given your required rate of return.
- Should you purchase the bond?

7-10. (Bond valuation) You own a bond that pays \$70 in annual interest, with a \$1,000 par value. It matures in 15 years. Your required rate of return is 7 percent.

- Calculate the value of the bond.
- How does the value change if your required rate of return (1) increases to 9 percent or (2) decreases to 5 percent?
- Explain the implications of your answers in part (b) as they relate to interest rate risk, premium bonds, and discount bonds.
- Assume that the bond matures in 5 years instead of 15 years. Recompute your answers in part (b).
- Explain the implications of your answers in part (d) as they relate to interest rate risk, premium bonds, and discount bonds.

7-11. (Bond valuation) New Generation Public Utilities issued a bond with a \$1,000 par value that pays \$30 in annual interest. It matures in 20 years. Your required rate of return is 4 percent.

- Calculate the value of the bond.
- How does the value change if your required rate of return (1) increases to 7 percent or (2) decreases to 2 percent?
- Explain the implications of your answers in part (b) as they relate to interest rate risk, premium bonds, and discount bonds.
- Assume that the bond matures in 10 years instead of 20 years. Recompute your answers in part (b).
- Explain the implications of your answers in part (d) as they relate to interest rate risk, premium bonds, and discount bonds.

7-12. (Bond valuation—zero coupon) The Logos Corporation is planning on issuing bonds that pay no interest but can be converted into \$1,000 at maturity, 7 years from their purchase. To price these bonds competitively with other bonds of equal risk, it is determined that they should yield 6 percent, compounded annually. At what price should the Logos Corporation sell these bonds?

7-13. (Bond valuation) You are examining three bonds with a par value of \$1,000 (you receive \$1,000 at maturity) and are concerned with what would happen to their market value if interest rates (or the market discount rate) changed. The three bonds are

Bond A—a bond with 3 years left to maturity that has a 6 percent annual coupon interest rate, but the interest is paid semiannually.

Bond B—a bond with 7 years left to maturity that has a 6 percent annual coupon interest rate, but the interest is paid semiannually.

Bond C—a bond with 20 years left to maturity that has a 6 percent annual coupon interest rate, but the interest is paid semiannually.

What would be the value of these bonds if the market discount rate were

- 6 percent per year compounded semiannually?
- 3 percent per year compounded semiannually?
- 9 percent per year compounded semiannually?
- What observations can you make about these results?

7-14. (Bond valuation) Bank of America has bonds that pay a 6.5 percent coupon interest rate and mature in 5 years. If an investor has a 4.3 percent required rate of return, what should she be willing to pay for the bond? What happens if she pays more or less?

7-15. (Bond valuation) Xerox issued bonds that pay \$67.50 in interest each year and will mature in 5 years. You are thinking about purchasing the bonds. You have decided that you would need to receive a 5 percent return on your investment. What is the value of the bond to you, first assuming that the interest is paid annually and then semiannually?



7-16. (Bondholders' expected rate of return) Sharp Co. bonds are selling in the market for \$1,045. These 15-year bonds pay 7 percent interest annually on a \$1,000 par value. If they are purchased at the market price, what is the expected rate of return?

7-17. (Bondholders' expected rate of return) The market price is \$900 for a 10-year bond (\$1,000 par value) that pays 6 percent interest (6 percent semiannually). What is the bond's expected rate of return?

7-18. (Bondholders' expected rate of return) You own a bond that has a par value of \$1,000 and matures in 5 years. It pays a 5 percent annual coupon rate. The bond currently sells for \$1,100. What is the bond's expected rate of return?

7-19. (Expected rate of return and current yield) Time Warner has bonds that are selling for \$1,371. The coupon interest rate on the bonds is 9.15 percent and they mature in 21 years. What is the yield to maturity on the bonds? What is the current yield?

7-20. (Expected rate of return and current yield) Citigroup issued bonds that pay a 5.5 percent coupon interest rate. The bonds mature in 5 years. They are selling for \$1,076. What would be your expected rate of return (yield to maturity) if you bought the bonds? What would the current yield be?

7-21. (Bondholders' expected rate of return) Zenith Co.'s bonds mature in 12 years and pay 7 percent interest annually. If you purchase the bonds for \$1,150, what is your expected rate of return?

7-22. (Yield to maturity) Assume the market price of a 5-year bond for Margaret Inc. is \$900, and it has a par value of \$1,000. The bond has an annual interest rate of 6 percent that is paid semiannually. What is the yield to maturity of the bond?

7-23. (Current yield) Assume you have a bond with a semiannual interest payment of \$35, a par value of \$1,000, and a current market of \$780. What is the current yield of the bond?

7-24. (Yield to maturity) An 8-year bond for Katy Corporation has a market price of \$700 and a par value of \$1,000. If the bond has an annual interest rate of 6 percent, but pays interest semiannually, what is the bond's yield to maturity?

7-25. (Expected rate of return) Assume you own a bond with a market value of \$820 that matures in 7 years. The par value of the bond is \$1,000. Interest payments of \$30 are paid semiannually. What is your expected rate of return on the bond?

7-26. (Yield to maturity) You own a 10-year bond that pays 6 percent interest annually. The par value of the bond is \$1,000 and the market price of the bond is \$900. What is the yield to maturity of the bond?

7-27. (Bondholders' expected rate of return) You purchased a bond for \$1,100. The bond has a coupon rate of 8 percent, which is paid semiannually. It matures in 7 years and has a par value of \$1,000. What is your expected rate of return?

Mini Case

This Mini Case is available in [MyFinanceLab](#).

Here are data on \$1,000 par value bonds issued by Microsoft, GE Capital, and Morgan Stanley at the end of 2012. Assume you are thinking about buying these bonds as of January 2013. Answer the following questions:

- Assuming interest is paid annually, calculate the values of the bonds if your required rates of return are as follows: Microsoft, 6 percent; GE Capital, 8 percent; and Morgan Stanley, 10 percent; where

	MICROSOFT	GE CAPITAL	MORGAN STANLEY
Coupon interest rate	5.25%	4.25%	4.75%
Years to maturity	30	10	5

- b. At the end of 2008, the bonds were selling for the following amounts:

Microsoft	\$1,100
GE Capital	\$1,030
Morgan Stanley	\$1,015

What were the expected rates of return for each bond?

- c. How would the value of the bonds change if (1) your required rate of return (r_b) increased 2 percentage points or (2) decreased 2 percentage points?
- d. Explain the implications of your answers in part (b) in terms of interest rate risk, premium bonds, and discount bonds.
- e. Should you buy the bonds? Explain.