CHAPTER – V

Valuation of Securities (Bond Management)

Introduction:

Bonds and Debentures both are long-term fixed income debt securities. Bonds may be issued by Governments, Corporations and Companies. Bonds issued by Governments (Federal or State) are referred to as Government bonds. Bonds issued by Corporations, Share companies and Private companies are referred to as Corporate bonds.

The words bonds and debentures are often used interchangeably. Generally, Debt securities issued by corporations and share companies are called as bonds and debt securities issued by private companies are called as debentures. Internationally, a secured corporate debt instrument is called a corporate bond whereas an unsecured corporate debt instrument is called as corporate debenture.

For the sake of simplicity, in this chapter, we will refer to all corporate debt instruments as corporate bonds.

Bond characteristics:

A bond represents a security issued in connection with a borrowing arrangement. It is an "IOU" issued by the borrower. The basic character of the bonds is that they promise to pay a stipulated steam of cash flows i.e. periodic interest payments over the life of the instrument and principal payment at the time of maturity.

A bond may be described in terms of par value, coupon rate, and maturity date.

Par value: It is the value stated on the face of the bond. It represents the amount the issuer promises to pay at the time of maturity.

Coupon rate: It is the interest rate printed on the face of the bond payable by issuer to the bondholder.

Maturity date: It is the date on which principal amount is paid to the bond holder.

For example, an issuer may sell a bond with a par value of Birr 1,000, a coupon rate of 8 percent payable semi-annually, and a maturity period of 12 years. The buyer of such a bond would receive an interest of Birr 40 every six months for 12 years and principal amount of Birr 1,000 at the end of 12 years.

Types of Bonds:

1.Straight Bonds: The straight bond is the most popular type of bond. It pays a fixed periodic (annually or semi-annually) coupon over its life and returns the principal on the maturity date.

2.Zero Coupon Bonds: A zero bond (or just zero) does not carry any regular interest payment. It is issued at a steep discount over its face value and redeemed at face value on maturity. For example, if corporation issues a bond of face value of Birr 200,000 for 25 years at Birr 5,300, it is called a zero coupon bond.

3.Convertible Bonds: Convertible bonds give the bond holder the right (option) to convert them into equity shares on certain pre-specified terms and conditions.

4.Callable Bonds: Callable bonds give the issuer the right (option) to redeem them pre-maturely on certain pre-specified terms and conditions.

5.Puttable bonds: Puttable bonds give the investor the right (option) to pre-maturely sell them back to the issuer on certain pre-specified terms and conditions.

Bond Yields:

The following are the commonly employed bond yield measures.

1. Current Yield
2. Yield to maturity
3. Yield to call

Let us examine how these yield measures are calculated.

Current Yield: The current market price of a bond in the secondary market may differ from its face value. A bond of a face value Birr 100 may be selling at a discount, say at Birr 90 or it may be selling at premium say at Birr 105.

Current yield relates the annual coupon interest receivable on a bond to its current market price. It is calculated as follows:

$$\text{Current yield} = \frac{\text{Annual Interest}}{\text{Current Market Price}}$$

Illustration 1: A bond of face value of Birr 1,000, a coupon interest rate of 12 percent, is currently selling at Birr 800. What is the current yield on the bond?

$$\text{Current yield} = \frac{\text{Annual Interest}}{\text{Current Market Price}}$$

Where Annual interest 1000 *12/100 = 120

$$= \frac{120}{800} = 0.15 = 15\%$$

Illustration 2: A bond par value is Birr 100, a coupon interest rate of 10 percent, having maturity period of 10 years is now selling at Birr 95. What is the current yield?

Current yield = $\frac{\text{Annual Interest}}{\text{Current Market Price}}$ Where Annual interest 100 * 10/100 = 10

$= \frac{10}{95} = 0.10526 = 10.53\%$

Current yield measures only the annual return accrues to the bond holder. It does not consider the capital gain or loss that an investor realizes if the bond is purchased at discount/premium and is held it till maturity. It also ignores the time value of money. It is simplistic but incomplete measure of yield.

Yield to Maturity: This is the most widely used measure of return on bonds. In this method, using the information of Bond price, Bond par value, maturity date, and coupon interest payments, you have to calculate the rate of return offered by the bond over its life. This method is popularly known as YTM. YTM is the discount rare that makes the *present value of cash flows* to the price of the bond.

Formula to calculate YTM: $P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$

Where:

P= Current price of the bond

C= Periodical interest (may be annually or semi-annually etc)

M= Maturity value of the bond

The above formula can be written as follows:

$P = C\ (PVIFA_{r,\ t}) + M\ (PVIF_{r,\ n})$

Illustration 3: A Birr 1,000 par value bond, carrying a coupon rate of 9 percent, is maturing after eight years. The bond is currently selling for Birr 800. What is YTM on this bond?

$P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$

$P = C\ (PVIFA_{r,\ t}) + M\ (PVIF_{r,\ n})$

$800 = 90\ (PVIFA_{r,\ 8\ \text{years}}) + 1000\ (PVIF_{r,\ 8\ \text{years}})$

The computation of YTM requires a trial and error procedure. Let us begin with a discount rate of 12 percent. Putting a value of 12% for r, we find the right hand side of the equation in above is:

$= 90 (PVIFA_{12\%, 8 \text{ years}}) + 1000 (PVIF_{12\%, 8 \text{ years}})$

$= 90 (4.968) + 1000 (0.404)$

$= 447.12 + 403.90 = 851.02$

$= 851$

Since the value we got 851 is greater than P i.e. 800, we have to try a higher value for r.

Let us try by putting a discount rate of 14 percent for r.

$= 90 (PVIFA_{14\%, 8 \text{ years}}) + 1000 (PVIF_{14\%, 8 \text{ years}})$

$= 90 (4.639) + 1000 (0.351)$

$= 417.51 + 351$

$= 768.51$

$= 769$

Since this value (769) is less than P i.e. 800, we have to try a lower value for r.

Let us try with a discount rate of 13 percent.

$= 90 (PVIFA_{13\%, 8 \text{ years}}) + 1000 (PVIF_{13\%, 8 \text{ years}})$

$= 90 (4.799) + 1000 (0.376)$

$= 431.91 + 376$

$= 807.91$

$= 808$

At 14 percent discount rate the amount is 769 and at 13 percent the amount is 808. Therefore, r lies between 13 and 14 percents.

Linear interpolation to get accurate rate;

$$= LDR + \left(\frac{LDRYTM - CMP}{LDRYTM - HDRYTM} \right) X (HDR - LDR)$$

$= 13\% + \left(\frac{808-800}{808-769} \right) \text{ x } (14 - 13)$

$= 13 + \frac{8}{39} \text{ x } 1$

$= 13 + 0.2051 \text{ x } 1$

$= 13 + 0.2051$

$= 13.2051$

$= 13.20\%$

YTM is 13.20

Approximation:

The tedious calculations involved in determining YTM can be avoided by using the following formula which gives an approximate estimate of YTM

$$\text{YTM} = \frac{\text{C}+(\text{M}-\text{P})/\text{n}}{0.4 \text{ x M}+0.6 \text{ x P}}$$

Where YTM is yield to maturity, C is the annual payment, M is the maturity value of the bond, P is the present price of the bond and n is the years to maturity.

This formula of YTM gives a close approximation but not accurate YTM.

To illustrate the use of this formula, let us consider the bond discussed above. The approximate YTM of the bond works out to:

$$\text{YTM} = \frac{\text{C}+(\text{M}-\text{P})/\text{n}}{0.4 \text{ x M}+0.6 \text{ x P}}$$

$$\text{YTM} = \frac{90+(1000-800)/8}{0.4 \text{ x } 1000+0.6 \text{ x } 800}$$

$$\text{YTM} = \frac{90+(200)/8}{0.4 \text{ x } 1000+0.6 \text{ x } 800}$$

$$\text{YTM} = \frac{90+25}{400+480}$$

$$\text{YTM} = \frac{115}{880}$$

$$\text{YTM} = 0.1307 \text{ x } 100$$

YTM = 13.07%

Note: To calculate Yield to maturity or Yield to call, first use approximation in rough work, and proceed to calculate Yield to maturity or Yield to call.

Yield to Call:

Some bonds carry a call feature that entitles the issuer of the bonds to call back (buy back) the bonds prior to the stated maturity date in accordance with a call schedule (which specifies a call price for each call date).

For example, a company may issue 15 years bonds which can be called back or redeemed by the issuer at the end of 5^{th} year say with a call price of 5% premium on face value.

The yield too call is computed on the assumption that the bond's cash inflows are terminated at the call date with redemption of the bond at the specified call price.

The procedure for calculating the Yield to call (YTC) is same as for the YTM.

Illustration 4: An investor recently purchased a bond of Birr 1000 face value, having 6 percent coupon rate, for Birr 950. The bond matures five years from now.

a) What is the Yield to maturity of bond
b) If the bond is callable three years from now at a price of Birr 1050, what is the Yield to call?

Rough work:

Approximation:

$$YTM = \frac{C+(M-P)/n}{0.4 \times M+0.6 \times P}$$

$$YTM = \frac{60+(1000-950)/5}{0.4 \times 1000+0.6 \times 950} = 0.072 = 7.2\%$$

$$YTC = \frac{C+(M-P)/n}{0.4 \times M+0.6 \times P}$$

$$YTC = \frac{60+(1050-950)/3}{0.4 \times 1050+0.6 \times 950} = 0.0942 = 9.42\%$$

Solution:

A.Calculation of YTM:

$$P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$$

$P = C\ (PVIFA_{r,\ t}) + M\ (PVIF_{r,\ n})$

Putting a value of 7% for r

$950 = 60(PVIFA_{7\%,\ 5\ years}) + 1000\ (PVIF_{7\%,\ 5\ years})$

$= 60(4.100) + 1000(0.713)$

$= 246 + 713 = 959$

Since the value 959 is greater than P i.e. 950, let us try a higher value for r.

Putting a value of 8% for r

$950 = 60(PVIFA_{8\%,\ 5\ years}) + 1000\ (PVIF_{8\%,\ 5\ years})$

$= 60(3.993) + 1000(0.681)$

$= 239.58 + 681 = 920.58$

Therefore, r value lies in between 7% and 8%.

Interpolation to get accurate rate:

$$7\% + \left(\frac{959-950}{959-920.58} \right) \text{ x } (8 - 7)$$

$$= 7 + \frac{9}{38.42} \text{ x } 1$$

$$= 7 + 0.2342 \text{ x } 1$$

$$= 7 + 0.2342$$

$$= 7.2342$$

YTM = 7.23%

B.Calculation of Yield to call:

$$P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$$

$P = C\ (PVIFA_{r,\ t}) + M\ (PVIF_{r,\ n})$

Putting a value of 9% for r

950 = 60(PVIFA $_{9,\ 3}$ years) + 1050 (PVIF $_{9,\ 3\text{years}}$)

= 60(2.531) + 1050(0.772)

= 151.86 +810.6 = 962.46

Since the value 962.46 is greater than P i.e. 950, let us try a higher value for r.

Putting a value of 10% for r

950 = 60(PVIFA $_{10,\ 3}$ years) + 1050 (PVIF $_{10,\ 3\text{years}}$)

= 60(2.487) + 1050(0.751)

= 149.22 + 788.55 = 937.77

Therefore, r value lies in between 9% and 10%.

Interpolation to get accurate rate:

$$9\% + \left(\frac{962.46 - 950}{962.46 - 937.77} \right) \text{ x } (10 - 9)$$

$$= 9 + \frac{12.46}{24.69} \text{ x } 1$$

$$= 9 + 0.505$$

YTC = 9.505 = 9.51%

Bond Prices:

The value of a bond is equal to the present value of its expected cash flows. The cash flows from a bond consist of the periodical interest payments as well as the principal repayment at maturity. These cash flows have to be discounted at an **appropriate discount rate** (required rate of return) to determine the current value of the bond.

Assumptions in calculating bond price:

- The coupon interest rate is fixed for the term of the bond
- The coupon payments are made periodically i.e. annually or semi-annually.
- The bond will be redeemed at par value on maturity

Given these assumptions, the bond price will be calculated as follows:

$$P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$$

Where:

P = Current price of the bond

C = Periodical interest

M = Maturity value of the bond

r = Appropriate discount rate (require rate of return)

The above formula can be written as follows:

$$P = C\,(PVIFA_{r,\,t}) + M\,(PVIF_{r,\,n})$$

Illustration 5:

A Birr 1000 par value bond bearing a coupon rate of 10 percent will mature after five years. What is the value of the bond, if the discount rate is 14 percent?

Solution:

$$P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$$

$$P = C\,(PVIFA_{r,\,t}) + M\,(PVIF_{r,\,n})$$

$$P = 100(PVIFA_{14\%,\,5\text{ years}}) + 1000\,(PVIF_{14\%,\,5\text{years}})$$

$$= 100\,(3.433) + 1000\,(0.519)$$

$$= 343.30 + 519 = 862.30$$

Illustration6:

A 20 years, 10 percent coupon rate bond has Birr 1000 face value. The required rate of return is 12 percent; calculate the present value of the bond?

Solution:

$$P = \frac{C}{(1+r)} + \frac{M}{(1+r)}$$

$$P = C\,(PVIFA_{r,\,t}) + M\,(PVIF_{r,\,n})$$

$P = 100(PVIFA_{12\%, 20 \text{ years}}) + 1000 (PVIF_{12\%, 20\text{years}})$

$= 100 (7.469) + 1000 (0.104)$

$= 746.9 + 104 = 850.90$

Risk in Bonds: Bonds are considered to be less risk than equity shares; nevertheless they are not entirely risk free. The risk in bonds is related to interest rate, default, marketability and callability.

1. Interest rate risk: Variability in return from debt instruments to investors is caused by the changes in the market interest rate. This is known as interest rate risk. Changes in interest rates affect bonds more directly than they affect the equity shares. If the market interest rate moves up, the price of the bond declines and vice versa.

2. Default risk: Default risk refers to the possibility that a company may fail to pay the interest or principal on the stipulated dates. Poor financial performance of the company leads to such default. A part of the interest and principal may not be received at all or may be received after a long delay. In either case the investor suffers a loss which goes to reduce his return from the bond.

However, Treasury bills and bonds issued by the government are devoid of this default risk. One of the steps taken to avoid default risk is to have rating agencies rate the capacity of a company to serve the debt.

3. Marketability risk/ Liquidity risk: Barring some of the popular bonds like government bonds and large corporate bonds, most bonds do not seem to have a very liquid market. Given the poor liquidity in the debt market, investors face difficulty in trading debt instruments, particularly when the quantity of bonds holding is large. They may have to accept a discount over the quoted price while selling and pay premium while buying. This seems to be a major problem in certain segments of debt instruments.

Liquidity risk is not a major concern for an investor who plans to hold the security until maturity.

4. Callability risk: A bond may have a call provision that gives the issuer the option to redeem the bond before its scheduled maturity. The issuer would generally exercise the call option when interest rates decline. While this is attractive from the issuer's point of view, it exposes the investors to call risk. Since bonds are typically called for prepayment after interest rates have fallen, investors will not find comparable investment options. They almost invariably have to accept a lower yield when they reinvest the amount received on premature redemption.

Rating Bonds

Agencies ratings are an integral part of the bond market because most corporate and municipal bonds are rated by one or more of the rating agencies. The exceptions are very small issues and bonds from certain industries, such as bank issues. These are known as nonrated bonds. There are three major rating agencies: (1) Fitch Investors Service, (2) Moody's, and (3) Standard and Poor's. Bond ratings provide the fundamental analysis for thousands of issues. The rating agencies analyze the issuing organization and the specific issue to determine the probability of default and inform the market of their analyses through their ratings.

The primary question in bond credit analysis is whether the firm can service its debt in a timely manner over the life of a given issue. Consequently, the rating agencies consider expectations over the life of the issue, along with the historical and current financial position of the company. We consider default estimation further when we discuss high-yield (junk) bonds. Several studies have examined the relationship between bond ratings and issue quality as indicated by financial variables. The results clearly demonstrated that bond ratings were positive related to profitability, size, and cash flow coverage, and they were inversely related to financial leverage and earnings instability.

The original ratings assigned to bonds have an impact on their marketability and effect interest rate. Generally, the three agencies' ratings agree. When they do not, the issue is said to have a split rating. Seasoned issues are regularly reviewed to ensure that the assigned rating is still valid. If not, revisions are made either upward or downward. Revisions are usually done in increments of one rating grade. The ratings are based on both the company and the issue. After an evaluation of the creditworthiness of the total company is completed, a company rating is assigned to the firm's most senior unsecured issue. All junior bonds receive lower ratings based on indenture specifications. Also, an issue could receive a higher rating than justified because of credit-enhancement devices, such as the attachment of bank letters of credit, surety, or indemnification bonds from insurance companies.

The agencies assign letter ratings depicting what they view as the risk of default of an obligation. The letter ratings range from AAA (Aaa) to D. Except for slight variations in designations, the

meaning and interpretation are basically the same. The agencies modify the ratings with + and – signs for Fitch and S&P or with numbers (1-2-3) for Moody's. As an example, an A+(A1) bond is at the top of the A-rated group. The top four ratings—AAA (or Aaa), AA (or Aa), A, and BBB (or Baa)—are generally considered to be investment-grade securities.The next level of securities is known as speculative bonds and includes the BB- and B-rated obligations. The C categories are generally either income obligations or revenue bonds, many of which are trading flat. (Flat bonds are in arrears on their interest payments.) In the case of D-rated obligations, the issues are in outright default, and the ratings indicate the bonds' relative salvage values.