

Chapter Review and Self-Test Problems

- 7.1 Bond Values** A Microgates Industries bond has a 10 percent coupon rate and a \$1,000 face value. Interest is paid semiannually, and the bond has 20 years to maturity. If investors require a 12 percent yield, what is the bond's value? What is the effective annual yield on the bond?
- 7.2 Bond Yields** A Macrohard Corp. bond carries an 8 percent coupon, paid semiannually. The par value is \$1,000, and the bond matures in six years. If the bond currently sells for \$911.37, what is its yield to maturity? What is the effective annual yield?

Answers to Chapter Review and Self-Test Problems

- 7.1** Because the bond has a 10 percent coupon yield and investors require a 12 percent return, we know that the bond must sell at a discount. Notice that, because the bond pays interest semiannually, the coupons amount to $\$100/2 = \50 every six months. The required yield is $12\%/2 = 6\%$ every six months. Finally, the bond matures in 20 years, so there are a total of 40 six-month periods.

The bond's value is thus equal to the present value of \$50 every six months for the next 40 six-month periods plus the present value of the \$1,000 face amount:

$$\begin{aligned}\text{Bond value} &= \$50 \times [(1 - 1/1.06^{40})/.06] + 1,000/1.06^{40} \\ &= \$50 \times 15.04630 + 1,000/10.2857 \\ &= \$849.54\end{aligned}$$

Notice that we discounted the \$1,000 back 40 periods at 6 percent per period, rather than 20 years at 12 percent. The reason is that the effective annual yield on the bond is $1.06^2 - 1 = 12.36\%$, not 12 percent. We thus could have used 12.36 percent per year for 20 years when we calculated the present value of the \$1,000 face amount, and the answer would have been the same.

- 7.2** The present value of the bond's cash flows is its current price, \$911.37. The coupon is \$40 every six months for 12 periods. The face value is \$1,000. So the bond's yield is the unknown discount rate in the following:

$$\$911.37 = \$40 \times [1 - 1/(1 + r)^{12}]/r + 1,000/(1 + r)^{12}$$

The bond sells at a discount. Because the coupon rate is 8 percent, the yield must be something in excess of that.

If we were to solve this by trial and error, we might try 12 percent (or 6 percent per six months):

$$\begin{aligned}\text{Bond value} &= \$40 \times (1 - 1/1.06^{12})/.06 + 1,000/1.06^{12} \\ &= \$832.32\end{aligned}$$

This is less than the actual value, so our discount rate is too high. We now know that the yield is somewhere between 8 and 12 percent. With further trial and error (or a little machine assistance), the yield works out to be 10 percent, or 5 percent every six months.

By convention, the bond's yield to maturity would be quoted as $2 \times 5\% = 10\%$. The effective yield is thus $1.05^2 - 1 = 10.25\%$.

Concepts Review and Critical Thinking Questions

- 1. Treasury Bonds** Is it true that a U.S. Treasury security is risk-free?
- 2. Interest Rate Risk** Which has greater interest rate risk, a 30-year Treasury bond or a 30-year BB corporate bond?
- 3. Treasury Pricing** With regard to bid and ask prices on a Treasury bond, is it possible for the bid price to be higher? Why or why not?
- 4. Yield to Maturity** Treasury bid and ask quotes are sometimes given in terms of yields, so there would be a bid yield and an ask yield. Which do you think would be larger? Explain.
- 5. Call Provisions** A company is contemplating a long-term bond issue. It is debating whether or not to include a call provision. What are the benefits to the company from including a call provision? What are the costs? How do these answers change for a put provision?
- 6. Coupon Rate** How does a bond issuer decide on the appropriate coupon rate to set on its bonds? Explain the difference between the coupon rate and the required return on a bond.
- 7. Real and Nominal Returns** Are there any circumstances under which an investor might be more concerned about the nominal return on an investment than the real return?
- 8. Bond Ratings** Companies pay rating agencies such as Moody's and S&P to rate their bonds, and the costs can be substantial. However, companies are not required to have their bonds rated in the first place; doing so is strictly voluntary. Why do you think they do it?
- 9. Bond Ratings** U.S. Treasury bonds are not rated. Why? Often, junk bonds are not rated. Why?
- 10. Term Structure** What is the difference between the term structure of interest rates and the yield curve?
- 11. Crossover Bonds** Looking back at the crossover bonds we discussed in the chapter, why do you think split ratings such as these occur?
- 12. Municipal Bonds** Why is it that municipal bonds are not taxed at the federal level, but are taxable across state lines? Why is it that U.S. Treasury bonds are not taxable at the state level? (You may need to dust off the history books for this one.)
- 13. Bond Market** What are the implications for bond investors of the lack of transparency in the bond market?
- 14. Treasury Market** All Treasury bonds are relatively liquid, but some are more liquid than others. Take a look back at Figure 7.4. Which issues appear to be the most liquid? The least liquid?
- 15. Rating Agencies** A controversy erupted regarding bond-rating agencies when some agencies began to provide unsolicited bond ratings. Why do you think this is controversial?
- 16. Bonds as Equity** The 100-year bonds we discussed in the chapter have something in common with junk bonds. Critics charge that, in both cases, the issuers are really selling equity in disguise. What are the issues here? Why would a company want to sell "equity in disguise"?

Questions and Problems

Basic

(Questions 1–14)

- 1. Interpreting Bond Yields** Is the yield to maturity on a bond the same thing as the required return? Is YTM the same thing as the coupon rate? Suppose today a 10 percent coupon bond sells at par. Two years from now, the required return on the same bond is 8 percent. What is the coupon rate on the bond now? The YTM?
- 2. Interpreting Bond Yields** Suppose you buy a 7 percent coupon, 20-year bond today when it's first issued. If interest rates suddenly rise to 15 percent, what happens to the value of your bond? Why?
- 3. Bond Prices** WMS, Inc., has 7 percent coupon bonds on the market that have 10 years left to maturity. The bonds make annual payments. If the YTM on these bonds is 9 percent, what is the current bond price?
- 4. Bond Yields** Finley Co. has 10 percent coupon bonds on the market with nine years left to maturity. The bonds make annual payments. If the bond currently sells for \$1,075.25, what is its YTM?
- 5. Coupon Rates** Mustaine Enterprises has bonds on the market making annual payments, with 13 years to maturity, and selling for \$850. At this price, the bonds yield 7.4 percent. What must the coupon rate be on Mustaine's bonds?
- 6. Bond Prices** Mullineaux Co. issued 11-year bonds one year ago at a coupon rate of 8.6 percent. The bonds make semiannual payments. If the YTM on these bonds is 7.5 percent, what is the current bond price?
- 7. Bond Yields** Clapper Corp. issued 12-year bonds 2 years ago at a coupon rate of 7.8 percent. The bonds make semiannual payments. If these bonds currently sell for 108 percent of par value, what is the YTM?
- 8. Coupon Rates** Barely Heroes Corporation has bonds on the market with 14.5 years to maturity, a YTM of 9 percent, and a current price of \$850. The bonds make semiannual payments. What must the coupon rate be on Barely Heroes' bonds?
- 9. Calculating Real Rates of Return** If Treasury bills are currently paying 8 percent and the inflation rate is 6 percent, what is the approximate real rate of interest? The exact real rate?
- 10. Inflation and Nominal Returns** Suppose the real rate is 3.5 percent and the inflation rate is 3 percent. What rate would you expect to see on a Treasury bill?
- 11. Nominal and Real Returns** An investment offers a 16 percent total return over the coming year. Alan Wingspan thinks the total real return on this investment will be only 10 percent. What does Alan believe the inflation rate will be over the next year?
- 12. Nominal versus Real Returns** Say you own an asset that had a total return last year of 13 percent. If the inflation rate last year was 4 percent, what was your real return?
- 13. Using Treasury Quotes** Locate the Treasury issue in Figure 7.4 maturing in November 2016. Is this a note or a bond? What is its coupon rate? What is its bid price? What was the *previous day's* asked price?
- 14. Using Treasury Quotes** Locate the Treasury bond in Figure 7.4 maturing in November 2026. Is this a premium or a discount bond? What is its current yield? What is its yield to maturity? What is the bid-ask spread?

Intermediate
(Questions 15–25)

- 15. Bond Price Movements** Bond X is a premium bond making annual payments. The bond pays a 9 percent coupon, has a YTM of 7 percent, and has 13 years to maturity. Bond Y is a discount bond making annual payments. This bond pays a 7 percent coupon, has a YTM of 9 percent, and also has 13 years to maturity. If interest rates remain unchanged, what do you expect the price of these bonds to be one year from now? In three years? In eight years? In 12 years? In 13 years? What's going on here? Illustrate your answers by graphing bond prices versus time to maturity.
- 16. Interest Rate Risk** Both Bond Bob and Bond Tom have 8 percent coupons, make semiannual payments, and are priced at par value. Bond Bob has 2 years to maturity, whereas Bond Tom has 15 years to maturity. If interest rates suddenly rise by 2 percent, what is the percentage change in the price of Bond Bob? Of Bond Tom? If rates were to suddenly fall by 2 percent instead, what would the percentage change in the price of Bond Bob be then? Of Bond Tom? Illustrate your answers by graphing bond prices versus YTM. What does this problem tell you about the interest rate risk of longer-term bonds?
- 17. Interest Rate Risk** Bond J is a 5 percent coupon bond. Bond K is an 11 percent coupon bond. Both bonds have 8 years to maturity, make semiannual payments, and have a YTM of 8 percent. If interest rates suddenly rise by 2 percent, what is the percentage price change of these bonds? What if rates suddenly fall by 2 percent instead? What does this problem tell you about the interest rate risk of lower-coupon bonds?
- 18. Bond Yields** Lifehouse Software has 10 percent coupon bonds on the market with 7 years to maturity. The bonds make semiannual payments and currently sell for 104 percent of par. What is the current yield on Lifehouse's bonds? The YTM? The effective annual yield?
- 19. Bond Yields** BDJ Co. wants to issue new 10-year bonds for some much-needed expansion projects. The company currently has 8 percent coupon bonds on the market that sell for \$1,095, make semiannual payments, and mature in 10 years. What coupon rate should the company set on its new bonds if it wants them to sell at par?
- 20. Finding the Bond Maturity** Massey Co. has 12 percent coupon bonds making annual payments with a YTM of 9 percent. The current yield on these bonds is 9.80 percent. How many years do these bonds have left until they mature?
- 21. Using Bond Quotes** Suppose the following bond quote for IOU Corporation appears on the financial page of today's newspaper. If this bond has a face value of \$1,000, what closing price appeared in *yesterday's* newspaper?

Bonds	Cur Yld	Vol	Close	Net Chg
IOU 7% s11	9.4	10	??	- $\frac{1}{2}$

- 22. Bond Prices versus Yields**
- What is the relationship between the price of a bond and its YTM?
 - Explain why some bonds sell at a premium over par value while other bonds sell at a discount. What do you know about the relationship between the coupon rate and the YTM for premium bonds? What about for discount bonds? For bonds selling at par value?

Intermediate*(continued)*

- c. What is the relationship between the current yield and YTM for premium bonds? For discount bonds? For bonds selling at par value?
23. **Interest on Zeroes** HSD Corporation needs to raise funds to finance a plant expansion, and it has decided to issue 20-year zero coupon bonds to raise the money. The required return on the bonds will be 9 percent.
- What will these bonds sell for at issuance?
 - Using the IRS amortization rule, what interest deduction can HSD Corporation take on these bonds in the first year? In the last year?
 - Repeat part (b) using the straight-line method for the interest deduction.
 - Based on your answers in (b) and (c), which interest deduction method would HSD Corporation prefer? Why?
24. **Zero Coupon Bonds** Suppose your company needs to raise \$10 million and you want to issue 30-year bonds for this purpose. Assume the required return on your bond issue will be 9 percent, and you're evaluating two issue alternatives: a 9 percent annual coupon bond and a zero coupon bond. Your company's tax rate is 35 percent.
- How many of the coupon bonds would you need to issue to raise the \$10 million? How many of the zeroes would you need to issue?
 - In 30 years, what will your company's repayment be if you issue the coupon bonds? What if you issue the zeroes?
 - Based on your answers in (a) and (b), why would you ever want to issue the zeroes? To answer, calculate the firm's aftertax cash outflows for the first year under the two different scenarios. Assume the IRS amortization rules apply for the zero coupon bonds.
25. **Finding the Maturity** You've just found a 10 percent coupon bond on the market that sells for par value. What is the maturity on this bond?
26. **Components of Bond Returns** Bond P is a premium bond with a 10 percent coupon. Bond D is a 6 percent coupon bond currently selling at a discount. Both bonds make annual payments, have a YTM of 8 percent, and have eight years to maturity. What is the current yield for Bond P? For Bond D? If interest rates remain unchanged, what is the expected capital gains yield over the next year for Bond P? For Bond D? Explain your answers and the interrelationship among the various types of yields.
27. **Holding Period Yield** The YTM on a bond is the interest rate you earn on your investment if interest rates don't change. If you actually sell the bond before it matures, your realized return is known as the holding period yield (HPY).
- Suppose that today you buy a 9 percent coupon bond making annual payments for \$1,150. The bond has 10 years to maturity. What rate of return do you expect to earn on your investment?
 - Two years from now, the YTM on your bond has declined by 1 percent, and you decide to sell. What price will your bond sell for? What is the HPY on your investment? Compare this yield to the YTM when you first bought the bond. Why are they different?
28. **Valuing Bonds** The Moulon Rouge Corporation has two different bonds currently outstanding. Bond M has a face value of \$20,000 and matures in 20 years. The bond makes no payments for the first six years, then pays \$1,000 every six months over the subsequent eight years, and finally pays \$1,750 every six

Challenge*(Questions 26–29)*

months over the last six years. Bond N also has a face value of \$20,000 and a maturity of 20 years; it makes no coupon payments over the life of the bond. If the required return on both these bonds is 12 percent compounded semiannually, what is the current price of Bond M? Of Bond N?

29. **Valuing the Call Feature** Consider the prices on the following three Treasury issues as of February 24, 2002:

6½	May 08n	106:10	106:12	-13	5.28
8½	May 03-08	103:14	103:16	-3	5.24
12	May 08	134:25	134:31	-15	5.32

Notice that the bond in the middle is callable. What is the implied value of the call feature? (Hint: Is there a way to combine the two noncallable issues to create an issue that has the same coupon as the callable bond?)

1. **Bond Ratings** Look up Coca-Cola (KO), Gateway (GTW), Callaway Golf (ELY), and Navistar International (NAV). For each company, follow the “Financial Highlights” link and find the bond rating. Which companies have an investment grade rating? Which companies are rated below investment grade? Are any unrated? When you find the credit rating for one of the companies, click on the “S&P Issuer Credit Rating” link. What are the three considerations listed that Standard & Poor’s uses to issue a credit rating?

- 7.1 **Bond Quotes** You can find current bond prices at www.bondsonline.com. You want to find the bond prices and yields for bonds issued by Georgia Pacific. To find these bonds at the site, click the “Bond Search” link, then the “Corporate” link. Type “Georgia Pacific” in the issue block, select “All” on the pull-down menu, and hit “Find Bonds.” What is the shortest maturity bond issued by Georgia Pacific that is being offered for sale? What is the longest maturity bond? What are the credit ratings for Georgia Pacific’s bonds? Do all of the bonds have the same credit rating? Why do you think this is?

- 7.2 **Bond Pricing** You can find an online bond calculator at www.smartmoney.com. Follow the “Economy & Bonds” link and then click on the “Bond Calculator” link. What is the YTM for a bond that matures in August 2015 with a coupon rate of 9 percent and current price of 104.5? What about a bond with the same coupon and price that matures in August 2028? Why don’t the bonds have the same price?

- 7.3 **Yield Curves** You can find information regarding the most current bond yields at money.cnn.com. Follow the “Bonds & Rates” link and the “Latest Rates” link. Graph the yield curve for U.S. Treasury bonds. What is the general shape of the yield curve? What does this imply about expected future inflation? Now graph the yield curve for AAA-, AA-, and A-rated corporate bonds. Is the corporate yield curve the same shape as the Treasury yield curve? Why or why not?

- 7.4 **Default Premiums** The St. Louis Federal Reserve Board has files listing historical interest rates on their web site www.stls.frb.org. Follow the link for

Challenge
(continued)

S&P Problem
STANDARD
& POOR’S

**What’s On
the Web**

“FRED” data, then “Interest Rates.” You will find listings for Moody’s Seasoned Aaa Corporate Bond Yield and Moody’s Seasoned Baa Corporate Bond Yield. A default premium can be calculated as the difference between the Aaa bond yield and the Baa bond yield. Calculate the default premium using these two bond indices for the most recent 36 months. Is the default premium the same for every month? Why do you think this is?



Spreadsheet Templates 7-5, 7-6, 7-7, 7-18, 7-27