WEEK 1: INTRODUCTION TO FINANCIAL SECURITIES

BASIC CONCEPTS IN FINANCE

- Arbitrage and the law of one price (in the long run, prices of the same products will be equal and any differences will only reflect additional costs or values added)
- Price (net present value of future cashflows)
- Time value of money ($1 today is worth more than $1 tomorrow because people tend to prefer immediate consumption over deferred one).
- Business vs. Financial risk (discuss how relate to each other)
- Physical vs. Financial assets (plants and buildings vs paper assets)
- Price of money/capital (required return on capital, interest rate, yield, etc)
- Simple vs. compound interest (understanding of rate of growth)
- Continuous compounding (understanding of rate of growth)

KEY CONCEPTS RELATED TO FIXED INCOME SECURITIES

- Bond indenture
- Nominal price, principal value, par value, maturity value, face value, redemption value
- Yield to maturity (YTM), yield to call (YTC)
- Bond price, market value of FIS, dirty price, clean price, etc
- Coupon, coupon rate, yield rate, annual yield rate, nominal yield, etc
- Current yield
- Spot rate
- Forward rate
- Term to maturity, time to maturity, maturity, term
- Duration (%), Macaulay duration (years), dollar duration ($), convexity
- Interest rate derivatives: interest rate futures, interest rate swap, forward rate agreement
- Embedded options: call and put provisions, caps and floors
- Binomial-valuation of bonds with embedded options

PART I: FEATURES OF FIXED INCOME SECURITIES

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 module is on one of the two major asset classes: fixed income securities.

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.

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.

Term to 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 ''shortterm.'' 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.

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, all other factors constant, the longer the maturity of a bond, the greater the price volatility resulting from a change in interest rates.

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.

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:

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

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,

coupon = coupon rate × 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 × 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 semi-annual instalments. 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. All other factors constant, the higher the coupon rate, the less the price will change in response to a change in market interest rates.

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).

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.

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:

coupon rate = reference rate + 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). Suppose that the quoted margin is 100 basis points. Then the coupon formula is:

coupon rate = 1-month LIBOR + 100 basis points

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

Caps and floors

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. Caps and floors are effectively embedded options.

Inverse floater

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. 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.

The coupon formula for an inverse floater is:

coupon rate = K − L × (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:

coupon rate = 20% − 2 × (reference rate)

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

coupon rate = 20% − 2 × (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:

coupon rate = 20% − 2 × 6% = 8%

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

coupon rate = 20% − 2 × 5% = 10%

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.

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.

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.

A bond issue that **permits the issuer to call an issue prior to the stated maturity date** is referred to as a **callable bond.**

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 6.78s 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.

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.

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.

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.

Convertible and exchangeable bonds

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 favourable 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.

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 standalone 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.

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.

PART II: RISKS ASSOCIATED WITH INVESTING IN BONDS

Bonds may expose an investor (i.e. bondholder or lender) to one or more of the following risks:

1. Interest-rate risk
2. Reinvestment risk
3. Call risk
4. Credit risk (default risk, credit spread risk, downgrade risk)
5. Inflation risk
6. Exchange-rate risk
7. Liquidity risk
8. Volatility risk
9. Risk risk
10. Yield curve risk
11. Event risk
12. Modelling risk

1. Interest-rate risk

The price of a typical bond will change in the opposite direction from a change in interest rates: as interest rates rise, the price of a bond will fall; as interest rates fall, the price of a bond will rise. If a bondholder has to sell a bond prior to the maturity date, an increase in interest rates will mean the realization of a capital loss (i.e. selling the bond below the purchase price). This risk is called **market risk** in the case of all assets that have prices **or interest-rate risk** in the case of bonds. This is a major risk for investors.

The actual degree of sensitivity of a bond's price depends on various characteristics of the bond such as the yield level (from which the interest-rates moved), coupon rate, maturity, embedded options, etc.

2. Reinvestment risk

Calculation of the yield to maturity of a bond assumes that the cash flows received are reinvested. The additional income from such reinvestment, sometimes called **interest-on-interest,** depends on the prevailing interest-rate levels at the time of reinvestment, as well as on the reinvestment strategy. Variability in the reinvestment rate of a given strategy because of changes in market interest rates is called **reinvestment risk**. **This risk is that the interest rate at which interim cashflows can be reinvested will fall.** Reinvestment risk is greater for longer holding periods, as well as for bonds with large, early, cashflows, such as high-coupon bonds.

It should be noted that interest-rate risk and reinvestment risk have offsetting effects. That is, interest-rate risk is the risk that interest rates will rise, thereby reducing a bond's price. In contrast, reinvestment risk is the risk that interest rates will fall. A strategy based on these offsetting effects is called **immunization.**

3. Call risk

Many bonds include a provision that allows the issuer (i.e. borrower) to retire or 'call' all or part of the issue before the maturity date. The issuer usually retains this right in order to have flexibility to refinance the bond in the future if the market interest rate drops below the coupon rate.

From the investor's perspective, there are three disadvantages to call provisions. First, the cash flow pattern of a callable bond is not known with certainty. Second, because the issuer will call the bonds when interest rates have dropped, the investor is exposed to reinvestment risk (i.e. the investor will have to reinvest the proceeds when the bond is called at a relatively lower interest rates). Finally, the capital appreciation potential of a bond will be reduced, because the price of a callable bond may not rise much above the price at which the issuer will call the bond.

4. Credit risk

Default risk, one of the three forms of credit risk, is the risk that the issuer of a bond may default (i.e. will unable to make timely principal and interest payments on the issue). Default risk is gauged by quality ratings assigned by four nationally recognised rating companies: Moody's Investors Service, Standard & Poor's Corporation, Fitch IBCA, and Duff & Phelps Credit Rating Company, as well as the credit research staff of securities firms.

Except in the case of the lowest-rated securities, known as high-yield or junk bonds, the investor is normally more concerned with the changes in the perceived default risk and/or the cost associated with a given level of default risk with the actual event of default.

Even though the actual default of an issuing corporation may be highly unlikely, they reason, the impact of a change in perceived default risk, or the spread demanded by the market for any given level of default risk, can have an immediate impact on the value of a bond.

Even in the absence of default, an investor is concerned that the market value of a bond will decline and/or the price performance of a bond will be worse than that of other bonds. To understand this, recall that the price of a bond changes in the opposite direction to the change in the yield required by the market. Thus, if yields in the economy increase, the price of a bond declines, and vice versa.

The yield on a bond is made up of two components: (1) the yield on a similar default-free bond issue and (2) a premium above the yield on a default-free bond issue necessary to compensate for the risks associated with the bond. The risk premium is referred to as a **yield spread**. In the United States, Treasury issues are the benchmark yields because they are believed to be default free, they are highly liquid, and they are not callable (with the exception of some old issues). The part of the risk premium or yield spread attributable to default risk is called the credit spread.

The price performance of a non-Treasury bond issue and the return over some time period will depend on how the credit spread changes. If the credit spread increases, investors say that the spread has ''widened'' and the market price of the bond issue will decline (assuming U.S. Treasury rates have not changed). The risk that an issuer's debt obligation will decline due to an increase in the credit spread is called **credit spread risk.**

One tool investors use to gauge the default risk of an issue is the credit ratings assigned to issues by rating companies, popularly referred to as rating agencies. There are three rating agencies in the United States: Moody's Investors Service, Inc., Standard & Poor's Corporation, and Fitch Ratings.

A credit rating is an indicator of the potential default risk associated with a particular bond issue or issuer. It represents in a simplistic way the credit rating agency's assessment of an issuer's ability to meet the payment of principal and interest in accordance with the terms of the indenture. Credit rating symbols or characters are uncomplicated representations of more complex ideas.

In all systems, the term high grade means low credit risk, or conversely, a high probability of receiving future payments is promised by the issuer. The highest-grade bonds are designated by Moody's by the symbol Aaa, and by S&P and Fitch by the symbol AAA.

Once a credit rating is assigned to a debt obligation, a rating agency monitors the credit quality of the issuer and can reassign a different credit rating. An improvement in the credit quality of an issue or issuer is rewarded with a better credit rating, referred to as an upgrade; a deterioration in the credit rating of an issue or issuer is penalized by the assignment of an inferior credit rating, referred to as a downgrade. An unanticipated downgrading of an issue or issuer increases the credit spread and results in a decline in the price of the issue or the issuer's bonds. This risk is referred to as **downgrade risk** and is closely related to credit spread risk.

5. Inflation risk

Inflation risk or purchasing-power risk arises because of the variation in the value of cash flows from a security due to inflation, as measured in terms of purchasing power. For example, if investors purchase a bond on which they can realize a coupon rate of 7% but the rate of inflation is 8%, the purchasing power of the cash flow actually has declined. For all but floating rate bonds, an investor is exposed to inflation risk because the interest rate the issuer promises to make is fixed for the life of the issue. To the extent that interest rates reflect inflation rate, floating-rate bonds have a lower level of inflation risk.

6. Exchange-rate risk

A non-dollar-denominated bond (i.e. a bond whose payments occur in a foreign currency) has unknown U.S. dollar cash flows. The dollar cash flows are dependent on the exchange rate at the time the payments are received. For example, suppose that an investor purchases a bond whose payments are in Japanese yen. If the yen depreciates relative to the U.S. dollar, fewer dollars will be received. The risk of this occurring is referred to as exchange-rate or currency risk. Should the yen appreciate relative to the U.S. dollar, the investor will benefit by receiving more dollars.

7. Liquidity risk

Liquidity or marketability risk depends on the ease with which an issue can be sold at or near its value. The primary measure of liquidity is the size of the spread between the bid price and the ask

price quoted by a dealer. The wider the dealer spread, the more the liquidity risk. For an investor who plans to hold the bond until the maturity date, liquidity risk is less important.

8. Volatility risk (mostly affects bonds with embedded options)

The price of a bond with certain types of embedded options depends on the level of interest rates and factors that influence the value of the embedded option. One of these factors is the expected volatility of interest rates. Specifically, the value of an option rises when expected interest-rate volatility increases. In the case of a bond that is callable, or a mortgage-backed security, in which the investor has granted the borrower an option, the price of the security falls, because the investor has given away a more valuable option. **The risk that a change in volatility will affect the price of a bond adversely is called volatility risk.**

9. Risk risk

Risk risk is defined as not knowing what the risk of a security is. There are two ways to mitigate or eliminate risk risk. The first approach is to keep up with the literature on the state-of-the-art methodologies for analysing securities. The second approach is to avoid securities that are not clearly understood.

10. Yield curve risk

The yield curve risk is the risk of experiencing an adverse shift in market interest rates associated with investing in a fixed income instrument. The risk is associated with either a flattening or steepening of the yield curve, which is a result of changing yields among comparable bonds with different maturities.

When the yield curve shifts, the price of the bond, which was initially priced based on the initial yield curve, will change in price. If the yield curve flattens, then the yield spread between long- and short-term interest rates narrows, and the price of the bond will change accordingly. If the bond is a short-term bond maturing in three years and the three-year yield decreases, the price of this bond will increase. If the yield curve steepens, this means that the spread between long- and short-term interest rates increases. Therefore, long-term bond prices will decrease relative to short-term bonds. Changes in the yield curve are based on bond risk premiums and expectations of future interest rates.

The implication is that any measure of interest rate risk that assumes that the interest rates changes by an equal number of basis points for all maturities (referred to as a ‘‘parallel yield curve shift’’) is only an approximation.

11. Event risk

An event risk is the possibility that an unforeseen event will negatively affect a company or industry. Unforeseen corporate reorganizations or bond buybacks may have positive or negative impacts upon the market price of a stock.

The risk is also associated with a changing portfolio value due to large swings in market prices. Also referred to as "jump risk" or "fat-tails." These are extreme portfolio risks due to substantial changes in market price.

12. Modelling risk

A type of risk that occurs when a financial model used to measure a firm's market risks or value transactions does not perform the tasks or capture the risks it was designed to.

Model risk is considered a subset of operational risk, as model risk mostly affects the firm that creates and uses the model. Traders or other investors who use the model may not completely understand its assumptions and limitations, which limits the usefulness and application of the model itself.

PART III: OVERVIEW OF BOND MARKET SECTORS AND INSTRUMENTS

From the perspective of a given country, the bond market can be classified into two markets: an internal bond market and an external bond market.

A. Internal Bond Market

The internal bond market of a country is also called the national bond market. It is divided into two parts: the domestic bond market and the foreign bond market. The domestic bond market is where issuers domiciled in the country issue bonds and where those bonds are subsequently traded.

The foreign bond market of a country is where bonds of issuers not domiciled in the country are issued and traded. For example, in the United States, the foreign bond market is the market where bonds are issued by non–U.S. entities and then subsequently traded in the United States. In the U.K., a sterling-denominated bond issued by a Japanese corporation and subsequently traded in the U.K. bond market is part of the U.K. foreign bond market.

B. External Bond Market

The external bond market includes bonds with the following distinguishing features:

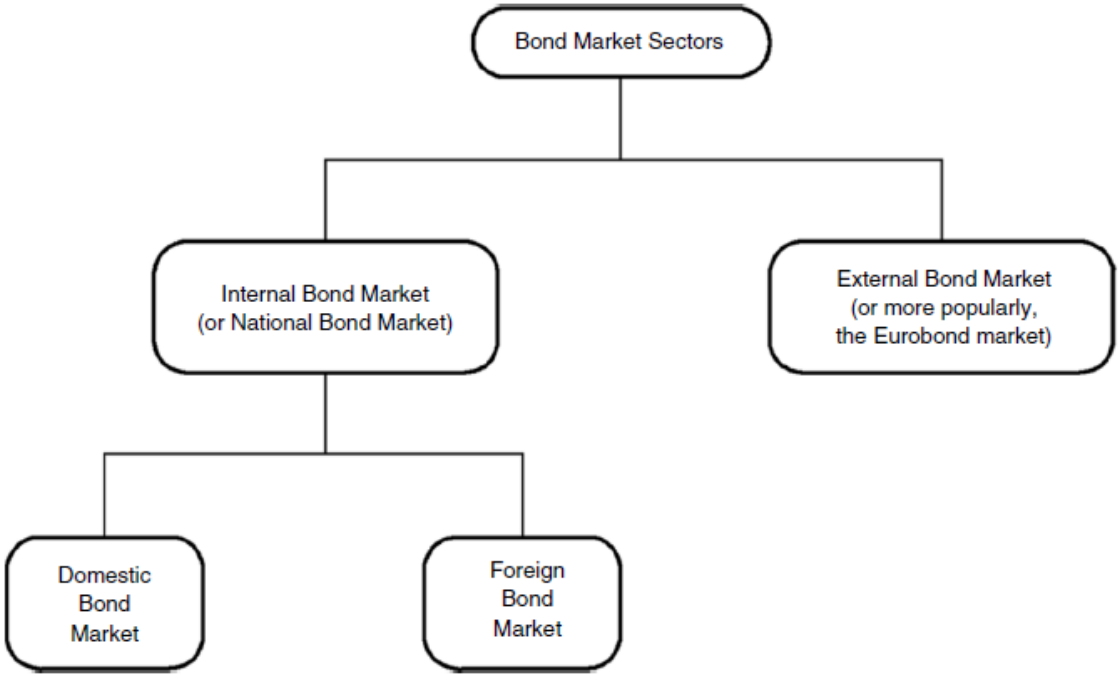
- they are underwritten by an international syndicate
- at issuance, they are offered simultaneously to investors in a number of countries
- they are issued outside the jurisdiction of any single country

• they are in unregistered form.

The external bond market is referred to as the international bond market, the offshore bond market, or, more popularly, ***the Eurobond market.*** Throughout this book we will use the term Eurobond market to describe this sector of the bond market.

Eurobonds are classified based on the currency in which the issue is denominated. For example, when Eurobonds are denominated in U.S. dollars, they are referred to as Eurodollar bonds. Eurobonds denominated in Japanese yen are referred to as Euroyen bonds.

EXHIBIT 1 Overview of the Sectors of the Bond Market



B. Methods of Distributing New Government Securities

Four methods have been used by central governments to distribute new bonds that they issue: (1) regular auction cycle/multiple-price method, (2) regular auction cycle/single-price method, (3) ad hoc auction method, and (4) tap method.

With the regular auction cycle/multiple-price method, there is a regular auction cycle and winning bidders are allocated securities at the yield (price) they bid. For the regular auction cycle/single-price method, there is a regular auction cycle and all winning bidders are awarded securities at the highest yield accepted by the government. For example, if the highest yield for a single-price auction is 7.14% and someone bid 7.12%, that bidder would be awarded the securities at 7.14%. In contrast, with a multiple-price auction that bidder would be awarded securities at 7.12%. U.S. government bonds are currently issued using a regular auction cycle/single-price method.

In the ad hoc auction system, governments announce auctions when prevailing market conditions appear favourable. It is only at the time of the auction that the amount to be auctioned and the maturity of the security to be offered is announced. This is one of the methods used by the Bank of England in distributing British government bonds. In a tap system, additional bonds of a previously outstanding bond issue are auctioned. The government announces periodically that it is adding this new supply. The tap system has been used in the United Kingdom, the United States, and the Netherlands.

U.S. Treasury securities are categorized as fixed-principal securities or inflation-indexed securities.

A. **Fixed-Principal Treasury Securities.** Fixed principal securities include Treasury bills, Treasury notes, and Treasury bonds. Treasury bills are issued at a discount to par value, have no coupon rate, mature at par value, and have a maturity date of less than 12 months. As discount securities, Treasury bills do not pay coupon interest; the return to the investor is the difference between the maturity value and the purchase price. Treasury coupon securities issued with original maturities of more than one year and no more than 10 years are called Treasury notes. Coupon securities are issued at approximately par value and mature at par value. Treasury coupon securities with original maturities greater than 10 years are called Treasury bonds. While a few issues of the outstanding bonds are callable, the U.S. Treasury has not issued callable Treasury securities since 1984.

B. **Inflation-Indexed Treasury Securities**. The U.S. Department of the Treasury issues Treasury notes and bonds that provide protection against inflation. These securities are popularly referred to as **Treasury inflation protection securities or TIPS**. (The Treasury refers to these securities as Treasury inflation indexed securities, TIIS.).
TIPS work as follows. The coupon rate on an issue is set at a fixed rate. That rate is determined via the auction process described later in this section. The coupon rate is called the ‘‘real rate’’ because it is the rate that the investor ultimately earns above the inflation rate. The inflation index that the government uses for the inflation adjustment is the non-seasonally adjusted U.S. City Average All Items Consumer Price Index for All Urban Consumers (CPI-U). The principal that the Treasury Department will base both the dollar amount of the coupon payment and the maturity value on is adjusted semi-annually. This is called the inflation-adjusted principal. The adjustment for inflation is as follows. Suppose that the coupon rate for a TIPS is 3.5% and the annual inflation rate is 3%. Suppose further that an investor purchases on January 1, $100,000 of par value (principal) of this issue. The semiannual inflation rate is 1.5% (3% divided by 2). The inflation-adjusted principal at the end of the first six-month period is found by multiplying the original par value by (1 + the semi-annual inflation rate). In our example, the inflation-adjusted principal at the end of the first six-month period is $101,500. It is this inflation-adjusted principal that is the basis for computing the coupon interest for the first six-month period. The coupon payment is then 1.75% (one half the real rate of 3.5%) multiplied by the inflation-adjusted principal at the coupon payment date ($101,500). The coupon payment is therefore $1,776.25. Let’s look at the next six months. The inflation-adjusted principal at the beginning of the period is $101,500. Suppose that the semiannual inflation rate for the second six-month period is 1%. Then the inflation-adjusted principal at the end of the second six-month period is the inflation-adjusted principal at the beginning of the six-month period ($101,500) increased by the semiannual inflation rate (1%). The adjustment to the principal is $1,015 (1% times $101,500). So, the inflation-adjusted principal at the end of the second six-month period (December 31 in

our example) is $102,515 ($101, 500 + $1, 015). The coupon interest that will be paid to the investor at the second coupon payment date is found by multiplying the inflation-adjusted principal on the coupon payment date ($102,515) by one half the real rate (i.e., one half of 3.5%). That is, the coupon payment will be $1,794.01.

C. **Treasury STRIPs.** The Treasury does not issue zero-coupon notes or bonds. However, because of the demand for zero-coupon instruments with no credit risk and a maturity greater than one year, the private sector has created such securities. Stripped Treasury securities are simply referred to as Treasury strips. Strips created from coupon payments are called coupon strips and those created from the principal payment are called principal strips. To illustrate the process, suppose $100 million of a Treasury note with a 10-year maturity and a coupon rate of 10% is purchased to create zero-coupon Treasury securities. The cash flows from this Treasury note are 20 semi-annual payments of $5 million each ($100 million times 10% divided by 2) and the repayment of principal (''corpus'') of $100 million 10 years from now. As there are 21 different payments to be made by the Treasury, a receipt representing a single payment claim on each payment is issued at a discount, creating 21 zero-coupon instruments.

Non-U.S. Sovereign Bond Issuers

The **German government** issues bonds (called Bunds) with maturities from 8–30 years and notes (Bundesobligationen, Bobls) with a maturity of five years. Ten-year Bunds are the largest sector of the German government securities market in terms of amount outstanding and secondary market turnover. Bunds and Bobls have a fixed-rate coupons and are bullet structures.

The bonds issued by the **United Kingdom** are called ''gilt-edged stocks'' or simply gilts. There are more types of gilts than there are types of issues in other government bond markets. The largest sector of the gilt market is straight fixed-rate coupon bonds. The second major sector of the gilt market is index-linked issues, referred to as ''linkers.'' There are a few issues of outstanding gilts called ''irredeemables.'' These are issues with no maturity date and are therefore called ''undated gilts.''

There are two types of **Japanese government** securities (referred to as JGBs) issued publicly: (1) medium-term bonds and (2) long-dated bonds. There are two types of medium term bonds: bonds with coupons and zero-coupon bonds. Bonds with coupons have maturities of 2, 3, and 4 years. The other type of medium-term bond is the 5-year zero-coupon bond. Long-dated bonds are interest bearing.

SEMI-GOVERNMENT/AGENCY BONDS

A central government can establish an agency or organization that issues bonds. The bonds of such entities are not issued directly by the central government but may have either a direct or implied government guarantee. These bonds are generically referred to as semi-government bonds or government agency bonds. In some countries, semi-government bonds include bonds issued by regions of the country.

In the United States, semi-government bonds are referred to as **federal agency securities.** They are further classified by the types of issuer—those issued by **federally related institutions** and those issued by **government-sponsored enterprises**.

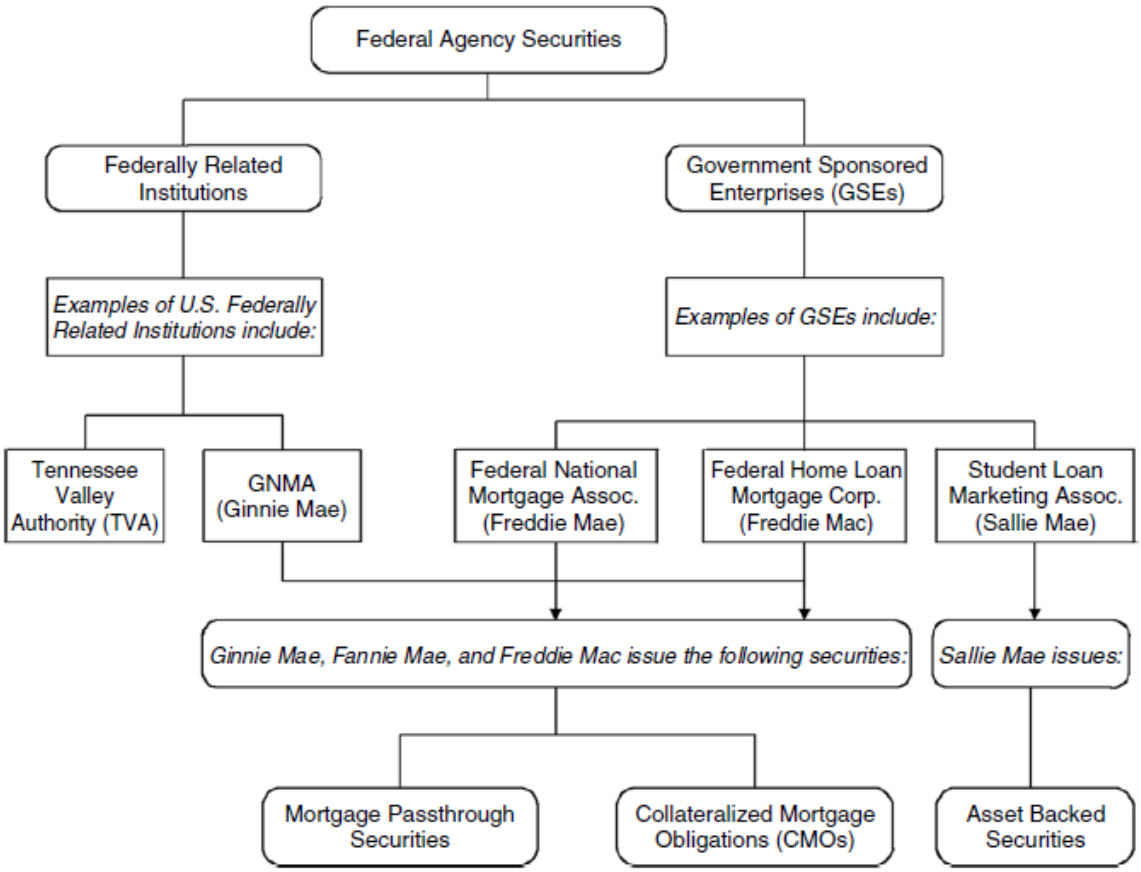
Federally related institutions are arms of the federal government. They include the Export-Import Bank of the United States, the Tennessee Valley Authority (TVA), the Commodity Credit Corporation, the Farmers Housing Administration, the General Services Administration, the Government National Mortgage Association (GinnieMae), the Maritime Administration, the Private Export Funding Corporation, the Rural Electrification Administration, the Rural Telephone Bank, the Small Business Administration, and the Washington Metropolitan Area Transit Authority. With the exception of securities of the TVA and the Private Export Funding Corporation, the securities are backed by the full faith and credit of the U.S. government. In recent years, the TVA has been the only issuer of securities directly into the marketplace.

Government-sponsored enterprises (GSEs) are privately owned, publicly chartered entities. They were created by Congress to reduce the cost of capital for certain borrowing sectors of the economy deemed to be important enough to warrant assistance. The entities in these sectors include farmers, homeowners, and students. The enabling legislation dealing with a GSE is reviewed periodically. GSEs issue securities directly in the marketplace. The market for these securities, while smaller than that of Treasury securities, has in recent years become an active and important sector of the bond market.

Today there are six GSEs that currently issue securities: Federal National Mortgage Association (Fannie Mae), Federal Home Loan Mortgage Corporation (Freddie Mac), Federal Agricultural Mortgage Corporation (Farmer Mac), Federal Farm Credit System, Federal Home Loan Bank System, and Student Loan Marketing Association (Sallie Mae). Fannie Mae, Freddie Mac, and the Federal Home Loan Bank are responsible for providing credit to the residential housing sector. Farmer Mac provides the same function for farm properties. The Federal Farm Credit Bank System is responsible for the credit market in the agricultural sector of the economy. Sallie Mae provides funds to support higher education.

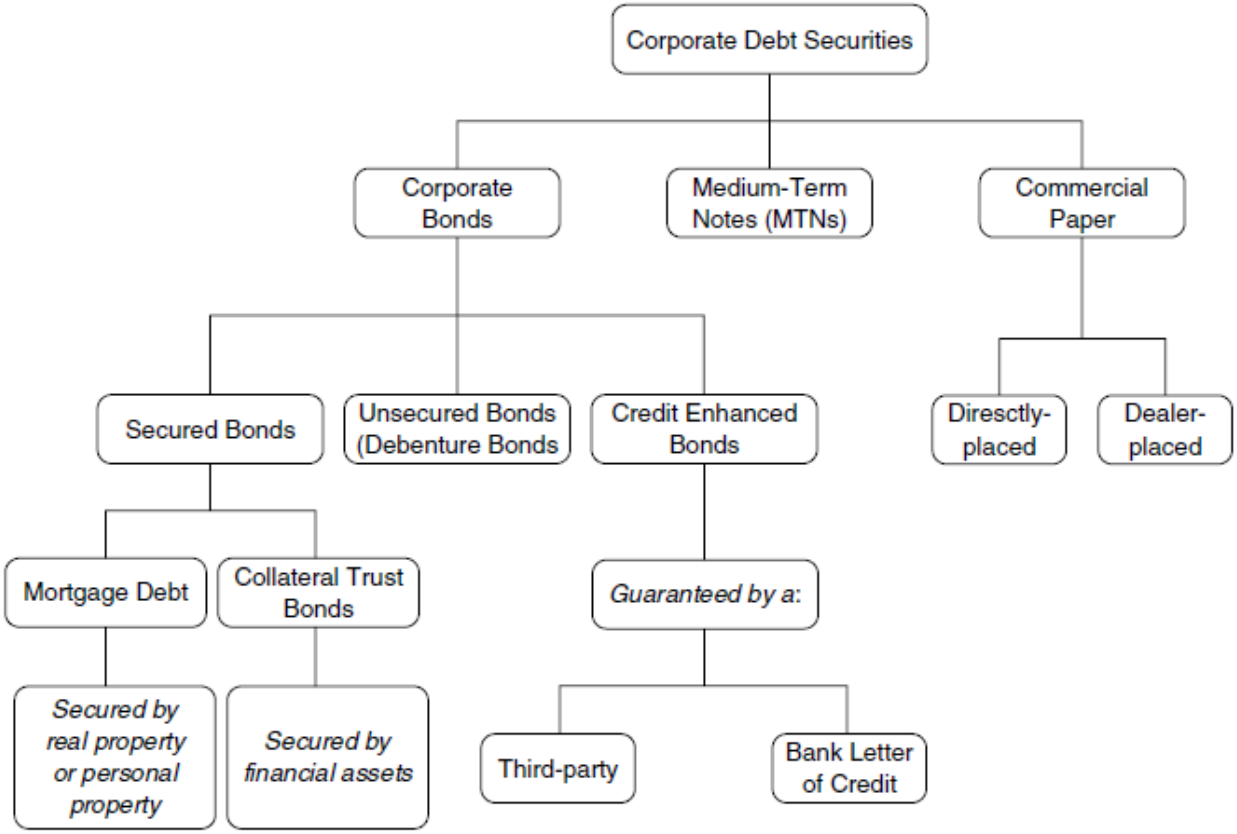
Generally, GSEs issue two types of debt: debentures and discount notes. Debentures and discount notes do not have any specific collateral backing the debt obligation. The ability to pay debtholders depends on the ability of the issuing GSE to generate sufficient cash flows to satisfy the obligation. Debentures can be either notes or bonds. GSE issued notes, with minor exceptions, have 1 to 20 year maturities and bonds have maturities longer than 20 years. Discount notes are short-term obligations, with maturities ranging from overnight to 360 days.

The two GSEs charged with providing liquidity to the mortgage market—Fannie Mae and Freddie Mac—also issue securities backed by the mortgage loans that they purchase. That is, they use the mortgage loans they underwrite or purchase as collateral for the securities they issue. These securities are called agency mortgage-backed securities and include mortgage pass-through securities, collateralized mortgage obligations (CMOs), and stripped mortgage backed securities. The latter two mortgage-backed securities are referred to as derivative mortgage-backed securities because they are created from mortgage pass-through securities.



CORPORATE DEBT SECURITIES

Corporations throughout the world that seek to borrow funds can do so through either bank borrowing or the issuance of debt securities. The securities issued include bonds (called corporate bonds), medium term notes, asset-backed securities, and commercial paper. The exhibit below provides an overview of the structures found in the corporate debt market. In many countries throughout the world, the principal form of borrowing is via bank borrowing and, as a result, a well-developed market for non-bank borrowing has not developed or is still in its infancy stage.


Corporate Debt Securities
Corporate Bonds
Medium-Term Notes (MTNs)
Commercial Paper
Secured Bonds
Unsecured Bonds (Debenture Bonds
Credit Enhanced Bonds
Diresctly-placed
Dealer-placed
Mortgage Debt
Collateral Trust Bonds
Guaranteed by a:
Secured by real property or personal property
Secured by financial assets
Third-party
Bank Letter of Credit