Chapter 8
Debt Instruments and Markets

Learning Objectives

After reading this chapter, students should be able to:

◆ Identify the key characteristics common to all bonds.

◆ List the four main classifications of bonds and differentiate among them.

◆ Calculate the value of a bond.

◆ Explain why the market value of an outstanding fixed-rate bond will fall when interest rates rise on new bonds of equal risk, or vice versa.

◆ Calculate the current yield, the yield to maturity, and/or the yield to call on a bond.

◆ Differentiate among interest rate risk, reinvestment rate risk, and default risk.

◆ Briefly explain why floating-rate bonds are more difficult to value than fixed-rate bonds.

◆ Define the following terms: commercial paper, eurocredits, eurobond, floating-rate notes, and foreign bond.

◆ Briefly explain some of the recent developments in the international credit market.
Answers to End-of Chapter Questions

8-1 This statement is false. While the first two sentences of this statement are correct, the final sentence is incorrect. In fact, long-term bonds are more sensitive to changes in interest rates than are short-term bonds. The reason is that a long-term bond’s cash flows (interest payments and maturity) are outstanding longer and thus exposed to changes in interest rates than are the cash flows of a short-term bond. This risk of a decline in a bond’s price due to an increase in interest rates is called interest rate risk.

8-2 As can be seen from the valuation equation at the beginning of this chapter, the cost of debt capital (the bond’s required return) and the bond’s interest and principal payments determine a bond’s value. The higher the bond’s risk, the higher the bond’s required return—which will lower the bond’s value. However, the bond’s coupon interest payments will also have to be higher to induce investors to purchase the bond.

8-3 A call provision gives the issuer the right to redeem the bonds under specified terms prior to the normal maturity date. The call provision generally states that the issuer must pay the bondholders an amount greater than the par value if they are called. The additional sum, a call premium, is often set equal to one year’s interest if the bonds are called during the first year, and the premium declines at a constant rate of INT/N each year thereafter. However, bonds are often not callable until several years after they are issued. This is known as a deferred call, and the bonds are said to have call protection during this time.

8-4 A put provision allows bonds to be “put back” to the issuer at the holder’s option, and the issuer must then redeem them at par. The put provision protects investors against an increase in interest rates. This provision enables issuers to sell bonds at lower coupon rates than other similarly rated bonds, but issuers are exposed to greater risk because they may have to replace the putable bonds with others that carry higher interest rates.

8-5 A sinking fund provision requires the issuer to retire a portion of the bond issue each year. It facilitates the orderly retirement of a bond issue. A sinking fund can be handled in two ways: (1) The issuer can call in for redemption at par value a certain percentage of the bonds each year, or (2) the issuer may buy the required number of bonds on the open market.

The issuer will choose the least-cost method. If interest rates have risen, causing bond prices to fall, it will buy bonds in the open market at a discount; if
interest rates have fallen, it will call the bonds. A sinking fund call typically requires no call premium (although it could), but only a small percentage of the issue is normally callable in any one year.

Although sinking funds are designed to protect bondholders by ensuring that an issue is retired in an orderly fashion, sinking funds work to the detriment of bondholders if market interest rates fall. Bondholders will have to invest their funds in bonds with lower interest rates, thus earning a lower return on their money. On balance, bonds that have a sinking fund are regarded as being safer than those without such a provision, so, at the time they are issued, sinking fund bonds typically have lower coupon rates than otherwise similar bonds without sinking funds.

8-6 Generally, the valuation equation given at the beginning of the chapter can be used to value all three types of bonds: regular coupon bonds, zero coupon bonds, and floating-rate bonds. The valuation equation discounts each bond’s cash flows (coupon and principal payments) at the going market interest rate. For a regular coupon bond, its cash flows will consist of periodic interest payments and then a final maturity value equal to the face value of the bond. For a zero coupon bond, its cash flow will consist only of a maturity value equal to the face value of the bond due at the bond’s maturity. Valuing a floating-rate bond is more difficult than valuing a fixed-rate bond because the future coupon payments are uncertain. Typically, analysts treat these types of bonds as if they were fixed-rate bonds and perform sensitivity analysis with various interest rate scenarios to bracket the bond’s value.

8-7 A bond that has just been issued is known as a new issue. Once the bond has been on the market for a while, it is classified as an outstanding bond, also called a seasoned issue. Newly issued bonds generally sell very close to par, but the prices of seasoned bonds vary widely from par.

8-8 The yield to call is the rate of return earned on a bond if it is called before the maturity date, while the yield to maturity is the rate of return earned on a bond if it is held to maturity. If current rates are well below an outstanding bond’s coupon rate, then a callable bond is likely to be called, and investors will expect to earn the yield to call rather than the yield to maturity. If current rates are at or above an outstanding bond’s coupon rate and are likely to remain at that level, then a callable bond will not be called, and investors will expect to earn the yield to maturity.

8-9 The YTM is identical to a bond’s total rate of return. It can also be viewed as a bond’s promised rate of return, which is the return that investors will receive if all promised payments are made. However, the YTM equals the expected rate of return only if (1) the probability of default is zero and (2) the bond cannot be called, for otherwise there is some probability that the promised payments to
maturity will not be received, causing the calculated yield to maturity to differ from the expected return.

8-10 Interest rate risk is the risk of a decline in a bond's price due to an increase in interest rates. Interest rate risk exposure is higher on bonds with long maturities than on those with short maturities. Reinvestment rate risk is the risk that a decline in interest rates will lead to a decline in income from a bond portfolio. Reinvestment rate risk is obviously high on callable bonds. It is also high on short-term bonds, because the shorter the maturity of a bond, the fewer the years when the relatively high old-interest rate will be earned, and the sooner the funds will have to be reinvested at the new low rate. Default risk is the risk that an investor will receive less than the promised return on the bond because the issuer fails to make either interest or principal payments. The quoted interest rate includes a default risk premium—the greater the default risk, the higher the bond's yield to maturity. The default risk on U.S. Treasury securities is zero, but default risk can be substantial for corporate, municipal, and some foreign government bonds.

8-11 There are three major types of credit markets in the international marketplace that mirror equivalent U.S. markets in many ways. Floating-rate bank loans, called eurocredits, are tied to LIBOR for the issue's currency as the reference rate and tend to be issued for a fixed term with no early repayment. Today eurocredits come in most major trading currencies. As in the U.S., there is no secondary market for eurocredit bank loans. The eurobond market is the medium- to long-term international market for both fixed- and floating-rate debt. A eurobond is an international bond underwritten by an international bank syndicate and sold to investors in countries other than the one in whose money unit the bond is denominated. Most eurobonds are not rated by one of the rating agencies such as S&P or Moody's, although an increasing number of them are starting to be rated. The most recently developed international credit market is the short- to medium-term euronote market. This category includes the euro commercial paper market at the very short end of the maturity spectrum. Also at the short-term end are negotiable promissory notes placed with public investors at a lower cost than is incurred with eurocredits or syndicated credits. One of the more recent innovations in the euronote market is the euro medium-term note, which can be issued over a period of time in a manner similar to shelf registration in the U.S. They fill in the maturity gap between euro commercial paper and eurobonds, and the relatively small denominations increase the liquidity of the secondary market.
**Solutions to End-of-Chapter Problems**

**8-1** To calculate YTM:
N = 20; PV = -1050; PMT = 30; FV = 1000; and then solve for I/YR = 2.67% × 2 = 5.35%.

To calculate YTC:
N = 10; PV = -1050; PMT = 30; FV = 1020; and then solve for I/YR = 2.60% × 2 = 5.21%.

**8-2**

a. **Current yield = Annual coupon payment/Current price.**

   Step 1: Find the price of the bond:
   N = 18; I/YR = 6; PMT = 40; FV = 1000; and then solve for PV = V_B = $783.45.

   Step 2: Calculate the current yield: CY = $80/$783.45 = 10.21%.

b. **Total return = Current yield + Capital gains yield**
   12% = 10.21% + Capital gains yield
   1.79% = Capital gains yield.

**8-3** Two years from now, there will be 18 years left to maturity. Use your financial calculator to determine its price by entering the following data as inputs:

N = 18 × 2 = 36; I/YR = 8/2 = 4; PMT = 60/2 = 30; FV = 1000; and then solve for PV = V_B = $810.92.

**8-4**

a. **Current yield = Annual interest/Current bond price**
   Current yield = $90/$850
   Current yield = 10.59%.

b. Enter the following data as inputs in your calculator as follows:
   N = 10 × 2 = 20; PV = -850; PMT = 90/2 = 45; FV = 1000; I = ? Solve for I/YR = r_d = YTM = 5.785% × 2 = 11.57%.
c. Enter the following data as inputs in your calculator as follows:
   \[ N = 7 \times 2 = 14; \ I/YR = 11.57/2 = 5.785; \ PMT = 90/2 = 45; \ FV = 1000; \ PV = ? \]
   Solve for \( PV = V_B = \$878.95 \).

\[ \begin{array}{llllllllll}
   & 1/1/2005 & & 1/1/2015 \\
   0 & 5\% & 1 & 2 & \cdot & \cdot & \cdot & 20 & 6\text{-month} & \text{Periods} \\
   \hline
   \text{PMT} & 30 & 30 & 30 \\
   V_B = ? & & & \\
   \text{FV} & 1,000 & & & \\
\end{array} \]

\( N = 10 \times 2 = 20; \ I/YR = 10/2 = 5; \ PMT = 60/2 = 30; \ FV = 1000. \ PV = V_B = \$750.7558. \)

Since there are 25,000 bonds outstanding (calculated as \$25,000,000/\$1,000),
the total value of debt is \$750.7558(25,000) = \$18,768,895.

8-6
The YTM = Current yield + Capital gains yield.
Thus: Capital gains yield = YTM – Current yield
   = 8.5043\% - 9\% = -0.4957\%.

The price in one year = Price now \times (1 + CG\%).

Calculate current price:
Current yield = Annual coupon/Current price.
Current price = Annual coupon/Current yield
   = $120/0.09 = $1,333.33.

Price in one year = $1,333.33 \times (1 + CG\%)
   = $1,333.33 \times (1 - 0.004957)
   = $1,326.72.

8-7
The company must call 5 percent or \$50,000 face value each year. It could
call at par and spend \$50,000 or buy on the open market. Since the interest
rate is higher than the coupon rate (12\% vs. 10\%), the bonds will sell at a
discount, so open market purchases should be used.

\[ \begin{array}{llllllllll}
   & 6\% & 1 & 2 & \cdot & \cdot & \cdot & 30 & 6\text{-month} & \text{Periods} \\
   \hline
   \text{PMT} & 50 & 50 & 50 \\
   PV = ? & & & \\
   \text{FV} & 1,000 & & & \\
\end{array} \]
N = 2 × 15 = 30; I/YR = 12/2 = 6; PMT = 100/2 = 50; FV = 1000. PV = \( V_B = \$862.3517 \approx \$862.35 \).

The company would have to buy \( $50,000/\$1,000 = 50 \) bonds at \( \$862.3517 \) each = \( \$43,117.58 \approx \$43,118 \).

Calculate YTM or \( r_d \) for first issue:
Inputs: N = 15; PV = -712.37; PMT = 70; FV = 1000.
Output: I/YR = \( r_d = \) YTM = 11%.

Calculate PMT on second issue using 11% = \( r_d = \) YTM:
Inputs: N = 8; I/YR = 11; PV = -712.37; FV = 1000.
Output: PMT = \( \$54.11 \).