Class :	B.Com.	**Prepared By**
Semester:	II	**Dr. Mohd Arif**
Subject:	Concepts in Valuation	Assistant Professor
Unit:	3	Faculty of Commerce
Title:	Valuation of Bond (Redeemable and Irredeemable) and Yield to Maturity (YTM)	Sri Jai Narain Misra PG College, Lucknow

Meaning of Bond

A bond is a debt instrument that provides a periodic stream of interest payments to investors while repaying the principal sum on a specified maturity date. A bond's terms and conditions are contained in a legal contract between the buyer and the seller, known as the indenture.

A bond is a contract that requires the borrower to pay the interest income to the lender. It resembles the promissory note issued by the government and corporate. The par value of the bond indicates the face value of the bond i.e., the value stated on the bond paper. Most of the bonds make fixed interest payment till the maturity period. This specific rate of interest is known as coupon rate. Coupons are paid quarterly, semi-annually and annually. At the end of the maturity period, the value is repaid. A bond is more or less the same as a debenture.

Nature/Features of Bonds

1) **Indenture:** The indenture is a long, complicated legal instrument containing the restrictions, pledges and promises of the contract. Bond indenture involves three parties.
2) **Face Value:** The face value (also known as the par value) of a bond is the price at which the bond is sold to investors when first issued.
3) **Coupon Rate:** The periodic interest payments promised to bond holders are computed as a fixed percentage of the bond's face value. This percentage is known as the coupon rate.
4) **Repayment of Principal:** The face value of the bond represents the promise to repay the amount to the bondholder at the end of the specified period. This, in other words, may be called the most important feature of bond, return of the principal to the lender on a fixed date specified earlier.
5) **Maturities / Specified Time Period:** Maturities vary widely. Bonds are usually grouped by their maturity classes..
6) **Interest Payment:** Bond interest is usually paid semi-annually, though annual payments are also popular. The method of payment depends upon whether the bond is a coupon (bearer) or registered bond.

Bond/Debenture Valuation

The value of bonds or debentures is, generally, determined through the technique known as Capitalization. It is the process of determining the fair price of a bond/Debenture. As with any security or capital investment, the fair value of a bond is the present value of the stream of cash flows it is expected to generate. Hence, the price or value of a bond is determined by discounting the bond's expected cash flows to the present using the appropriate discount rate. The process of determination of the present value of a bond/debenture can be classified into two parts:

1) Redeemable Bond/Debenture (Have Finite Maturity Period)
2) Irredeemable (Perpetual) Bond/Debenture (Infinite Maturity Period)

Present Value of Redeemable Bond or Debenture

When a bond or debenture is redeemable, its present value can be determined by estimating its future cash flows, and then, discounting the estimated future cash flows at an appropriate capitalisation rate or discounting rate. The estimated cash flows from the bond or debenture consists of the stream of future interest payments plus the principal repayment.

The following formula may be used to find out the present value of the bond or debenture

$$PV = \frac{I}{(1+k)} + \frac{I}{(1+k)^2} + ... + \frac{I}{(1+k)^n} + \frac{M}{(1+k)^n}$$

where, PV = Present Value or Price of the Bond/Debenture
I = Annual Interest/Coupon
M = Maturity Value
n = Number of years (Maturity)
k= Discounting Factor/Rate

Example Mr. Amit purchased a bond with a Rs. 1,000 face value having 10 per cent coupon rate. He will get Rs. 1,100 after four years from the bond. If the discounting rate is 12% then find out the present value of bond.

Solution: $PV = \frac{I}{(1+k)} + \frac{I}{(1+k)^2} + ... + \frac{I}{(1+k)^n} + \frac{M}{(1+k)^n}$

$$PV = \frac{Rs.100}{(1+0.12)} + \frac{Rs.100}{(1+0.12)^2} + \frac{Rs.100}{(1+0.12)^3} + \frac{Rs.100}{(1+0.12)^4} + \frac{Rs.1{,}100}{(1+0.12)^4}$$

PV of Bond/Debenture = Rs. 1003

Present Value of a Perpetual or Irredeemable Bond/ Debenture

When a bond or debenture is irredeemable, its present value can be determined by simply discounting the stream of interest payments for the infinite period by an appropriate capitalization rate or discount rate. The following formula may be used to determine the present value of the bond or debenture.

$$PV = \frac{I}{k}$$

where, PV = Present Value or Price of the Bond/Debenture
I = Annual Interest/Coupon
K= Discounting Factor/Rate

Example: Find the present value of perpetual bond of par value Rs. 6,000 with required rate of interest 10% and annual interest of Rs. 500.

Solution: $PV = \frac{I}{k}$

$$PV = \frac{500}{0.10}$$

PV of Bond = Rs. 5,000

Yield to Maturity (YTM)

Yield to maturity (YTM) measures the annual return an investor would receive if they held a particular bond until maturity. It is the discount rate (k) that makes the present value of the cash flows receivable from owning the bond equal to the price of the bond.

$$PV = \frac{I}{(1+k)} + \frac{I}{(1+k)^2} + \ldots + \frac{I}{(1+k)^n} + \frac{M}{(1+k)^n}$$

where, PV = Present Value or Price of the Bond/Debenture
I = Annual Interest/Coupon
M = Maturity Value/Face Value
n = Number of years (Maturity)
k= Discounting Factor/Rate (YTM)

The Yield to Maturity (YTM) can also be calculated by using the **Alternative formula:**

$$YTM = \frac{I + (F - PV)/n}{0.4F + 0.6PV}$$

where,
F= Face value of bond
, PV = Present Value or Price of the Bond/Debenture
I = Annual Interest/Coupon
n = Number of years (Maturity)

Example Find the Yield to Maturity of 5 years bond has a par value of Rs. 20,000 at 12% per annum rate of interest and present market price of Rs. 15,000.

Solution: $YTM = \frac{I + (F - PV)/n}{0.4F + 0.6PV}$

$$YTM = \frac{2400 + (20{,}000 - 15{,}000)/5}{0.4(20{,}000) + 0.6(15{,}000)}$$

YTM = Approx. 20%

Reference

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