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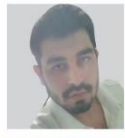
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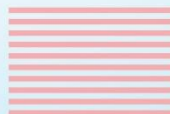
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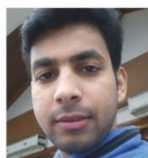
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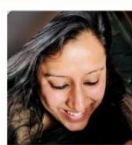
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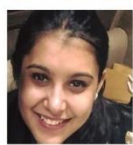
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Fixed Income Securities

Study Session 10

LOS 1 : Introduction (Fixed Income Security)

Bonds are the type of long term obligation which pay periodic interest & repay the principal amount on maturity.

Three types of Cash Flows

- (i) Interest
- (ii) Principal Repayment
- (iii) Re-Investment Income

Purpose of Bond's indenture & describe affirmative and negative covenants

- ❖ The contract that specifies all the rights and obligations of the issuer and the owners of a fixed income security is called the Bond indenture.
- ❖ These contract provisions are known as covenants and include both negative covenants (prohibitions on the borrower) and affirmative covenants (actions that the borrower promises to perform) sections.

1. Negative Covenants : This Includes

- a) Restriction on asset sales (the company can't sell assets that have been pledged as collateral).
- b) Negative pledge of collateral (the company can't claim that the same assets back several debt issues simultaneously).
- c) Restriction on additional borrowings (the company can't borrow additional money unless certain financial conditions are met).

2. Affirmative Covenants: This Includes

- a) Maintenance of certain financial ratios.
- b) Timely payment of principal and interest.

Common Options embedded in a bond Issue, Options benefit the issuer or the Bondholder

- ❖ Security owner options:
 - a) Conversion option
 - b) Put provision
 - c) Floors set a minimum on the coupon rate
- ❖ Security issuer option:
 - a) Call provisions
 - b) Prepayment options
 - c) Caps set a maximum on the coupon rate

LOS 2 : Terms used in Bond Valuation

(i)	Face Value	₹ 1,000
(ii)	Maturity Year	10 Years
(iii)	Coupon rate	10%

(iv)	Coupon Amount	₹ 1,000 × 10% = ₹ 100 p.a.
(v)	B ₀ / Value of the Bond as on Today/ Current Market Price/Issue Price/ Net Proceeds	₹ 950
(vi)	Yield to Maturity/ K _d / Discount Rate / Required return of investor / Cost of debt / Expected Return/ Opportunity Cost / Market Rate of Interest	12%
(vii)	Redemption Value/ Maturity Value	₹ 1,200

Note :

- (i) Coupon Rate is used to calculate Interest Amount.
- (ii) Face Value is always used to calculate Interest Amount.
- (iii) If Maturity Value is not given, then it is assumed to be equal to Face Value.
- (iv) If Face Value is not given, then it is assumed to be ₹ 100 or ₹ 1000 according to the Question.
- (v) If Maturity Year is not given, then it is assumed to be equal to infinity.

LOS 3 : Valuation of Straight Bond / Plain Vanilla Bond

Straight Coupon Bonds are those bonds which pay equal amount of interest and repay principal amount on Maturity.

Step 1: Estimates the cash flows over the Life of the bond.

Step 2: Determine the appropriate discount rate.

Step 3: Calculate the present value of the estimated cash flow using appropriate discount rate.

$$B_0 = \frac{\text{Interest}}{(1+YTM)^1} + \frac{\text{Interest}}{(1+YTM)^2} + \dots + \frac{\text{Interest}}{(1+YTM)^n} + \frac{\text{Maturity value or Par value}}{(1+YTM)^n}$$

Or

$$\text{Interest} \times \text{PVAF (Yield \%, n year)} + \text{Maturity Value} \times \text{PVF (Yield \%, nth year)}$$

n = No. of years to Maturity

LOS 4 : Coupon Rate Structures**1. Zero – Coupon Bond (Pure Discount Securities)**

- a) They do not pay periodic interest.
- b) They pay the Par value at maturity and the interest results from the fact that Zero – Coupon Bonds are initially sold at a price below Par Value. (i.e. They are sold at a significant discount to Par Value).

2. Step – up Notes

- a) They have coupon rates that increase over – time at a specified rate.
- b) The increase may take place one or more times during the life cycle of the issue.

3. Deferred – Coupon Bonds

- They carry coupons, but the initial coupon payments are deferred for some period.
- The coupon payments accrue, at a compound rate, over the deferral period and are paid as a lump sum at the end of that period.
- After the initial deferment period has passed, these bonds pay regular coupon interest for the rest of the life of the issue (to maturity).

4. Floating – Rate Securities

- These are bond for which coupon interest payments over the life of security vary based on a specified reference rate.
- Reference Rate may be LIBOR [London Interbank Offered Rate] or EURIBOR or any other rate and then adds or subtracts a stated margin to or from that reference rate.

$$\text{New coupon rate} = \text{Reference rate} \pm \text{quoted margin}$$

5. Inflation – indexed Bond (TIPS)

They have coupon formulas based on inflation.

$$\text{E.g.: Coupon rate} = 3\% + \text{annual change in CPI}$$

LOS 5 : Valuation of Perpetual Bond/ Irredeemable Bond/ Non – Callable Bond

They are infinite bond, never redeemable, non- callable bond.

$$\text{Value of Bond} = \frac{\text{Annual Interest}}{\text{YTM}}$$

LOS 6 : Valuation of Zero-Coupon Bond

- ❖ Zero- coupon Bond has only a single payment at maturity.
- ❖ Value of Zero- Coupon Bond is simply the PV of the Par or Face Value.

$$\text{Bond value} = \frac{\text{Maturity Value}}{(1 + \text{YTM})^n}$$

LOS 7 : Confusion regarding Coupon Rate & YTM

YTM → Required Return / Investor's Expectation / Mkt. Rate of Interest.

- ❖ YTM is always subjected to change according to Market Conditions.

Coupon Rate → Rate of Interest paid by the company.

- ❖ Coupon Rate is always constant throughout the life of the bond and it is not affected by change in market condition.
- ❖ Sometimes interest is expressed in terms of Basis Point i.e. 1% = 100 Basis Points

LOS 8 : Valuation of Semi – annual Coupon Bonds

Pay interest every six months

$$a) \frac{\text{YTM p.a.}}{2}$$

$$b) \frac{\text{Coupon rate p.a}}{2}$$

$$c) n \times 2$$

Note:

If quarterly use 4 instead of 2

If monthly use 12 instead of 2

LOS 9 : Valuation of Bond with Changing Coupon Rate

Coupon rate changes from one year to another year as per the terms of bond-indenture.

LOS 10: Over – Valued & Under – Valued Bonds

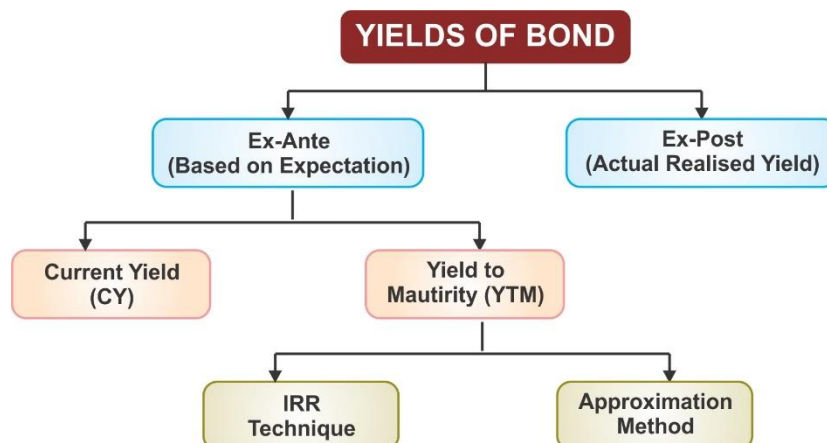
Case	Value	Decision
PV of MP of Bond < Actual MP of Bond	Over – Valued	Sell
PV of MP of Bond > Actual MP of Bond	Under – Valued	Buy
PV of MP of Bond = Actual MP of Bond	Correctly Valued	Either Buy/ Sell

LOS 11: Self – Amortization Bond

- ❖ They make periodic interest and principal payments over the life of the bond. i.e. at regular interval.
- ❖ Interest is calculated on balance amount.

LOS 12: Holding Period Return (HPR) for Bonds

$$\begin{aligned} \text{HPR} &= \frac{B_1 - B_0 + I_1}{B_0} \\ &= \underbrace{\frac{B_1 - B_0}{B_0}}_{\substack{\downarrow \\ \text{(Capital gain Yield/ Return)}}} + \underbrace{\frac{I_1}{B_0}}_{\substack{\downarrow \\ \text{(Interest Yield /Current Yield)}}} \end{aligned}$$



LOS 13 : Calculation of Current Yield/ Interest Yield

$$\text{Current Yield} = \frac{\text{Annual Cash Coupon Payment}}{\text{Bond Price or Market Price}}$$

Note: Current Yield is always calculated on per annum basis.

1. If existing bond :-

B_0 = Current Market Price of Bond (1st preference)

Or

Present value Market Price of Bonds (2nd preference)

2. If new bond issued :-

B_0 = Issue Price

Issue Price = Face value – Discount + Premium

3. Company Point of view :-

B_0 = Net Proceeds

Net Proceeds = Face value – Discount + Premium (-) Floating Cost

LOS 14 : YTM (Yield to Maturity) / K_d / Cost of debt/ Market rate of Interest/ Market rate of return

- ❖ YTM is an annualized overall return on the bond if it is held till maturity.
- ❖ YTM is the IRR of a Bond
- ❖ It is the annualized rate of return on the investment that the investor expect (on the date of investment) to earn from the date of investment to the date of maturity. It is also referred to as required rate of return.

Alternative 1: By IRR technique.

$$B_0 = \frac{\text{Interest}}{(1+YTM)^1} + \frac{\text{Interest}}{(1+YTM)^2} + \dots + \frac{\text{Interest}}{(1+YTM)^n} + \frac{\text{Maturity value or Par value}}{(1+YTM)^n}$$

- ❖ YTM & price contain the same information

- If YTM given, calculate Price.
- If Price given, calculate YTM.

$$\text{YTM} = \text{Lower Rate} + \frac{\text{Lower Rate}_{NPV}}{\text{Lower Rate}_{NPV} - \text{Higher Rate}_{NPV}} \times \text{Difference in Rate}$$

Alternative 2: By approximation formula

$$\text{YTM} = \frac{\text{Interest} + \frac{\text{Maturity Value} - \text{CMP}/B_0}{n}}{\frac{\text{Maturity Value} + \text{CMP}/B_0}{2}}$$

LOS 15 : YTM (Yield to Maturity) of Semi-Annual Bond

$$\text{YTM per 6 months} = \frac{\text{Interest for 6 months} + \frac{\text{Maturity Value} - \text{CMP}/B_0}{n \times 2}}{\frac{\text{Maturity Value} + \text{CMP}/B_0}{2}}$$

YTM per annum = YTM of 6 month × 2

LOS 16 : YTM of a Zero – Coupon Bond

$$\text{Bond value} = \frac{\text{Maturity Value}}{(1 + \text{YTM})^n}$$

- ❖ If YTM is given, calculate B_0 .
- ❖ If B_0 is given, Calculate YTM.

LOS 17 : YTM of a Perpetual Bond

$$\text{Bond value} = \frac{\text{Annual Interest}}{\text{YTM}}$$

- ❖ If YTM is given, calculate B_0 .
- ❖ If B_0 is given, Calculate YTM.

LOS 18 : Calculation of K_d in case of Floating Cost

- ❖ Floating Cost is cost associated with issue of new bonds.
e.g. Brokerage, Commission, etc
- ❖ We should take Bond value (B_0) Net of Floating Cost.

$$K_d = \frac{\text{Interest}(1 - \text{tax rate}) + \frac{\text{Maturity Value} - \text{Net Proceeds}}{n}}{\frac{\text{Maturity Value} + \text{Net Proceeds}}{2}}$$

LOS 19 : Treatment of Tax

Tax is important part for our analysis, it must be considered if it is given in question.
Two types of Tax rates are given :-

1. Interest Tax rate/ Normal Tax Rate

We should take Interest Net of Tax i.e. Interest Amount $(1 - \text{Tax})$

2. Capital Gain Tax rate

Take Maturity value after Capital Gain Tax i.e. Maturity Value – Capital Gain Tax Amount
 Maturity value – (Maturity value – B_0) × Capital gain tax rate

$$YTM = \frac{\text{Interest}(1 - \text{Tax rate}) + \frac{\text{MV net of CG Tax} - B_0}{n}}{\frac{\text{MV net of CG Tax} + B_0}{2}}$$

LOS 20 : Yield to call (YTC) & Yield to Put (YTP)

1. Yield to Call

Callable Bond : When company call its bond or Re-purchase its bond prior to the date of Maturity.
Call Price: Price at which Bond will call by the Company.
Call Date: Date on which Bond is called by the Company prior to Maturity.
n : No. of Years upto Call Date.

$$YTC = \frac{\text{Interest} + \frac{\text{Call Price} - B_0}{n}}{\frac{\text{Call Price} + B_0}{2}}$$

2. Yield to Put

Puttable Bond: When investor sell their bonds prior to the date of maturity to the company.
Put Price: Price at which Bond will put/ Sell to the Company.
Put Date: Date on which Bond is sold by the investor prior to Maturity.
n : No. of years upto Put Date.

$$YTP = \frac{\text{Interest} + \frac{\text{Put Price} - B_0}{n}}{\frac{\text{Put Price} + B_0}{2}}$$

LOS 21 : Yield to worst

- ❖ It is the lowest yield between YTM, YTC, YTP, Yield to first call.
- ❖ Yield to worst is lowest among all.

LOS 22 : Conversion Value/ Stock Value of Bond

- ❖ Converted into equity shares after certain period.
- ❖ Conversion Ratio = No. of share Received per Convertible Bond
- ❖ When **Conversion Value > Bond value**, option can be exercised otherwise not.

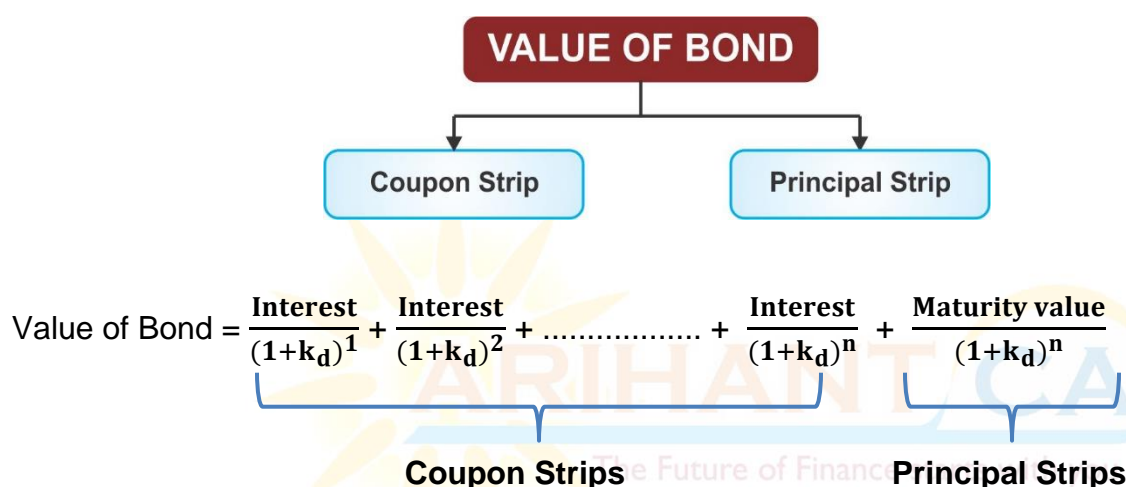
$$\text{Conversion Value} = \text{No. of equity shares issued} \times \text{MPS at the time of Conversion}$$

LOS 23 : Credit Rating Requirement

- ❖ As per SEBI regulation, no public or right issue of debt/bond instruments shall be made unless credit rating from credit rating agency has been obtained and disclosed in the offer document.
- ❖ Rating is based on the track record, financial statement, profitability ratios, debt – servicing capacity ratios, credit worthiness & risk associated with the company.
- ❖ Higher rated Bonds means low risk and a lower rated bond means high risk.
- ❖ Higher the risk higher will be the expectation and higher will be the discount rate.

LOS 24 : Strips (Separate Trading of Registered Interest & Principal Securities) Program

Under this, Strip the coupons from the principal, repackage the cash flows and sell them separately as Zero – Coupon Bonds, at discount.

**LOS 25 : Relationship between Coupon Rate & YTM**

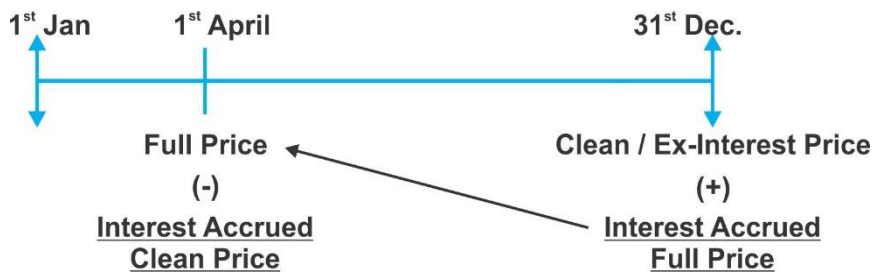
Bonding Selling At	
Par	Coupon Rate = Yield to Maturity
Discount	Coupon Rate < Yield to Maturity
Premium	Coupon Rate > Yield to Maturity

LOS 26 : Cum Interest & Ex-interest Bond Value

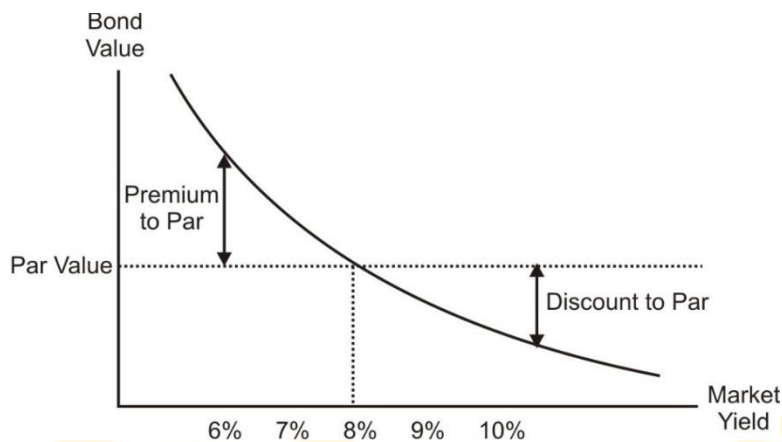
- ❖ When Bond value include amount of interest it is known as Cum-Interest Bond Value, other - wise not.
- ❖ If question is Silent, we will always assume ex-interest.
- ❖ Assume value of Bond (B_0) as ex – interest.
- ❖ If it is given Cum-Interest then deduct Interest and proceeds your calculations.

Full Price = Clean Price + Interest accrued
 Or
Cum - Interest Price = Ex – Interest Price + Interest Accrued

Valuation of a Bond between two coupon dates



LOS 27 : Relationship between Bond Value & YTM



- ❖ When the coupon rate on a bond is equal to its market yield, the bond will trade at its par value.
- ❖ If yield required in the market subsequently rises, the price of the bond will fall & it will trade at a discount.
- ❖ If required yield falls, the bond price will increase and bond will trade at a premium.

Crux:

- ❖ If YTM increases, bond value decreases & vice-versa, other things remaining same.
- ❖ YTM & Bond value have inverse relationship.

Convexity of a Bond

- ❖ However, this relationship is not a straight line relationship but it is convex to the origin.
- ❖ So, we find that price rise is greater than price fall, we call it positive convexity (i.e. % rise is greater than % fall)

LOS 28 : Value of the Bond at the end of each Year

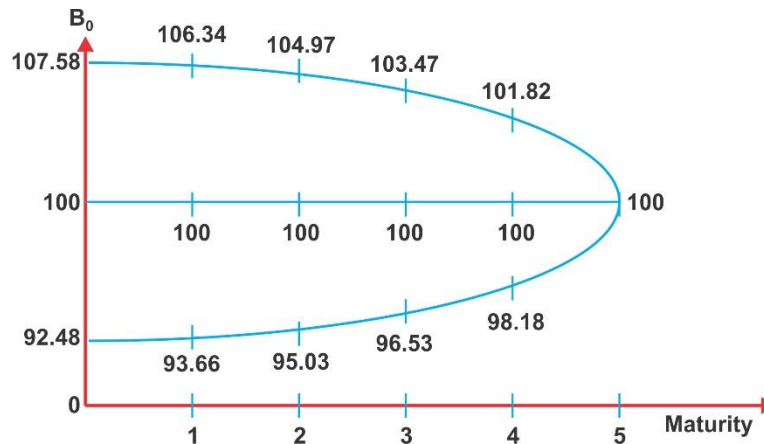
$$B_0 = \frac{B_1 + I_1}{(1 + YTM)^1}$$

$$B_1 = \frac{B_2 + I_2}{(1 + YTM)^1}$$

So on

LOS 29 : Relationship between Bond Value & Maturity

- ❖ Prior to Maturity, a bond can be selling at significant discount or premium to Par value.
- ❖ Regardless of its required yield, the price will converge to par value as Maturity approaches.
- ❖ Value of premium bond decrease to par value, value of Discount bond increases to Par value.
- ❖ Premium and discount vanishes.

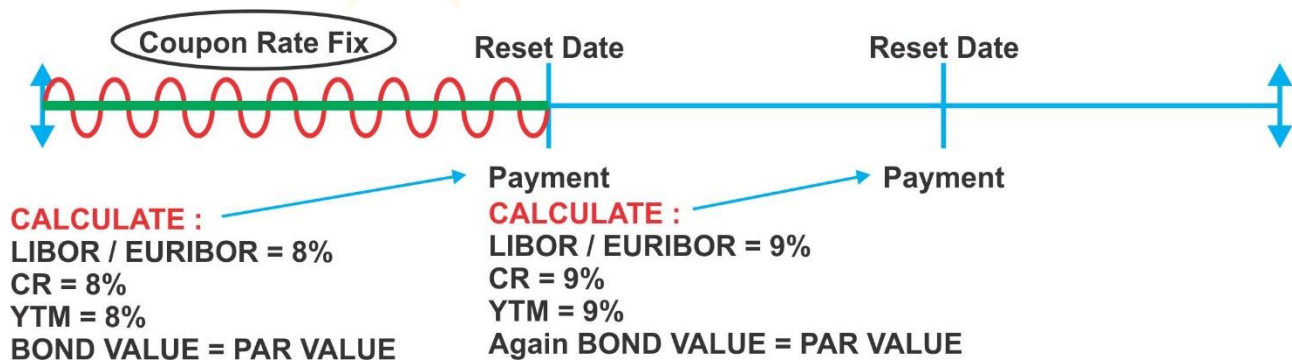


LOS 30 : Floating Rate Bonds

- ❖ Floating Rate Bonds are those bonds where coupon rate is decided according to the Reference rate (Market Interest Rate).
- ❖ Coupon Rate should be changed with the change in Reference rate (Market Interest Rate).
- ❖ In this case

Coupon Rate = YTM

starts with you



LOS 31 : Duration of a Bond (Macaulay Duration)

- ❖ Duration of the bond is a weighted average of the time (in years) until each cash flow will be received i.e. our initial investment is fully recovered.
- ❖ Duration is a measurement of how long in years it takes for the price of a bond to be repaid by its internal cash flows.
- ❖ Duration of bond will always be less than or equal to maturity years.

Duration =

$$\frac{1 \times \frac{\text{Interest}}{(1+YTM)^1} + 2 \times \frac{\text{Interest}}{(1+YTM)^2} + \dots + n \times \frac{\text{Interest}}{(1+YTM)^n} + n \times \frac{\text{Maturity value}}{(1+YTM)^n}}{CMP/B_0}$$

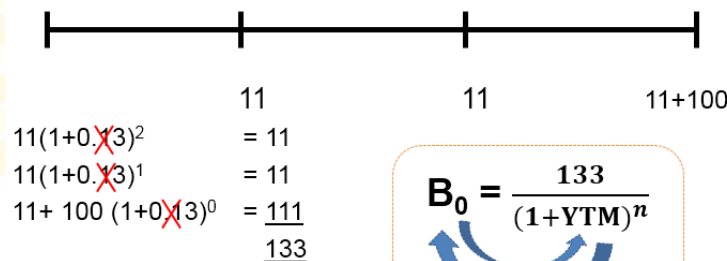
LOS 32 : Duration of a Zero - Coupon Bond

Duration of a Zero Coupon Bond will always be equal to its Maturity Years

LOS 33 : Relationship between Duration of Bond & YTM

- ❖ If YTM increases, Bond Value decreases so duration of the bond decreases (recovery is less) & vice versa.
- ❖ Higher the YTM, lower will be duration of a bond. Lower the YTM, higher will be duration of a bond, other things remaining constant.

LOS 34 : Calculation of yield when Coupon Payment is not available for Re-Investment



- If YTM is given, calculate B_0 .
- If B_0 is given, Calculate YTM.

LOS 35 : Modified Duration/ Sensitivity/ Volatility/ Effective Duration

- ❖ Volatility measures the sensitivity of interest rate to bond prices.
- ❖ Duration of a bond can be used to estimate the price sensitivity. It can be calculated through below formula.
- ❖ Modified duration will always be lower than Macaulay's Duration.
- ❖ Volatility measures the % change in the bond value with 1% change in YTM.

Example:

If Volatility is 5%, it means if YTM increases by 1% bond value will decrease by 5% or vice versa.

Method 1:

$$\text{Modified Duration} = \frac{\text{Macaulay Duration}}{1 + YTM}$$

Method 2:

$$\text{Effective Duration} = \frac{BV_{-\Delta Y} - BV_{+\Delta Y}}{2 \times BV_0 \times \Delta Y}$$

Convexity Adjustment

As mentioned above duration is a good approximation of the percentage of price change for a small change in interest rate. However, the change cannot be estimated so accurately of convexity effect as duration base estimation assumes a linear relationship.

This estimation can be improved by adjustment on account of 'convexity'. The formula for convexity is as follows:

$$C^* \times (\Delta y)^2 \times 100$$

Δy = Change in Yield

$$C^* = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta^2)}$$

V_0 = Initial Price

V_+ = price of Bond if yield increases by Δy

V_- = price of Bond if yield decreases by Δy

LOS 36 : Ratios related to Convertible Bond1. Conversion Premium/ Premium over Conversion Value

$$= \frac{\text{Market value of Convertible bond} - \text{CV (No. of Shares} \times \text{MPS)}}{\text{CV (No. of Shares} \times \text{MPS)}}$$

$$\% \text{ Conversion Premium} = \frac{\text{Conversion Premium}}{\text{Conversion Value}}$$

2. Conversion Premium per share

$$= \frac{\text{Conversion Premium}}{\text{Conversion Ratio}}$$

3. Conversion Parity Price/ No Gain No Loss / Market Conversion Price

When the market value of convertible bond = Conversion Value.

$$= \frac{\text{Market value of Convertible bond}}{\text{No. of equity share issued on Conversion}}$$

OR

$$= \text{Current MPS} + \text{Conversion Premium per share}$$

4. Premium Pay Back Period or Break Even Period of Convertible Bond

It is a time period, when bond would be converted into equity share so that the loss on conversion would be set-off by income from interest.

$$\text{Break Even Period} = \frac{\text{Conversion Premium}}{\text{Favourable Income Differential}}$$

OR

$$= \frac{\text{Market Price of Bond} - \text{Conversion Value}}{\text{Interest on Bond} - \text{Dividend on Share}}$$

5. Downside Risk or Premium over Non-Convertible Bond

Downside Risk reflects the extent of decline in market value of convertible bonds at which conversion option become worthless.

$$= \text{Market value of Convertible bond} \\ (-) \\ \text{Market value of Non-Convertible bond}$$

$$\% \text{ Downside Risk} / \% \text{ Price Decline} = \frac{\text{Downside Risk}}{\text{Market value of Non-convertible bond}}$$

6. Premium Over Investment Value of Non-Convertible bond / MV of NCB :

$$= \frac{\text{Market Price of CB} - \text{Investment Value} / \text{MV of Non-Convertible Bond}}{\text{Investment Value} / \text{MV of Non-Convertible Bond}}$$

7. Floor Value : Floor Value is the maximum of :

- a) Conversion Value
- b) Market Value of Non-Convertible Bond.

Note: Market Value of Convertible Bond (Assume 5 Years)

$$= \frac{\text{Interest}}{(1+YTM)^1} + \frac{\text{Interest}}{(1+YTM)^2} + \dots + \frac{\text{Interest}}{(1+YTM)^5} + \frac{\text{Conversion Value (CV}_5\text{)}}{(1+YTM)^5}$$

$$\text{CV}_5 = \text{MPS at the end of Year 5} \times \text{No. of Shares.}$$

LOS 37: Callable Bond

Those bonds which can be called before the date of Maturity.

Step 1 : Calculate Net Initial Outflow.

Step 2 : Calculate Tax Saving on Call Premium & Unamortized Issue Cost.

Step 3 : Calculate Annual Saving on Cash Outflow.

Step 4 : Calculation of Overlapping Interest

Step 5: Calculate Present Value of Total Net Savings by replacing Outstanding Bonds with New Bonds.

LOS 38: Spot Rate

- ❖ Yield to maturity is a single discount rate that makes the present value of the bond's promised cash flow equal to its Market Price.
- ❖ The appropriate discount rates for individual future payments are called Spot Rate.
- ❖ Discount each cash flow using a discount rate i.e. specific to the maturity of each cash flow.

LOS 39: Relationship between Forward Rate and Spot Rate

Forward Rate is a borrowing/ lending rate for a loan to be made at some future date.

$1f_0$ = Spot Rate or Current YTM (rate of 1 year loan)

$1f_1$ = Rate for a 1 year loan, one year from now

$1f_2$ = Rate for a 1 year loan to be made two years from now

Relationship:

$$(1+S_1)^1 = (1 + 1f_0)$$

$$(1+S_2)^2 = (1 + 1f_0) (1 + 1f_1)$$

$$\text{Or } S_2 = \{(1 + 1f_0) (1 + 1f_1)\}^{1/2} - 1$$

$$(1 + S_3)^3 = (1+1f_0) (1+ 1f_1) (1 + 1f_2)$$

$$\text{Or } S_3 = \{(1 + 1f_0) (1 + 1f_1) (1 + 1f_2)\}^{1/3} - 1$$

LOS 40 : Calculation of After-tax yield of a taxable security & tax-equivalent yield of a tax-exempt security

$$\text{After-tax yield} = \text{taxable yield} \times (1 - \text{marginal tax rate})$$

Taxable-equivalent yield is the yield a particular investor must earn on a taxable bond to have the same after-tax return they would receive from a particular tax-exempt issue.

$$\text{Taxable-equivalent yield} = \frac{\text{tax-free yield}}{(1 - \text{marginal tax rate})}$$

LOS 41 : Duration of a Portfolio

It is simply the weighted average of the durations of the individual securities in the Portfolio.

$$\text{Portfolio Duration} = W_1D_1 + W_2D_2 + W_3D_3 + \dots + W_nD_n$$

$$W_i = \frac{\text{Market value of bond } i}{\text{Market value of Portfolio}}$$

D_i = Duration of bond (i)

N = No. Of bonds in the Portfolio

Note :

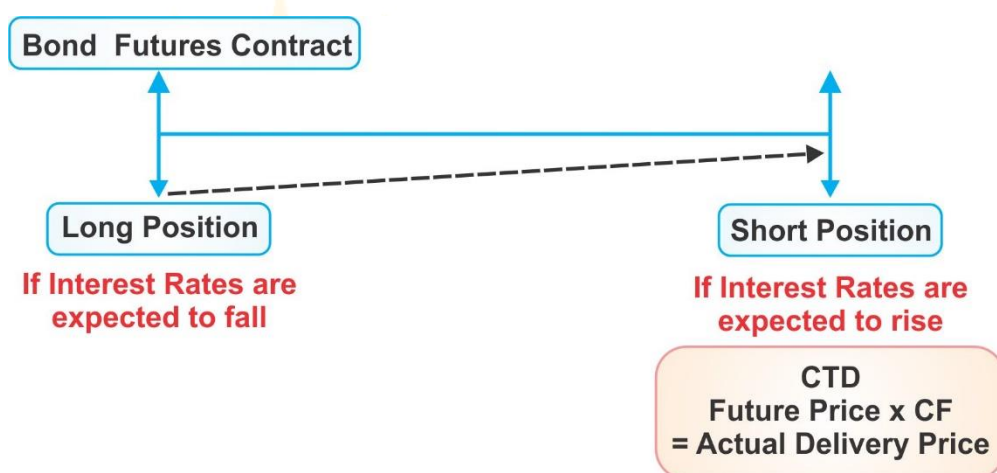
- ❖ Other factors are constant, Long term bonds are more volatile than Short term bonds.

- ❖ Other factors are constant, Lower coupon bonds are more volatile than Higher coupon bonds.
- ❖ Other factors are constant, Lower Yield bonds are more volatile than Higher Yield bonds.

LOS 42 : Interest Rate anticipation Strategy

Bond Portfolio Management	
Interest Rate is expected to Fall	Interest Rate is expected to Rise
↓	↓
Bond Price are expected to Rise	Bond Prices are expected to Fall
↓	↓
To Profit from the same, portfolio duration should be increased by shifting from Short Term Bonds to the Long Term Bonds	To Protect / Hedge against the same, portfolio duration should be decreased by shifting from Long Term Bonds to the Short Term Bonds

LOS 43: Hedging Interest Rate Risk using Bond Futures



Profit of seller of futures

= (Futures Settlement Price x Conversion factor) – Quoted Spot Price of Deliverable Bond

Loss of Seller of futures

= Quoted Spot Price of deliverable bond – (Futures Settlement Price x Conversion factor)

An interest rate future is a contract between the buyer and seller agreeing to the future delivery of any interest-bearing asset. The interest rate future allows the buyer and seller to lock in the price of the interest-bearing asset for a future date.

Interest rate futures are used to hedge against the risk that interest rates will move in an adverse direction, causing a cost to the company.

For example, borrowers face the risk of interest rates rising. Futures use the inverse relationship between interest rates and bond prices to hedge against the risk of rising interest rates.

A borrower will enter to sell a future today. Then if interest rates rise in the future, the value of the future will fall (as it is linked to the underlying asset, bond prices), and hence a profit can be made when closing out of the future (i.e. buying the future).

Bonds form the underlying instruments, not the interest rate. Further, IRF, settlement is done at two levels:

- ❖ Mark-to-Market settlement done on a daily basis and
- ❖ physical delivery which happens on any day in the expiry month.

Final settlement can happen only on the expiry date. In IRF following are two important terms:

- a) **Conversion factor:** All the deliverable bonds have different maturities and coupon rates. To make them comparable to each other, RBI introduced Conversion Factor.

$$(\text{Conversion Factor}) \times (\text{futures price}) = \text{actual delivery price for a given deliverable bond.}$$
- b) **Cheapest to Deliver (CTD) :** It is called CTD bond because it is the least expensive bond in the basket of deliverable bonds.

Profit & Loss = the difference between cost of acquiring the bonds for delivery and the price received by delivering the acquired bond.

