CHAPTER 1

FEATURES OF DEBT SECURITIES

I. INTRODUCTION

In investment management, the most important decision made is the allocation of funds among asset classes. The two major asset classes are equities and fixed income securities. Other asset classes such as real estate, private equity, hedge funds, and commodities are referred to as "alternative asset classes." Our focus in this book is on one of the two major asset classes: fixed income securities.

While many people are intrigued by the exciting stories sometimes found with equities—who has not heard of someone who invested in the common stock of a small company and earned enough to retire at a young age?—we will find in our study of fixed income securities that the multitude of possible structures opens a fascinating field of study. While frequently overshadowed by the media prominence of the equity market, fixed income securities play a critical role in the portfolios of individual and institutional investors.

In its simplest form, a fixed income security is a financial obligation of an entity that promises to pay a specified sum of money at specified future dates. The entity that promises to make the payment is called the **issuer** of the security. Some examples of issuers are central governments such as the U.S. government and the French government, government-related agencies of a central government such as Fannie Mae and Freddie Mac in the United States, a municipal government such as the state of New York in the United States and the city of Rio de Janeiro in Brazil, a corporation such as Coca-Cola in the United States and Yorkshire Water in the United Kingdom, and supranational governments such as the World Bank.

Fixed income securities fall into two general categories: debt obligations and preferred stock. In the case of a debt obligation, the issuer is called the **borrower**. The investor who purchases such a fixed income security is said to be the **lender** or **creditor**. The promised payments that the issuer agrees to make at the specified dates consist of two components: interest and principal (principal represents repayment of funds borrowed) payments. Fixed income securities that are debt obligations include **bonds, mortgage-backed securities, asset-backed securities**, and **bank loans**.

In contrast to a fixed income security that represents a debt obligation, **preferred stock** represents an ownership interest in a corporation. Dividend payments are made to the preferred stockholder and represent a distribution of the corporation's profit. Unlike investors who own a corporation's common stock, investors who own the preferred stock can only realize a contractually fixed dividend payment. Moreover, the payments that must be made to preferred stockholders have priority over the payments that a corporation pays to common

stockholders. In the case of the bankruptcy of a corporation, preferred stockholders are given preference over common stockholders. Consequently, preferred stock is a form of equity that has characteristics similar to bonds.

Prior to the 1980s, fixed income securities were simple investment products. Holding aside default by the issuer, the investor knew how long interest would be received and when the amount borrowed would be repaid. Moreover, most investors purchased these securities with the intent of holding them to their maturity date. Beginning in the 1980s, the fixed income world changed. First, fixed income securities became more complex. There are features in many fixed income securities that make it difficult to determine when the amount borrowed will be repaid and for how long interest will be received. For some securities it is difficult to determine the amount of interest that will be received. Second, the hold-to-maturity investor has been replaced by institutional investors who actively trades fixed income securities.

We will frequently use the terms "fixed income securities" and "bonds" interchangeably. In addition, we will use the term bonds generically at times to refer collectively to mortgage-backed securities, asset-backed securities, and bank loans.

In this chapter we will look at the various features of fixed income securities and in the next chapter we explain how those features affect the risks associated with investing in fixed income securities. The majority of our illustrations throughout this book use fixed income securities issued in the United States. While the U.S. fixed income market is the largest fixed income market in the world with a diversity of issuers and features, in recent years there has been significant growth in the fixed income markets of other countries as borrowers have shifted from funding via bank loans to the issuance of fixed income securities. This is a trend that is expected to continue.

II. INDENTURE AND COVENANTS

The promises of the issuer and the rights of the bondholders are set forth in great detail in a bond's **indenture**. Bondholders would have great difficulty in determining from time to time whether the issuer was keeping all the promises made in the indenture. This problem is resolved for the most part by bringing in a trustee as a third party to the bond or debt contract. The indenture identifies the trustee as a representative of the interests of the bondholders.

As part of the indenture, there are **affirmative covenants** and **negative covenants**. Affirmative covenants set forth activities that the borrower promises to do. The most common affirmative covenants are (1) to pay interest and principal on a timely basis, (2) to pay all taxes and other claims when due, (3) to maintain all properties used and useful in the borrower's business in good condition and working order, and (4) to submit periodic reports to a trustee stating that the borrower is in compliance with the loan agreement. Negative covenants set forth certain limitations and restrictions on the borrower's activities. The more common restrictive covenants are those that impose limitations on the borrower's ability to incur additional debt unless certain tests are satisfied.

III. MATURITY

The **term to maturity** of a bond is the number of years the debt is outstanding or the number of years remaining prior to final principal payment. The **maturity date** of a bond refers to the date that the debt will cease to exist, at which time the issuer will redeem the bond by paying

the outstanding balance. The maturity date of a bond is always identified when describing a bond. For example, a description of a bond might state "due 12/1/2020."

The practice in the bond market is to refer to the "term to maturity" of a bond as simply its "maturity" or "term." As we explain below, there may be provisions in the indenture that allow either the issuer or bondholder to alter a bond's term to maturity.

Some market participants view bonds with a maturity between 1 and 5 years as "short-term." Bonds with a maturity between 5 and 12 years are viewed as "intermediate-term," and "long-term" bonds are those with a maturity of more than 12 years.

There are bonds of every maturity. Typically, the longest maturity is 30 years. However, Walt Disney Co. issued bonds in July 1993 with a maturity date of 7/15/2093, making them 100-year bonds at the time of issuance. In December 1993, the Tennessee Valley Authority issued bonds that mature on 12/15/2043, making them 50-year bonds at the time of issuance.

There are three reasons why the term to maturity of a bond is important:

Reason 1: Term to maturity indicates the time period over which the bondholder can expect to receive interest payments and the number of years before the principal will be paid in full.

Reason 2: The yield offered on a bond depends on the term to maturity. The relationship between the yield on a bond and maturity is called the **yield curve** and will be discussed in Chapter 4.

Reason 3: The price of a bond will fluctuate over its life as interest rates in the market change. The price volatility of a bond is a function of its maturity (among other variables). More specifically, as explained in Chapter 7, all other factors constant, the longer the maturity of a bond, the greater the price volatility resulting from a change in interest rates.

IV. PAR VALUE

The **par value** of a bond is the amount that the issuer agrees to repay the bondholder at or by the maturity date. This amount is also referred to as the **principal value, face value, redemption value**, and **maturity value**. Bonds can have any par value.

Because bonds can have a different par value, the practice is to quote the price of a bond as a percentage of its par value. A value of "100" means 100% of par value. So, for example, if a bond has a par value of $1,000 and the issue is selling for $900, this bond would be said to be selling at 90. If a bond with a par value of $5,000 is selling for $5,500, the bond is said to be selling for 110.

When computing the dollar price of a bond in the United States, the bond must first be converted into a price per US$1 of par value. Then the price per $1 of par value is multiplied by the par value to get the dollar price. Here are examples of what the dollar price of a bond is, given the price quoted for the bond in the market, and the par amount involved in the transaction:[1]

Quoted price	Price per $1 of par value (rounded)	Par value	Dollar price
$90\frac{1}{2}$	0.9050	$1,000	905.00
$102\frac{3}{4}$	1.0275	$5,000	5,137.50
$70\frac{5}{8}$	0.7063	$10,000	7,062.50
$113\frac{11}{32}$	1.1334	$100,000	113,343.75

[1] See the preface to this book regarding rounding.

Notice that a bond may trade below or above its par value. When a bond trades below its par value, it said to be **trading at a discount**. When a bond trades above its par value, it said to be **trading at a premium**. The reason why a bond sells above or below its par value will be explained in Chapter 2.

V. COUPON RATE

The **coupon rate**, also called the **nominal rate**, is the interest rate that the issuer agrees to pay each year. The annual amount of the interest payment made to bondholders during the term of the bond is called the **coupon**. The coupon is determined by multiplying the coupon rate by the par value of the bond. That is,

$$\text{coupon} = \text{coupon rate} \times \text{par value}$$

For example, a bond with an 8% coupon rate and a par value of $1,000 will pay annual interest of $80 ($= \$1,000 \times 0.08$).

When describing a bond of an issuer, the coupon rate is indicated along with the maturity date. For example, the expression "6s of 12/1/2020" means a bond with a 6% coupon rate maturing on 12/1/2020. The "s" after the coupon rate indicates "coupon series." In our example, it means the "6% coupon series."

In the United States, the usual practice is for the issuer to pay the coupon in two semiannual installments. Mortgage-backed securities and asset-backed securities typically pay interest monthly. For bonds issued in some markets outside the United States, coupon payments are made only once per year.

The coupon rate also affects the bond's price sensitivity to changes in market interest rates. As illustrated in Chapter 2, all other factors constant, the higher the coupon rate, the less the price will change in response to a change in market interest rates.

A. Zero-Coupon Bonds

Not all bonds make periodic coupon payments. Bonds that are not contracted to make periodic coupon payments are called **zero-coupon bonds**. The holder of a zero-coupon bond realizes interest by buying the bond substantially below its par value (i.e., buying the bond at a discount). Interest is then paid at the maturity date, with the interest being the difference between the par value and the price paid for the bond. So, for example, if an investor purchases a zero-coupon bond for 70, the interest is 30. This is the difference between the par value (100) and the price paid (70). The reason behind the issuance of zero-coupon bonds is explained in Chapter 2.

B. Step-Up Notes

There are securities that have a coupon rate that increases over time. These securities are called **step-up notes** because the coupon rate "steps up" over time. For example, a 5-year step-up note might have a coupon rate that is 5% for the first two years and 6% for the last three years. Or, the step-up note could call for a 5% coupon rate for the first two years, 5.5% for the third and fourth years, and 6% for the fifth year. When there is only one change (or step up), as in our first example, the issue is referred to as a **single step-up note**. When there is more than one change, as in our second example, the issue is referred to as a **multiple step-up note**.

An example of an actual multiple step-up note is a 5-year issue of the Student Loan Marketing Association (Sallie Mae) issued in May 1994. The coupon schedule is as follows:

6.05%	from	5/3/94	to	5/2/95
6.50%	from	5/3/95	to	5/2/96
7.00%	from	5/3/96	to	5/2/97
7.75%	from	5/3/97	to	5/2/98
8.50%	from	5/3/98	to	5/2/99

C. Deferred Coupon Bonds

There are bonds whose interest payments are deferred for a specified number of years. That is, there are no interest payments during for the deferred period. At the end of the deferred period, the issuer makes periodic interest payments until the bond matures. The interest payments that are made after the deferred period are higher than the interest payments that would have been made if the issuer had paid interest from the time the bond was issued. The higher interest payments after the deferred period are to compensate the bondholder for the lack of interest payments during the deferred period. These bonds are called **deferred coupon bonds**.

D. Floating-Rate Securities

The coupon rate on a bond need not be fixed over the bond's life. **Floating-rate securities**, sometimes called **variable-rate securities**, have coupon payments that reset periodically according to some reference rate. The typical formula (called the **coupon formula**) on certain determination dates when the coupon rate is reset is as follows:

$$\text{coupon rate} = \text{reference rate} + \text{quoted margin}$$

The **quoted margin** is the additional amount that the issuer agrees to pay above the reference rate. For example, suppose that the reference rate is the 1-month London interbank offered rate (LIBOR).[2] Suppose that the quoted margin is 100 basis points.[3] Then the coupon formula is:

$$\text{coupon rate} = \text{1-month LIBOR} + 100 \text{ basis points}$$

So, if 1-month LIBOR on the coupon reset date is 5%, the coupon rate is reset for that period at 6% (5% plus 100 basis points).

The quoted margin need not be a positive value. The quoted margin could be subtracted from the reference rate. For example, the reference rate could be the yield on a 5-year Treasury security and the coupon rate could reset every six months based on the following coupon formula:

$$\text{coupon rate} = \text{5-year Treasury yield} - 90 \text{ basis points}$$

[2]LIBOR is the interest rate which major international banks offer each other on Eurodollar certificates of deposit.

[3]In the fixed income market, market participants refer to changes in interest rates or differences in interest rates in terms of basis points. A **basis point** is defined as 0.0001, or equivalently, 0.01%. Consequently, 100 basis points are equal to 1%. (In our example the coupon formula can be expressed as 1-month LIBOR + 1%.) A change in interest rates from, say, 5.0% to 6.2% means that there is a 1.2% change in rates or 120 basis points.

So, if the 5-year Treasury yield is 7% on the coupon reset date, the coupon rate is 6.1% (7% minus 90 basis points).

It is important to understand the mechanics for the payment and the setting of the coupon rate. Suppose that a floater pays interest semiannually and further assume that the coupon reset date is today. Then, the coupon rate is determined via the coupon formula and this is the interest rate that the issuer agrees to pay at the next interest payment date six months from now.

A floater may have a restriction on the maximum coupon rate that will be paid at any reset date. The maximum coupon rate is called a **cap**. For example, suppose for a floater whose coupon formula is the 3-month Treasury bill rate plus 50 basis points, there is a cap of 9%. If the 3-month Treasury bill rate is 9% at a coupon reset date, then the coupon formula would give a coupon rate of 9.5%. However, the cap restricts the coupon rate to 9%. Thus, for our hypothetical floater, once the 3-month Treasury bill rate exceeds 8.5%, the coupon rate is capped at 9%. Because a cap restricts the coupon rate from increasing, a cap is an unattractive feature for the investor. In contrast, there could be a minimum coupon rate specified for a floater. The minimum coupon rate is called a **floor**. If the coupon formula produces a coupon rate that is below the floor, the floor rate is paid instead. Thus, a floor is an attractive feature for the investor. As we explain in Section X, caps and floors are effectively embedded options.

While the reference rate for most floaters is an interest rate or an interest rate index, a wide variety of reference rates appear in coupon formulas. The coupon for a floater could be indexed to movements in foreign exchange rates, the price of a commodity (e.g., crude oil), the return on an equity index (e.g., the S&P 500), or movements in a bond index. In fact, through financial engineering, issuers have been able to structure floaters with almost any reference rate. In several countries, there are government bonds whose coupon formula is tied to an inflation index.

The U.S. Department of the Treasury in January 1997 began issuing inflation-adjusted securities. These issues are referred to as **Treasury Inflation Protection Securities** (TIPS). The reference rate for the coupon formula is the rate of inflation as measured by the Consumer Price Index for All Urban Consumers (i.e., CPI-U). (The mechanics of the payment of the coupon will be explained in Chapter 3 where these securities are discussed.) Corporations and agencies in the United States issue **inflation-linked** (or **inflation-indexed**) **bonds**. For example, in February 1997, J. P. Morgan & Company issued a 15-year bond that pays the CPI plus 400 basis points. In the same month, the Federal Home Loan Bank issued a 5-year bond with a coupon rate equal to the CPI plus 315 basis points and a 10-year bond with a coupon rate equal to the CPI plus 337 basis points.

Typically, the coupon formula for a floater is such that the coupon rate increases when the reference rate increases, and decreases when the reference rate decreases. There are issues whose coupon rate moves in the opposite direction from the change in the reference rate. Such issues are called **inverse floaters** or **reverse floaters**.[4] It is not too difficult to understand why an investor would be interested in an inverse floater. It gives an investor who believes interest rates will decline the opportunity to obtain a higher coupon interest rate. The issuer isn't necessarily taking the opposite view because it can hedge the risk that interest rates will decline.[5]

[4]In the agency, corporate, and municipal markets, inverse floaters are created as structured notes. We discuss structured notes in Chapter 3. Inverse floaters in the mortgage-backed securities market are common and are created through a process that will be discussed in Chapter 10.

[5]The issuer hedges by using financial instruments known as derivatives, which we cover in later chapters.

The coupon formula for an inverse floater is:

$$\text{coupon rate} = K - L \times (\text{reference rate})$$

where K and L are values specified in the prospectus for the issue.

For example, suppose that for a particular inverse floater, K is 20% and L is 2. Then the coupon reset formula would be:

$$\text{coupon rate} = 20\% - 2 \times (\text{reference rate})$$

Suppose that the reference rate is the 3-month Treasury bill rate, then the coupon formula would be

$$\text{coupon rate} = 20\% - 2 \times (\text{3-month Treasury bill rate})$$

If at the coupon reset date the 3-month Treasury bill rate is 6%, the coupon rate for the next period is:

$$\text{coupon rate} = 20\% - 2 \times 6\% = 8\%$$

If at the next reset date the 3-month Treasury bill rate declines to 5%, the coupon rate increases to:

$$\text{coupon rate} = 20\% - 2 \times 5\% = 10\%$$

Notice that if the 3-month Treasury bill rate exceeds 10%, then the coupon formula would produce a negative coupon rate. To prevent this, there is a floor imposed on the coupon rate. There is also a cap on the inverse floater. This occurs if the 3-month Treasury bill rate is zero. In that unlikely event, the maximum coupon rate is 20% for our hypothetical inverse floater.

There is a wide range of coupon formulas that we will encounter in our study of fixed income securities.[6] These are discussed below. The reason why issuers have been able to create floating-rate securities with offbeat coupon formulas is due to derivative instruments. It is too early in our study of fixed income analysis and portfolio management to appreciate why some of these offbeat coupon formulas exist in the bond market. Suffice it to say that some of these offbeat coupon formulas allow the investor to take a view on either the movement of some interest rate (i.e., for speculating on an interest rate movement) or to reduce exposure to the risk of some interest rate movement (i.e., for interest rate risk management). The advantage to the issuer is that it can lower its cost of borrowing by creating offbeat coupon formulas for investors.[7] While it may seem that the issuer is taking the opposite position to the investor, this is not the case. What in fact happens is that the issuer can hedge its risk exposure by using derivative instruments so as to obtain the type of financing it seeks (i.e., fixed rate borrowing or floating rate borrowing). These offbeat coupon formulas are typically found in "structured notes," a form of medium-term note that will be discussed in Chapter 3.

[6] In Chapter 3, we will describe other types of floating-rate securities.

[7] These offbeat coupon bond formulas are actually created as a result of inquiries from clients of dealer firms. That is, a salesperson will be approached by fixed income portfolio managers requesting a structure be created that provides the exposure sought. The dealer firm will then notify the investment banking group of the dealer firm to contact potential issuers.

E. Accrued Interest

Bond issuers do not disburse coupon interest payments every day. Instead, typically in the United States coupon interest is paid every six months. In some countries, interest is paid annually. For mortgage-backed and asset-backed securities, interest is usually paid monthly. The coupon payment is made to the bondholder of record. Thus, if an investor sells a bond between coupon payments and the buyer holds it until the next coupon payment, then the entire coupon interest earned for the period will be paid to the buyer of the bond since the buyer will be the holder of record. The seller of the bond gives up the interest from the time of the last coupon payment to the time until the bond is sold. The amount of interest over this period that will be received by the buyer even though it was earned by the seller is called **accrued interest**. We will see how to calculate accrued interest in Chapter 5.

In the United States and in many countries, the bond buyer must pay the bond seller the accrued interest. The amount that the buyer pays the seller is the agreed upon price for the bond plus accrued interest. This amount is called the **full price**. (Some market participants refer to this as the **dirty price**.) The agreed upon bond price without accrued interest is simply referred to as the **price**. (Some refer to it as the **clean price**.)

A bond in which the buyer must pay the seller accrued interest is said to be trading *cum-coupon* ("with coupon"). If the buyer forgoes the next coupon payment, the bond is said to be trading *ex-coupon* ("without coupon"). In the United States, bonds are always traded *cum-coupon*. There are bond markets outside the United States where bonds are traded *ex-coupon* for a certain period before the coupon payment date.

There are exceptions to the rule that the bond buyer must pay the bond seller accrued interest. The most important exception is when the issuer has not fulfilled its promise to make the periodic interest payments. In this case, the issuer is said to be in default. In such instances, the bond is sold without accrued interest and is said to be **traded flat**.

VI. PROVISIONS FOR PAYING OFF BONDS

The issuer of a bond agrees to pay the principal by the stated maturity date. The issuer can agree to pay the entire amount borrowed in one lump sum payment at the maturity date. That is, the issuer is not required to make any principal repayments prior to the maturity date. Such bonds are said to have a **bullet maturity**. The bullet maturity structure has become the most common structure in the United States and Europe for both corporate and government issuers.

Fixed income securities backed by pools of loans (mortgage-backed securities and asset-backed securities) often have a schedule of partial principal payments. Such fixed income securities are said to be **amortizing securities**. For many loans, the payments are structured so that when the last loan payment is made, the entire amount owed is fully paid.

Another example of an amortizing feature is a bond that has a **sinking fund provision**. This provision for repayment of a bond may be designed to pay all of an issue by the maturity date, or it may be arranged to repay only a part of the total by the maturity date. We discuss this provision later in this section.

An issue may have a **call provision** granting the issuer an option to retire all or part of the issue prior to the stated maturity date. Some issues specify that the issuer must retire a predetermined amount of the issue periodically. Various types of call provisions are discussed in the following pages.

A. Call and Refunding Provisions

An issuer generally wants the right to retire a bond issue prior to the stated maturity date. The issuer recognizes that at some time in the future interest rates may fall sufficiently below the issue's coupon rate so that redeeming the issue and replacing it with another lower coupon rate issue would be economically beneficial. This right is a disadvantage to the bondholder since proceeds received must be reinvested in the lower interest rate issue. As a result, an issuer who wants to include this right as part of a bond offering must compensate the bondholder when the issue is sold by offering a higher coupon rate, or equivalently, accepting a lower price than if the right is not included.

The right of the issuer to retire the issue prior to the stated maturity date is referred to as a **call provision**. If an issuer exercises this right, the issuer is said to "call the bond." The price which the issuer must pay to retire the issue is referred to as the **call price** or **redemption price**.

When a bond is issued, typically the issuer may not call the bond for a number of years. That is, the issue is said to have a **deferred call**. The date at which the bond may first be called is referred to as the **first call date**. The first call date for the Walt Disney 7.55s due 7/15/2093 (the 100-year bonds) is 7/15/2023. For the 50-year Tennessee Valley Authority $6\frac{7}{8}$s due 12/15/2043, the first call date is 12/15/2003.

Bonds can be called in whole (the entire issue) or in part (only a portion). When less than the entire issue is called, the certificates to be called are either selected randomly or on a **pro rata basis**. When bonds are selected randomly, a computer program is used to select the serial number of the bond certificates called. The serial numbers are then published in *The Wall Street Journal* and major metropolitan dailies. Pro rata redemption means that all bondholders of the issue will have the same percentage of their holdings redeemed (subject to the restrictions imposed on minimum denominations). Pro rata redemption is rare for publicly issued debt but is common for debt issues directly or privately placed with borrowers.

A bond issue that permits the issuer to call an issue prior to the stated maturity date is referred to as a **callable bond**. At one time, the callable bond structure was common for corporate bonds issued in the United States. However, since the mid-1990s, there has been significantly less issuance of callable bonds by corporate issuers of high credit quality. Instead, as noted above, the most popular structure is the bullet bond. In contrast, corporate issuers of low credit quality continue to issue callable bonds.[8] In Europe, historically the callable bond structure has not been as popular as in the United States.

1. Call (Redemption) Price

When the issuer exercises an option to call an issue, the call price can be either (1) fixed regardless of the call date, (2) based on a price specified in the call schedule, or (3) based on a make-whole premium provision. We will use various debt issues of Anheuser-Busch Companies to illustrate these three ways by which the call price is specified.

a. Single Call Price Regardless of Call Date On 6/10/97, Anheuser-Busch Companies issued $250 million of notes with a coupon rate of 7.1% due June 15, 2007. The prospectus stated that:

[8]As explained in Chapter 2, high credit quality issuers are referred to as "investment grade" issuers and low credit quality issuers are referred to as "non-investment grade" issuers. The reason why high credit quality issuers have reduced their issuance of callable bonds while it is still the more popular structure for low credit quality issuers is explained later.

. . . The Notes will be redeemable at the option of the Company at any time on or after June 15, 2004, as set forth herein.

The Notes will be redeemable at the option of the Company at any time on or after June 15, 2004, in whole or in part, upon not fewer than 30 days' nor more than 60 days' notice, at a Redemption Price equal to 100% of the principal amount thereof, together with accrued interest to the date fixed for redemption.

This issue had a deferred call of seven years at issuance and a first call date of June 15, 2004. Regardless of the call date, the call price is par plus accrued interest.

b. Call Price Based on Call Schedule With a **call schedule**, the call price depends on when the issuer calls the issue. As an example of an issue with a call schedule, in July 1997 Anheuser-Busch Companies issued $250 million of debentures with a coupon rate of $7\frac{1}{8}$ due July 1, 2017. (We will see what a debt instrument referred to as a "debenture" is in Chapter 3.) The provision dealing with the call feature of this issue states:

The Debentures will be redeemable at the option of the Company at any time on or after July 1, 2007, in whole or in part, upon not fewer than 30 days' nor more than 60 days' notice, at Redemption Prices equal to the percentages set forth below of the principal amount to be redeemed for the respective 12-month periods beginning July 1 of the years indicated, together in each case with accrued interest to the Redemption Date:

12 months beginning July 1	Redemption price	12 months beginning July 1	Redemption price
2007	103.026%	2012	101.513%
2008	102.723%	2013	101.210%
2009	102.421%	2014	100.908%
2010	102.118%	2015	100.605%
2011	101.816%	2016	100.303%

This issue had a deferred call of 10 years from the date of issuance, and the call price begins at a premium above par value and declines over time toward par value. Notice that regardless of when the issue is called, the issuer pays a premium above par value.

A second example of a call schedule is provided by the $150 million Anheuser-Busch Companies $8\frac{5}{8}$s due 12/1/2016 issued November 20,1986. This issue had a 10-year deferred call (the first call date was December 1, 1996) and the following call schedule:

If redeemed during the 12 months beginning December 1:	Call price	If redeemed during the 12 months beginning December 1:	Call price
1996	104.313	2002	101.725
1997	103.881	2003	101.294
1998	103.450	2004	100.863
1999	103.019	2005	100.431
2000	102.588	2006 and thereafter	100.000
2001	102.156		

Notice that for this issue the call price begins at a premium but after 2006 the call price declines to par value. The first date at which an issue can be called at par value is the **first par call date**.

c. Call Price Based on Make-Whole Premium A **make-whole premium provision**, also called a **yield-maintenance premium provision**, provides a formula for determining the premium that an issuer must pay to call an issue. The purpose of the make-whole premium is to protect the yield of those investors who purchased the issue at issuance. A make-whole premium does so by setting an amount for the premium, such that when added to the principal amount and reinvested at the redemption date in U.S. Treasury securities having the same remaining life, it would provide a yield equal to the original issue's yield. The premium plus the principal at which the issue is called is referred to as the **make-whole redemption price**.

We can use an Anheuser-Busch Companies issue to illustrate a make-whole premium provision—the $250 million 6% debentures due 11/1/2041 issued on 1/5/2001. The prospectus for this issue states:

> *We may redeem the Debentures, in whole or in part, at our option at any time at a redemption price equal to the greater of (i) 100% of the principal amount of such Debentures and (ii) as determined by a Quotation Agent (as defined below), the sum of the present values of the remaining scheduled payments of principal and interest thereon (not including any portion of such payments of interest accrued as of the date of redemption) discounted to the date of redemption on a semi-annual basis (assuming a 360-day year consisting of twelve 30-day months) at the Adjusted Treasury Rate (as defined below) plus 25 basis points plus, in each case, accrued interest thereon to the date of redemption.*

The prospectus defined what is meant by a "Quotation Agent" and the "Adjusted Treasury Rate." For our purposes here, it is not necessary to go into the definitions, only that there is some mechanism for determining a call price that reflects current market conditions as measured by the yield on Treasury securities. (Treasury securities are explained in Chapter 3.)

2. Noncallable versus Nonrefundable Bonds If a bond issue does not have any protection against early call, then it is said to be a **currently callable** issue. But most new bond issues, even if currently callable, usually have some restrictions against certain types of early redemption. The most common restriction is that of prohibiting the refunding of the bonds for a certain number of years or for the issue's life. Bonds that are noncallable for the issue's life are more common than bonds which are nonrefundable for life but otherwise callable.

Many investors are confused by the terms **noncallable** and **nonrefundable**. Call protection is much more robust than refunding protection. While there may be certain exceptions to absolute or complete call protection in some cases (such as sinking funds and the redemption of debt under certain mandatory provisions discussed later), call protection still provides greater assurance against premature and unwanted redemption than refunding protection. Refunding protection merely prevents redemption from certain sources, namely the proceeds of other debt issues sold at a lower cost of money. The holder is protected only if interest rates decline and the borrower can obtain lower-cost money to pay off the debt.

For example, Anheuser-Busch Companies issued on 6/23/88 10% coupon bonds due 7/1/2018. The issue was immediately callable. However, the prospectus specified in the call schedule that

> *prior to July 1, 1998, the Company may not redeem any of the Debentures pursuant to such option, directly or indirectly, from or in anticipation of the proceeds of the issuance of any indebtedness for money borrowed having an interest cost of less than 10% per annum.*

Thus, this Anheuser-Busch bond issue could not be redeemed prior to July 2, 1998 if the company raised the money from a new issue with an interest cost lower than 10%. There is

nothing to prevent the company from calling the bonds within the 10-year refunding protected period from debt sold at a higher rate (although the company normally wouldn't do so) or from money obtained through other means. And that is exactly what Anheuser-Busch did. Between December 1993 and June 1994, it called $68.8 million of these relatively high-coupon bonds at 107.5% of par value (the call price) with funds from its general operations. This was permitted because funds from the company's general operations are viewed as more expensive than the interest cost of indebtedness. Thus, Anheuser-Busch was allowed to call this issue prior to July 1, 1998.

3. Regular versus Special Redemption Prices The call prices for the various issues cited above are called the **regular redemption prices** or **general redemption prices**. Notice that the regular redemption prices are above par until the first par call date. There are also **special redemption prices** for bonds redeemed through the sinking fund and through other provisions, and the proceeds from the confiscation of property through the right of eminent domain or the forced sale or transfer of assets due to deregulation. The special redemption price is usually par value. Thus, there is an advantage to the issuer of being able to redeem an issue prior to the first par call date at the special redemption price (usually par) rather than at the regular redemption price.

A concern of an investor is that an issuer will use all means possible to maneuver a call so that the special redemption price applies. This is referred to as the **par call problem**. There have been ample examples, and subsequent litigation, where corporations have used the special redemption price and bondholders have challenged the use by the issuer.

B. Prepayments

For amortizing securities that are backed by loans that have a schedule of principal payments, individual borrowers typically have the option to pay off all or part of their loan prior to a scheduled principal payment date. Any principal payment prior to a scheduled principal payment date is called a **prepayment**. The right of borrowers to prepay principal is called a **prepayment option**.

Basically, the prepayment option is the same as a call option. However, unlike a call option, there is not a call price that depends on when the borrower pays off the issue. Typically, the price at which a loan is prepaid is par value. Prepayments will be discussed when mortgage-backed and asset-backed securities are discussed.

C. Sinking Fund Provision

An indenture may require the issuer to retire a specified portion of the issue each year. This is referred to as a **sinking fund requirement**. The alleged purpose of the sinking fund provision is to reduce credit risk (discussed in the next chapter). This kind of provision for debt payment may be designed to retire all of a bond issue by the maturity date, or it may be designed to pay only a portion of the total indebtedness by the end of the term. If only a portion is paid, the remaining principal is called a **balloon maturity**.

An example of an issue with a sinking fund requirement that pays the entire principal by the maturity date is the $150 million Ingersoll Rand 7.20s issue due 6/1/2025. This bond, issued on 6/5/1995, has a sinking fund schedule that begins on 6/1/2006. Each year the issuer must retire $7.5 million.

Generally, the issuer may satisfy the sinking fund requirement by either (1) making a cash payment to the trustee equal to the par value of the bonds to be retired; the trustee then calls

the bonds for redemption using a lottery, or (2) delivering to the trustee bonds purchased in the open market that have a total par value equal to the amount to be retired. If the bonds are retired using the first method, interest payments stop at the redemption date.

Usually, the periodic payments required for a sinking fund requirement are the same for each period. Selected issues may permit variable periodic payments, where payments change according to certain prescribed conditions set forth in the indenture. Many bond issue indentures include a provision that grants the issuer the option to retire more than the sinking fund requirement. This is referred to as an **accelerated sinking fund provision**. For example, the Anheuser-Busch $8\frac{5}{8}$s due 12/1/2016, whose call schedule was presented earlier, has a sinking fund requirement of $7.5 million each year beginning on 12/01/1997. The issuer is permitted to retire up to $15 million each year.

Usually the sinking fund call price is the par value if the bonds were originally sold at par. When issued at a premium, the call price generally starts at the issuance price and scales down to par as the issue approaches maturity.

VII. CONVERSION PRIVILEGE

A **convertible bond** is an issue that grants the bondholder the right to convert the bond for a specified number of shares of common stock. Such a feature allows the bondholder to take advantage of favorable movements in the price of the issuer's common stock. An **exchangeable bond** allows the bondholder to exchange the issue for a specified number of shares of common stock of a corporation different from the issuer of the bond. These bonds are discussed later where a framework for analyzing them is also provided.

VIII. PUT PROVISION

An issue with a **put provision** included in the indenture grants the bondholder the right to sell the issue back to the issuer at a specified price on designated dates. The specified price is called the **put price**. Typically, a bond is putable at par if it is issued at or close to par value. For a zero-coupon bond, the put price is below par.

The advantage of a put provision to the bondholder is that if, after the issuance date, market rates rise above the issue's coupon rate, the bondholder can force the issuer to redeem the bond at the put price and then reinvest the put bond proceeds at the prevailing higher rate.

IX. CURRENCY DENOMINATION

The payments that the issuer makes to the bondholder can be in any currency. For bonds issued in the United States, the issuer typically makes coupon payments and principal repayments in U.S. dollars. However, there is nothing that forces the issuer to make payments in U.S. dollars. The indenture can specify that the issuer may make payments in some other specified currency.

An issue in which payments to bondholders are in U.S. dollars is called a **dollar-denominated issue**. A **nondollar-denominated issue** is one in which payments are not denominated in U.S. dollars. There are some issues whose coupon payments are in one currency and whose principal payment is in another currency. An issue with this characteristic is called a **dual-currency issue**.

X. EMBEDDED OPTIONS

As we have seen, it is common for a bond issue to include a provision in the indenture that gives the issuer and/or the bondholder an option to take some action against the other party. These options are referred to as **embedded options** to distinguish them from stand alone options (i.e., options that can be purchased on an exchange or in the over-the-counter market). They are referred to as embedded options because the option is embedded in the issue. In fact, there may be more than one embedded option in an issue.

A. Embedded Options Granted to Issuers

The most common embedded options that are granted to issuers or borrowers discussed in the previous section include:

- the right to call the issue
- the right of the underlying borrowers in a pool of loans to prepay principal above the scheduled principal payment
- the accelerated sinking fund provision
- the cap on a floater

The accelerated sinking fund provision is an embedded option because the issuer can call more than is necessary to meet the sinking fund requirement. An issuer usually takes this action when interest rates decline below the issue's coupon rate even if there are other restrictions in the issue that prevent the issue from being called.

The cap of a floater can be thought of as an option requiring no action by the issuer to take advantage of a rise in interest rates. Effectively, the bondholder has granted to the issuer the right not to pay more than the cap.

Notice that whether or not the first three options are exercised by the issuer or borrower depends on the level of interest rates prevailing in the market relative to the issue's coupon rate or the borrowing rate of the underlying loans (in the case of mortgage-backed and asset-backed securities). These options become more valuable when interest rates fall. The cap of a floater also depends on the prevailing level of rates. But here the option becomes more valuable when interest rates rise.

B. Embedded Options Granted to Bondholders

The most common embedded options granted to bondholders are:

- conversion privilege
- the right to put the issue
- floor on a floater

The value of the conversion privilege depends on the market price of the stock relative to the embedded purchase price held by the bondholder when exercising the conversion option. The put privilege benefits the bondholder if interest rates rise above the issue's coupon rate. While a cap on a floater benefits the issuer if interest rates rise, a floor benefits the bondholder if interest rates fall since it fixes a minimum coupon rate payable.

C. Importance of Understanding Embedded Options

At the outset of this chapter, we stated that fixed income securities have become more complex. One reason for this increased complexity is that embedded options make it more difficult to project the cash flows of a security. The cash flow for a fixed income security is defined as its interest and the principal payments.

To value a fixed income security with embedded options, it is necessary to:

1. model the factors that determine whether or not an embedded option will be exercised over the life of the security, and
2. in the case of options granted to the issuer/borrower, model the behavior of issuers and borrowers to determine the conditions necessary for them to exercise an embedded option.

For example, consider a callable bond issued by a corporation. Projecting the cash flow requires (1) modeling interest rates (over the life of the security) at which the issuer can refund an issue and (2) developing a rule for determining the economic conditions necessary for the issuer to benefit from calling the issue. In the case of mortgage-backed or asset-backed securities, again it is necessary to model how interest rates will influence borrowers to refinance their loan over the life of the security. Models for valuing bonds with embedded options will be covered in Chapter 9.

It cannot be overemphasized that embedded options affect not only the value of a bond but also the total return of a bond. In the next chapter, the risks associated with the presence of an embedded option will be explained. What is critical to understand is that due to the presence of embedded options it is necessary to develop models of interest rate movements and rules for exercising embedded options. Any analysis of securities with embedded options exposes an investor to **modeling risk**. Modeling risk is the risk that the model analyzing embedded options produces the wrong value because the assumptions are not correct or the assumptions were not realized. This risk will become clearer when we describe models for valuing bonds with embedded options.

XI. BORROWING FUNDS TO PURCHASE BONDS

In later chapters, we will discuss investment strategies an investor uses to borrow funds to purchase securities. The expectation of the investor is that the return earned by investing in the securities purchased with the borrowed funds will exceed the borrowing cost. There are several sources of funds available to an investor when borrowing funds. When securities are purchased with borrowed funds, the most common practice is to use the securities as collateral for the loan. In such instances, the transaction is referred to as a **collateralized loan**. Two collateralized borrowing arrangements are used by investors—margin buying and repurchase agreements.

A. Margin Buying

In a **margin buying arrangement**, the funds borrowed to buy the securities are provided by the broker and the broker gets the money from a bank. The interest rate banks charge brokers for these transactions is called the call money rate (or broker loan rate). The broker charges

the investor the call money rate plus a service charge. The broker is not free to lend as much as it wishes to the investor to buy securities. In the United States, the Securities and Exchange Act of 1934 prohibits brokers from lending more than a specified percentage of the market value of the securities. The 1934 Act gives the Board of Governors of the Federal Reserve the responsibility to set initial margin requirements, which it does under Regulations T and U. While margin buying is the most common collateralized borrowing arrangement for common stock investors (both retail investors and institutional investors) and retail bond investors (i.e., individual investors), it is not the common for institutional bond investors.

B. Repurchase Agreement

The collateralized borrowing arrangement used by institutional investors in the bond market is the repurchase agreement. We will discuss this arrangement in more detail later. However, it is important to understand the basics of the repurchase agreement because it affects how some bonds in the market are valued.

A **repurchase agreement** is the sale of a security with a commitment by the seller to buy the same security back from the purchaser at a specified price at a designated future date. The **repurchase price** is the price at which the seller and the buyer agree that the seller will repurchase the security on a specified future date called the repurchase date. The difference between the repurchase price and the sale price is the dollar interest cost of the loan; based on the dollar interest cost, the sales price, and the length of the repurchase agreement, an implied interest rate can be computed. This implied interest rate is called the **repo rate**. The advantage to the investor of using this borrowing arrangement is that the interest rate is less than the cost of bank financing. When the term of the loan is one day, it is called an **overnight repo** (or overnight RP); a loan for more than one day is called a **term repo** (or term RP). As will be explained, there is not one repo rate. The rate varies from transaction to transaction depending on a variety of factors.