

premium bonds
discount bonds
realized compound return
horizon analysis
reinvestment rate risk
credit risk

investment-grade bonds
speculative-grade or junk
bonds
sinking fund
subordination clauses
collateral

debenture
default premium
credit default swap (CDS)
collateralized debt obligations
(CDOs)

1. Define the following types of bonds:

- a. Catastrophe bond.
- b. Eurobond.
- c. Zero-coupon bond.
- d. Samurai bond.
- e. Junk bond.
- f. Convertible bond.
- g. Serial bond.
- h. Equipment obligation bond.
- i. Original issue discount bond.
- j. Indexed bond.
- k. Callable bond.
- l. Puttable bond.

2. Two bonds have identical times to maturity and coupon rates. One is callable at 105, the other at 110. Which should have the higher yield to maturity? Why?

3. The stated yield to maturity and realized compound yield to maturity of a (default-free) zero-coupon bond will always be equal. Why?

4. Why do bond prices go down when interest rates go up? Don't lenders like high interest rates?

5. A bond with an annual coupon rate of 4.8% sells for \$970. What is the bond's current yield?

6. Which security has a higher *effective* annual interest rate?

- a. A 3-month T-bill selling at \$97,645 with par value \$100,000.
- b. A coupon bond selling at par and paying a 10% coupon semiannually.

7. Treasury bonds paying an 8% coupon rate with *semiannual* payments currently sell at par value. What coupon rate would they have to pay in order to sell at par if they paid their coupons *annually*? (Hint: What is the effective annual yield on the bond?)

8. Consider a bond with a 10% coupon and with yield to maturity = 8%. If the bond's yield to maturity remains constant, then in 1 year, will the bond price be higher, lower, or unchanged? Why?

9. Consider an 8% coupon bond selling for \$953.10 with 3 years until maturity making *annual* coupon payments. The interest rates in the next 3 years will be, with certainty, $r_1 = 8\%$, $r_2 = 10\%$, and $r_3 = 12\%$. Calculate the yield to maturity and realized compound yield of the bond.

10. Assume you have a 1-year investment horizon and are trying to choose among three bonds. All have the same degree of default risk and mature in 10 years. The first is a zero-coupon bond that pays \$1,000 at maturity. The second has an 8% coupon rate and pays the \$80 coupon once per year. The third has a 10% coupon rate and pays the \$100 coupon once per year.

- a. If all three bonds are now priced to yield 8% to maturity, what are their prices?
- b. If you expect their yields to maturity to be 8% at the beginning of next year, what will their prices be then? What is your before-tax holding-period return on each bond? If your tax bracket is 30% on ordinary income and 20% on capital gains income, what will your after-tax rate of return be on each?
- c. Recalculate your answer to (b) under the assumption that you expect the yields to maturity on each bond to be 7% at the beginning of next year.

PROBLEM SETS

i. Basic

ii. Intermediate

11. A 20-year maturity bond with par value of \$1,000 makes semiannual coupon payments at a coupon rate of 8%. Find the bond equivalent and effective annual yield to maturity of the bond if the bond price is:
 - a. \$950.
 - b. \$1,000.
 - c. \$1,050.
12. Repeat Problem 11 using the same data, but assuming that the bond makes its coupon payments annually. Why are the yields you compute lower in this case?
13. Fill in the table below for the following zero-coupon bonds, all of which have par values of \$1,000.

Price	Maturity (years)	Bond-Equivalent Yield to Maturity
\$400	20	—
\$500	20	—
\$500	10	—
—	10	10%
—	10	8%
\$400	—	8%

14. Consider a bond paying a coupon rate of 10% per year semiannually when the market interest rate is only 4% per half-year. The bond has 3 years until maturity.
 - a. Find the bond's price today and 6 months from now after the next coupon is paid.
 - b. What is the total (6-month) rate of return on the bond?
15. A bond with a coupon rate of 7% makes semiannual coupon payments on January 15 and July 15 of each year. *The Wall Street Journal* reports the asked price for the bond on January 30 at 100:02. What is the invoice price of the bond? The coupon period has 182 days.
16. A bond has a current yield of 9% and a yield to maturity of 10%. Is the bond selling above or below par value? Explain.
17. Is the coupon rate of the bond in Problem 16 more or less than 9%?
18. Return to Table 14.1 and calculate both the real and nominal rates of return on the TIPS bond in the second and third years.
19. A newly issued 20-year maturity, zero-coupon bond is issued with a yield to maturity of 8% and face value \$1,000. Find the imputed interest income in the first, second, and last year of the bond's life.
20. A newly issued 10-year maturity, 4% coupon bond making *annual* coupon payments is sold to the public at a price of \$800. What will be an investor's taxable income from the bond over the coming year? The bond will not be sold at the end of the year. The bond is treated as an original-issue discount bond.
21. A 30-year maturity, 8% coupon bond paying coupons semiannually is callable in 5 years at a call price of \$1,100. The bond currently sells at a yield to maturity of 7% (3.5% per half-year).
 - a. What is the yield to call?
 - b. What is the yield to call if the call price is only \$1,050?
 - c. What is the yield to call if the call price is \$1,100, but the bond can be called in 2 years instead of 5 years?
22. A 10-year bond of a firm in severe financial distress has a coupon rate of 14% and sells for \$900. The firm is currently renegotiating the debt, and it appears that the lenders will allow the firm to reduce coupon payments on the bond to one-half the originally contracted amount. The firm can handle these lower payments. What is the stated and expected yield to maturity of the bonds? The bond makes its coupon payments annually.
23. A 2-year bond with par value \$1,000 making annual coupon payments of \$100 is priced at \$1,000. What is the yield to maturity of the bond? What will be the realized compound yield to maturity if the 1-year interest rate next year turns out to be (a) 8%, (b) 10%, (c) 12%?

24. Suppose that today's date is April 15. A bond with a 10% coupon paid semiannually every January 15 and July 15 is listed in *The Wall Street Journal* as selling at an asked price of 101:04. If you buy the bond from a dealer today, what price will you pay for it?
25. Assume that two firms issue bonds with the following characteristics. Both bonds are issued at par.

	ABC Bonds	XYZ Bonds
Issue size	\$1.2 billion	\$150 million
Maturity	10 years*	20 years
Coupon	9%	10%
Collateral	First mortgage	General debenture
Callable	Not callable	In 10 years
Call price	None	110
Sinking fund	None	Starting in 5 years

*Bond is extendible at the discretion of the bondholder for an additional 10 years.

Ignoring credit quality, identify four features of these issues that might account for the lower coupon on the ABC debt. Explain.

26. An investor believes that a bond may temporarily increase in credit risk. Which of the following would be the most liquid method of exploiting this?
- The purchase of a credit default swap.
 - The sale of a credit default swap.
 - The short sale of the bond.
27. Which of the following *most accurately* describes the behavior of credit default swaps?
- When credit risk increases, swap premiums increase.
 - When credit and interest rate risk increases, swap premiums increase.
 - When credit risk increases, swap premiums increase, but when interest rate risk increases, swap premiums decrease.
28. What would be the likely effect on the yield to maturity of a bond resulting from:
- An increase in the issuing firm's times-interest-earned ratio.
 - An increase in the issuing firm's debt-to-equity ratio.
 - An increase in the issuing firm's quick ratio.
29. A large corporation issued both fixed and floating-rate notes 5 years ago, with terms given in the following table:

	9% Coupon Notes	Floating-Rate Note
Issue size	\$250 million	\$280 million
Original maturity	20 years	10 years
Current price (% of par)	93	98
Current coupon	9%	8%
Coupon adjusts	Fixed coupon	Every year
Coupon reset rule	—	1-year T-bill rate + 2%
Callable	10 years after issue	10 years after issue
Call price	106	102.50
Sinking fund	None	None
Yield to maturity	9.9%	—
Price range since issued	\$85–\$112	\$97–\$102

- Why is the price range greater for the 9% coupon bond than the floating-rate note?
- What factors could explain why the floating-rate note is not always sold at par value?
- Why is the call price for the floating-rate note not of great importance to investors?

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- d. Is the probability of a call for the fixed-rate note high or low?
 - e. If the firm were to issue a fixed-rate note with a 15-year maturity, what coupon rate would it need to offer to issue the bond at par value?
 - f. Why is an entry for yield to maturity for the floating-rate note not appropriate?
30. Masters Corp. issues two bonds with 20-year maturities. Both bonds are callable at \$1,050. The first bond is issued at a deep discount with a coupon rate of 4% and a price of \$580 to yield 8.4%. The second bond is issued at par value with a coupon rate of 8¾%.
- a. What is the yield to maturity of the par bond? Why is it higher than the yield of the discount bond?
 - b. If you expect rates to fall substantially in the next 2 years, which bond would you prefer to hold?
 - c. In what sense does the discount bond offer “implicit call protection”?
31. A newly issued bond pays its coupons once annually. Its coupon rate is 5%, its maturity is 20 years, and its yield to maturity is 8%.
- a. Find the holding-period return for a 1-year investment period if the bond is selling at a yield to maturity of 7% by the end of the year.
 - b. If you sell the bond after 1 year, what taxes will you owe if the tax rate on interest income is 40% and the tax rate on capital gains income is 30%? The bond is subject to original-issue discount tax treatment.
 - c. What is the after-tax holding-period return on the bond?
 - d. Find the realized compound yield *before taxes* for a 2-year holding period, assuming that (1) you sell the bond after 2 years, (2) the bond yield is 7% at the end of the second year, and (3) the coupon can be reinvested for 1 year at a 3% interest rate.
 - e. Use the tax rates in (b) above to compute the *after-tax* 2-year realized compound yield. Remember to take account of OID tax rules.

iii. Challenge



1. Leaf Products may issue a 10-year maturity fixed-income security, which might include a sinking fund provision and either refunding or call protection.
 - a. Describe a sinking fund provision.
 - b. Explain the impact of a sinking fund provision on:
 - i. The expected average life of the proposed security.
 - ii. Total principal and interest payments over the life of the proposed security.
 - c. From the investor's point of view, explain the rationale for demanding a sinking fund provision.
2. Bonds of Zello Corporation with a par value of \$1,000 sell for \$960, mature in 5 years, and have a 7% annual coupon rate paid semiannually.
 - a. Calculate the:
 - i. Current yield.
 - ii. Yield to maturity (to the nearest whole percent, i.e., 3%, 4%, 5%, etc.).
 - iii. Realized compound yield for an investor with a 3-year holding period and a reinvestment rate of 6% over the period. At the end of 3 years the 7% coupon bonds with 2 years remaining will sell to yield 7%.
 - b. Cite one major shortcoming for each of the following fixed-income yield measures:
 - i. Current yield.
 - ii. Yield to maturity.
 - iii. Realized compound yield.
3. On May 30, 2008, Janice Kerr is considering one of the newly issued 10-year AAA corporate bonds shown in the following exhibit.

Description	Coupon	Price	Callable	Call Price
Sentinal, due May 30, 2018	6.00%	100	Noncallable	NA
Colina, due May 30, 2018	6.20%	100	Currently callable	102

- a. Suppose that market interest rates decline by 100 basis points (i.e., 1%). Contrast the effect of this decline on the price of each bond.
 - b. Should Kerr prefer the Colina over the Sentinal bond when rates are expected to rise or to fall?
 - c. What would be the effect, if any, of an increase in the *volatility* of interest rates on the prices of each bond?
4. A convertible bond has the following features:

Coupon	5.25%
Maturity	June 15, 2027
Market price of bond	\$77.50
Market price of underlying common stock	\$28.00
Annual dividend	\$1.20
Conversion ratio	20.83 shares

Calculate the conversion premium for this bond.

5. a. Explain the impact on the offering yield of adding a call feature to a proposed bond issue.
 - b. Explain the impact on the bond's expected life of adding a call feature to a proposed bond issue.
 - c. Describe one advantage and one disadvantage of including callable bonds in a portfolio.
6. a. An investment in a coupon bond will provide the investor with a return equal to the bond's yield to maturity at the time of purchase if:
- i. The bond is not called for redemption at a price that exceeds its par value.
 - ii. All sinking fund payments are made in a prompt and timely fashion over the life of the issue.
 - iii. The reinvestment rate is the same as the bond's yield to maturity and the bond is held until maturity.
 - iv. All of the above.
- b. A bond with a call feature:
- i. Is attractive because the immediate receipt of principal plus premium produces a high return.
 - ii. Is more apt to be called when interest rates are high because the interest savings will be greater.
 - iii. Will usually have a higher yield to maturity than a similar noncallable bond.
 - iv. None of the above.
- c. In which *one* of the following cases is the bond selling at a discount?
- i. Coupon rate is greater than current yield, which is greater than yield to maturity.
 - ii. Coupon rate, current yield, and yield to maturity are all the same.
 - iii. Coupon rate is less than current yield, which is less than yield to maturity.
 - iv. Coupon rate is less than current yield, which is greater than yield to maturity.
- d. Consider a 5-year bond with a 10% coupon that has a present yield to maturity of 8%. If interest rates remain constant, 1 year from now the price of this bond will be:
- i. Higher.
 - ii. Lower.
 - iii. The same.
 - iv. Par.

Credit Spreads

At www.bondsonline.com review the *Industrial Spreads* for various ratings (click the links on the left-side menus to follow the links to *Today's Markets*, *Corporate Bond Spreads*). These are spreads above U.S. Treasuries of comparable maturities. What factors tend to explain the yield differences? How might these yield spreads differ during an economic boom versus a recession?

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