CHAPTER 1

Introduction to European Fixed Income Securities and Markets

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A *bond* is a debt capital market instrument issued by a borrower, who is then required to repay to the lender/investor the amount borrowed plus interest, over a specified period of time. Bonds are also known as *fixed income* instruments, or *fixed interest* instruments in the sterling markets. Usually bonds are considered to be those debt securities with terms to maturity of over one year. Debt issued with a maturity of less than one year is considered to be *money market* debt. There are many different types of bonds that can be issued. The most common bond is the *conventional* (or *plain vanilla* or *bullet*) *bond*. This is a bond paying periodic interest pay-

ments at a fixed rate over a fixed period to maturity or redemption, with the return of *principal* (the par or nominal value of the bond) on the maturity date. All other bonds will be variations of this basic structure.

A bond is therefore a financial contract from the person or body that has issued the bond, that is, the borrowed funds. Unlike shares or equity capital, bonds carry no ownership privileges. The bond remains an interest-bearing obligation of the issuer until it is repaid, which is usually on its maturity date.

There is a wide range of participants involved in the European fixed-income markets. We can group them broadly into borrowers and investors, plus the institutions and individuals who are part of the business of bond trading. Borrowers access the bond markets as part of their financing requirements; hence borrowers can include sovereign governments, local authorities, public sector organisations and corporations. Virtually all businesses operate with a financing structure that is a mixture of debt and equity finance. The debt finance may well contain a form of bond finance, so it is easy to see what an important part of the global economy the bond markets are.

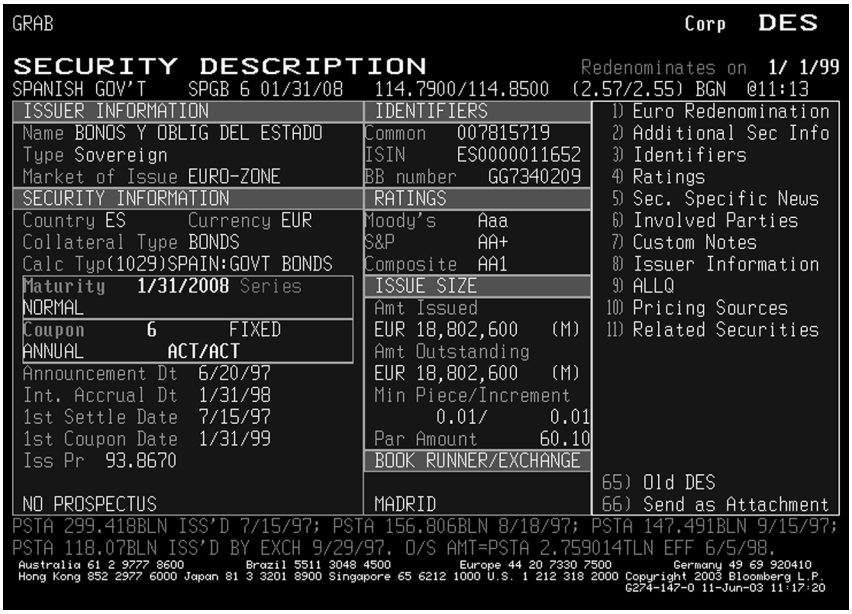
The different types of bonds in the European market reflect the different types of issuers and their respective requirements. Some bonds are safer investments than others. The advantage of bonds to an investor is that they represent a fixed source of current income, with an assurance of repayment of the loan on maturity. Bonds issued by developed country governments are deemed to be guaranteed investments in that the final repayment is virtually certain. For a corporate bond, in the event of default of the issuing entity, bondholders rank above shareholders for compensation payments. There is lower risk associated with bonds compared to shares as an investment, and therefore almost invariably a lower return in the long term.

In this chapter, we will provide a basic description of the various types of fixed-income instruments encountered in the European markets as well as the definitions of some key terms and concepts that will assist the reader throughout the remainder of the book. Important groups of investors in these markets are briefly discussed in the last section of the chapter.

DESCRIPTION OF THE BASIC FEATURES

A bond, like any security, can be thought of as a package of cash flows. A bond's cash flows come in two forms—coupon interest payments and the *maturity value* or *par value*. In European markets, many bonds deliver annual cash flows. As an illustration, consider a 6% coupon

EXHIBIT 1.1 **Bloomberg Security Description Screen for a Spanish Government Bond**



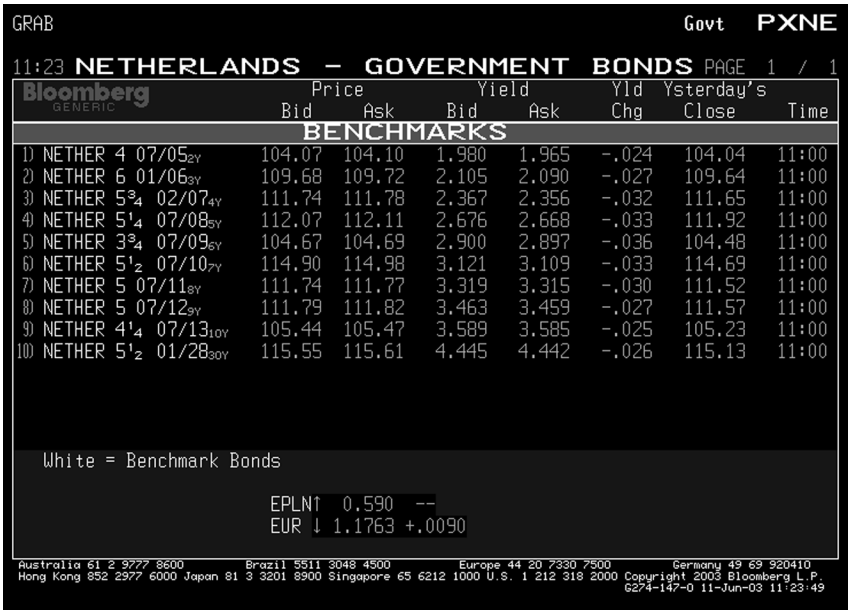
Source: Bloomberg Financial Markets.

bond issued by the Spanish government that matures on 31 January 2008. Exhibit 1.1 presents the Bloomberg Security Description Screen for this issue. The *coupon rate* is the rate of interest that is multiplied by the maturity value to determine the size of the bond's coupon payments. Note that this bond delivers annual coupon payments. Suppose one owns this bond in June 2003, what cash flows can the bondholder expect between now and the maturity date assuming the maturity value is €100? On each 31 January for the years 2004 through 2008, the bondholder will receive annual coupon payments of €6. Moreover, on the maturity date, the bondholder receives the maturity value of €100, which is the bond's terminal cash flow.

Type of Issuer

A primary distinguishing feature of a bond is its issuer. The nature of the issuer will affect the way the bond is viewed in the market. There are four issuers of bonds: sovereign governments and their agencies, local government authorities, supranational bodies such as the World Bank, and corporations. Within the corporate bond market there is a wide

EXHIBIT 1.2 Bloomberg Screen of the Benchmark Government Bonds of The Netherlands



Source: Bloomberg Financial Markets.

range of issuers, each with differing abilities to satisfy their contractual obligations to investors. The largest bond markets are those of sovereign borrowers, the government bond markets.

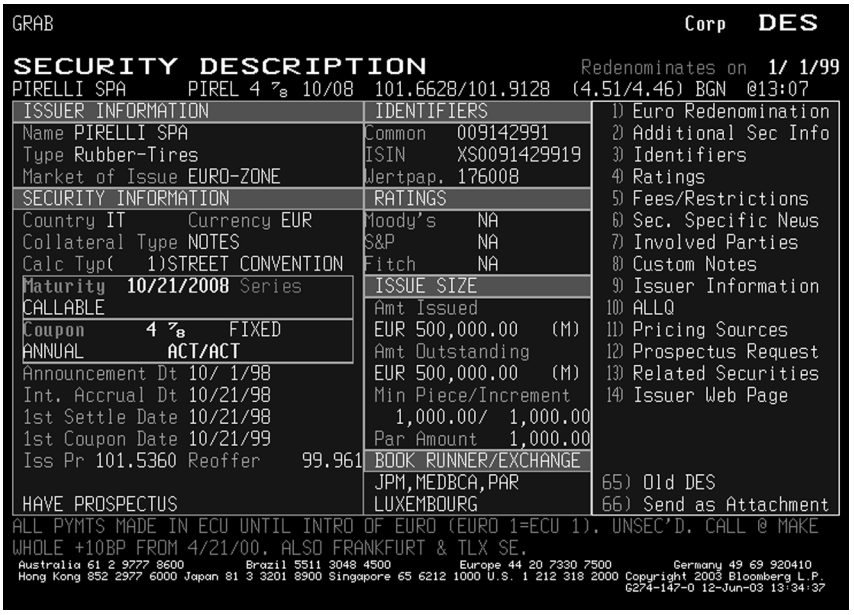
The most actively traded government securities for various maturities are called *benchmark issues*. Yields on these issues serve as reference interest rates which are used extensively for pricing other securities.[1] Exhibit 1.2 is a Bloomberg screen of the benchmark bonds issued by the government of the Netherlands. European government bonds will be discussed in Chapter 5. As an illustration of a corporate bond, Exhibit 1.3 shows a Bloomberg Security Description screen for 4.875% coupon bond issued by Pirelli SPA that matures on 21 October 2008.

Term to Maturity

The *term to maturity* of a bond is the number of years after which the issuer will repay the obligation. During the term the issuer will also

[1] In some European countries, swap curves are used as a benchmark for pricing securities.

EXHIBIT 1.3 **Bloomberg Security Description Screen for a Corporate Bond Issued by Pirelli**



Source: Bloomberg Financial Markets.

make periodic interest payments on the debt. The *maturity* 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 principal. The practice in the market is often to refer simply to a bond's "term" or "maturity." The provisions under which a bond is issued may allow either the issuer or investor to alter a bond's term to maturity after a set notice period, and such bonds need to be analysed in a different way. The term to maturity is an important consideration in the makeup of a bond. It indicates the time period over which the bondholder can expect to receive the coupon payments and the number of years before the principal will be paid in full. The bond's *yield* also depends on the term to maturity. Finally, the price of a bond will fluctuate over its life as yields in the market change and as it approaches maturity. As we will discover later, the *volatility* of a bond's price is dependent on its maturity; assuming other factors constant, the longer a bond's maturity the greater the price volatility resulting from a change in market yields.

One common way to distinguish between different sectors of the debt markets is by the maturity of the instruments. The *money market* is

the market for short-term debt instruments with original maturities of one year or less. This market includes such instruments as short-term government debt, commercial paper, some medium-term notes, bankers' acceptances, most certificates of deposit, and repurchase agreements. According to the European Central Bank, as March 2003, the total short-term debt outstanding (maturities of one year or less) in the Euro area was €783.6 billion. Although this is an important sector of the debt market, money market instruments are not covered in this book.[2] Instead, our focus is on the *capital market,* which includes debt instruments that have original maturities of greater than one year.

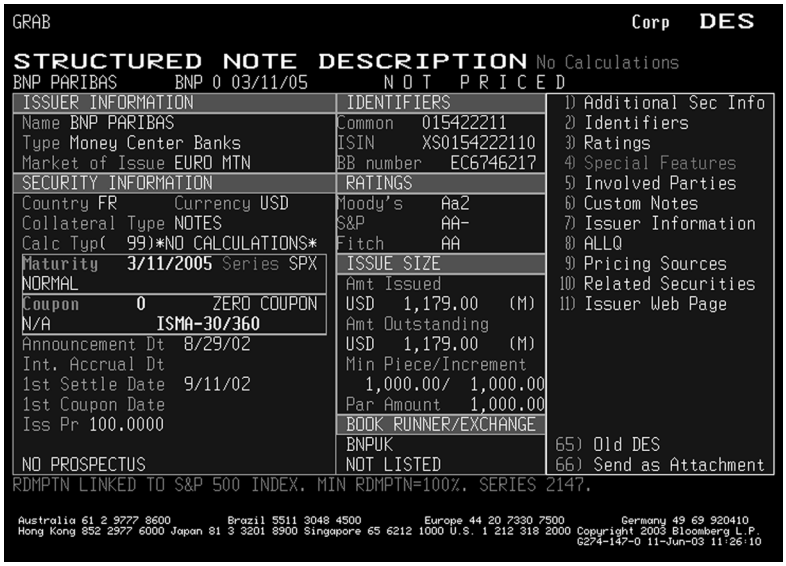
Coupon Types

As noted, the coupon rate is the interest rate the issuer agrees to pay each year. The coupon rate is used to determine the annual coupon payment which can be delivered to the bondholder once per year or in two or more equal installments. As noted, for bonds issued in European bond markets and the Eurobond markets, coupon payments are made annually. Conversely, in the United Kingdom, United States, and Japan, the usual practice is for the issuer to pay the coupon in two semiannual installments. An important exception is structured products (e.g., asset-backed securities) which often deliver cash flows more frequently (e.g., quarterly, monthly).

Certain bonds do not make any coupon payments at all and these issues are known as *zero-coupon bonds*. A zero-coupon bond has only one cash flow which is the maturity value. Zero-coupon bonds are issued by corporations and governments. Exhibit 1.4 shows a Bloomberg Security Description screen of a zero-coupon bond issued by the French bank BNP Paribus that matures March 11, 2005. Since the maturity value is €1,000, the price will be at a discount to €1,000. The difference between the price paid for the bond and the maturity value is the interest realized by the bondholder. One important type of zero-coupon bond is called *strips*. In essence, strips are government zero-coupon bonds. However, strips are issued by governments directly but are created by dealer firms. Conventional coupon bonds can be stripped or broken apart into a series of individual cash flows which would then trade separately as zero-coupon bonds. This is a common practice in European government bond markets. Exhibit 1.5 presents a Bloomberg screen of some German government coupon strips. Since zero-coupon bonds can created from coupon payments or the maturity value, a distinction is made between the two.

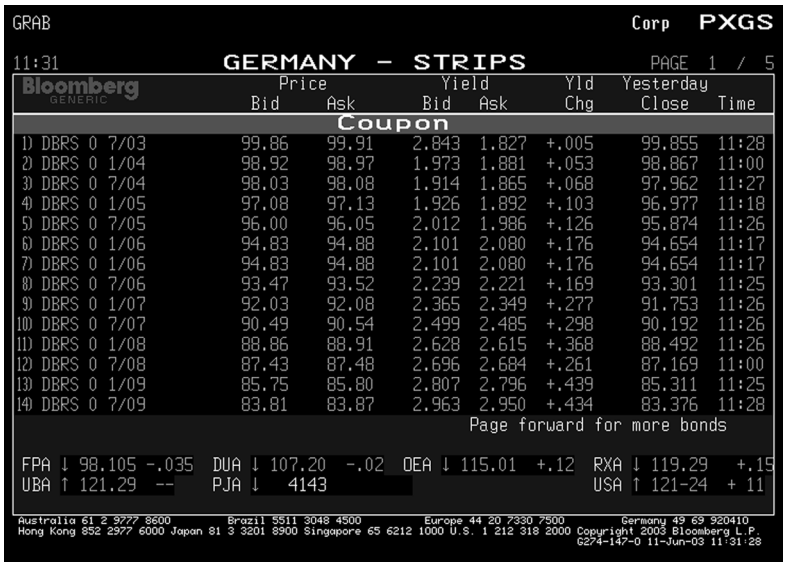
[2] For a complete treatment of the money markets, see Frank J. Fabozzi, Steven V. Mann, and Moorad Choudhry, *The Global Money Markets* (Hoboken, NJ: John Wiley & Sons, Inc., 2002).

EXHIBIT 1.4 Bloomberg Security Description Screen for a Zero-Coupon Bond Issued by BNP Paribus



Source: Bloomberg Financial Markets.

EXHIBIT 1.5 Bloomberg Screen of German Government Coupon Strips



Source: Bloomberg Financial Markets.

In contrast to a coupon rate that remains unchanged for the bond's entire life, a *floating-rate security* or *floater* is a debt instrument whose coupon rate is reset at designated dates based on the value of some reference rate. Thus, the coupon rate will vary over the instrument's life. The coupon rate is almost always determined by a coupon formula. For example, a floater issued by Aareal Bank AG in Denmark (due in May 2007) has a coupon formula equal to three month EURIBOR plus 20 basis points and delivers cash flows quarterly.

There are several features about floaters that deserve mention. First, a floater may have a restriction on the maximum (minimum) coupon rate that be paid at any reset date called a *cap* (*floor*). Second, while a floater's coupon rate normally moves in the same direction as the reference rate moves, there are floaters whose coupon rate moves in the opposite direction from the reference rate. These securities are called *inverse floaters*. As an example, consider an inverse floater issued by the Republic of Austria. This issue matures in April 2005 and delivers semiannual coupon payments according to the following formula:

12.125% – 6-month EURIBOR.

An *index-linked* bond has its coupon or maturity value or sometimes both linked to a specific index. When governments issue index-linked bonds, the cash flows are linked to a price index such as consumer or commodity prices. Corporations have also issued index-linked bonds that are connected to either an inflation index or a stock market index. For example, Kredit Fuer Wiederaufbau, a special purpose bank in Denmark, issued a floating-rate note in March 2003 whose coupon rate will be linked to the Eurozone CPI (excluding tobacco) beginning in September 2004. Inflation-indexed bonds are detailed in Chapter 8.

Currency Denomination

The cash flows of a fixed-income security can be denominated in any currency. For bonds issued by countries within the European Union, the issuer typically makes both coupon payments and maturity value payments in euros. However, there is nothing that prohibits the issuer from making payments in other currencies. The bond's indenture can specify that the issuer may make payments in some other specified currency. There are some issues whose coupon payments are in one currency and whose maturity value is in another currency. An issue with this feature is called a *dual-currency issue*.

NONCONVENTIONAL BONDS

The definition of bonds given earlier in this chapter referred to conventional or *plain vanilla* bonds. There are many variations on vanilla bonds and we can introduce a few of them here.

Securitised Bonds

There is a large market in bonds whose interest and principal payments are backed by an underlying cash flow from another asset. By securitising the asset, a borrower can provide an element of cash flow backing to investors. For instance, a mortgage bank can use the cash inflows it receives on its mortgage book as asset backing for an issue of bonds. Such an issue would be known as a *mortgage-backed security* (MBS). Because residential mortgages rarely run to their full term, but are usually paid off earlier by homeowners, the notes that are backed by mortgages are also prepaid ahead of their legal final maturity. This feature means that MBS securities are not bullet bonds like vanilla securities, but are instead known as *amortising bonds*. Other asset classes that can be securitised include credit card balances, car loans, equipment lease receivables, nursing home receipts, museum or leisure park receipts, and so on. Securitised bonds are usually called structured finance products or *structured products*, and the market in MBS, asset-backed securities (ABS), collateralised debt obligations (CDOs), and asset-backed commercial paper (AB-CP) is known as the structured finance market. Some of the more popular structured products are described in later chapters.

Bonds with Embedded Options

Some bonds include a provision in their offer particulars that gives either the bondholder and/or the issuer an option to enforce early redemption of the bond. The most common type of option embedded in a bond is a *call feature*. A call provision grants the issuer the right to redeem all or part of the debt before the specified maturity date. An issuing company may wish to include such a feature as it allows it to replace an old bond issue with a lower coupon rate issue if interest rates in the market have declined. As a call feature allows the issuer to change the maturity date of a bond it is considered harmful to the bondholder's interests; therefore the market price of the bond at any time will reflect this. A call option is included in all asset-backed securities based on mortgages, for obvious reasons.

A bond issue may also include a provision that allows the investor to change the maturity of the bond. This is known as a *put feature* and gives the bondholder the right to sell the bond back to the issuer at par on specified dates. The advantage to the bondholder is that if interest

EXHIBIT 1.6
Euro Corporate Index by Structure 1998 through 31 May 2003

	Market Value Percent (%) of Euro Corporate Index			
	Bullets	Callables	Putables	Total
1998	94.0%	5.7%	0.4%	100.0%
1999	98.4%	1.5%	0.1%	100.0%
2000	98.8%	1.1%	0.1%	100.0%
2001	99.5%	0.5%	0.1%	100.0%
2002	99.1%	0.8%	0.1%	100.0%
May 31, 2003	99.3%	0.6%	0.1%	100.0%

Pan-Euro Corporate Index by Structure 1999 through 31 May 2003

	Market Value Percent (%) of Pan-Euro Corporate Index			
	Bullets	Callables	Putables	Total
1999	98.2%	1.7%	0.1%	100.0%
2000	97.9%	2.0%	0.1%	100.0%
2001	99.4%	0.5%	0.1%	100.0%
2002	99.1%	0.9%	0.1%	100.0%
May 31, 2003	99.1%	0.8%	0.1%	100.0%

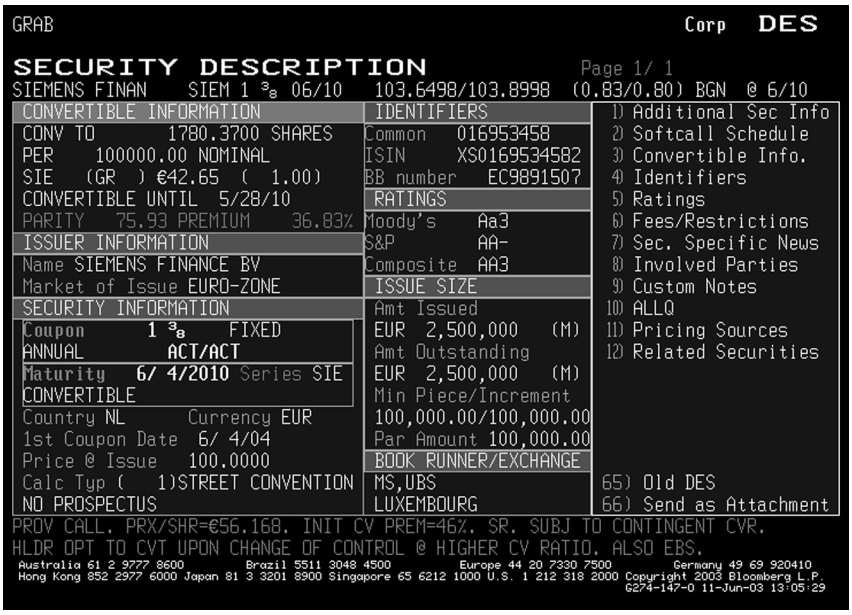
Source: Lehman Brothers Fixed Income Research.

rates rise after the issue date, thus depressing the bond's value, the investor can realise par value by *putting* the bond back to the issuer.

Bonds with embedded call and put options comprise a relatively small percentage of the European bond market. Exhibit 1.6 shows the percentage of the market value of the Euro Corporate Index and Pan-Euro Corporate Index attributable to bullets (i.e., option-free bonds), callable and putable bonds from the late 1990s through 31 May 2003. Accordingly, our discussion of bonds with embedded options in the remainder of the book will be confined to structured products.

A *convertible* bond is an issue giving the bondholder the right to exchange the bond for a specified amount of shares (equity) in the issuing company. This feature allows the investor to take advantage of favourable movements in the price of the issuer's shares. Exhibit 1.7 shows a Bloomberg Security Description screen of a convertible bond issued by Siemens Finance BV that matures in June 2010. This bond is convertible into 1,780.37 shares as can be seen in the upper left-hand corner of the screen in the box labeled "Convertible Information."

EXHIBIT 1.7 **Bloomberg Security Description Screen of a Convertible Bond Issued by Siemens Financial BV**



Source: Bloomberg Financial Markets.

The presence of embedded options in a bond makes valuation more complex compared to plain vanilla bonds.

PRICING A CONVENTIONAL BOND

The principles of pricing in the bond market are exactly the same as those in other financial markets, which states that the price of any financial instrument is equal to the net present value today of all the future cash flows from the instrument. In Chapter 3, bond pricing will be explained. In this chapter we will just present the basic elements of bond pricing.

A bond price is expressed as per 100 nominal of the bond, or "per cent." So for example if the all-in price of a euro-denominated bond is quoted as "98.00", this means that for every €100 nominal of the bond a buyer would pay €98. The interest rate or discount rate used as part of the present value (price) calculation is key to everything, as it reflects where the bond is trading in the market and how it is perceived by the market. All the determining factors that identify the bond—those dis-

cussed earlier in this chapter and including the type of issuer, the maturity, the coupon, and the currency—influence the interest rate at which a bond's cash flows are discounted, which will be roughly similar to the rate used for comparable bonds.

Since the price of a bond is equal to the present value of its cash flows, first we need to know the bond's cash flows before then determining the appropriate interest rate at which to discount the cash flows. We can then compute the price of the bond.

A conventional bond's cash flows are the interest payments or coupons that are paid during the life of the bond, together with the final redemption payment. It is possible to determine the cash flows with certainty only for conventional bonds of a fixed maturity. So for example, we do not know with certainty what the cash flows are for bonds that have embedded options and can be redeemed early.

The interest rate that is used to discount a bond's cash flows (therefore called the *discount rate*) is the rate required by the bondholder. It is therefore known as the bond's *yield*. The required yield for any bond will depend on a number of political and economic factors, including what yield is being earned by other bonds of the same class. Yield is always quoted as an annualised interest rate.

The *fair price* of a bond is the present value of all its cash flows. The formulas that can be used for determining the fair price are presented in Chapter 3.

The date used as the point for calculation is the *settlement date* for the bond, the date on which a bond will change hands after it is traded. For a new issue of bonds the settlement date is the day when the bond stock is delivered to investors and payment is received by the bond issuer. The settlement date for a bond traded in the *secondary market* is the day that the buyer transfers payment to the seller of the bond and when the seller transfers the bond to the buyer. Different markets will have different settlement conventions; for example, UK gilts normally settle one business day after the trade date (the notation used in bond markets is $T + 1$) whereas Eurobonds settle on $T + 3$. The term *value date* is sometimes used in place of settlement date, however the two terms are not strictly synonymous. A settlement date can only fall on a business date, so that a gilt traded on a Friday will settle on a Monday. However a value date can sometimes fall on a nonbusiness day.

ACCRUED INTEREST, CLEAN PRICE, AND DIRTY PRICE

All bonds coupon-paying bonds accrue interest on a daily basis, and this is then paid out on the coupon date. In determination of the fair price

for a bond that is not purchased on a coupon date, *accrued interest* must be incorporated into the price. Accrued interest is the amount of interest earned by the bond's seller since the last coupon payment date. The calculation of accrued interest will differ across bonds due to day count conventions that will be discussed shortly.

In all major bond markets the convention is to quote price as a *clean price*. This is the price of the bond as given by the present value of its cash flows, but excluding coupon interest that has accrued on the bond since the last dividend payment. As all bonds accrue interest on a daily basis, even if a bond is held for only one day, interest will have been earned by the bondholder. However, we have referred already to a bond's *all-in* price, which is the price that is actually paid for the bond in the market. This is also known as the *dirty price* (or *gross price*), which is the clean price of a bond plus accrued interest. In other words, the accrued interest must be added to the quoted price to get the total consideration for the bond.

Accruing interest compensates the seller of the bond for giving up all of the next coupon payment even though they will have held the bond for part of the period since the last coupon payment. The clean price for a bond will move with changes in market interest rates; assuming that this is constant in a coupon period, the clean price will be constant for this period. The dirty price, however, for the same bond will increase steadily from one interest payment date until the next one. On the coupon date the clean and dirty prices are the same and the accrued interest is zero. Between the coupon payment date and the next *ex-dividend* date the bond is traded *cum dividend*, so that the buyer gets the next coupon payment. The seller is compensated for not receiving the next coupon payment by receiving accrued interest instead. This is positive and increases up to the next ex-dividend date, at which point the dirty price falls by the present value of the amount of the coupon payment. The dirty price at this point is below the clean price, reflecting the fact that accrued interest is now negative. This is because after the ex-dividend date the bond is traded "ex-dividend"; the seller not the buyer receives the next coupon and the buyer has to be compensated for not receiving the next coupon by means of a lower price for holding the bond.

The net interest accrued since the last ex-dividend date is determined as follows:

$$AI = C \times \left[\frac{N_{xt} - N_{xc}}{\text{Day Base}} \right]$$

where

AI	=	next accrued interest
C	=	bond coupon
N_{xc}	=	number of days between the ex-dividend date and the coupon payment date (seven business days for UK gilts)
N_{xt}	=	number of days between the ex-dividend date and the date for the calculation
Day Base	=	day count base (usually 365 or 360)

Interest accrues on a bond from and including the last coupon date up to and excluding what is called the *value date*. The value date is almost always the *settlement* date for the bond, or the date when a bond is passed to the buyer and the seller receives payment. Interest does not accrue on bonds whose issuer has subsequently gone into default. Bonds that trade without accrued interest are said to be trading *flat* or *clean*. By definition therefore,

$$\text{Clean price of a bond} = \text{Dirty price} - AI$$

For bonds that are trading ex-dividend, the accrued coupon is negative and would be subtracted from the clean price. The calculation is given below:

$$AI = -C \times \frac{\text{Days to next coupon}}{\text{Day Base}}$$

Certain classes of bonds, for example US Treasuries and Eurobonds, do not have an ex-dividend period and therefore trade cum dividend right up to the coupon date.

Accrual Day Count Conventions

The accrued interest calculation for a bond is dependent on the day-count basis specified for the bond in question. We have already seen that when bonds are traded in the market the actual consideration that changes hands is made up of the clean price of the bond together with the accrued that has accumulated on the bond since the last coupon payment; these two components make up the dirty price of the bond. When calculating the accrued interest, the market will use the appropriate day-count convention for that bond. A particular market will apply one of five different methods to calculate accrued interest; these are:

EXHIBIT 1.8 Government Bond Market Conventions

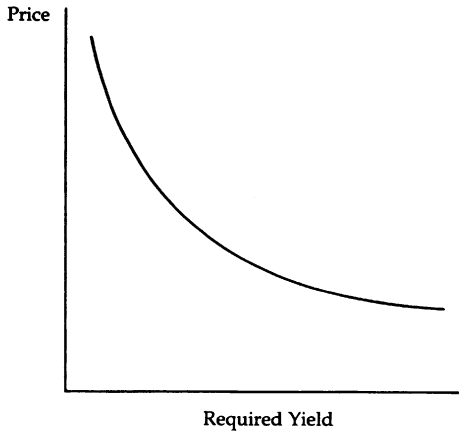
Market	Coupon Frequency	Day Count Basis	Ex-dividend Period
Austria	Annual	actual/actual	No
Belgium	Annual	actual/actual	No
Denmark	Annual	30E/360	Yes
Eurobonds	Annual	30/360	No
France	Annual	actual/actual	No
Germany	Annual	actual/actual	No
Ireland	Annual	actual/actual	No
Italy	Annual	actual/actual	No
Norway	Annual	actual/365	Yes
Spain	Annual	actual/actual	No
Sweden	Annual	30E/360	Yes
Switzerland	Annual	30E/360	No
United Kingdom	Semi-annual	actual/actual	Yes

actual/365	Accrued = Coupon × days/365
actual/360	Accrued = Coupon × days/360
actual/actual	Accrued = Coupon × days/actual number of days in the interest period
30/360	See below
30E/360	See below

When determining the number of days in between two dates, include the first date but not the second; thus, under the actual/365 convention, there are 37 days between 4 August and 10 September. The last two conventions assume 30 days in each month, so, for example, there are "30 days" between 10 February and 10 March. Under the 30/360 convention, if the first date falls on the 31st, it is changed to the 30th of the month, and if the second date falls on the 31st and the first date is on the 30th or 31st, the second date is changed to the 30th. The difference under the 30E/360 method is that if the second date falls on the 31st of the month it is automatically changed to the 30th.

Exhibit 1.8 shows the conventions (coupon frequency, Day count basis, and ex-dividend period) for the the government bond market of major European countries.

EXHIBIT 1.9 Price/Yield Relationship for an Option-Free Bond



RISKS ASSOCIATED WITH INVESTING IN FIXED INCOME SECURITIES

Risk can thought of as the possibility of unpleasant surprise. Fixed-income securities expose the investor to one or more of the following types of risk: (1) interest rate risk; (2) credit risk; (3) call and prepayment risk; (4) exchange rate risk; (5) liquidity risk; and (6) inflation or purchasing power risk.

Interest Rate Risk

A fundamental property is that an upward change in a bond's price results in a downward move in the yield and vice versa. This result makes sense because the bond's price is the present value of the expected future cash flows. As the required yield decreases, the present value of the bond's cash flows will increase. The price/yield relationship for an option-free bond is depicted in Exhibit 1.9. This inverse relationship embodies the major risk faced by investors in fixed-income securities—*interest rate risk*. Interest rate risk is the possibility that the value of a bond or bond portfolio will decline due to an adverse movement in interest rates.

Bonds differ in their exposure to interest rate risk so investors want to know the sensitivity of a bond to change in interest rates. This sensitivity is first approximated by a bond's duration. There are various measures of duration (e.g., Macaulay, modified, effective, etc.) that will be

discussed in Chapter 4. For the time being, a workable definition for duration is that it is the approximate percentage change in the bond's value for a 100 basis point change in the interest rates. As an illustration, suppose a bond has a duration of six and has a market price of €100. If rates increase by 100 basis points, this bond's value will fall be approximately 6%. The opposite is true for a decrease in interest rates.

Credit Risk

There are two main types of credit risk that a bond portfolio or position is exposed to. They are credit default risk and credit spread risk. *Credit default risk* is defined as the risk that the issuer will be unable to make timely payments of interest and principal. Typically, investors rely on the ratings agencies—Fitch Ratings, Moody's Investors Service, Inc., and Standard & Poor's Corporation—who publish their opinions in the form of ratings.

The *credit spread* is the excess premium over the government or risk-free rate required by the market for taking on a certain assumed credit exposure. Accordingly, *credit spread risk* is the risk of a financial loss resulting from changes in the level of credit spreads used in the marking-to-market of a fixed income product. Changes in observed credit spreads affect the value of the portfolio and can lead to losses for traders or underperformance for portfolio managers.

Call and Prepayment Risk

As noted, a bond may contain an embedded option which permits the issuer to call or retire all or part of the issue before the maturity date. The bondholder, in effect, is the writer of the call option. From the bondholder's perspective, there are three disadvantages of the embedded call option. First, relative to bond that is option-free, the call option introduces uncertainty into the cash flow pattern. Second, since the issuer is more likely to call the bond when interest rates have fallen, if the bond is called, then the bondholder must reinvest the proceeds received at the lower interest rates. Third, a callable bond's upside potential is reduced because the bond price will not rise above the price at which the issuer can call the bond. Collectively, these three disadvantages are referred to as *call risk*. MBS and ABS that are securitized by loans where the borrower has the option to prepay are exposed to similar risks. This is called *prepayment risk,* which is discussed in Chapter 11.

Exchange Rate Risk

If a European investor buys a bond whose cash flows are denominated in a currency other than euros, they are exposed to an additional risk. Namely,

the euro-denominated cash flows are dependent on the exchange rate at the time the payments are received. For example, suppose a European investor purchases a US corporate bond whose payments are denominated in US dollars. If the dollar depreciates relative to the euro, then fewer euros will be received. This risk is called *exchange rate risk*. Thus, if an investor buys a bond in a currency other than her own, she is, in essence, making two investments—an investment in the bond and an investment in the currency.

Liquidity Risk

Liquidity involves the ease with which investors can buy or sell securities quickly at close to their perceived true values. *Liquidity risk* is the risk that the investor (who must trade at short notice) will have to buy/sell at security at a price above/below its true value. One widely used indicator of liquidity is the size of the spread between the bid price (i.e., the price at which the dealer is willing to buy a security) and the ask price (i.e., the price at which a dealer is willing to sell a security). Other things equal, the wider the bid-ask spread, the greater the liquidity risk. For investors who buy bonds with the intent of holding them until maturity, liquidity risk is of secondary importance.

Inflation or Purchasing Power Risk

Inflation or *purchasing power risk* reflects the possibility of the erosion of the purchasing power of bond's cash flows due to inflation. Bonds whose coupon payments are fixed with long maturities are especially vulnerable to this type of risk. Floaters and inflation-indexed bonds have relatively low exposures to inflation risk.

INVESTORS

There is a large variety of players in the bond markets, each trading some or all of the different instruments available to suit their own purposes. We can group the main types of investors according to the time horizon of their investment activity.

Short-Term Institutional Investors

Short-term institutional investors include banks and building societies, money market fund managers, central banks and the treasury desks of some types of corporates. Such bodies are driven by short-term investment views, often subject to close guidelines, and will be driven by the total return available on their investments. Banks will have an addi-

tional requirement to maintain *liquidity*, often in fulfilment of regulatory authority rules, by holding a proportion of their assets in the form of easily-tradeable short-term instruments.

Long-Term Institutional Investors

Typically *long-term institutional investors* include pension funds and life assurance companies. Their investment horizon is long-term, reflecting the nature of their liabilities. Often they will seek to match these liabilities by holding long-dated bonds.

Mixed Horizon Institutional Investors

Mixed horizon institutional investors are possibly the largest category of investors and will include general insurance companies and most corporate bodies. Like banks and financial sector companies, they are also very active in the primary market, issuing bonds to finance their operations.

Market Professionals

Market professionals include the banks and specialist financial intermediaries mentioned above, firms that one would not automatically classify as "investors," although they will also have an investment objective. Their time horizon will range from one day to the very long term. They include the proprietary trading desks of investment banks, as well as bond market makers in securities houses and banks who are providing a service to their customers. Proprietary traders will actively position themselves in the market in order to gain trading profit, for example, in response to their view on where they think interest rate levels are headed. These participants will trade direct with other market professionals and investors, or via brokers. Market makers or *traders* (also called *dealers* in the United States) are wholesalers in the bond markets; they make two-way prices in selected bonds. Firms will not necessarily be active market makers in all types of bonds; smaller firms often specialise in certain sectors.