GLOBAL EDITION

FINANCIAL MANAGEMENT

CORE CONCEPTS

FOURTH EDITION

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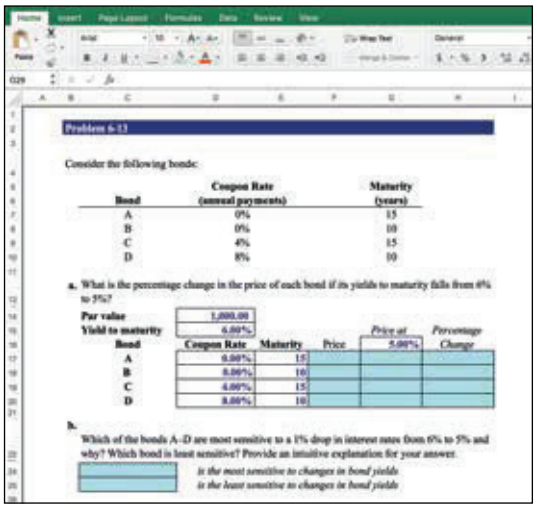

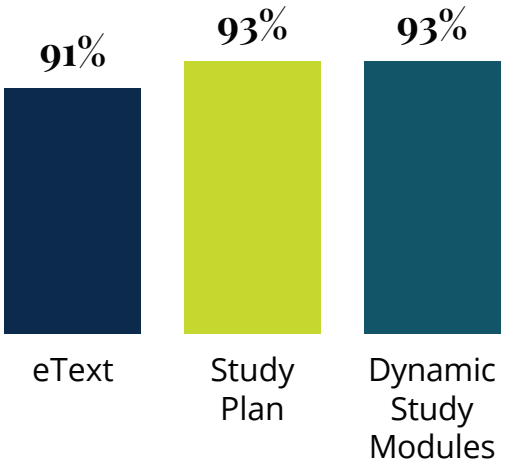

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bond becomes a **floating-rate bond**. A floating-rate bond's annual interest rate adjusts based on a benchmark rate such as the **prime rate**. The prime rate is the rate that banks charge their best customers for money. When the prime rate increases, the bond's coupon rate and coupon payment also increase. When the prime rate falls, the bond's coupon rate and coupon payment also fall.

We can also tie the payment schedule and coupon amount to a company's income. We call these types of bonds **income bonds**. Income bonds pay coupons based on the company's income. During periods of low income, the company reduces or eliminates coupon payments, which reduces the probability of default on an income bond, but also reduces its attractiveness.

The more creative the issuer gets with the bond's features, the more exotic the bond. In general, **exotic bonds** are bonds with special features distinct to that particular bond. For example, you could buy a bond in U.S. dollars, but receive your coupons and principal in euros. However, the more creative the issuer gets, the more difficult it is to price the bond and the harder it is to sell it. With these special features, the bond attracts fewer potential buyers and is less liquid.

You may not be an expert in bonds yet, but you should now be proficient at pricing standard bonds with their promised set of future cash payments. We will leave these creative features of bonds for another finance class.

6.6 U.S. Government Bonds

Both Treasury notes and Treasury bonds are semiannual bonds. Their only difference is the maturity or age of the financial asset. The U.S. government issues **Treasury notes** with maturities of between two years and ten years. It issues **Treasury bonds** with maturities of more than ten years. The **Treasury bill** is a short-term borrowing instrument with a maturity of less than one year. The Treasury issues one-month (four-week), three-month (thirteen-week), six-month (twenty-six-week), and one-year (fifty-two-week) Treasury bills. In addition to having shorter maturities than the Treasury notes and bonds, the Treasury bills are zero-coupon instruments in that they pay both the principal and the interest at maturity.

There are also **state bonds**, issued by individual state governments, and **municipal bonds** (sometimes called **munis**), issued by county, city, or local government agencies. To see municipal bonds at work in a job setting, read the "Putting Finance to Work" feature in this chapter. In addition, foreign corporations and governments issue **foreign bonds**.

Pricing a U.S. Government Note or Bond

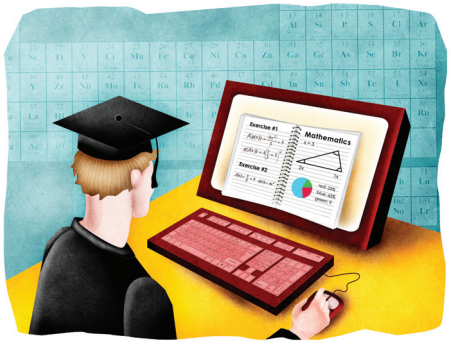
Suppose the U.S. government has announced that it intends to raise funds by selling a seven-year Treasury note with a 6% coupon rate with a par value of $100,000. Let's assume you want to buy one of these notes and want to earn 8% on it over the coming seven years. What price should you pay?

The same process applies here as with a corporate bond. The first step is to set up the cash flow from the note and then discount these future cash payments at the appropriate discount rate. The semiannual coupon payments are

$$\text{coupon payments} = \frac{\$100{,}000 \times 0.06}{2} = \$3{,}000$$

PUTTING FINANCE TO WORK

Municipal Manager



Whether you hail from a big city or a small town, you know that the financing of large capital projects is important to the smooth running of the community. There are schools, police stations, and libraries to renovate or build. The upkeep of water supplies and sewer systems and the paving and repair of roads can carry steep price tags. Current tax revenues cannot finance these items, and the availability of grants from the state or federal government is unpredictable.

Enter the municipal manager, whose job is not unlike that of a corporate CFO. Among their many financial responsibilities, these managers need to raise funds, and one of the chief ways they do it is by selling bonds.

Fortunately, municipalities have relatively easy access to capital markets. They cannot sell stock, of course, but even small and medium-size communities have better access to the bond markets than similar-sized corporations. High-income investors like to purchase municipal bonds and notes because the interest is often—but not always—exempt from federal, state, and city income taxes. The tax exemption means that the community can issue municipal bonds at lower coupon rates, yet still offer a higher after-tax yield than corporate bonds.

When they need to issue bonds, municipal managers face the same rating system that corporations face. To be marketable, one or more of the major rating agencies—Standard & Poor's, Moody's, and Fitch—must rate the bonds. To obtain a good rating, a community must have its fiscal house in order, which means adequate capacity to raise revenues through taxes, balanced budgets, manageable existing debt, stable population, and a qualified financial team. In addition, rating agencies can downgrade municipal bonds in status just as they do corporate bonds. For example, in 2009, in the face of a declining local economy and a $300 million budget deficit, Moody's and Standard & Poor's lowered Detroit's rating to junk bond status.

Municipal managers must decide whether to issue *general obligation bonds*, backed only by tax revenues; *revenue bonds*, which pay interest from some revenue source such as water and sewer fees; or *mortgage bonds*, secured by buildings or other assets. Then there is the marketing challenge: sewers and city streets are not as glamorous compared with most corporate assets.

A good understanding of bonds and debt markets is a must to become a municipal manager, whether in a big city or a small town. Salaries for municipal managers may not equal those in much of the corporate world, but most have comfortable incomes and excellent benefit packages. The knowledge, experience, and political contacts that these managers acquire in their positions can result in lucrative opportunities to move to the private sector, especially to banks, insurance companies, construction companies, and consulting firms that do business with municipal governments.

Figure 6.11 depicts the timing of the cash flow.

Method 2: Using the TVM keys

Mode: P/Y = 2 and C/Y = 2

Input	14	8.0	?	3,000	100,000
Key	N	I/Y	PV	PMT	FV
CPT			−89,436.88		

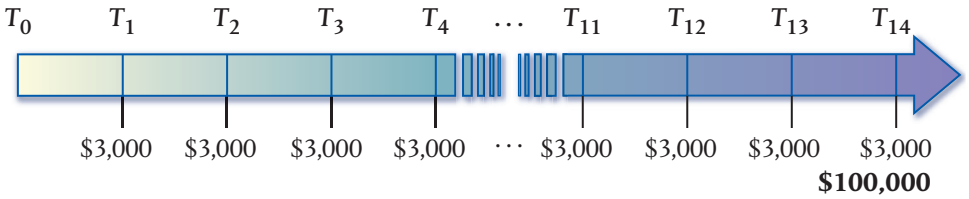


Figure 6.11 U.S. Treasury note cash flow.

Method 3: Using a spreadsheet

B6	*fx*	=PV(B1,B2,B3,B4,B5)

Use the present value function to find the price of the bond.

	A	B	C	D	E
1	Rate	0.04			
2	Nper	14			
3	Pmt	$ 3,000.00			
4	Fv	$ 100,000.00			
5	Type	0			
6	Pv	**($89,436.88)**			

Table 6.6 provides an abbreviated list of government notes and bonds.

Pricing a Treasury Bill

Treasury notes and bonds follow our standard bond pricing conventions using the time value of money equation from Chapters 3 and 4. Pricing Treasury bills is different. We price Treasury bills using a bank discount basis. We discount the Treasury bill price from its par value based on the discount rate and the days to maturity. This pricing technique ignores compounding and conventional return calculation methods, so it is important to review it.

Table 6.7 lists selected Treasury bills and their bank discount rates. We have selected these bank discount rates from the U.S. Treasury Web site's historical records. These reflect the rates during the first week of April for the year selected.

The bank discount rate is a special rate for Treasury bills. To find the price of the Treasury bill, you must discount its face value and adjust for the days to maturity with the bank discount rate. If we use $10,000 as the face value, we can

Table 6.6 Government Notes and Bonds, Prices as of April 8, 2008

Type	Issue Date	Price	Coupon Rate	Maturity Date	Yield to Maturity	Current Yield	Rating
Note	Feb 2000	105.84	6.50%	2-15-2010	3.952%	6.142%	AAA
Note	May 2005	99.19	4.125%	5-15-2013	4.248%	4.158%	AAA
Bond	Aug 1994	117.09	6.25%	8-15-2023	4.711%	5.337%	AAA
Bond	Feb 1985	144.17	11.25%	2-15-2015	4.250%	7.803%	AAA

Table 6.7 Selected Historical Treasury Bill Bank Discount Rates

Year	4-Week Treasury Bill	13-Week Treasury Bill	26-Week Treasury Bill
2005	2.61%	2.74%	3.04%
2006	4.58%	4.55%	4.68%
2007	5.03%	4.91%	4.88%
2008	1.53%	1.38%	1.50%
2009	0.18%	0.22%	0.41%
2010	0.16%	0.16%	0.24%
2011	0.03%	0.07%	0.15%
2012	0.05%	0.08%	0.14%
2013	0.06%	0.08%	0.11%
2014	0.02%	0.04%	0.06%

calculate the price of any of the thirty Treasury bills from Table 6.7. For example, let's look at the 2005 row and find the price of the four-week Treasury bill. The formula for the price is

$$\text{price} = \text{face value} \times \left[1 - \left(\text{discount rate} \times \frac{\text{days to maturity}}{360}\right)\right] \qquad \textbf{6.3}$$

For the four-week Treasury bill (at issue), the days to maturity would be twenty-eight, and the discount rate would be 0.0261 (2.61%):

$$\text{price} = \$10{,}000 \times \left[1 - \left(0.0261 \times \frac{28}{360}\right)\right] = \$9{,}979.70$$

or

$$\text{discount} = \text{face value} \times \text{discount rate} \times \frac{\text{days to maturity}}{360} \qquad \textbf{6.4}$$

$$= \$10{,}000 \times 0.0261 \times \frac{28}{360} = \$20.30$$

$$\text{price} = \$10{,}000 - \$20.30 = \$9{,}979.70$$

The bank discount rates are not consistent with our earlier treatment of interest rates. So let's find the rate that would be similar to our earlier treatment of yields and find the **bond equivalent yield (BEY)** of this Treasury bill. We will make two adjustments to the discount process. First, we will use the price instead of the par value as the initial investment (cost of the bond). Second, we will use 365 days for the year instead of 360.

Using the initial bond cost and the earned interest, we find the holding period return (HPR) of the investment:

$$HPR = \frac{\$10{,}000 - \$9{,}979.70}{\$9{,}979.70} = 0.002034129$$

Then, using the simple interest approach, we annualize the result:

$$BEY = 0.002034129 \times \frac{365}{28} = 0.026516328 \text{ or } \approx 2.65\%$$

Another way to find the BEY is to use the formula

$$BEY = \frac{365 \times \text{discount yield}}{360 - \text{days to maturity} \times \text{discount yield}}$$

$$= \frac{365 \times 0.0261}{360 - 28 \times 0.0261} = 0.026516328 \approx 2.65\% \qquad \textbf{6.5}$$

We have another name for the BEY, one we have met earlier in the text. It is the annual percentage rate (APR).

Why pay so much attention to the Treasury bill? The yield on the Treasury bill is a nominal risk-free rate. The U.S. government guarantees it. Its default premium is essentially zero, and we determine its interest at purchase as a discount bond. Thus, we know at purchase the guaranteed or risk-free return for buying a Treasury bill. In future chapters, when we need a risk-free rate, we will often use the yield on a Treasury bill.

To review this chapter, see the Summary Card at the end of the text.

KEY TERMS

basis point, p. 201
bearer bond, p. 203
bond, p. 185
bond equivalent yield (BEY), p. 210
callable bond, p. 205
collateral, p. 204
convertible bond, p. 206
corpus, p. 203
coupon, p. 185
coupon rate, p. 185
current yield, p. 186
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deed of trust, p. 204
discount bond, p. 199
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zero-coupon bond, p. 194

QUESTIONS

1. What is a bond? What determines the price of this financial asset?
2. What is the primary difference between an annual bond and a semiannual bond? What changes do you need to make in finding the price of a semiannual bond versus an annual bond?
3. When we talk about the yield of a bond, we usually mean the yield to maturity of the bond. Why?
4. Does a zero-coupon bond pay interest?
5. If a zero-coupon bond does not pay coupons each year, why buy it?
6. How does the potential for default of a bond affect the yield of the bond?
7. Why are some bonds sold at a premium, some at par value, and some at a discount?
8. How does collateral impact the price of a bond?
9. What role do Moody's, Standard & Poor's, and Fitch's bond ratings play in the pricing of a bond?
10. What must happen for us to call a bond a "fallen angel"?

PREPPING FOR EXAMS

1. Five years ago Thompson Tarps, Inc. issued twenty-five-year 10% annual coupon bonds with a $1,000 face value. Since then, interest rates in general have risen, and the yield to maturity on the Thompson Tarps bonds is now 12%. Given this information, what is the price today for a Thompson Tarps bond?

   a. $843.14
   b. $850.61
   c. $1,181.54
   d. $1,170.27

2. Endicott Enterprises, Inc. has issued thirty-year semiannual coupon bonds with a face value of $1,000. If the annual coupon rate is 14% and the current yield to maturity is 8%, what is the firm's current price per bond?

   a. $578.82
   b. $579.84
   c. $1,675.47
   d. $1,678.70

3. Benson Biometrics, Inc. has outstanding $1,000 face value 8% coupon bonds that make semiannual payments and have fourteen years remaining to maturity. If the current price for these bonds is $1,118.74, what is the annualized yield to maturity?

   a. 6.68%
   b. 6.67%
   c. 6.12%
   d. 6.00%

4. Delagold Corporation is issuing a zero-coupon bond that will have a maturity of fifty years. The bond's par value is $1,000, and the current yield on