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# 1. Fundamentals

## 1.1 Main Characteristics

### 1.1.1 What is a bond?

A **bond** is a financial instrument that represents the debt of a borrower (issuer) towards a lender (bondholder). It is a financial obligation in which the issuer promises to pay the bondholder a specified **stream of future cash flows**, which consists of periodic **interest payments** and a **principal repayment**.

The characteristics of the bond are described in the **bond indenture**. Bond indenture is a legal document that defines the rights and obligations of the borrower and the lender with respect to the bond issue. In many instances, the indenture obligates the borrower to maintain certain level of retained earnings, working capital, debt in relation to assets etc. The indenture also covers such areas as the following:

- Are any assets subject to, or may they be subjected to, a prior claim of creditors?
- What is the nature of off-balance-sheet guarantees and commitments, both current and future?
- What is the impact of external regulation on creditor rights?

### 1.1.2 Coupon and principal

Generally, a bond issue is identified as: “XYZ 4% 99-09”. This description includes the name of the issuer (“XYZ”), the coupon rate (“4%”), and the year of issue and the maturity year (issued in 1999, and matures in 2009) of the bond.

The **face value** or **par value** is the total amount to be repaid at maturity and is also used to determine the coupon payments. The term *face value* is based on the fact that it was the value which was originally printed on the certificates when bonds used to be physically traded.

The **time to maturity** is defined as the number of years remaining for the debt to be fully repaid. The **maturity date** is the scheduled date on which the final bond payment will be made.

The **coupon payment** is the periodic payment made to bondholders by the issuer during the tenure of the bond. Most bonds pay coupons annually or semi-annually, as the following table shows:

Coupon payment	Bond market
Annual payment	Euro-bonds, all currencies EUR domestic bonds CHF domestic bonds
Semi-annual payment	USD domestic bonds British domestic bonds JPY domestic bonds Convertible Euro-bonds from Japanese firms
Quarterly payment	British consols

**Figure 1-1: Coupon payment frequency**

The **coupon rate** is the annual interest rate which is multiplied with the face value of the bond to calculate coupon payment. If coupon payments are made semi-annually then the annual coupon payment is divided by two to determine the semi-annual coupon payments.

**Example:**

A bond with a face value of 1'000 CHF and a fixed annual coupon rate of 6% would pay 60 CHF annually, or 30 CHF semi-annually, depending on the bond's provisions.

### **1.1.3 Price quotes**

A price of a bond is the market value at which the bond is currently traded.

The price of a bond is generally quoted as **percentage of the face value**. To convert the price quote to a CHF figure, multiply the quoted price by the face value and divide the result by 100.

**Example:**

A bond with a par value of 5'000 CHF is traded at 86.70. What is its price in CHF?

The bond price is:

$$(86.7 \cdot 5'000 \text{ CHF}) / 100 = 0.867 \cdot 5'000 \text{ CHF} = 4'335 \text{ CHF}.$$

Some US Treasury bonds, however, are quoted in **percentage of the face value and in 32nds of a percent**.

**Example:**

An American T-Bond with a par-value of 1'000 USD is traded at 89-16. What is its value in USD?  
Its value is 895 USD, as

$$1'000 \cdot (89 + 16 / 32) / 100 = 1'000 \cdot (89.50) / 100 = 895 \text{ USD}$$

This pricing method arises from the trading convention of 1/32nd point (0.03125 decimal) as the minimum price change for this type of bonds.

### 1.1.4 Accrued interest

Since the dates of interest payments vary from bond to bond, the comparison of the prices of two bonds is difficult. Therefore, bond prices are generally quoted **net of interest**, i.e., as if the coupon had just been paid and the full period (one year for an annual coupon, six month for a semi-annual coupon, ...) is left until the next coupon.

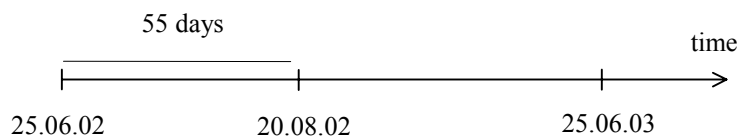
In practice, when the bond is purchased between two coupon payment dates, buyer pays an **accrued interest** amount on pro-rata basis to the seller in addition to the quoted price. The buyer in turn will get this amount back when he receives the next coupon from the issuing company, as he retains the entire coupon amount.

$$\text{Full Price of bonds} = \text{Quoted price} + \text{Accrued interest}$$

This implies that when one buys a bond between two coupon payment dates, the full purchase price (also called **gross price** or **dirty price**) is higher than the quoted price (also called **flat price** or **clean price**).

**Example:**

On the 20.08.2002, a 1996-2007 bond with a 8.5% coupon, 2'000 CHF face value, is quoted at 111.55. The annual coupon is paid on the 25th of June. What is the price paid by the buyer of such a bond?



Accrued interest for 55 days (from 25.06.02 to 20.08.02) has to be paid to the bond seller. The interest for the remaining period until the next coupon payment (i.e., from 20.08.02 to 25.06.03) is payable to the buyer. Though the bond buyer will pay the interest accrued till the date of purchase to bond seller, at the next coupon payment he will receive the total coupon.

On the 20.8.02, the buyer will pay the bond price:

$$1.1155 \cdot 2'000 = 2'231 \text{ CHF}$$

plus the accrued interest on 55 days:

$$\frac{55}{360} \cdot 8.5\% \cdot 2'000 = 25.97 \text{ CHF}$$

which makes a total payment to the seller of 2'256.97 CHF. At the next coupon payment (25.06.03), the buyer will receive the total coupon, i.e.

$$8.5\% \cdot 2'000 = 170 \text{ CHF}$$

But he has paid 25.97 CHF of accrued interest; so, in fact, its net income will be

$$170 - 25.97 = 144.03$$

which corresponds to 305 days of interest (from 20.08.02 to 25.06.03).

$$\frac{305}{360} \cdot 8.5\% \cdot 2'000 = 144.03 \text{ CHF}$$

Of course, there are some exceptions to this style of quoting. British Gilts, for example, are quoted with the coupon included.

One should also note that the computation rules vary from one market to another and from one type of bond to another. For example:

- for **Swiss bonds, German domestic bonds and Eurobonds** one year is assumed to have 360 days, ie. 12 months of 30 days each. The formula to calculate the accrued interest is:

$$\text{Accrued interest} = \frac{30 \cdot m + d}{360} \cdot C$$

where C is the coupon rate, m is the number of months and d the number of days since the last coupon payment.

- for **US Treasury Bonds**, the exact number of days (actual/actual) are used in the accrued interest formula. Note that for US treasury bonds the coupon is paid semi-annually, hence the coupon rate is divided by 2. So, the formula to calculate accrued interest becomes:

$$\text{Accrued interest} = \frac{\text{Exact number of days since last coupon}}{\text{Exact number of days between coupons}} \cdot \frac{C}{2}$$

where C is the annual coupon rate.

- for **US domestic bonds** (corporate, yankees, federal agency issues excluding T-Bonds, ...), a 360 days year (30/360) is used. Since, the coupon is paid twice a year the accrued interest can be calculated using:

$$\text{Accrued interest} = \frac{30 \cdot m + d}{180} \cdot \frac{C}{2}$$

- for **Japanese or English government bonds**, accrued interest is calculated using actual number of days since the last coupon payment and a 365 days year:

$$\text{Accrued interest} = \frac{\text{Exact number of days since last coupon}}{365} \cdot C$$

- for **French bonds**, accrued interest is calculated using actual number of days in the denominator as well as the numerator:

$$\text{Accrued interest} = \frac{\text{Exact number of days since last coupon}}{\text{Exact number of days between coupons}} \cdot C$$

where C is the annual coupon rate.

These different methods of computing accrued interest may lead to different interest figures.

**Example:**

On the 15th of July 1987, what is the accrued interest on a US T-bond and a US corporate bond with a 10% annual coupon rate, if both have paid a semi-annual coupon, on the 15th of May 1987?

For the T-Bond, we have an actual /actual basis. In the May 15 to July 15 period, we have 61 days (16 + 30 + 15); in the May 15 to November 15 period, we have 184 days (16 + 30 + 31 + 31 + 30 + 31 + 15). The accrued interest is

$$\frac{61}{184} \cdot 10\% \cdot \frac{1}{2} = 1.6576\%$$

For the corporate bond, we have a 30/360 basis. In the May 15 to July 15 period, we have 60 days (15 + 30 + 15); in the May 15 to November 15 period, we have 180 days. The accrued interest is

$$\frac{60}{180} \cdot 10\% \cdot \frac{1}{2} = 1.6667\%$$

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## 1.2 Types of fixed income securities

A bond that pays interest periodically and repays the principal at maturity is called a **straight bond**.

Some bonds may have a **sinking-fund provision**, which requires the issuer to retire a portion of the outstanding debt, designated as the **sinker percentage**, each year. The sinking fund provisions can be satisfied in many different ways: the retired bonds can be purchased on the open market, or the portion to be redeemed can be selected by a lottery, etc.

**Example:**

An investor can buy a 5% coupon, 1'000 CHF face value, 10 years bond with a quoted price of 102.00. The bond has a 90% sinker<sup>1</sup> at par value. What are the annual cash flows paid by the bond?

The sinking funds payments should commence at the end of the first year, repaying 10% of the bonds annually through the nine years. The final 10% repayment will be at the maturity date. All repayments are made at par value.

The annual cash flows are as follows:

Time	Total amount due	Interest payment (5%)	Sinking payment	Principal repayment	Total annual payment
		[1]	[2]	[3]	[1] + [2] + [3]
1	1'000 CHF	50 CHF	100 CHF		150 CHF
2	900 CHF	45 CHF	100 CHF		145 CHF
3	800 CHF	40 CHF	100 CHF		140 CHF
4	700 CHF	35 CHF	100 CHF		135 CHF
5	600 CHF	30 CHF	100 CHF		130 CHF
6	500 CHF	25 CHF	100 CHF		125 CHF
7	400 CHF	20 CHF	100 CHF		120 CHF
8	300 CHF	15 CHF	100 CHF		115 CHF
9	200 CHF	10 CHF	100 CHF		110 CHF
10	100 CHF	5 CHF		100 CHF	105 CHF

A **callable** bond gives the issuer the right to repurchase the bond at a pre-determined price (called **call price**), at a certain time (called **call date**). The **call price** is generally the par value plus a premium (called the **call premium**). The earliest call date and corresponding call price are specified when the bonds are issued.

**Example:**

Citicorp Capital II has issued in 1997 a 450 Mio. USD bond with coupon 8.015%, maturity February 15, 2027 callable on and anytime after the dates shown at the following prices:

- at 104.007% on February 15, 2007
- at 103.607% on February 15, 2008
- at 103.206% on February 15, 2009
- .....
- at 100% on February 15, 2017

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<sup>1</sup> The **sinker percentage** is the percentage of bonds retired before maturity. In this case, the annual retirement is 10% of the face value ( $= 90\% / (10 - 1)$ ).



If the interest rates fall substantially, issuer of callable bonds can exercise the call option and get refinancing at lower coupon rates. Hence, it protects the issuer from being compelled to continue paying high coupons if interest rates drop.

Call provision reduces the value of the bond to an investor because it does not give the investor the advantage of enjoying higher returns when interest rates drop. For example, if a company has issued a bond with a 15% coupon several years ago and can now borrow money at 10%, the call provision gives the company an opportunity to refinance the bonds and save on interest payments. (See also chapter 5)

**Putable bonds** are just the reverse of callable bonds. In putable bonds, bondholder has right to sell the bond to the issuer at pre-determined price.

**Bullet bonds** are bonds that are not callable.

**Consol bonds** are perpetual bonds: the issuer pays interest at a fixed rate forever but the principal is never redeemed. These bonds were mainly issued by the Canadian and British government as well as by some large companies.

**Example:**

BNP Paribas Capital Trust II has issued on October 5, 2001 a 350 Mio. EUR perpetual bond with annual coupon of 7%, callable at par on October 5, 2006 and every year thereafter.

**Zero-coupon bonds** do not pay any interest during their life. These bonds generally mature at face value, but are issued at a large discount to the face value. Hence, return on such a bond is derived from the difference between the issue price and the face value.

**Example:**

In 1998 IBRD [International Bank for Reconstruction and Development] issued a 4.5 Mia ZAR (South-African Rand) zero-coupon bond with maturity date December 31, 2029. The issue price was 3.05 ZAR (for 100 nominal). This means that an investor who paid at issue 3.05 ZAR will receive at maturity 100 ZAR (but no intermediate coupon). This implies a yield to maturity (at issue) of  $\sqrt[3]{\frac{100}{3.05}} - 1 = 11.9\%$ .

**Stripped bonds** are zero-coupon bonds artificially created from default risk-free government bonds. Some examples are LIONS from Lehman Brothers (Lehman Investment Opportunity Notes), TIGRs from Merrill Lynch (Treasury Investment Growth Receipts), and CATs from Salomon Brothers (Certificates of Accrual on Treasury Securities), and more recently, STRIPS (Separate Trading of Registered Interest and Principal of Securities).

**Income bonds** are bonds that pay interest only if profits of the issuing firm are adequate enough to pay interest; therefore, a missed coupon payment in the case of income bonds is not viewed as a default. Some income bonds are **cumulative**, which means that if a coupon payment is missed, it must be made up before dividends are paid to shareholders.

**Floating rate notes** are long term securities wherein coupon rates are adjusted periodically (at the **reset period**) according to changes in a base or benchmark rate.

Many floating rate note investors are financial institutions with outstanding floating rate liabilities. If interest rates are expected to rise, the noteholder can expect increase in coupon rates of such bonds at the next reset date.

In the case of **dual currency bonds**, the interest is paid in one currency, while the principal repayment is made in another currency.

**Example:**

In 1986 Standard Oil issued a 200 Mio CHF bond with maturity in 2049, with annual coupon of 7.5% until 1996, then 5.875% until 2006, then reset every 10 years at a rate equal to the average yield on Treasury bills minus 50 basis points. The coupon is paid in USD; the principal is paid in CHF. The foreign exchange rate used is 1 USD= 2.01 CHF. The bond is callable in 1996, 2006, 2016, 2026, 2036 and 2046 at par.

For **foreign interest payment securities**, only the interest is paid in foreign currency. The **multiple currency clause bonds** are a simple extension of the dual currency bonds, in which the investors have the choice between two different currencies for the interest and /or principal repayment.

The holder of a **convertible bond** can exchange the security for a fixed number of shares of the common stock of the issuing company in accordance with terms set forth in the bond indenture. The option to convert is solely at the discretion of the holder (although some corporations may have the ability to force conversion). The conversion cannot be reversed.

We can broadly classify bonds in three types based on the issuer of the bond:

- **Domestic bonds:** They are issued on the local market by a **domestic borrower** and are usually denominated in the local currency. For example, Nestlé issues a bond in CHF in Switzerland.
- **Foreign bonds:** They are also issued on the local market, but by a **foreign borrower** and are usually denominated in the local currency. For example, **Yankee bonds** are USD denominated bonds issued in the United States by a foreign issuer, **Samurai bonds** are JPY denominated bonds issued by non Japanese firms, and **Bulldog bonds** are GBP denominated bonds issued by non British entities.
- **Eurobonds:** They are issued by a **multinational syndicate** in all countries other than the one in whose currency the bond is denominated. These bonds are not traded on a specific national bond market.

The following table gives an overview of the size and structure of the world bond market in 2001:

Country	TOTAL	Government	Corporate	Foreign	Eurobond
United States	17'090.9	8'588.8	5'174.9	486.8	2'840.4
Euroland	6'466.9	3'127.1	2'690.0	0	649.8
Japan	5'305.2	3'938.7	854.6	61.0	450.9
United Kingdom	1'081.6	390.9	55.6	145.1	490.0
Canada	514.4	356.0	111.0	0.4	47.1
Switzerland	261.6	49.6	82.1	110.4	19.5
Denmark	252.3	67.9	175.5	0	8.9
Australia	182.7	57.2	86.2	9.9	29.4
Sweden	128.6	60.2	60.7	3.9	3.8
Norway	47.7	20.5	22.2	0.5	4.6
New Zealand	16.6	10.7	0	0	5.9
<i>Emerging/Converging Markets</i>					
Asia	1'000.7	538.8	419.0	na	42.9
Latin America	391.6	389.1	na	na	2.5
Eastern Europe, Middle East, Africa	231.3	220.1	na	na	11.2
<b>TOTAL</b>	<b>32'972.1</b>	<b>17'815.6</b>	<b>9'731.8</b>	<b>818.0</b>	<b>4'606.9</b>

**Figure 1-2: Size and structure of the world bond market in 2001**  
(Nominal Values Outstanding in billions of USD)<sup>2</sup>

<sup>2</sup> Source: MOLINAS C. and BALES G., "Size and Structure of the world bond market: 2002", Global Fixed Income Research Team, Merrill Lynch, April 2002.

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### 1.3 Money market instruments

Money market instruments are **short-term** debt securities. They are traded in the money market, that is the segment of the financial market in which short-maturity instruments (i.e. instruments with maturities up to 12 months) are traded. Money market instruments are very liquid because their maturity is short (so that they are going to be transformed into cash in a short time) and because usually they are easily marketable. In order to keep transaction costs low, usually money market instruments are traded in very large denominations so that they are normally out of reach for small investors. In order to access (indirectly) money market instruments, retail investors can subscribe money market mutual fund's quotes. Example of money market instruments are time deposits (which are not securities), short-term Treasury securities (Treasury bills), bankers' acceptances, commercial paper and short term certificates of deposits. Interests earned on money market instruments are usually expressed on the so called *bank discount basis*. In this case the face value of the security, rather than its purchase price, is employed to compute the interest return<sup>3</sup>.

**Treasury bills** (T-bills) are the most important money market instrument. Treasury bills are issued by the government at a discount with respect to the face value (the amount of money that will be paid to investors at maturity); the difference between the face (reimbursement) value and the issuing (purchase) price constitutes the interest that is earned by the investor. Typical maturities of Treasury bills are three, six and twelve months (in US, 91, 182 and 364 days). The newly issued bills are placed with the investors by an auction process (either competitive or non competitive). With competitive **auction**, each potential subscriber submits a bid stating the price and quantity that he is willing to pay in order to purchase the security; the bid is filled only if its price is high enough with respect to other participants' bids and the subscriber pays the price offered. With non competitive auction, the price paid is equal for all the subscribers and is given by the marginal price (the price of the last bidder that is assigned a quantity of the issue) or by the average price of all the bids. Treasury bills are usually very liquid, their interest rate risk is very low (because of their short maturity) as well as their credit risk (given the creditworthiness of the government). In many countries, Treasury bills (as well as other government securities) are reserved a favourable tax treatment.

**Commercial paper** is the name given to the short-term unsecured debt instruments issued by large and well-known financial (especially personal finance and leasing companies) and non-financial companies. Usually the instrument is guaranteed by a bank line of credit and its credit risk is summarised in a rating given by one or more rating agencies (Moody's, Standard & Poor's<sup>4</sup>). The most frequent maturities are equal to one or two months and seldom exceed 270 days (the maximum term allowed by the US Sec without registration requirement). The commercial paper is usually issued in big denominations and for large companies with a good credit rating it constitutes a source of funds cheaper than the ordinary bank borrowing.

A **bankers' acceptance** is an order given to a bank by one of its customers to pay a given amount of money at some given future date (e.g. six months); the bank then accepts that order (by endorsing it) and thus subsumes the ultimate responsibility for paying it. The acceptance by the bank makes the instrument very safe (its credit quality is given by the creditworthiness of the accepting bank, not by the creditworthiness of the subject ordering the payment) so that

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<sup>3</sup> For example, a 90-day security having a face value of 100 is sold at 98 and reimbursed at 100 at maturity; the difference of 2 is the interest earned by the investor. In case the bank discount basis is used, the return is 2%, while the real rate of return of the security is 2.04% (2/98).

<sup>4</sup> Please refer to section 3.2.3 for more details.

it can be traded in the money market. Bankers' acceptances are traded at a discount from the face value (just like the aforementioned Treasury bills).

A **certificate of deposit (CD)** is a security representing a time deposit with a bank; the time deposit cannot be withdrawn, but the security (CD) can be sold over the secondary market, which is quite liquid especially for the shortest maturities and largest denominations (the so called *jumbos*). Generally, the interest is paid at maturity, especially for shortest maturities. Euro-CDs are large short-term CDs denominated in dollars and issued by international banks outside the US.

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## 1.4 Government bonds

Government and corporate bonds constitute the fixed-income capital market which is distinguished from the money market by the longer maturity of the instruments there traded. As far as the US market is concerned, government bonds are further classified in Treasury **notes** (T-notes, with maturity up to 10 years) and Treasury **bonds** (T-bonds, with maturity from 10 to 30 years). T-notes and T-bonds make semi-annual coupon payments (but government bonds in other countries pay interest annually) and may carry a call provision enabling the issuer to reimburse the bond at par value before the maturity. Government bonds are issued by the Department of the Treasury and as a consequence their credit risk is very low, being guaranteed by the creditworthiness of the central Government. In most financial systems, the circulation of Treasury bonds is managed by the central bank in book-entry form, so that there is no physical circulation.

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## 1.5 Corporate securities

Corporate bonds are debt instruments issued **by private and public corporations** that need funds for many different purposes. Corporate bonds usually make interest payments semi-annually. The interest payment constitute taxable income for the investor (it is deductible for the issuer). Since there is a wide variety of issuers there is also variety in the characteristics of corporate bond issues. However, the basic features are quite simple.

The contract between the bond issuer and the investors is called bond indenture; it specifies the promises of the issuer and the rights of the investors. The contract can be very specific and not very easy to understand and to handle, so it is not uncommon that the interests of the investors are represented by a corporate trustee who acts as a fiduciary to the investors.

As with Treasury securities, corporate fixed income instruments whose maturity is under 10 years are called notes, the one whose maturity is over 10 years are called bonds.

Corporate bonds can be classified by the **nature of the issuer**; the traditional classification is: utilities; transportation; industrials; banks and finance companies, where industrials includes not only manufacturing companies but also service and commercial companies.

When investing in corporate bonds maximum attention has to be paid to the **credit quality**, because, unlike government bonds, the credit quality of corporate bonds can be very variable. Useful information about the credit quality of a bond at the moment of issuance can be drawn from the "offering document" in which the issuer provides details about its creditworthiness. As time passes that information becomes outdated and the investor has to rely on ratings assigned by rating agencies that assign ratings to bonds when they are issued and constantly monitor credit quality during the bond's life. Rating is a synthetic grade given to a bond's issue and based on an analysis of the issuer's financial condition and management, economic and debt characteristics as well as the revenue sources securing the bond.<sup>5</sup>

In order to offer better protection to the bondholder, various kinds of property (either real or personal) can be pledged. When a property is pledged, the bondholder has, in case of default, the right to have the goods sold (the so called *asset foreclosure*) and the proceeds employed to pay the obligations of the issuer. When the asset to be pledged is a real property the contract is called **mortgage**. Also securities can be pledged in order to guarantee payment of a bond; in that case the guarantee is called collateral and the bonds secured in that way are called **collateral trust bonds**. If, on the contrary, the bond is not secured by any type of guarantee, it is called debenture bond; the claim of debenture holders over the goods and properties of the issuer is exactly the same as the general creditors' one. **Subordinated debenture bonds** rank after secured bonds and after debenture bonds in their claim on corporate earnings and assets. When the payment of the obligations embedded in the bond is guaranteed by a third party the bonds are called guaranteed; the quality of the guarantee depends on the creditworthiness both of the issuer and the guarantor. Differences in the level of protection of the right of the bondholders account for differences in the expected yield that has to be offered to them: the lower the degree of protection, the higher the yield that has to be offered. If the debt instrument is not secured by any specific good, it is called *debenture*. Debenture bondholders still have a claim on all assets of the bond issuer, but they come after (their claim is *junior*) the creditors having a pledge over some specific good (the latter have a *senior* claim on those

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<sup>5</sup> A deeper and more comprehensive analysis of the rating is given in section 3.2.3.

goods). If the company has issued a subordinated debt, subordinated debenture holders rank after secured debt holders and after ordinary bond holders.

Besides the ordinary reimbursement at maturity, corporate issues may have different provisions for paying off bonds: **call provisions** and **sinking funds** provisions.

The **call provision** is the right of the bond issuer to repay before maturity the entire amount of the bonds outstanding. This right can be useful for issuers fearing that on some future time the level of interest rates can be low enough so that it can be advantageous for them to repay the entire issue and to distribute a new issue of bonds carrying a lower coupon rate. Of course, this is a **right** (something like a call option) that the bondholder gives to the bond issuer. As well as with all option contracts, the issuer has to pay for it (in terms of a higher yield at the time of the issue when compared to other similar but non callable bonds) and the bondholder loses when the option is exercised. Moreover, the bond indentures may state that calls an issue prior to maturity has to pay a **premium over the par value**. The premium may be decreasing over time (higher if the repayment is made early and decreasing as the bond approaches to its natural maturity). Usually the entire issue is called, but bonds can be called in part (only a given share of the issue); in that case the bonds to be repaid are selected randomly (on a lottery basis) or pro-rata (each bond is reimbursed a given share of its face value). Most bond issues carry some restrictions against early redemption (reimbursement before a given date). When a bond is **not callable** it is named a **bullet bond**.

The purpose of the **sinking fund provision** is to control the credit risk of the issuer by forcing him to make periodic payments. In order to fulfil the sinking fund requirement, the issuer has to make either a cash payment of the face value of the bonds to be retired to the trustee or to deliver to the trustee bonds purchased on the secondary market (for a quantity equal to the total face value that has to be retired by the trustee). The periodic payments can be organized so that the entire issue is progressively liquidated by the maturity date or so that only a part of the entire issue is paid by the maturity; in this latter case, the amount remaining is paid at maturity with the so called **balloon payment**. The issuer's option to retire at any date more than the amount stipulated in the sinking fund provision is called **accelerated sinking fund** provision.

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## 1.6 Indices

Bond indices have the purpose of representing the general price performance of a group of bond issues; they give the investors a general view of how the entire bond market, or a definite segment of it, is doing. There are many bond indices measuring the performance of the whole market (aggregate indices or **broad-based market indices**) or of different sub-segments of it like government bonds, corporate bonds, medium term bonds, long term bonds, asset-backed securities, mortgages (**specialized market indices**). The most broadly employed bond indexes are the ones calculated by Merrill Lynch, Lehman Brothers and Salomon Brothers. Broker dealer firms develop and publish market indices because they are able to sell tracking and rebalancing services to investors. With those services the broker-dealer executes the trades on behalf of an institutional investor who is willing to have the performance of his bond portfolio closely linked to the performance of an index (this policy is called indexing and will be treated broadly in the chapter about Fixed income portfolio management).

Bond indices measure the total return (interest plus capital gains) of a bond investment; the return is computed daily. A potential drawback with bond indices lies in the infrequency with which many of the bonds included in the index are traded that makes the calculation of the total return quite problematic, given the difficulty of determining the capital gain component of the total return in the absence of a market price. The common solution to this problem is to employ a fair price, calculated on the basis of a bond valuation model, but, as it is apparent, the fair price can be quite different from the market price.