CHAPTER 6

Bond Valuation

LEARNING OBJECTIVES

After studying this chapter, you should understand:

LO1 Important bond features and types of bond.
LO2 Bond values and yields, and why they fluctuate.
LO3 Bond ratings, and what they mean.
LO4 The impact of inflation on interest rates.
LO5 The term structure of interest rates, and the determinants of bond yields.

KEY NOTATIONS

C	Coupon
FV	Face value of bond
h	Inflation rate
PV	Present value
r	Interest rate or discount rate
t	Number of periods
YTM	Yield to maturity

IN ITS MOST BASIC FORM, a bond is a fairly simple thing. You lend a company some money, say €1,000. The company pays you interest regularly, and it repays the original loan amount of €1,000 at some point in the future. Bonds can also have complex features, and in 2008 a type of bond known as a *mortgage-backed security*, or *MBS*, caused havoc in the global financial system.

An MBS, as the name suggests, is a bond that is backed by a pool of home mortgages. The bondholders receive payments derived from payments on the underlying mortgages, and these payments can be divided up in various ways to create different classes of bond. Defaults on the underlying mortgages led to losses for MBS bondholders. Since most mortgage-backed securities were held and issued by banks, the collapse in the housing market (particularly in the US) led to a global credit crunch that nearly halted the whole financial system. Because some of the world's largest banks had to be rescued through state bail-outs, many governments had to implement stringent public sector spending cuts and tax increases to bring budgets back into balance. This was still affecting European countries in 2014, and the repercussions are likely to be felt for a number of years yet.

Our goal in this chapter is to introduce you to bonds. We begin by showing how the techniques we developed in Chapters 4 and 5 can be applied to bond valuation. From there, we go on to discuss bond features, and how bonds are bought and sold. One important thing we learn is that bond values depend, in large part, on interest rates. We therefore close the chapter with an examination of interest rates and their behaviour.

6.1 Bonds and Bond Valuation

When a corporation or government wishes to borrow money from the public on a long-term basis, it usually does so by issuing or selling debt securities that are generically called *bonds*. In this section we describe the various features of corporate bonds, and some of the terminology associated with bonds. We then discuss the cash flows associated with a bond, and how bonds can be valued using our discounted cash flow procedure.

Bond Features and Prices

coupon The stated interest payment made on a bond.

face value The principal amount of a bond that is repaid at the end of the term. Also called *par value*.

coupon rate The annual coupon divided by the face value of a bond.

maturity The specified date on which the principal amount of a bond is paid.

As we mentioned in our previous chapter, a bond is normally an interest-only loan, meaning that the borrower will pay the interest every period, but none of the principal will be repaid until the end of the loan. For example, suppose Conegliano plc wants to borrow £1,000 for 30 years. The interest rate on similar debt issued by similar corporations is 12 per cent. Conegliano will thus pay 0.12 × £1,000 = £120 in interest every year for 30 years. At the end of 30 years Conegliano will repay the £1,000. As this example suggests, a bond is a fairly simple financing arrangement. There is, however, a rich jargon associated with bonds, so we shall use this example to define some of the more important terms.

In our example, the £120 regular interest payments that Conegliano promises to make are called the bond's **coupons**. Because the coupon is constant and paid every year, the type of bond we are describing is sometimes called a *level coupon bond*. The amount that will be repaid at the end of the loan is called the bond's **face value**, or *par value*. As in our example, this par value is usually £1,000 for corporate bonds, and a bond that sells for its par value is called a *par value bond*. Government bonds frequently have much larger face, or par, values. Finally, the annual coupon divided by the face value is called the **coupon rate** on the bond: in this case, because £120/1,000 = 12%, the bond has a 12 per cent coupon rate.

The number of years until the face value is paid is called the bond's time to **maturity**. A corporate bond will frequently have a maturity of 30 years when it is originally issued, but this varies. Once the bond has been issued, the number of years to maturity declines as time goes by.

Bond Values and Yields

As time passes, interest rates change in the marketplace. The cash flows from a bond, however, stay the same. As a result, the value of the bond will fluctuate. When interest rates rise, the present value of the bond's remaining cash flows declines, and the bond is worth less. When interest rates fall, the bond is worth more.

To determine the value of a bond at a particular point in time, we need to know the number of periods remaining until maturity, the face value, the coupon, and the market interest rate for bonds with similar features. The interest rate required in the market on a bond is called the bond's **yield to maturity (YTM)**. This rate is sometimes called the bond's *yield* for short. Given all this information, we can calculate the present value of the cash flows as an estimate of the bond's current market value.

yield to maturity (YTM) The rate required in the market on a bond.

For example, suppose Conegliano plc were to issue a bond with 10 years to maturity. The Conegliano bond has an annual coupon of £80. Similar bonds have a yield to maturity of 8 per cent. Based on our preceding discussion, the Conegliano bond will pay £80 per year for the next 10 years in coupon interest. In 10 years, Conegliano will pay £1,000 to the owner of the bond. The cash flows from the bond are shown in Fig. 6.1. What would this bond sell for?

Cash flows

Year	0	1	2	3	4	5	6	7	8	9	10
Coupon		£80	£80	£80	£80	£80	£80	£80	£80	£80	£80
Face value											£1,000
		£80	£80	£80	£80	£80	£80	£80	£80	£80	£1,080

As shown, the Conegliano bond has an annual coupon of £80 and a face, or par, value of £1,000 paid at maturity in 10 years.

Figure 6.1 Cash flows for Conegliano plc bond

As illustrated in Fig. 6.1, the Conegliano bond's cash flows have an annuity component (the coupons) and a lump sum (the face value paid at maturity). We thus estimate the market value of the bond by calculating the present value of these two components separately and adding the results together. First, at the going rate of 8 per cent, the present value of the £1,000 paid in 10 years is

$$\text{Present value} = £1{,}000/1.08^{10} = £1{,}000/2.1589 = £463.19$$

Second, the bond offers £80 per year for 10 years; the present value of this annuity stream is

$$\begin{aligned}\text{Annuity present value} &= £80 \times (1 - 1/1.08^{10})/0.08 \\ &= £80 \times (1 - 1/2.1589)/0.08 \\ &= £80 \times 6.7101 \\ &= £536.81\end{aligned}$$

We can now add the values for the two parts together to get the bond's value:

$$\text{Total bond value} = £463.19 + 536.81 = £1{,}000$$

This bond sells for exactly its face value. This is not a coincidence. The going interest rate in the market is 8 per cent. Considered as an interest-only loan, what interest rate does this bond have? With an £80 coupon, this bond pays exactly 8 per cent interest only when it sells for £1,000.

To illustrate what happens as interest rates change, suppose a year has gone by. The Conegliano bond now has nine years to maturity. If the interest rate in the market has risen to 10 per cent, what will the bond be worth? To find out, we repeat the present value calculations with 9 years instead of 10, and a 10 per cent yield instead of an 8 per cent yield. First, the present value of the £1,000 paid in nine years at 10 per cent is

$$\text{Present value} = £1{,}000/1.10^{9} = £1{,}000/2.3579 = £424.10$$

Second, the bond now offers £80 per year for nine years; the present value of this annuity stream at 10 per cent is

$$\begin{aligned}\text{Annuity present value} &= £80 \times (1 - 1/1.10^{9})/0.10 \\ &= £80 \times (1 - 1/2.3579)/0.10 \\ &= £80 \times 5.7590 \\ &= £460.72\end{aligned}$$

We can now add the values for the two parts together to get the bond's value:

$$\text{Total bond value} = £424.10 + 460.72 = £884.82$$

Therefore the bond should sell for about £885. In the vernacular, we say that this bond, with its 8 per cent coupon, is priced to yield 10 per cent at £885.

The Conegliano plc bond now sells for less than its £1,000 face value. Why? The market interest rate is 10 per cent. Considered as an interest-only loan of £1,000, this bond pays only 8 per cent, its coupon rate. Because this bond pays less than the going rate, investors are willing to lend only something less than the £1,000 promised repayment. Because the bond sells for less than face value, it is said to be a *discount bond*.

The only way to get the interest rate up to 10 per cent is to lower the price to less than £1,000 so that the purchaser, in effect, has a built-in gain. For the Conegliano plc bond the price of £885 is £115 less than the face value, so an investor who purchased and kept the bond would get £80 per year and would have a £115 gain at maturity as well. This gain compensates the lender for the below-market coupon rate.

Another way to see why the bond is discounted by £115 is to note that the £80 coupon is £20 below the coupon on a newly issued par value bond, based on current market conditions. The bond would be worth £1,000 only if it had a coupon of £100 per year. In a sense, an investor who buys and keeps the bond gives up £20 per year for nine years. At 10 per cent, this annuity stream is worth

$$\begin{aligned}\text{Annuity present value} &= £20 \times (1 - 1/1.10^9)/0.10 \\ &= £20 \times 5.7590 \\ &= £115.18\end{aligned}$$

This is just the amount of the discount.

What would the Conegliano bond sell for if interest rates had dropped by 2 per cent instead of rising by 2 per cent? As you might guess, the bond would sell for more than £1,000. Such a bond is said to sell at a *premium*, and is called a *premium bond.*

This case is just the opposite of that of a discount bond. The Conegliano bond now has a coupon rate of 8 per cent when the market rate is only 6 per cent. Investors are willing to pay a premium to get this extra coupon amount. In this case, the relevant discount rate is 6 per cent, and there are nine years remaining. The present value of the £1,000 face amount is

$$\text{Present value} = £1{,}000/1.06^9 = £1{,}000/1.6895 = £591.89$$

The present value of the coupon stream is

$$\begin{aligned}\text{Annuity present value} &= £80 \times (1 - 1/1.06^9)/0.06 \\ &= £80 \times (1 - 1/1.6895)/0.06 \\ &= £80 \times 6.8017 \\ &= £544.14\end{aligned}$$

We can now add the values for the two parts together to get the bond's value:

$$\text{Total bond value} = £591.89 + 544.14 = £1{,}136.03$$

Total bond value is therefore about £136 in excess of par value. Once again, we can verify this amount by noting that the coupon is now £20 too high, based on current market conditions. The present value of £20 per year for nine years at 6 per cent is

$$\begin{aligned}\text{Annuity present value} &= £20 \times (1 - 1/1.06^9)/0.06 \\ &= £20 \times 6.8017 \\ &= £136.03\end{aligned}$$

This is just as we calculated.

Based on our examples, we can now write the general expression for the value of a bond. If a bond has (1) a face value of F paid at maturity, (2) a coupon of C paid per period, (3) t periods to maturity, and (4) a yield of r per period, its value is

$$\text{Bond value} = \underbrace{C \times \left[\frac{1 - 1/(1+r)^t}{r}\right]}_{\text{Present value of the coupons}} + \underbrace{\frac{F}{(1+r)^t}}_{\text{Present value of the face amount}} \qquad \textbf{(6.1)}$$

Example 6.1

Semi-annual Coupons

Many bonds make coupon payments twice a year. So, if an ordinary bond has a coupon rate of 14 per cent and a face value of £100,000, then the owner will get a total of £14,000 per year, but this £14,000 will come in two payments of £7,000 each. Suppose we are examining such a bond. The yield to maturity is quoted at 16 per cent.

Bond yields are presented in the same way as quoted rates, which is equal to the actual rate per period multiplied by the number of periods. In this case, with a 16 per cent quoted yield and semi-annual payments, the true yield is 8 per cent per six months. The bond matures in seven years. What is the bond's price? What is the effective annual yield on this bond?

Based on our discussion, we know the bond will sell at a discount, because it has a coupon rate of 7 per cent every six months when the market requires 8 per cent every six months. So, if our answer exceeds £100,000, we know we have made a mistake.

To get the exact price, we first calculate the present value of the bond's face value of £100,000 paid in seven years. This seven-year period has 14 periods of six months each. At 8 per cent per period, the value is

$$\text{Present value} = £100{,}000/1.08^{14} = £100{,}000/2.9372 = £34{,}046$$

The coupons can be viewed as a 14-period annuity of £7,000 per period. At an 8 per cent discount rate, the present value of such an annuity is

$$\begin{aligned}\text{Annuity present value} &= £7{,}000 \times (1 - 1/1.08^{14})/0.08\\ &= £7{,}000 \times (1 - 0.3405)/0.08\\ &= £7{,}000 \times 8.2442\\ &= £57{,}710\end{aligned}$$

The total present value gives us what the bond should sell for:

$$\text{Total present value} = £34{,}046 + 57{,}710 = £91{,}756$$

To calculate the effective yield on this bond, note that 8 per cent every six months is equivalent to

$$\text{Effective annual rate} = (1 + 0.08)^2 - 1 = 16.64\%$$

The effective yield, therefore, is 16.64 per cent.

As we have illustrated in this section, bond prices and interest rates always move in opposite directions. When interest rates rise, a bond's value, like any other present value, will decline. Similarly, when interest rates fall, bond values rise. Even if we are considering a bond that is riskless, in the sense that the borrower is certain to make all the payments, there is still risk in owning a bond. We discuss this next.

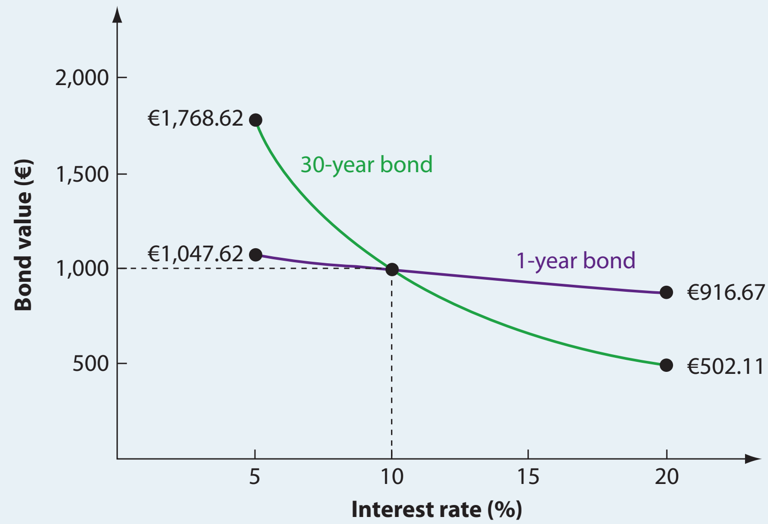
Interest Rate Risk

The risk that arises for bond owners from fluctuating interest rates is called *interest rate risk*. How much interest rate risk a bond has depends on how sensitive its price is to interest rate changes. This sensitivity depends directly on two things: the time to maturity and the coupon rate. As we shall see shortly, you should keep the following in mind when looking at a bond:

1. All other things being equal, the longer the time to maturity, the greater the interest rate risk.
2. All other things being equal, the lower the coupon rate, the greater the interest rate risk.

We illustrate the first of these two points in Fig. 6.2. As shown, we compute and plot prices under different interest rate scenarios for 10 per cent coupon bonds with maturities of one year and 30 years.

Figure



Value of a bond with a 10 per cent coupon rate for different interest rates and maturities

	Time to maturity	
Interest rate (%)	1 year	30 years
5	€1,047.62	€1,768.62
10	1,000.00	1,000.00
15	966.52	671.70
20	916.67	502.11

Figure 6.2 Interest rate risk and time to maturity

Notice how the slope of the line connecting the prices is much steeper for the 30-year maturity than it is for the one-year maturity. This steepness tells us that a relatively small change in interest rates will lead to a substantial change in the bond's value. In comparison, the one-year bond's price is relatively insensitive to interest rate changes.

Intuitively, we can see that longer-term bonds have greater interest rate sensitivity, because a large portion of a bond's value comes from the €1,000 face amount. The present value of this amount isn't greatly affected by a small change in interest rates if the amount is to be received in one year. Even a small change in the interest rate, however, once it is compounded for 30 years, can have a significant effect on the present value. As a result, the present value of the face amount will be much more volatile with a longer-term bond.

The other thing to know about interest rate risk is that, like most things in finance and economics, it increases at a decreasing rate. In other words, if we compared a 10-year bond with a one-year bond, we would see that the 10-year bond has much greater interest rate risk. However, if you were to compare a 20-year bond with a 30-year bond, you would find that the 30-year bond had somewhat greater interest rate risk because it has a longer maturity, but the difference in the risk would be fairly small.

The reason why bonds with lower coupons have greater interest rate risk is essentially the same. As we discussed earlier, the value of a bond depends on the present value of its coupons and the present value of the face amount. If two bonds with different coupon rates have the same maturity, then the value of the one with the lower coupon is proportionately more dependent on the face amount to be received at maturity. As a result, all other things being equal, its value will fluctuate more as interest rates change. Put another way, the bond with the higher coupon has a larger cash flow early in its life, so its value is less sensitive to changes in the discount rate.

Bonds are rarely issued with maturities longer than 30 years. However, low interest rates in recent years have led to the issuance of much longer-term issues. Since 2005, several European governments have issued 50-year bonds and China issued its first 50-year bond at the end of 2009. These countries evidently wanted to lock in the historically low interest rates for a *long* time.

Finding the Yield to Maturity: More Trial and Error

Frequently, we will know a bond's price, coupon rate and maturity date, but not its yield to maturity. For example, suppose we are interested in a six-year, 8 per cent coupon bond. A broker quotes a price of £955.14 for a bond with face value of £1,000. What is the yield on this bond?

We've seen that the price of a bond can be written as the sum of its annuity and lump sum components. Knowing that there is an £80 coupon for six years and a £1,000 face value, we can say that the price is

$$£955.14 = £80 \times \left[\frac{1 - 1/(1+r)^6}{r}\right] + \frac{1{,}000}{(1+r)^6}$$

where r is the unknown discount rate, or yield to maturity. We have one equation here and one unknown, but we cannot solve it for r explicitly. The only way to find the answer is to use trial and error.

This problem is essentially identical to the one we examined in the last chapter when we tried to find the unknown interest rate on an annuity. However, finding the rate (or yield) on a bond is even more complicated, because of the £1,000 face amount.

We can speed up the trial-and-error process by using what we know about bond prices and yields. In this case, the bond has an £80 coupon and is selling at a discount. We thus know that the yield is greater than 8 per cent. If we compute the price at 10 per cent:

$$\begin{aligned}\text{Bond value} &= £80 \times (1 - 1/1.10^6)/0.10 + 1{,}000/1.10^6 \\ &= £80 \times 4.3553 + 1{,}000/1.7716 \\ &= £912.89\end{aligned}$$

At 10 per cent, the value we calculate is lower than the actual price, so 10 per cent is too high. The true yield must be somewhere between 8 and 10 per cent. At this point, it's 'plug and chug' to find the answer. You would probably want to try 9 per cent next. If you did, you would see that this is in fact the bond's yield to maturity.

A bond's yield to maturity should not be confused with its **current yield**, which is simply a bond's annual coupon divided by its price. In the previous example the bond's annual coupon was £80, and its price was £955.14. Given these numbers, we see that the current yield is £80/955.14 = 8.38 per cent, which is less than the yield to maturity of 9 per cent. The reason why the current yield is too low is that it considers only the coupon portion of your return; it doesn't consider the built-in gain from the price discount. For a premium bond the reverse is true, meaning that current yield would be higher because it ignores the built-in loss.

Our discussion of bond valuation is summarized in Table 6.1.

current yield A bond's annual coupon divided by its price.

Table

Finding the value of a bond
Bond value = $C \times [1 - 1/(1+r)^t]/r + F/(1+r)^t$ where: C = coupon paid each period r = rate per period t = number of periods F = bond's face value
Finding the yield on a bond
Given a bond value, coupon, time to maturity and face value, it is possible to find the implicit discount rate, or yield to maturity, by trial and error only. To do this, try different discount rates until the calculated bond value equals the given value (or let a financial calculator do it for you). Remember that increasing the rate decreases the bond value.

Table 6.1 Summary of bond valuation

Example 6.2

Current Events

A bond has a quoted price of £108,042. It has a face value of £100,000, a semi-annual coupon of £3,000, and a maturity of five years. What is its current yield? What is its yield to maturity? Which is bigger? Why?

Notice that this bond makes semi-annual payments of £3,000, so the annual payment is £6,000. The current yield is thus £6,000/108,042 = 5.55 per cent. To calculate the yield to maturity, refer back to Example 6.1. In this case the bond pays £3,000 every six months, and has 10 six-month periods until maturity. So we need to find *r* as follows:

$$£108{,}042 = £3{,}000 \times [1 - 1/(1 + r)^{10}]/r + 100{,}000/(1 + r)^{10}$$

After some trial and error we find that *r* is equal to 2.1 per cent. But the tricky part is that this 2.1 per cent is the yield *per six months*. We have to double it to get the yield to maturity, so the yield to maturity is 4.2 per cent, which is less than the current yield. The reason is that the current yield ignores the built-in loss of the premium between now and maturity.

Example 6.3

Bond Yields

You're looking at two bonds identical in every way except for their coupons and, of course, their prices. Both have 12 years to maturity. The first bond has a 10 per cent annual coupon rate and sells for £93,508. The second has a 12 per cent annual coupon rate. What do you think it would sell for?

Because the two bonds are similar, they will be priced to yield about the same rate. We first need to calculate the yield on the 10 per cent coupon bond. Proceeding as before, we know that the yield must be greater than 10 per cent, because the bond is selling at a discount. The bond has a fairly long maturity of 12 years. We've seen that long-term bond prices are relatively sensitive to interest rate changes, so the yield is probably close to 10 per cent. A little trial and error reveals that the yield is actually 11 per cent:

$$\begin{aligned}\text{Bond value} &= £10{,}000 \times (1 - 1/1.11^{12})/0.11 + 100{,}000/1.11^{12}\\ &= £10{,}000 \times 6.4924 + 100{,}000/3.4985\\ &= £64{,}924 + 28{,}584\\ &= £93{,}508\end{aligned}$$

With an 11 per cent yield, the second bond will sell at a premium because of its £12,000 coupon. Its value is:

$$\begin{aligned}\text{Bond value} &= £12{,}000 \times (1 - 1/1.11^{12})/0.11 + 100{,}000/1.11^{12}\\ &= £12{,}000 \times 6.4924 + 100{,}000/3.4985\\ &= £77{,}908 + 28{,}584\\ &= £106{,}492\end{aligned}$$

Spreadsheet Strategies 6.1

How to Calculate Bond Prices and Yields Using a Spreadsheet

Most spreadsheets have fairly elaborate routines available for calculating bond values and yields; many of these routines involve details we have not discussed. However, setting up a simple spreadsheet to calculate prices or yields is straightforward, as our next two spreadsheets show.

Suppose we have a bond with 22 years to maturity, a coupon rate of 8 per cent, and a yield to maturity of 9 per cent. If the bond makes semi-annual payments, what is its price today?

B8 fx =PRICE(B1,B2,B3,B4,B5,B6)

	A	B	C
1	Settlement Date	01/01/2014	
2	Maturity Date	01/01/2036	
3	Annual Coupon Rate	8%	
4	Yield to Maturity	9%	
5	Face Value (% of Par)	100	
6	Coupons per Year	2	
7			
8	Bond Price (% of Par)	90.49	
9			

The formula for the bond price is given in the formula bar, and is '=PRICE(B1,B2,B3,B4,B5,B6)'. In our spreadsheet, notice that we had to enter two dates: a settlement date and a maturity date. The settlement date is just the date when you actually pay for the bond, and the maturity date is the day the bond actually matures. In most of our problems we don't explicitly have these dates, so we have to make them up. For example, because our bond has 22 years to maturity, we just picked 1/1/2014 (1 January 2014) as the settlement date and 1/1/2036 (1 January 2036) as the maturity date. Any two dates would do as long as they are exactly 22 years apart, but these are particularly easy to work with. Finally, notice that we had to enter the coupon rate and yield to maturity in annual terms and then explicitly provide the number of coupon payments per year.

Now suppose we have a bond with 22 years to maturity, a coupon rate of 8 per cent, and a price of €960.17. If the bond makes semi-annual payments, what is its yield to maturity?

	A	B
1	Settlement Date	01/01/2014
2	Maturity Date	01/01/2036
3	Annual Coupon Rate	8%
4	Bond Price (% of Par)	96.02
5	Face Value (% of Par)	100
6	Coupons per Year	2
7		
8	Yield to Maturity	8.40%
9		

The formula for yield to maturity is '=YIELD(B1,B2,B3,B4,B5,B6)'.

Concept Questions

6.1a What are the cash flows associated with a bond?

6.1b What is the general expression for the value of a bond?

6.1c Is it true that the only risk associated with owning a bond is that the issuer will not make all the payments? Explain.

6.2 More about Bond Features

In this section we continue our discussion of corporate debt by describing in some detail the basic terms and features that make up a typical long-term corporate bond. We discuss additional issues associated with long-term debt in subsequent sections.

Securities issued by corporations may be classified roughly as *equity securities* or *debt securities.* At the crudest level, a debt represents something that must be repaid; it is the result of borrowing money. When corporations borrow, they generally promise to make regularly scheduled interest payments, and to repay the original amount borrowed (that is, the principal). The person or firm making the loan is called the *creditor* or *lender*. The corporation borrowing the money is called the *debtor* or *borrower*.

From a financial point of view, the main differences between debt and equity are the following.

1 Debt is not an ownership interest in the firm. Creditors generally do not have voting power.
2 The corporation's payment of interest on debt is considered a cost of doing business, and is fully tax deductible. Dividends paid to shareholders are *not* tax deductible.
3 Unpaid debt is a liability of the firm. If it is not paid, the creditors can legally claim the assets of the firm. This action can result in liquidation or reorganization, two of the possible consequences of bankruptcy. Thus one of the costs of issuing debt is the possibility of financial failure. This possibility does not arise when equity is issued.

Is It Debt or Equity?

Sometimes it is not clear whether a particular security is debt or equity. For example, suppose a corporation issues a perpetual bond with interest payable solely from corporate income if and only if earned. Whether this is really a debt is hard to say, and is primarily a legal and semantic issue. Courts and tax authorities would have the final say.

Corporations are adept at creating exotic, hybrid securities that have many features of equity but are treated as debt. Obviously, the distinction between debt and equity is important for tax purposes. So one reason why corporations try to create a debt security that is really equity is to obtain the tax benefits of debt and the bankruptcy benefits of equity.

As a general rule, equity represents an ownership interest, and it is a residual claim. This means that equity holders are paid after debt holders. As a result, the risks and benefits associated with owning debt and equity are different. To give just one example, note that the maximum reward for owning a debt security is ultimately fixed by the amount of the loan, whereas there is no upper limit to the potential reward from owning an equity interest.

Finance Insights

How do we value bonds and equities? Are bond values related to equity values? These are questions that continue to vex analysts as the FT article below testifies.

'Robert Shiller (Arthur M. Okun Professor of Economics, Yale University) has written today that the valuation of equities remains more expensive than its long term historical average, indicating that future returns on the asset class may be below average. But the picture changes if we compare equities to government bonds. Bonds are so expensive by comparison to their past history that they make any other asset look relatively cheap, and that especially applies to equities. This might imply that future returns on all asset classes will be disappointing, but equities are much better protected than government bonds or, for that matter, corporate and emerging market credit, where the "reach for yield" has become excessive.

Let me end with the usual warning that none of this constitutes any form of investment advice. Robert Shiller points out, rightly, that equities are far too volatile for that. However, the high profit share, and low risk free rates, are factors which argue that equities are not yet flying on thin air. If there is a valuation bubble, the data suggest that it is primarily in government bonds, not in developed market equities.'

Source: An excerpt from 'Do economic fundamentals underpin peak equities?' FT.com, March 2013.

Long-Term Debt: The Basics

Ultimately, all long-term debt securities are promises made by the issuing firm to pay principal when due, and to make timely interest payments on the unpaid balance. Beyond this, a number of features distinguish these securities from one another. We discuss some of these features next.

The maturity of a long-term debt instrument is the length of time the debt remains outstanding with some unpaid balance. Debt securities can be *short-term* (with maturities of one year or less) or *long-term* (with maturities of more than one year).[1] Short-term debt is sometimes referred to as *unfunded debt*.[2]

Debt securities are typically called *notes*, *debentures* or *bonds*. Strictly speaking, a bond is a secured debt. However, in common usage the word 'bond' refers to all kinds of secured and unsecured debt. We shall therefore continue to use the term generically to refer to long-term debt. Also, usually the only difference between a note and a bond is the original maturity. Issues with an original maturity of 10 years or less are often called notes. Longer-term issues are called bonds.

The two major forms of long-term debt are public issue and privately placed. We concentrate on public-issue bonds. Most of what we say about them holds true for private-issue, long-term debt as well. The main difference between public-issue and privately placed debt is that the latter is placed directly with a lender and not offered to the public. Because this is a private transaction, the specific terms are up to the parties involved.

There are many other aspects of long-term debt, including such things as security, call features, sinking funds, ratings and protective covenants. Table 6.2 illustrates these features for a bond issued by the Instituto de Crédito Oficial (ICO), the Spanish state financing organization. If some of these terms are unfamiliar, have no fear. We shall discuss them all presently.

Many of these features will be detailed in the bond indenture, so we discuss this first.

The Indenture

The **indenture** is the written agreement between the corporation (the borrower) and its creditors. It is sometimes referred to as the *deed of trust*.[3] Usually, a trustee (a bank, perhaps) is appointed by the corporation to represent the bondholders. The trust company must: (1) make sure the terms of the indenture are obeyed; (2) manage the sinking fund (described in the following pages); and (3) represent the bondholders in default – that is, if the company defaults on its payments to them.

indenture The written agreement between the corporation and the lender detailing the terms of the debt issue.

Table

Term		Explanation
Amount of issue	€1 billion	The company issued €1 billion worth of bonds.
Date of issue	03/02/2010	The bonds were sold on 3 February 2010.
Maturity	03/02/2015	The bonds mature on 3 February 2015.
Face value	€1,000	The denomination of the bonds is €1,000.
Annual coupon	3.25%	Each bondholder will receive €32.50 per bond per year (3.25% of face value).
Offer price	99.864%	The offer price was 99.864% of the €1,000 face value, or €998.64, per bond.
Coupon payment dates	1 August, 1 February	Coupons of €32.50/2 = €16.25 will be paid on these dates.
Security	None	The bonds are guaranteed by the Kingdom of Spain.
Sinking fund	None	The bonds have no sinking fund.
Call provision	None	The bonds do not have a call provision.
Rating	Moody's Aaa; S&P AA+; Fitch AAA	The bonds have a very high credit rating.

Table 6.2 Features of an ICO bond

The bond indenture is a legal document. It can run to several hundred pages, and generally makes for tedious reading. It is an important document, however, because it generally includes the following provisions:

1 The basic terms of the bonds
2 The total quantity of bonds issued
3 A description of property used as security
4 The repayment arrangements
5 The call provisions
6 Details of the protective covenants

We discuss these features next.

Terms of a Bond

Corporate bonds usually have a face value (that is, a denomination) in multiples of 1,000 (for example, €1,000, €10,000 or €50,000). This *principal value* is stated on the bond certificate. So, if a corporation wanted to borrow €1 million, 1,000 bonds with a face value of €1,000 would have to be sold. The par value (that is, the initial accounting value) of a bond is almost always the same as the face value, and the terms are used interchangeably in practice.

Corporate bonds are usually in **registered form**. For example, the indenture might read as follows:

> Interest is payable semi-annually on 1 July and 1 January of each year to the person in whose name the bond is registered at the close of business on 15 June or 15 December respectively.

This means that the company has a registrar who will record the ownership of each bond, and record any changes in ownership. The company will pay the interest and principal by cheque, mailed directly to the address of the owner of record. A corporate bond may be registered and have attached 'coupons'. To obtain an interest payment the owner must separate a coupon from the bond certificate and send it to the company registrar (the paying agent).

Alternatively, the bond could be in **bearer form**. This means that the certificate is the basic evidence of ownership, and the corporation will 'pay the bearer'. Ownership is not otherwise recorded, and as with a registered bond with attached coupons, the holder of the bond certificate detaches the coupons and sends them to the company to receive payment.

There are two drawbacks to bearer bonds. First, they are difficult to recover if they are lost or stolen. Second, because the company does not know who owns its bonds, it cannot notify bondholders of important events. Bearer bonds are very common in Europe, and London is the financial centre of trading in these securities.

registered form The form of bond issue in which the registrar of the company records ownership of each bond; payment is made directly to the owner of record.

bearer form The form of bond issue in which the bond is issued without record of the owner's name; payment is made to whomever holds the bond.

Security

Debt securities are classified according to the collateral and mortgages used to protect the bondholder.

Collateral is a general term that frequently means securities (for example, bonds and equities) that are pledged as security for payment of debt. For example, collateral trust bonds often involve a pledge of equity shares held by the corporation. However, the term 'collateral' is commonly used to refer to any asset pledged on a debt.

Mortgage securities are secured by a mortgage on the real property of the borrower. The property involved is usually real estate – for example, land or buildings. The legal document that describes the mortgage is called a *mortgage trust indenture* or *trust deed.*

Sometimes mortgages are on specific property. More often, blanket mortgages are used. A *blanket mortgage* pledges all the real property owned by the company.[4]

Bonds frequently represent unsecured obligations of the company. An **unsecured bond** is a bond in which no specific pledge of property is made. The term **note** is generally used for such instruments if the maturity of the unsecured bond is less than 10 or so years when the bond is originally issued. Unsecured bondholders have a claim only on property not otherwise pledged – in other words, the property that remains after mortgages and collateral trusts are taken into account.

unsecured bond An unsecured debt security, usually with a maturity of 10 years or more.

note An unsecured debt security, usually with a maturity under 10 years.

The terminology that we use here and elsewhere in this chapter is standard. However, across countries, these terms can have different meanings. For example, bonds ('gilts') issued by the British government are called treasury 'stock'. Also, in the United Kingdom, a debenture is a *secured* obligation, whereas in the US it is an *unsecured* obligation!

At present, public bonds issued in Europe by industrial and financial companies are typically unsecured.

sinking fund An account managed by the bond trustee for early bond redemption.

Seniority

In general terms, *seniority* indicates preference in position over other lenders, and debts are sometimes labelled as *senior* or *junior* to indicate seniority. Some debt is *subordinated*, as in, for example, a subordinated unsecured bond.

In the event of default, holders of subordinated debt must give preference to other specified creditors. Usually, this means that the subordinated lenders will be paid off only after the specified creditors have been compensated. However, debt cannot be subordinated to equity.

call provision An agreement giving the corporation the option to repurchase a bond at a specified price prior to maturity.

call premium The amount by which the call price exceeds the par value of a bond.

deferred call provision A call provision prohibiting the company from redeeming a bond prior to a certain date.

call-protected bond A bond that, during a certain period, cannot be redeemed by the issuer.

Repayment

Bonds can be repaid at maturity, at which time the bondholder will receive the stated, or face, value of the bond; or they may be repaid in part or in entirety before maturity. Early repayment in some form is more typical, and is often handled through a sinking fund.

A **sinking fund** is an account managed by the bond trustee for the purpose of repaying the bonds. The company makes annual payments to the trustee, who then uses the funds to retire a portion of the debt. The trustee does this either by buying up some of the bonds in the market, or by calling in a fraction of the outstanding bonds. This second option is discussed in the next section.

There are many different kinds of sinking fund arrangement, and the details would be spelled out in the indenture. For example:

1. Some sinking funds start about 10 years after the initial issuance.
2. Some sinking funds establish equal payments over the life of the bond.
3. Some high-quality bond issues establish payments to the sinking fund that are not sufficient to redeem the entire issue. As a consequence, there is the possibility of a large 'balloon payment' at maturity.

The Call Provision

A **call provision** allows the company to repurchase or 'call' part or all of the bond issue at stated prices over a specific period. Corporate bonds are usually callable.

Generally, the call price is above the bond's stated value (that is, the par value). The difference between the call price and the stated value is the **call premium**. The amount of the call premium may become smaller over time. One arrangement is initially to set the call premium equal to the annual coupon payment, and then make it decline to zero as the call date moves closer to the time of maturity.

Call provisions are often not operative during the first part of a bond's life. This makes the call provision less of a worry for bondholders in the bond's early years. For example, a company might be prohibited from calling its bonds for the first 10 years. This is a **deferred call provision**. During this period of prohibition the bond is said to be **call protected**.

In recent years a new type of call provision, a 'make-whole' call, has become widespread in the corporate bond market. With such a feature, bondholders receive approximately what the bonds are worth if they are called. Because bondholders don't suffer a loss in the event of a call, they are 'made whole'.

protective covenant A part of the indenture limiting certain actions that might be taken during the term of the loan, usually to protect the lender's interest.

Protective Covenants

A **protective covenant** is that part of the indenture or loan agreement that limits certain actions a company might otherwise wish to take during the term of the loan. Protective covenants can be classified into two types: negative covenants and positive (or affirmative) covenants.

A *negative covenant* is a 'thou shalt not' type of covenant. It limits or prohibits actions the company might take. Here are some typical examples:

- The firm must limit the amount of dividends it pays according to some formula.
- The firm cannot pledge any assets to other lenders.
- The firm cannot merge with another firm.
- The firm cannot sell or lease any major assets without approval by the lender.
- The firm cannot issue additional long-term debt.

A *positive covenant* is a 'thou shalt' type of covenant. It specifies an action the company agrees to take, or a condition the company must abide by. Here are some examples:

- The company must maintain its working capital at or above some specified minimum level.
- The company must periodically furnish audited financial statements to the lender.
- The firm must maintain any collateral or security in good condition.

This is only a partial list of covenants; a particular indenture may feature many different ones.

Concept Questions

6.2a What are the distinguishing features of debt compared with equity?
6.2b What is the indenture? What are protective covenants? Give some examples.
6.2c What is a sinking fund?

6.3 Bond Ratings

Firms frequently pay to have their debt rated. The three leading bond-rating firms are Moody's, Standard & Poor's (S&P) and Fitch. The debt ratings are an assessment of the creditworthiness of the corporate issuer. The definitions of creditworthiness used by Moody's, S&P and Fitch are based on how likely the firm is to default, and on the protection that creditors have in the event of a default.

It is important to recognize that bond ratings are concerned *only* with the possibility of default. Earlier we discussed interest rate risk, which we defined as the risk of a change in the value of a bond resulting from a change in interest rates. Bond ratings do not address this issue. As a result, the price of a highly rated bond can still be quite volatile.

Bond ratings are constructed from information supplied by the corporation. The rating classes, and some information concerning them, are shown in Table 6.3.

The highest rating a firm's debt can have is AAA or Aaa, and such debt is judged to be the best quality and to have the lowest degree of risk. A large part of corporate borrowing takes the form of low-grade, or 'junk', bonds. If these low-grade corporate bonds are rated at all, they are rated below investment grade by the major rating agencies. Investment-grade bonds are bonds rated at least BBB by S&P and Fitch, or Baa by Moody's.

A bond's credit rating can change as the issuer's financial strength improves or deteriorates. For example, in 2013 Fitch downgraded Sony and Panasonic long-term debt to junk bond status. Bonds that drop into junk territory like this are called *fallen angels*. The reason for the downgrades came from a perception by Fitch that both companies needed a fundamental restructuring of their activities to remain internationally competitive.

Determinants of Credit Ratings

Many factors can influence the credit rating that is awarded to a bond. Considering sovereign bonds (bonds issued by governments in local or foreign currency) first, the primary determinants are political risk, economic strength and growth prospects, government debt, and monetary and fiscal flexibility.

Table

	Investment-quality bond ratings				Low-quality, speculative and/or 'junk' bond ratings					
	High grade		Medium grade		Low grade		Very low grade			
Moody's	Aaa	Aa	A	Baa	Ba	B	Caa	Ca	C	
Standard & Poor's	AAA	AA	A	BBB	BB	B	CCC	CC	C	D
Fitch	AAA	AA+	A	BBB	BB	B	CCC			D

Moody's	S&P	Fitch	
Aaa	AAA	AAA	Debt rated Aaa and AAA has the highest rating. Capacity to pay interest and principal is extremely strong.
Aa	AA	AA+	Debt rated Aa, AA and AA+ has a very strong capacity to pay interest and repay principal. Together with the highest rating, this group constitutes the high-grade bond class.
A	A	A	Debt rated A has a strong capacity to pay interest and repay principal, although it is somewhat more susceptible to the adverse effects of changes in circumstances and economic conditions than debt in high-rated categories.
Baa	BBB	BBB	Debt rated Baa and BBB is regarded as having an adequate capacity to pay interest and repay principal. Whereas it normally exhibits adequate protection parameters, adverse economic conditions or changing circumstances are more likely to lead to a weakened capacity to pay interest and repay principal for debt in this category than in higher-rated categories. These bonds are medium-grade obligations.
Ba; B Caa Ca C	BB; B CCC CC C	BB; B CCC	Debt rated in these categories is regarded, on balance, as predominantly speculative with respect to capacity to pay interest and repay principal in accordance with the terms of the obligation. BB and Ba indicate the lowest degree of speculation, and Ca, CC, and C the highest degree of speculation. Although such debt is likely to have some quality and protective characteristics, these are outweighed by large uncertainties or major risk exposures to adverse conditions. Issues rated C by Moody's are typically in default.
	D	D	Debt rated D is in default, and payment of interest and/or repayment of principal is in arrears.

Note: At times, Moody's, S&P and Fitch use adjustments (called notches) to these ratings. S&P uses plus and minus signs: A+ is the strongest A rating and A– the weakest. Moody's uses a 1, 2, or 3 designation, with 1 being the highest.

Table 6.3 Bond ratings

Political risk relates to the stability of a country's government, transparency in government decisions, public security and corruption. Economic strength is fairly self-explanatory, but it also includes financial sector development, the efficiency of the public sector in a country, the income gap between rich and poor, and flexibility in workforce patterns. Monetary and fiscal flexibility means that the country's economy is less subject to economic cycles, plus central bank independence, timely, transparent and accountable government reporting, and a sustainable level of pension obligations.

Corporate bond ratings are driven by a number of other factors, but most notably the most important determinant is financial risk, and whether the company is able to meet its debt payments. Other firm-level factors relate to the company's debt burden, and whether it is growing or getting smaller. Planned and committed capital expenditures and forecast earnings performance can also impact upon a corporation's credit rating.

Macroeconomic factors can cause corporate credit ratings to change. For example, if inflation is expected to increase, the cost of borrowing will also increase, and this could affect a company's investment plans. More recently, global oil price demand has pushed the cost of manufacturing up, which has affected most firms. The strength of a country's currency is also important.

As you can see, many factors can influence the credit rating of a company's bond issue. Some factors are quantitative and easily measured, whereas others are very subjective and difficult to quantify. Credit ratings can be influenced by the economy, by an industry's prospects, by the issuing company's performance, and by the bond itself. With such complexity, it is understandable that companies and investors pay a lot of money to subscribe to credit rating agencies to access all of their services.

Concept Questions

6.3a What does a bond rating say about the risk of fluctuations in a bond's value resulting from interest rate changes?

6.3b What is a junk bond?

6.4 Some Different Types of Bond

Thus far we have considered only 'plain vanilla' corporate bonds. In this section we briefly look at the characteristics of bonds issued by governments, and also at bonds with unusual features.

Government Bonds

The biggest borrowers in the world – by a wide margin – are governments. According to *The Guardian*, European government borrowing in 2012 was €9.06 trillion, or about 82 per cent of GDP. Italy and Germany were the largest borrowers (€1.8 trillion), followed by France (€1.5 trillion), and the UK (€1.3 trillion) (source: www.guardian.co.uk). When a government wishes to borrow money for more than one year, it sells what are known as Treasury notes and bonds to the public (in fact, most governments do so every month). Treasury notes and bonds can have original maturities ranging from 2 to 100 years.

Most Treasury issues are just ordinary coupon bonds. Some older issues are callable, and a few have some unusual features. There are two important things to keep in mind, however. First, most government Treasury issues, unlike essentially all other bonds, have no default risk, because governments can always come up with the money to make the payments (i.e. print more money!). Countries in the European Monetary Union are an exception, because the European Central Bank decides on money supply, which means that individual countries in the EMU can have default risk. Second, many Treasury issues are exempt from income taxes.

In some countries, state and local governments also borrow money by selling notes and bonds. Such issues are called *municipal* notes and bonds, or just 'munis'. Unlike Treasury issues, munis have varying degrees of default risk, and in fact they are rated much like corporate issues. Also, they are almost always callable.

Zero Coupon Bonds

zero coupon bond A bond that makes no coupon payments and is thus initially priced at a deep discount. Also called *pure discount bonds.*

A bond that pays no coupons at all must be offered at a price that is much lower than its stated value. Such bonds are called **zero coupon bonds**, *pure discount bonds*, or just *zeros*.[5]

Suppose Bocelli SpA issues a €1,000 face value, five-year zero coupon bond. The initial price is set at €508.35. Even though no interest payments are made on the bond, zero coupon bond calculations use semi-annual periods to be consistent with coupon bond calculations. Using semi-annual periods, it is straightforward to verify that, at this price, the bond yields 14 per cent to maturity. The total interest paid over the life of the bond is €1,000 − 508.35 = €491.65.

For tax purposes, the issuer of a zero coupon bond deducts interest every year, even though no interest is actually paid. Similarly, the owner must pay taxes on interest accrued every year, even though no interest is actually received. The way in which the yearly interest on a zero coupon bond is calculated is governed by the tax law existing in each country.

Some bonds are zero coupon bonds for only part of their lives. For example, General Motors has a 40-year debenture outstanding that matures on 15 March 2036. For the first 20 years of its life no coupon payments are made but after 20 years it will begin paying coupons semi-annually at a rate of 7.75 per cent per year.

Floating-Rate Bonds

The conventional bonds we have talked about in this chapter have fixed obligations, because the coupon rates are set as fixed percentages of the par values. Similarly, the principal amounts are set equal to the par values. Under these circumstances, the coupon payments and principal are completely fixed.

With *floating-rate bonds (floaters)*, the coupon payments are adjustable. The adjustments are tied to an interest rate index such as the Treasury bill interest rate or the 30-year Treasury bond rate. The value of a floating-rate bond depends on exactly how the coupon payment adjustments are defined. In most cases the coupon adjusts with a lag to some base rate. For example, suppose a coupon rate adjustment is made on 1 June. The adjustment might be based on the simple average of Treasury bond yields during the previous three months. In addition, the majority of floaters have the following features:

1. The holder has the right to redeem the note at par on the coupon payment date after some specified amount of time. This is called a *put* provision, and is discussed in the following section.
2. The coupon rate has a floor and a ceiling, meaning that the coupon is subject to a minimum and a maximum. In this case the coupon rate is said to be 'capped', and the upper and lower rates are sometimes called the *collar*.

A particularly interesting type of floating-rate bond is an *inflation-linked* bond. Such bonds have coupons that are adjusted according to the rate of inflation (the principal amount may be adjusted as well). The UK and French governments are the biggest European issuers of inflation-linked bonds, and they are called inflation-linked gilts (ILGs) in the UK and OATi and OAT€i in France. Other countries, including the US, Germany, Greece, Italy and Iceland, have issued similar securities.

Other Types of Bond

Many bonds have unusual or exotic features. So-called *catastrophe*, or *cat*, *bonds* provide an interesting example. Catastrophe bonds are issued at a large discount to par value (are rated below investment grade) and lose all their value if there is a major specific catastrophe (such as a hurricane, flooding or earthquake) in a stated region.

Although the catastrophe bond market is very small, it is a fast-growing segment of the debt asset class. In 2012, about $8 billion of cat bonds were issued.

At this point, cat bonds probably seem pretty risky. It might therefore be surprising to learn that, since cat bonds were first issued in 1997, only one has not been paid in full. Because of Hurricane Katrina, bondholders in that one issue lost $190 million.

Another possible bond feature is a *warrant*. A warrant gives the buyer of a bond the right to purchase shares of equity in the company at a fixed price. Such a right would be very valuable if the share price climbed substantially (a later chapter discusses this subject in greater depth). Because of the value of this feature, bonds with warrants are often issued at a very low coupon rate.

As these examples illustrate, bond features are really limited only by the imaginations of the parties involved. Unfortunately, there are far too many variations for us to cover in detail here. We therefore close this discussion by mentioning a few of the more common types.

Income bonds are similar to conventional bonds, except that coupon payments depend on company income. Specifically, coupons are paid to bondholders only if the firm's income is sufficient. This would appear to be an attractive feature, but income bonds are not very common.

A *convertible bond* can be swapped for a fixed number of shares of equity any time before maturity at the holder's option. Convertibles are relatively common, but the number has been decreasing in recent years.

A *put bond* allows the *holder* to force the issuer to buy back the bond at a stated price. For example, 3i Group plc, the private equity firm, has bonds outstanding that allow the holder to force 3i Group to buy the bonds back at 100 per cent of face value if certain relevant 'risk' events happen. One such event is a change in credit rating by Moody's or S&P from investment grade to lower than investment grade. The put feature is therefore just the reverse of the call provision.

A given bond may have many unusual features. Two of the most recent exotic bonds are *CoCo bonds*, which have a coupon payment, and *NoNo bonds*, which are zero coupon bonds. CoCo and NoNo bonds are contingent convertible, puttable, callable, subordinated bonds. The contingent convertible clause is similar to the normal conversion feature, except that the contingent feature must be met. For example, a contingent feature may require that the company equity trade at 110 per cent of the conversion price for 20 out of the most recent 30 days. Because they are so complex, valuation of NoNo and CoCo bonds is exceptionally difficult.

Concept Questions

6.4a Why might an income bond be attractive to a corporation with volatile cash flows? Can you think of a reason why income bonds are not more popular?

6.4b What do you think would be the effect of a put feature on a bond's coupon? How about a convertibility feature? Why?

6.5 Bond Markets

Bonds are bought and sold in enormous quantities every day. You may be surprised to learn that the trading volume in bonds on a typical day is many, many times larger than the trading volume in equities (by *trading volume* we simply mean the amount of money that changes hands). Here is a finance trivia question: where does most trading of financial securities take place? Most people would guess the stock exchanges. In fact, the largest securities market in the world in terms of trading volume is the government treasury market.

How Bonds Are Bought and Sold

Most trading in bonds takes place over the counter, or OTC, which means there is no particular place where buying and selling occur. Instead, dealers around the world stand ready to buy and sell. The various dealers are connected electronically. In 2010 the London Stock Exchange introduced a new electronic trading system for bonds that allowed private investors to buy bonds in denominations of £1,000. This retail market for individuals, which now has over 170 bonds, was an innovation for UK bonds, since most British bonds have a face value of at least £50,000. In the Eurozone the main bond markets are Deutsche Börse and Euronext, where many corporate bonds are traded through an electronic trading system.

One reason why the bond markets are so big is that the number of bond issues far exceeds the number of equity issues. There are two reasons for this. First, a corporation would typically have only one ordinary equity issue outstanding (there are exceptions to this, which we discuss in our next chapter). However, a single large corporation could easily have a dozen or more note and bond issues outstanding. Beyond this, government and local borrowing is simply enormous. For example, many large cities will have a wide variety of notes and bonds outstanding, representing money borrowed to pay for things such as roads, sewers and schools. When you think about how many large cities there are in the world, you begin to get the picture!

Although the total volume of trading in bonds far exceeds that in equities, only a small fraction of the total bond issues that exist actually trade on a given day. This fact, combined with the lack of transparency in the bond market, means that it can be difficult or impossible to get up-to-date prices on individual bonds, particularly for smaller corporate or municipal issues. Instead, a variety of sources of estimated prices exist and are commonly used.

Bond Price Reporting

In recent years, transparency in the corporate bond market has improved dramatically. The advent of high-speed Internet connections has allowed real-time updates on bond prices and trading volumes directly from the stock exchange. Our nearby *Work the Web 6.1* box shows you how to get this information.

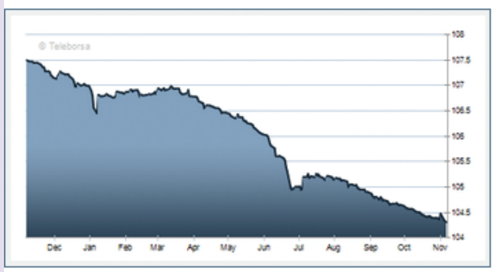
Work the Web 6.1

Bond quotes have become more available with the rise of the Internet. The best place to find current bond prices is the stock exchange itself. We went to the London Stock Exchange website and searched for bonds issued by Kingfisher plc. Here is a look at part of what we found:

52DJ KINGFISHER PLC 5.625% NTS 15/12/14

SUMMARY | INTERACTIVE CHART | PRICES AND TRADES | TECHNICAL ANALYSIS | NEWS ANALYSIS

Price	High	Low	Volume	Last close
104.31	104.50	104.28	-	104.31 on 06-Nov



Bid	103.56
Offer	105.06
Trading status	Regular Trading
Special conditions	NONE

As at 07-Nov-2013 08:25:23 - All data delayed by at least 15 minutes.
Prices displayed do not include any accrued interest payable.

TRADING INFORMATION

07-Nov-2013	
Country of share register	ZZ
Segment	UKCP
MiFID Status	Regulated Market
Exchange market size	10,000
SEDOL	3367348
ISIN number	XS0178322474

LAST 5 TRADES REFRESH MORE

Time/Date	Price	Volume	Trade value	Type
12:58:52 25-Oct-13	103.66	1,000	1,036.65	OK
16:27:54 13-Aug-13	105.00	5,000	5,250.00	LC
16:27:54 13-Aug-13	105.00	5,000	5,250.00	O
16:27:54 13-Aug-13	105.00	5,000	5,250.00	O
14:56:12 05-Jul-13	105.66	8,000	8,452.80	AT

BOND INFORMATION

Issue Date	21 Oct 2003
Maturity Date	15 Dec 2014
Coupon Value	+5.625%
Coupon Type	Fixed

Source: London Stock Exchange.

The bond has a coupon rate of 5.625 per cent and matures on 15 December 2014. The last sale on this bond was at a price of £104.31. Not only does the site provide the most recent price and yield information, it also provides more important information about the bond, such as the credit rating, coupon date, call date and call price. We'll leave it up to you to have a look at the page and the rest of the information available there.

Questions

1. Go to this website and find the bond shown above. When was this bond issued? What was the size of the bond issue? What were the yield to maturity and price when the bond was issued?
2. Search for HSBC bonds. Why do you think HSBC has issued so many different types of bond on the retail bond market?

As shown in Fig. 6.3 for Euronext bonds, stock exchanges provide a daily snapshot of trading in the most active issues. The information shown is largely self-explanatory. Notice that the price of the GlaxoSmithKline 5.25 per cent coupon bond was trading at 125.16 per cent of its face value, which reflects the fall in yields experienced by bonds of this type.

If you go to the website and click on a particular bond, you will get a lot of information about the bond, including the credit rating, the call schedule, original issue information and trade information.

As we mentioned before, the government Treasury market is the largest securities market in the world. As with bond markets in general, it is an OTC market, so there is limited transparency. However, unlike the situation with bond markets in general, trading in Treasury issues, particularly recently issued ones, is very heavy. Each day, representative prices for outstanding Treasury issues are reported.

Figure 6.4 shows a portion of the daily Treasury note and bond listings from the *Financial Times* website, ft.com. The entry that begins Tr 5pc '18 is highlighted. This information tells us that the bond will mature in 2018 and has a 5 per cent coupon. The next column is the price, which is £121.47. 'Day's chng' tells you that the price has fallen by £0.04 since the day before, but has increased by £0.15 over the previous week. 'Int yield' is the interest yield or current yield (%), and you can calculate this by dividing the coupon (£5) by the bond price (£121.47). The redemption yield, 'Red yield', is the internal rate of return or yield to maturity of the bond, assuming that the bond is held to maturity and all the coupon payments are paid on time. For the Tr 5pc '18 bond this is 0.81 per cent. UK Treasury bonds (gilts) all make semi-annual payments and have a face value of £100, so this bond will pay £2.50 per six months until it matures.

Figure

Code	ISIN	Name	Cur	Price	+/-	%+/-			
34MD	XS0381559979	GE CAP.UK 18	GBP	122.08	+0.09	+0.07			
92VF	XS0340495216	GE CAP.UK 33	GBP	121.69	+0.20	+0.16			
67GE	XS0357123131	GE CAP.UK 6.00%	GBP	101.74	-0.01	-0.01			
83IR	XS0297507773	GE CAP.UK5.625%	GBP	116.64	+0.12	+0.10			
31OL	XS0103214762	GKN 6.75% BDS19	GBP	113.68	+0.05	+0.04			
AG99	XS0140516864	GLAXOSMSC 5.25%	GBP	125.16	0.00	+0.00			
72VH	XS0184639895	HAMMERSON 6%26	GBP	122.38	+0.22	+0.18			
48LK	XS0085732716	HAMMERSON 7Q%28	GBP	133.86	+0.25	+0.19			
07OZ	XS0109514538	HAMMERSON6.875%	GBP	123.94	+0.07	+0.06			
31GZ	XS0043041879	HSBC 9SE%BD18	GBP	103.26	-0.01	-0.01			
HRMB	XS0773551972	HSBC BK. 2.875%	CNY	100.00	0.00	+0.00			
35LS	XS0174470764	HSBC BK.5.375%	GBP	111.02	+0.26	+0.24			
BR06	XS0088317853	HSBC BK.6.5%NT2	GBP	124.02	+0.18	+0.14			
IC55	XS0805454872	ICAP 5.50%	GBP	103.12	0.00	+0.00			
31ML	XS0180407602	IMP.TOB.FIN.6Q	GBP	120.53	+0.06	+0.05			
ICG7	XS0716336325	INT.CAP.GRP	GBP	105.92	0.00	+0.00			
ICG2	XS0818634668	INT.CAP.GRP20	GBP	100.30	0.00	+0.00			
52DJ	XS0178322474	KINGFISHER5.625	GBP	107.28	+0.02	+0.02			
LB1I	XS0459086749	LBG CAP 1 19	GBP	104.75	0.00	+0.00			
LB1G	XS0459086582	LBG CAP 1 20	GBP	103.68	-0.08	-0.07			

Source: London Stock Exchange.

Figure 6.3 Sample London Stock Exchange bond quotations

Figure

UK GILTS - cash market www.ft.com/gilts

Dec 7	Price £	Day's chng	W'ks chng	Int yield	Red yield	Red yield: Day's chng	Red yield: W'ks chng	Red yield: Mth's chng	Red yield: Year chng	52 Week High	52 Week Low	Amnt £m	Last xd date	Interest due
Shorts (Lives up to Five Years)														
Tr 8pc '13	106.15	-0.06	-0.21	7.53	0.26	-0.01	-0.01	+0.01	-0.14	113.74	**106.06**	8,679	18/09	27 Mar/Sep
Tr 4.5pc '13	101.02	-0.03	-0.11	4.45	0.25	-0.02	-0.01	-0.02	-0.12	105.21	**100.97**	34,283	29/08	7 Mar/Sep
Tr 2.25pc '14	102.46	-0.03	-0.01	2.20	0.26	+0.01	-0.05	+0.04	-0.11	104.35	102.30	35,104	29/08	7 Mar/Sep
Tr 5pc '14	108.24	-0.05	-0.07	4.62	0.25	+0.01	-0.05	+0.04	-0.18	112.66	108.07	40,579	29/08	7 Mar/Sep
Tr 2.75pc '15	105.21	-0.03	+0.04	2.61	0.28	+0.01	-0.06	+0.04	-0.26	107.08	104.91	28,813	11/07	22 Jan/Jul
Tr 4.75pc '15	112.15	-0.05	+0.02	4.23	0.30	+0.01	-0.06	+0.05	-0.33	115.62	111.77	36,129	29/08	7 Mar/Sep
Tr 8pc '15	122.93	-0.07	-0.04	6.50	0.30	+0.00	-0.06	+0.05	-0.39	129.14	122.50	10,357	28/11	7 Jun/Dec
Tr 2pc '16	104.93	-0.02	+0.11	1.91	0.41	+0.00	-0.06	+0.04	-0.39	106.21	103.70	32,037	11/07	22 Jan/Jul
Tr 4pc '16	113.09	-0.04	+0.08	3.54	0.47	+0.00	-0.06	+0.05	-0.43	115.24	112.53	34,648	29/08	7 Mar/Sep
Tr 1pc '17	101.16	-0.01	+0.24	0.99	0.75	+0.00	-0.07	+0.03	-	102.22	97.58	23,019	29/08	7 Mar/Sep
Tr 1.75pc '17	104.70	-0.02	+0.19	1.67	0.59	+0.00	-0.07	+0.04	-0.48	105.92	102.18	27,014	11/07	22 Jan/Jul
Tr 8.75pc '17	137.43	-0.07	+0.08	6.36	0.66	+0.00	-0.06	+0.03	-0.58	142.20	136.69	10,879	15/08	25 Feb/Aug
Five to Ten Years														
Tr 5pc '18	121.47	-0.04	+0.15	4.11	0.81	+0.00	-0.06	+0.03	-0.57	124.35	119.61	34,398	29/08	7 Mar/Sep
Tr 3.75pc '19	117.17	-0.04	+0.22	3.20	1.10	+0.00	-0.05	+0.02	-0.72	119.51	112.44	28,057	29/08	7 Mar/Sep
Tr 4.5pc '19	121.19	-0.05	+0.18	3.71	0.99	+0.00	-0.05	+0.03	-0.68	124.06	117.58	35,485	29/08	7 Mar/Sep
Tr 3.75pc '20	117.83	-0.03	+0.22	3.18	1.32	+0.00	-0.04	+0.01	-0.71	120.21	111.99	23,997	29/08	7 Mar/Sep
Tr 4.75pc '20	124.50	-0.04	+0.19	3.81	1.21	+0.00	-0.04	+0.02	-0.71	127.41	119.66	32,517	29/08	7 Mar/Sep
Tr 3.75pc '21	118.42	-0.03	+0.22	3.17	1.49	+0.00	-0.03	-0.01	-0.74	120.79	111.31	27,709	29/08	7 Mar/Sep
Tr 8pc '21	153.12	-0.07	+0.15	5.22	1.36	+0.00	-0.03	-0.01	-0.68	157.54	147.39	23,499	29/08	7 Mar/Sep
Tr 1.75pc '22	100.10	-0.03	+0.25	1.75	1.74	+0.00	-0.03	-0.01	-	101.73	97.81	18,783	-	7 Mar/Sep
Tr 4pc '22	120.90	-0.04	+0.26	3.31	1.56	+0.00	-0.04	-0.02	-0.72	123.25	113.27	35,120	29/08	7 Mar/Sep
Ten to Fifteen Years														
Tr 5pc '25	133.10	-0.06	+0.15	3.75	1.95	+0.00	-0.02	-0.01	-0.60	136.58	123.59	31,992	29/08	7 Mar/Sep

Source: REUTERS Ltd, via www.ft.com/gilts

Figure 6.4 Sample *Financial Times* UK gilts cash market prices

The next four columns deal with changes in the bond's redemption yield (yield to maturity). Finally, the amount of bonds traded is presented (Amnt £m), the final date at which an individual is eligible to receive the bond's coupon (Last xd date), and the dates on which coupon payments are due.

If you examine the yields on the various issues in Fig. 6.4, you will clearly see that they vary by maturity. Why this occurs, and what it might mean, are things that we discuss in our next section.

A Note about Bond Price Quotes

If you buy a bond between coupon payment dates, the price you pay is usually more than the price you are quoted. The reason is that standard convention in the bond market is to quote prices net of 'accrued interest', meaning that accrued interest is deducted to arrive at the quoted price. This quoted price is called the **clean price**. The price you actually pay, however, includes the accrued interest. This price is the **dirty price**, also known as the 'full' or 'invoice' price.

An example is the easiest way to understand these issues. Suppose you buy a bond with a 12 per cent annual coupon, payable semi-annually. You actually pay €1,080 for this bond, so €1,080 is the dirty, or invoice, price. Further, on the day you buy it, the next coupon is due in four months, so you are between coupon dates. Notice that the next coupon will be €60.

The accrued interest on a bond is calculated by taking the fraction of the coupon period that has passed, in this case two months out of six, and multiplying this fraction by the next coupon, €60. So, the accrued interest in this example is 2/6 × €60 = €20. The bond's quoted price (that is, its clean price) would be €1,080 – €20 = €1,060.

clean price The price of a bond net of accrued interest; this is the price that is typically quoted.

dirty price The price of a bond including accrued interest, also known as the *full* or *invoice price*. This is the price the buyer actually pays.

Concept Questions

6.5a What is meant by a bond's redemption yield and interest yield?
6.5b What is the difference between a bond's clean price and dirty price?

6.6 Inflation and Interest Rates

So far, we haven't considered the role of inflation in our various discussions of interest rates, yields and returns. Because this is an important consideration, we consider the impact of inflation next.

Real versus Nominal Rates

real rates Interest rates or rates of return that have been adjusted for inflation.

nominal rates Interest rates or rates of return that have not been adjusted for inflation.

In examining interest rates, or any other financial market rates such as discount rates, bond yields, rates of return or required returns, it is often necessary to distinguish between **real rates** and **nominal rates**. Nominal rates are called 'nominal' because they have not been adjusted for inflation. Real rates are rates that have been adjusted for inflation.

To see the effect of inflation, suppose prices are currently rising by 5 per cent per year. In other words, the rate of inflation is 5 per cent. An investment is available that will be worth £115.50 in one year. It costs £100 today. Notice that with a present value of £100 and a future value in one year of £115.50, the investment has a 15.5 per cent rate of return. In calculating this 15.5 per cent return, we did not consider the effect of inflation, however, so this is the nominal return.

What is the impact of inflation here? To answer, suppose pizzas cost £5 apiece at the beginning of the year. With £100, we can buy 20 pizzas. Because the inflation rate is 5 per cent, pizzas will cost 5 per cent more, or £5.25, at the end of the year. If we take the investment, how many pizzas can we buy at the end of the year? Measured in pizzas, what is the rate of return on this investment?

Our £115.50 from the investment will buy us £115.50/5.25 = 22 pizzas. This is up from 20 pizzas, so our pizza rate of return is 10 per cent. What this illustrates is that even though the nominal return on our investment is 15.5 per cent, our buying power goes up by only 10 per cent, because of inflation. Put another way, we are really only 10 per cent richer. In this case we say that the real return is 10 per cent.

Alternatively, we can say that with 5 per cent inflation each of the £115.50 nominal pounds we get is worth 5 per cent less in real terms, so the real cash value of our investment in a year is

$$£115.50/1.05 = £110$$

What we have done is to *deflate* the £115.50 by 5 per cent. Because we give up £100 in current buying power to get the equivalent of £110, our real return is again 10 per cent. Because we have removed the effect of future inflation here, this £110 is said to be measured in current pounds.

The difference between nominal and real rates is important, and bears repeating:

The nominal rate on an investment is the percentage change in the amount of cash you have.

The real rate on an investment is the percentage change in how much you can buy with your cash – in other words, the percentage change in your buying power.

The Fisher Effect

Fisher effect The relationship between nominal returns, real returns and inflation.

Our discussion of real and nominal returns illustrates a relationship often called the **Fisher effect** (after the great economist Irving Fisher). Because investors are ultimately concerned with what they can buy with their money, they require compensation for inflation. Let R stand for the nominal rate and r stand for the real rate. The Fisher effect tells us that the relationship between nominal rates, real rates and inflation can be written as

$$1 + R = (1 + r) \times (1 + h) \qquad \textbf{(6.2)}$$

where h is the inflation rate.

In the preceding example, the nominal rate was 15.50 per cent and the inflation rate was 5 per cent. What was the real rate? We can determine it by plugging in these numbers:

$$\begin{aligned} 1 + 0.1550 &= (1 + r) \times (1 + 0.05) \\ 1 + r &= 1.1550/1.05 = 1.10 \\ r &= 10\% \end{aligned}$$

This real rate is the same as we found before. If we take another look at the Fisher effect, we can rearrange things a little as follows:

$$\begin{aligned} 1 + R &= (1 + r) \times (1 + h) \\ R &= r + h + r \times h \end{aligned} \quad \textbf{(6.3)}$$

What this tells us is that the nominal rate has three components. First, there is the real rate on the investment, r. Next, there is the compensation for the decrease in the value of the money originally invested because of inflation, h. The third component represents compensation for the fact that the money earned on the investment is also worth less because of the inflation.

This third component is usually small, so it is often dropped. The nominal rate is then approximately equal to the real rate plus the inflation rate:

$$R \approx r + h \quad \textbf{(6.4)}$$

It is important to note that financial rates, such as interest rates, discount rates and rates of return, are almost always quoted in nominal terms. To remind you of this, we shall henceforth use the symbol R instead of r in most of our discussions about such rates.

Example 6.4

The Fisher Effect

If investors require a 10 per cent real rate of return, and the inflation rate is 8 per cent, what must be the approximate nominal rate? The exact nominal rate?

The nominal rate is approximately equal to the sum of the real rate and the inflation rate: 10% + 8% = 18%. From the Fisher effect, we have

$$\begin{aligned} 1 + R &= (1 + r) \times (1 + h) \\ &= 1.10 \times 1.08 \\ &= 1.1880 \end{aligned}$$

Therefore the nominal rate will actually be closer to 19 per cent.

Inflation and Present Values

One question that often comes up is the effect of inflation on present value calculations. The basic principle is simple: either discount nominal cash flows at a nominal rate, or discount real cash flows at a real rate. As long as you are consistent, you will get the same answer.

To illustrate, suppose you want to withdraw money each year for the next three years, and you want each withdrawal to have £25,000 worth of purchasing power as measured in current pounds. If the inflation rate is 4 per cent per year, then the withdrawals will simply have to increase by 4 per cent each year to compensate. The withdrawals each year will thus be

$$\begin{aligned} C_1 &= £25{,}000\,(1.04) = £26{,}000 \\ C_2 &= £25{,}000\,(1.04)^2 = £27{,}040 \\ C_3 &= £25{,}000\,(1.04)^3 = £28{,}121.60 \end{aligned}$$

What is the present value of these cash flows if the appropriate nominal discount rate is 10 per cent? This is a standard calculation, and the answer is

$$\begin{aligned} PV &= \frac{£26,000}{1.10} + \frac{£27,040}{1.10^2} + \frac{£28,121.60}{1.10^3} \\ &= £67,111.65 \end{aligned}$$

Notice that we discounted the nominal cash flows at a nominal rate.

To calculate the present value using real cash flows, we need the real discount rate. Using the Fisher equation, the real discount rate is obtained from

$$\begin{aligned} 1 + R &= (1 + r)(1 + h) \\ 1 + 0.10 &= (1 + r)(1 + 0.04) \\ r &= 0.0577 \end{aligned}$$

By design, the real cash flows are an annuity of £25,000 per year. So the present value in real terms is

$$PV = £25,000[1 - (1/1.0577^3)]/0.0577 = £67,111.65$$

Thus we get exactly the same answer (after allowing for a small rounding error in the real rate). Of course, you could also use the growing annuity equation we discussed in the previous chapter. The withdrawals are increasing at 4 per cent per year: so, using the growing annuity formula, the present value is

$$\begin{aligned} PV &= £26,000 \times \left[\frac{1 - \left(\frac{1 + 0.04}{1 + 0.10} \right)^3}{0.10 - 0.04} \right] \\ &= £26,000(2.58122) \\ &= £67,111.65 \end{aligned}$$

This is exactly the same present value we calculated before.

Concept Questions

6.6a What is the difference between a nominal and a real return? Which is more important to a typical investor?

6.6b What is the Fisher effect?

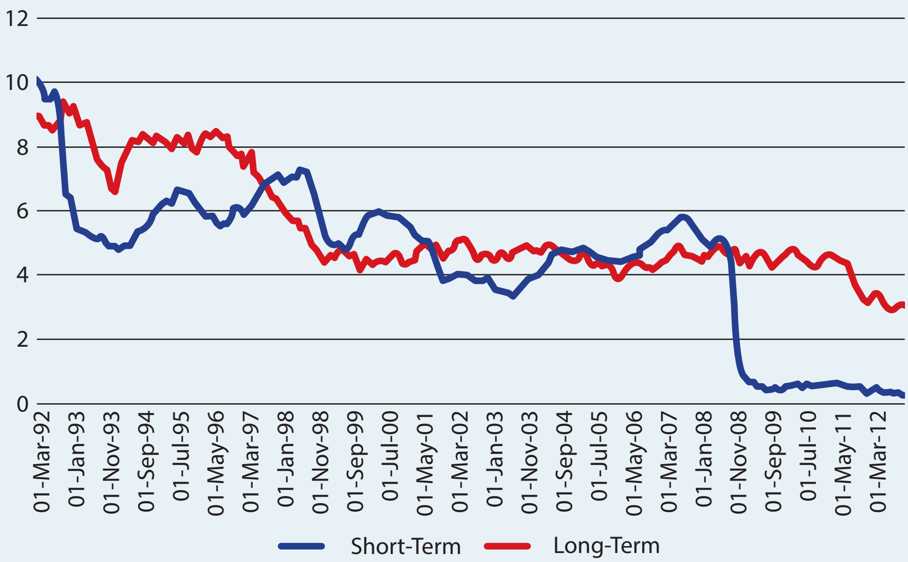
6.7 Determinants of Bond Yields

We are now in a position to discuss the determinants of a bond's yield. As we shall see, the yield on any particular bond reflects a variety of factors, some common to all bonds and some specific to the issue under consideration.

The Term Structure of Interest Rates

At any one time, short-term and long-term interest rates will generally be different. Sometimes short-term rates are higher, sometimes lower. Figure 6.5 gives us a long-range perspective on this by showing over twenty years of short- and long-term interest rates for the UK. As shown, through time, the difference between short- and long-term rates has ranged from essentially zero to up to several percentage points, both positive and negative.

Figure



Source: Bank of England.

Figure 6.5 UK interest rates: 1992–2012

The relationship between short- and long-term interest rates is known as the **term structure of interest rates**. To be a little more precise, the term structure of interest rates tells us what *nominal* interest rates are on *default-free, pure discount* bonds of all maturities. These rates are, in essence, 'pure' interest rates, because they involve no risk of default and a single, lump sum future payment. In other words, the term structure tells us the pure time value of money for different lengths of time.

When long-term rates are higher than short-term rates, we say that the term structure is upward sloping; when short-term rates are higher, we say it is downward sloping. The term structure can also be 'humped'. When this occurs, it is usually because rates increase at first, but then begin to decline as we look at longer- and longer-term rates. The most common shape of the term structure, particularly in modern times, is upward sloping, but the degree of steepness has varied quite a bit.

What determines the shape of the term structure? There are three basic components. The first two are the ones we discussed in our previous section: the real rate of interest and the rate of inflation. The real rate of interest is the compensation that investors demand for forgoing the use of their money. You can think of it as the pure time value of money after adjusting for the effects of inflation.

The real rate of interest is the basic component underlying every interest rate, regardless of the time to maturity. When the real rate is high, all interest rates will tend to be higher, and vice versa. Thus the real rate doesn't really determine the shape of the term structure; instead, it mostly influences the overall level of interest rates.

In contrast, the prospect of future inflation strongly influences the shape of the term structure. Investors thinking about lending money for various lengths of time recognize that future inflation erodes the value of the cash that will be returned. As a result, investors demand compensation for this loss in the form of higher nominal rates. This extra compensation is called the **inflation premium**.

If investors believe the rate of inflation will be higher in the future, then long-term nominal interest rates will tend to be higher than short-term rates. Thus an upward-sloping term structure may reflect anticipated increases in inflation. Similarly, a downward-sloping term structure probably reflects the belief that inflation will be falling in the future.

term structure of interest rates The relationship between nominal interest rates on default-free, pure discount securities and time to maturity: that is, the pure time value of money.

inflation premium The portion of a nominal interest rate that represents compensation for expected future inflation.

The third, and last, component of the term structure has to do with interest rate risk. As we discussed earlier in the chapter, longer-term bonds have much greater risk of loss resulting from changes in interest rates than do shorter-term bonds. Investors recognize this risk, and they demand extra compensation in the form of higher rates for bearing it. This extra compensation is called the **interest rate risk premium**. The longer is the term to maturity, the greater is the interest rate risk, so the interest rate risk premium increases with maturity. However, as we discussed earlier, interest rate risk increases at a decreasing rate, so the interest rate risk premium does as well.[6]

> **interest rate risk premium** The compensation investors demand for bearing interest rate risk.

Putting the pieces together, we see that the term structure reflects the combined effect of the real rate of interest, the inflation premium, and the interest rate risk premium. Figure 6.6 shows how these can interact to produce an upward-sloping term structure (in the top part of the figure) or a downward-sloping term structure (in the bottom part).

Figure

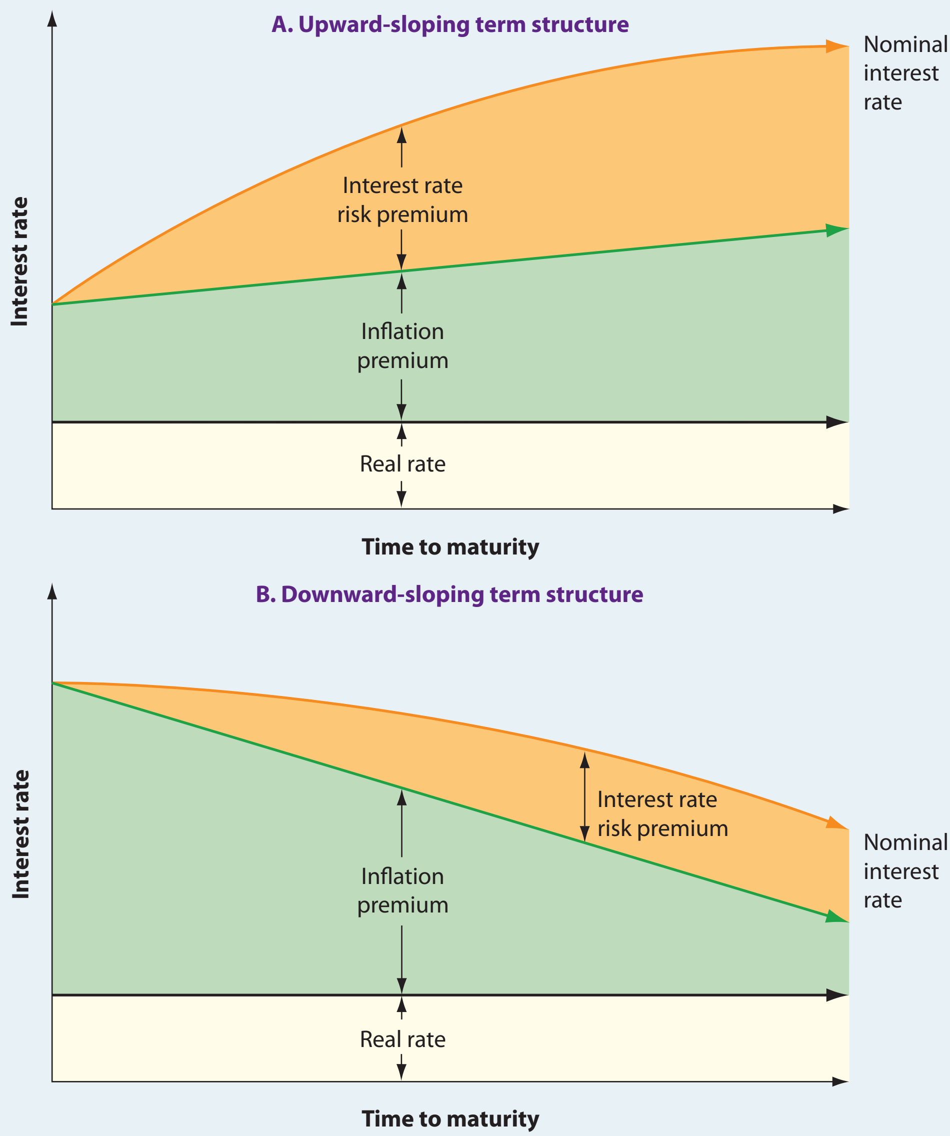


Figure 6.6 The term structure of interest rates

In the top part of Fig. 6.6, notice how the rate of inflation is expected to rise gradually. At the same time, the interest rate risk premium increases at a decreasing rate, so the combined effect is to produce a pronounced upward-sloping term structure. In the bottom part of Fig. 6.6, the rate of inflation is expected to fall in the future, and the expected decline is enough to offset the interest rate risk premium and produce a downward-sloping term structure. Notice that if the rate of inflation was expected to decline by only a small amount, we could still get an upward-sloping term structure because of the interest rate risk premium.

We assumed in drawing Fig. 6.6 that the real rate would remain the same. Actually, expected future real rates could be larger or smaller than the current real rate. Also, for simplicity, we used straight lines to show expected future inflation rates as rising or declining, but they do not necessarily have to look like this. They could, for example, rise and then fall, leading to a humped yield curve.

Bond Yields and the Yield Curve: Putting It All Together

Going back to Fig. 6.4, recall that we saw that the yields on Treasury notes and bonds of different maturities are not the same. Each day, in addition to the Treasury prices and yields shown in Fig. 6.4, the *Financial Times* provides a plot of Treasury yields relative to maturity. This plot is called the **Treasury yield curve** (or just the *yield curve*). Figure 6.7 shows the yield curve for the UK and Eurozone late 2013. As can be seen both are almost identical and upward sloping.

As you probably now suspect, the shape of the yield curve reflects the term structure of interest rates. In fact, the Treasury yield curve and the term structure of interest rates are almost the same thing. The only difference is that the term structure is based on pure discount bonds, whereas the yield curve is based on coupon bond yields. As a result, Treasury yields depend on the three components that underlie the term structure – the real rate, expected future inflation, and the interest rate risk premium.

Treasury notes and bonds have three important features that we need to remind you of: they are default-free (except for Eurozone countries), they are taxable, and they are highly liquid. This is not true of bonds in general, so we need to examine what additional factors come into play when we look at bonds issued by corporations or municipalities.

The first thing to consider is credit risk – that is, the possibility of default. Investors recognize that in most countries (except the Eurozone) issuers other than the Treasury may or may not make all the promised payments on a bond, so they demand a higher yield as compensation for this risk. This extra compensation is called the **default risk premium**. Earlier in the chapter we saw how bonds were rated based on their credit risk. What you will find if you start looking at bonds of different ratings is that lower-rated bonds have higher yields.

An important thing to recognize about a bond's yield is that it is calculated assuming that all the promised payments will be made. As a result, it is really a promised yield, and it may or may not be what you will earn. In particular, if the issuer defaults, your actual yield will be lower – probably much lower. This fact is particularly important when it comes to junk bonds. Thanks to a clever bit of marketing, such bonds are now commonly called high-yield bonds, which has a much nicer ring to it; but now you recognize that these are really high *promised* yield bonds.

Next, recall that we discussed earlier how government bonds are free from most taxes and, as a result, have much lower yields than taxable bonds. Investors demand the extra yield on a taxable bond as compensation for the unfavourable tax treatment. This extra compensation is the **taxability premium**.

Finally, bonds have varying degrees of liquidity. As we discussed earlier, there are an enormous number of bond issues, most of which do not trade regularly. As a result, if you wanted to sell quickly, you would probably not get as good a price as you could otherwise. Investors prefer liquid assets to illiquid ones, so they demand a **liquidity premium** on top of all the other premiums we have discussed. As a result, all else being the same, less liquid bonds will have higher yields than more liquid bonds.

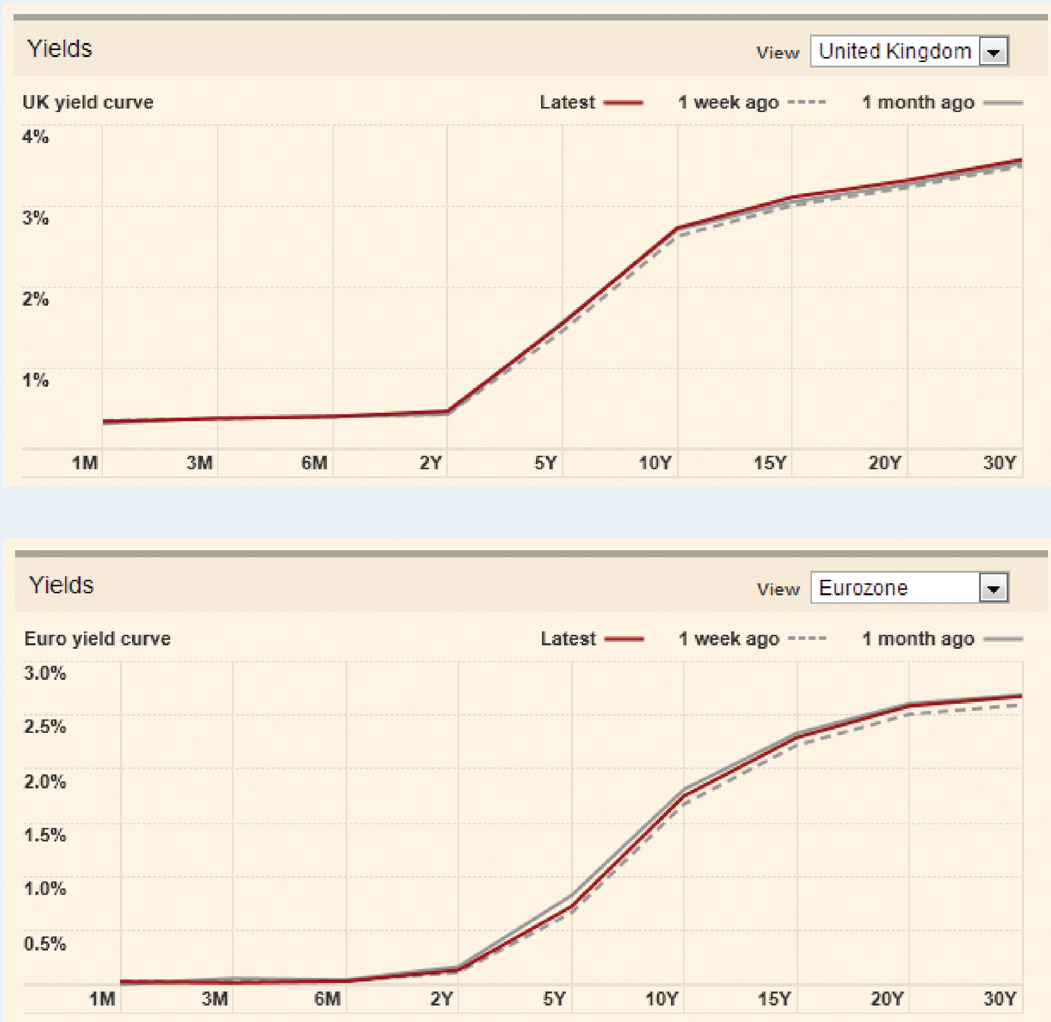
Treasury yield curve A plot of the yields on Treasury notes and bonds relative to maturity.

default risk premium The portion of a nominal interest rate or bond yield that represents compensation for the possibility of default.

taxability premium The portion of a nominal interest rate or bond yield that represents compensation for unfavourable tax status.

liquidity premium The portion of a nominal interest rate or bond yield that represents compensation for lack of liquidity.

Figure



Source: ft.com, 12 February 2012. © The Financial Times Ltd 2012.

Figure 6.7 Yield curve: UK and Eurozone

Conclusion

If we combine all of the things we have discussed regarding bond yields, we find that bond yields represent the combined effect of no fewer than six things. The first is the real rate of interest. On top of the real rate are five premiums representing compensation for:

1 Expected future inflation
2 Interest rate risk
3 Default risk
4 Taxability
5 Lack of liquidity

As a result, determining the appropriate yield on a bond requires careful analysis of each of these effects.

Concept Questions

6.7a What is the term structure of interest rates? What determines its shape?
6.7b What is the Treasury yield curve?
6.7c What six components make up a bond's yield?

Summary and Conclusions

This chapter has explored bonds, bond yields and interest rates:

1. Determining bond prices and yields is an application of basic discounted cash flow principles.
2. Bond values move in the direction opposite to that of interest rates, leading to potential gains or losses for bond investors.
3. Bonds have a variety of features, spelled out in a document called the indenture.
4. Bonds are rated based on their default risk. Some bonds, such as Treasury bonds, have no risk of default, whereas so-called junk bonds have substantial default risk.
5. A wide variety of bonds exist, many of which contain exotic or unusual features.
6. Much bond trading is OTC, with little or no market transparency in many cases. As a result, bond price and volume information can be difficult to find for some types of bond.
7. Bond yields and interest rates reflect the effect of six different things: the real interest rate, and five premiums that investors demand as compensation for inflation, interest rate risk, default risk, taxability and lack of liquidity.

In closing, we note that bonds are a vital source of financing for governments and corporations of all types. Bond prices and yields are a rich subject, and our one chapter necessarily touches on only the most important concepts and ideas. There is a great deal more we could say, but instead we shall move on to equities in our next chapter.

Chapter Review and Self-Test Problems

6.1 **Bond Values** A Svenska AB bond has a 10 per cent coupon rate and a SKr1,000 face value. Interest is paid semi-annually, and the bond has 20 years to maturity. If investors require a 12 per cent yield, what is the bond's value? What is the effective annual yield on the bond?

6.2 **Bond Yields** An Ekornes ASA bond carries an 8 per cent coupon, paid semi-annually. The par value is NKr1,000, and the bond matures in six years. If the bond currently sells for NKr911.37, what is its yield to maturity? What is the effective annual yield?

Solutions

6.1 Because the bond has a 10 per cent coupon yield and investors require a 12 per cent return, we know that the bond must sell at a discount. Notice that, because the bond pays interest semi-annually, the coupons amount to SKr100/2 = SKr50 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 SKr50 every six months for the next 40 six-month periods plus the present value of the SKr1,000 face amount:

$$\begin{aligned}\text{Bond value} &= \text{SKr}50 \times \left[\frac{1 - 1/1.06^{40}}{0.06}\right] + \frac{1{,}000}{1.06^{40}} \\ &= \text{SKr}50 \times 15.04630 + 1{,}000 / 10.2857 \\ &= \text{SKr}849.54\end{aligned}$$

Notice that we discounted the SKr1,000 back 40 periods at 6 per cent per period, rather than 20 years at 12 per cent. The reason is that the effective annual yield on the bond is $1.06^2 - 1 = 12.36\%$, not 12 per cent. We thus could have used 12.36 per cent per year for 20 years when we calculated the present value of the SKr1,000 face amount, and the answer would have been the same.

6.2 The present value of the bond's cash flows is its current price, NKr911.37. The coupon is NKr40 every six months for 12 periods. The face value is NKr1,000. So the bond's yield is the unknown discount rate in the following:

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

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

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

$$\begin{aligned}\text{Bond value} &= \text{NKr}40 \times \left[\frac{1 - 1/1.06^{12}}{0.06}\right] + \frac{1{,}000}{1.06^{12}} \\ &= \text{NKr}832.32\end{aligned}$$

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 per cent. With further trial and error (or a little computer assistance), the yield works out to be 10 per cent, or 5 per cent 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

6.1 **Treasury Bonds [LO1]** Is it true that a British Treasury security is risk-free? What about an Italian Treasury security?

6.2 **Interest Rate Risk [LO2]** Which has greater interest rate risk, a 30-year Treasury bond or a 30-year BB corporate bond?

6.3 **Yield to Maturity [LO2]** Treasury clean and dirty prices can be given in terms of yields, so there would be a clean yield and a dirty yield. Which do you think would be larger? Explain.

6.4 **Call Provisions [LO1]** A company is contemplating a long-term bond issue. It is debating whether 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?

6.5 **Bond Concepts [LO1]** Explain the difference between a coupon rate and a yield to maturity. Show, using examples, how changing the coupon rate and yield to maturity affects the bond price.

6.6 **Coupon Rate [LO1]** 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.

6.7 **Real and Nominal Returns [LO4]** Are there any circumstances under which an investor might be more concerned about the nominal return on an investment than the real return?

6.8 Bond Ratings [LO3] Companies pay rating agencies such as Moody's, S&P and Fitch to rate their bonds, and the costs can be substantial. However, companies are not required to have their bonds rated; doing so is strictly voluntary. Why do you think they do it?

6.9 Bond Ratings [LO3] US Treasury bonds are not rated. Why? Often, junk bonds are not rated. Why?

6.10 Term Structure [LO5] What is the difference between the term structure of interest rates and the yield curve?

6.11 Crossover Bonds [LO3] Looking back at the crossover bonds we discussed in the chapter, why do you think split ratings such as these occur?

6.12 Bond Market [LO1] What are the implications for bond investors of the lack of transparency in the bond market?

6.13 Rating Agencies [LO3] A controversy erupted regarding bond-rating agencies when some agencies began to provide unsolicited bond ratings. Why do you think this is controversial?

6.14 Bonds as Equity [LO1] The 50-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'?

Level of difficulty: Basic | Intermediate | Challenge

Questions and Problems

connect

6.15 Interpreting Bond Yields [LO1] 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 per cent coupon bond sells at par. Two years from now, the required return on the same bond is 8 per cent. What is the coupon rate on the bond then? The YTM?

6.16 Interpreting Bond Yields [LO2] Suppose you buy a 7 per cent coupon, 20-year bond today when it's first issued. If interest rates suddenly rise to 15 per cent, what happens to the value of your bond? Why?

6.17 Bond Prices [LO2] Staind plc has 8.5 per cent coupon bonds on the market that have 10 years left to maturity. The bonds make annual payments. If the YTM on these bonds is 9.75 per cent, what is the current bond price? The par value of the bond is £1,000

6.18 Bond Yields [LO2] Ackerman plc has 10 per cent coupon bonds on the market, with nine years left to maturity. The bonds make annual payments. If the bond currently sells for £9,340 and the face value of the bonds is £10,000, what is its YTM?

6.19 Valuing Bonds [LO2] In March 2013, Volkswagen AG issued an eight-year bond with face value of €1,000 and paying an annual coupon of 2 per cent. What is the price of the bond if the YTM is:

(a) 1 per cent.

(b) 2 per cent.

(c) 4 per cent.

Assume interest is calculated at the beginning of the period and paid annually.

6.20 Coupon Rates [LO2] Steen Familie NV has bonds on the market making annual payments, with 13 years to maturity, and selling for €1,045. At this price, the bonds yield 7.5 per cent. The par value of the bond is €1,000. What must the coupon rate be on the bonds?

6.21 Bond Yields [LO2] In March 2013, British American Tobacco plc issued a 12-year bond with a face value of €1,000, and an annual coupon rate of 2.75 per cent, paid every 6 months. The issue price was €997.48. What was its YTM?

6.22 Bond Yields [LO2] Ngata SA issued 10-year bonds two years ago at a coupon rate of 7.5 per cent. The bonds make semi-annual payments. If these bonds currently sell for 105 per cent of par value, what is the YTM?

6.23 Coupon Rates [LO2] Stand AG has bonds on the market with 17.5 years to maturity, a YTM of 8 per cent, and a current price of €924. The bonds make semi-annual payments. The par value of the bond is €1,000. What must the coupon rate be on these bonds?

6.24 Calculating Real Rates of Return [LO4] If Treasury bills are currently paying 7 per cent and the inflation rate is 3.8 per cent, what is the approximate real rate of interest? The exact real rate?

6.25 Inflation and Nominal Returns [LO4] Suppose the real rate is 4 per cent and the inflation rate is 4.7 per cent. What rate would you expect to see on a Treasury bill?

6.26 Nominal and Real Returns [LO4] An investment offers a 15 per cent total return over the coming year. You think the total real return on this investment will be only 9 per cent. What do you believe the inflation rate will be over the next year?

6.27 Total Returns [LO4] A six-year government bond makes annual coupon payments of 5 per cent and offers a yield of 3 per cent annually compounded. Suppose that one year later the bond still yields 3 per cent. What return has the bondholder earned over the 12-month period? Now suppose that the bond yields 2 per cent at the end of the year. What return would the bondholder earn in this case? Assume the face value of the bond is €1,000 and that coupon payments are made at the beginning of the year.

6.28 Using Treasury Quotes [LO2] Locate the 5 per cent coupon Treasury issue in Fig. 6.4 maturing in 2014. Is this a note or a bond? What is its interest yield? What is its redemption yield? What was the *previous* day's price?

6.29 Using Treasury Quotes [LO2] Locate the 8 per cent coupon Treasury bond in Fig. 6.4 maturing in 2021. Is this a premium or a discount bond? What is its current yield? What is its yield to maturity?

6.30 Bond Price Movements [LO2] Consider the Volkswagen bond in question 6.19(c). If yields remain unchanged, what do you expect the price of this bond will be one year from now? In two years? What's going on here? Illustrate your answers by graphing bond prices versus time to maturity. Assume the coupon payments are made at the beginning of the year and YTM is 4 per cent.

6.31 Bond Price Movements [LO2] Bond X is a premium bond making annual payments. The bond pays an 8 per cent coupon, has a YTM of 6 per cent, and has 13 years to maturity. Bond Y is a discount bond making annual payments. This bond pays a 6 per cent coupon, has a YTM of 8 per cent, and also has 13 years to maturity. The par value of the bonds is 1,000. 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 plotting bond prices against time to maturity.

6.32 Bond Returns [LO2] You purchase a bond with an invoice price of £9,680. The bond has a coupon rate of 7.4 per cent, and there are four months to the next semi-annual coupon date. What is the clean price of the bond?

6.33 Interest Rate Risk [LO2] Both Bond Tony and Bond Peter have 10 per cent coupons, make semi-annual payments, and are priced at par value. Bond Tony has 3 years to maturity, whereas Bond Peter has 20 years to maturity. If interest rates suddenly rise by 2 per cent, what is the percentage change in the price of Bond Tony? Of Bond Peter? If rates were to suddenly fall by 2 per cent instead, what would the percentage change in the price of Bond Tony be then? Of Bond Peter? Illustrate your answers by plotting bond prices against YTM. What does this problem tell you about the interest rate risk of longer-term bonds?

6.34 Interest Rate Risk [LO2] Bond J is a 4 per cent coupon bond. Bond K is a 12 per cent coupon bond. Both bonds have nine years to maturity, make semi-annual payments, and have a YTM of 8 per cent. The par value of the bonds is 1,000. If interest rates suddenly rise by 2 per cent, what is the percentage price change of these bonds? What if rates suddenly fall by 2 per cent instead? What does this problem tell you about the interest rate risk of lower-coupon bonds?

6.35 Bond Yields [LO2] One More Time Software has 10.2 per cent coupon bonds on the market with nine years to maturity. The bonds make semi-annual payments and currently sell for 105.8 per cent of par. What is the current yield on the bonds? The YTM? The effective annual yield?

6.36 Bond Yields [LO2] Seether plc wants to issue new 20-year bonds for some much-needed expansion projects. The company currently has 8 per cent coupon bonds on the market that sell for £93,000 with a par value of £100,000, make semi-annual payments, and mature in 20 years. What coupon rate should the company set on its new bonds if it wants them to sell at par?

6.37 Finding the Bond Maturity [LO2] Fluss AB has 8 per cent coupon bonds making annual payments with a YTM of 7.2 per cent. The current yield on these bonds is 7.55 per cent. How many years do these bonds have left until they mature?

6.38 Accrued Interest [LO2] You purchase a bond with a coupon rate of 6.8 per cent and a clean price of £10,730, face value is £10,000. If the next semi-annual coupon payment is due in two months, what is the invoice price?

6.39 Using Bond Quotes [LO2] Suppose the following bond quotes for Giorni di Estate SpA appear in the financial page of today's newspaper. Assume the bond makes semi-annual payments, has a face value of €1,000 and the current date is 15 February 2014. What is the yield to maturity of the bond? What is the current yield?

Company (ticker)	Coupon	Maturity	Last price	Last yield	Est vol (000s)
Giorni di Estate	9.2	15 Feb 2028	108.96	??	1,827

6.40 Bond Prices versus Yields [LO2]

(a) What is the relationship between the price of a bond and its YTM?

(b) 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?

(c) What is the relationship between the current yield and YTM for premium bonds? For discount bonds? For bonds selling at par value?

6.41 Interest on Zeros [LO2] Tesla plc 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 12 per cent. What will these bonds sell for at issuance? Assume semi-annual compounding. The par value is £1,000.

6.42 Zero Coupon Bonds [LO2] Suppose your company needs to raise €30 million and you want to issue 30-year bonds for this purpose. Assume the required return on your bond issue will be 8 per cent, and you're evaluating two issue alternatives: an 8 per cent semi-annual coupon bond and a zero coupon bond. Your company's tax rate is 35 per cent. The par value of the bonds is €1,000.

(a) How many of the coupon bonds would you need to issue to raise the €30 million? How many of the zeros would you need to issue?

(b) In 30 years, what will your company's repayment be if you issue the coupon bonds? What if you issue the zeros?

(c) Based on your answers in (a) and (b), why would you ever want to issue the zeros? To answer, calculate the firm's after-tax cash outflows for the first year under the two different scenarios.

6.43 Finding the Maturity [LO2] You've just found a 12 per cent coupon bond on the market that sells for par value. What is the maturity on this bond?

6.44 Real Cash Flows [LO4] When Marilyn Monroe died, ex-husband Joe DiMaggio vowed to place fresh flowers on her grave every Sunday as long as he lived. The week after she died in 1962, a bunch of fresh flowers that the former baseball player thought appropriate for the star cost about $5. Based on actuarial tables, 'Joltin' Joe' could expect to live for 30 years after the actress died. Assume that the EAR is 8.4 per cent. Also, assume that the price of the flowers will increase at 3.7 per cent per year, when expressed as an EAR. Assuming that each year has exactly 52 weeks, what is the present value of this commitment? Joe began purchasing flowers the week after Marilyn died.

6.45 Real Cash Flows [LO4] You want to have €1.5 million in real euros in an account when you retire in 40 years. The nominal return on your investment is 11 per cent and the inflation rate is 3.8 per cent. What real amount must you deposit each year to achieve your goal?

6.46 Components of Bond Returns [LO2] Bond P is a premium bond with a 12 per cent coupon. Bond D is a 6 per cent coupon bond currently selling at a discount. Both bonds make annual payments, have a YTM of 9 per cent, and have five years to maturity. The par value is 1,000. 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 interrelationships among the various types of yield.

6.47 Holding Period Yield [LO2] 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).

(a) Suppose that today you buy a 7 per cent annual coupon bond for £106, when its face value is £100. The bond has 10 years to maturity. What rate of return do you expect to earn on your investment?

(b) Two years from now, the YTM on your bond has declined by 1 per cent, and you decide to sell. What price will your bond sell for? What is the HPY on your investment? Compare this yield with the YTM when you first bought the bond. Why are they different?

6.48 Valuing Bonds [LO2] Keegan plc 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 £1,100 every six months over the subsequent eight years, and finally pays £1,400 every six 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 7 per cent compounded semi-annually, what is the current price of bond M? Of bond N?

6.49 Valuing the Call Feature [LO2] Consider the prices in the following three Treasury issues as of 15 May 2014:

Coupon	Maturity	Price	Change	YTM
6.500	16 May	106:10	–13	5.28
8.250	16 May	103:14	–3	5.24
12.000	16 May	134:25	–15	5.32

The bond in the middle is callable in February 2015. Assume £1,000 par value. What is the implied value of the call feature? (*Hint*: Is there a way to combine the two non-callable issues to create an issue that has the same coupon as the callable bond?)

6.50 Treasury Bonds [LO2] Consider the following Treasury bond on 11 May 2014:

9.125	15 May	100:03	···	–2.15

Why would anyone buy this Treasury bond with a negative yield to maturity? How is this possible?

6.51 Real Cash Flows [LO4] You are planning to save for retirement over the next 30 years. To save for retirement, you will invest £900 a month in an equity account in real pounds and £450 a month in a bond account in real pounds. The effective annual return of the equity account is expected to be 11 per cent, and the bond account will earn 7 per cent. When you retire, you will combine your money into an account with a 9 per cent effective return. The inflation rate over this period is expected to be 4 per cent. How much can you withdraw each month from your account in real terms, assuming a 25-year withdrawal period? What is the nominal pound amount of your last withdrawal?

Mini Case

Financing West Coast Yachts' Expansion Plans with a Bond Issue

Larissa Warren, the owner of West Coast Yachts, has decided to expand her operations. She asked her newly hired financial analyst, Dan Ervin, to enlist an underwriter to help sell £30 million in new 20-year bonds to finance new construction. Dan has entered into discussions with Robin Perry, an underwriter from the firm of Crowe & Mallard, about which bond features West Coast Yachts should consider, and also what coupon rate the issue is likely to have. Although Dan is aware of bond features, he is uncertain of the costs and benefits of some features, so he isn't sure how each feature would affect the coupon rate of the bond issue.

Questions

1 You are Robin's assistant, and she has asked you to prepare a memo to Dan describing the effect of each of the following bond features on the coupon rate of the bond. She would also like you to list any advantages or disadvantages of each feature.
   - (a) The security of the bond – that is, whether the bond has collateral.
   - (b) The seniority of the bond.
   - (c) The presence of a sinking fund.
   - (d) A call provision with specified call dates and call prices.
   - (e) A deferred call accompanying the call provision in (d).
   - (f) A make-whole call provision.
   - (g) Any positive covenants. Also, discuss several possible positive covenants West Coast Yachts might consider.
   - (h) Any negative covenants. Also, discuss several possible negative covenants West Coast Yachts might consider.
   - (i) A conversion feature (note that West Coast Yachts is not a publicly traded company).
   - (j) A floating-rate coupon.

Dan is also considering whether to issue coupon-bearing bonds or zero coupon bonds. The YTM on either bond issue will be 8 per cent. The coupon bond would have an 8 per cent coupon rate. The company's tax rate is 28 per cent.

2 How many of the coupon bonds must West Coast Yachts issue to raise the £30 million? How many of the zeros must it issue?

3 In 20 years, what will be the principal repayment due if West Coast Yachts issues the coupon bonds? What if it issues the zeros?

4 What are the company's considerations in issuing a coupon bond compared with a zero coupon bond?

5 Suppose West Coast Yachts issues the coupon bonds with a make-whole call provision. The make-whole call rate is the Treasury rate plus 0.40 per cent. If West Coast calls the bonds in 7 years when the Treasury rate is 5.6 per cent, what is the call price of the bond? What if it is 9.1 per cent?

6 Are investors really made whole with a make-whole call provision?

7 After considering all the relevant factors, would you recommend a zero coupon issue or a regular coupon issue? Why? Would you recommend an ordinary call feature or a make-whole call feature? Why?

Additional Reading

The bond valuation methods used in this chapter can be extended easily to complex instruments that have a number of additional characteristics. If you wish to explore this area in more detail, you should read: *Financial Markets and Corporate Strategy*, 2nd edition, McGraw-Hill, 2011, by David Hillier, Mark Grinblatt and Sheridan Titman.

Endnotes

1 There is no universally agreed-upon distinction between short-term and long-term debt. In addition, people often refer to *intermediate-term debt*, which has a maturity of more than 1 year and less than 3 to 5, or even 10, years.

2 The word *funding* is part of the jargon of finance. It generally refers to the long term. Thus a firm planning to 'fund' its debt requirements may be replacing short-term debt with long-term debt.

3 The words *loan agreement* or *loan contract* are usually used for privately placed debt and term loans.

4 Real property includes land and things 'affixed thereto'. It does not include cash or inventories.

5 A bond issued with a very low coupon rate (as opposed to a zero coupon rate) is an *original-issue discount (OID) bond*.

6 In days of old, the interest rate risk premium was called a 'liquidity' premium. Today, the term *liquidity premium* has an altogether different meaning, which we explore in our next section. Also, the interest rate risk premium is sometimes called a *maturity risk premium*. Our terminology is consistent with the modern view of the term structure.