Security Valuation

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Part I Introduction to security valuation

- Meaning of security valuation
  - involves valuation of perils of securities so that an investor can take decision regarding purchase/sale of a security.
- Fundamental Analysis approach (using financial data of a company) is used to carry out security valuation

- Required rate of return on security using CAPM (also known as Expected Return)
  - CAPM → $Rf + \beta(Rm - Rf)$
    - Rf → Risk premium
    - $(Rm - Rf)$ = Risk premium in market (MRP)
    - $\beta(Rm - Rf)$ ⇒ Risk premium in security (Security Risk premium)

Part II Valuation of equity shares.

I. Models for valuation of Equity shares.

- Dividend based models.
  - I Gordon model.
    - (i) Perpetual dividend with constant growth assumption
      - $V_0 = \frac{D_1}{K_e - g}$.
    - (ii) Perpetual dividend with variable growth assumption
      - PV of uneven dividend for certain period (i.e. calculate PV of discrete value using Table) xxx
      - (+) PV of perpetual dividend (i.e. calculate PV of Terminal value) xxx
      - V_0 xxx
    - (iii) sale of share - [Held for fixed period assumption] Two stage dividend model
      - PV of uneven dividend for certain period (i.e. calculate PV of discrete using Table) xxx
      - (+) PV of price expected to be received on sale of shares xxx
      - xxx
- Earning based models. (**)
- DDM approach PTO

[II] DDM Approach

(i) Constant growth.
[Perpetual dividend with constant growth assumption]

$$Ke = \left[\frac{D_1}{P_0} \times 100\right] + g$$

(ii) Trial & error method.
IRR calculation (we used to do in IFC)

Note:- (1) If Question is silent regarding whether dividend is D_0 or D_1, then assume it as D_0 in following cases (otherwise we will assume it as D_1):-

(D_0)
- :- 'Dividend paid' or 'dividend pays' wording is given in Question.
- :- Dividend is given in Income statement for the year in Question.

(ii) Decision making on the basis of intrinsic value of share.
- If IV > current MPS = underpriced ⇒ Buy share
- If IV < current MPS = overpriced ⇒ Sale share
- If IV = current MPS ⇒ Fair priced ⇒ Buy share.

** Earning Based models.

(I) Earning growth model (EPS growth model)

$$V_0 = \frac{EPS(1+g)}{Ke - g}$$

(II) P/E multiple approach

MPS = P/E Ratio × EPS

(III) Gordon's model.

$$V_0 = \frac{EPS(1-b)}{Ke - br}$$

OR

$$\frac{D_1}{Ke - g}$$

Here
b = Retention ratio
r = ROE

(IV) Walter's model.

$$V_0 = \frac{D + \frac{(E-D)r}{Ke}}{Ke}$$

D = DPS
E = EPS
r = ROE
Ke = Req. rate of return

(V) Yield on share approach (Yield based model)

V_0 = Actual yield on Eq share % / Expected yield on Eq share %

(*) Calculation of Actual yield on Eq share (%) =

$$\frac{\text{Yield on Eq cap}}{\text{Eq sh cap}} \times 100$$

Expected yield on Eq share (%) =

Normal return on Equity share of similar co in market	xxx
(+) Risk prem of our company	xxx
	xxx

Valuation of a right

Right Issue means issuing equity shares to existing shareholders of comp.

(1) Theoretical ex-right/Post right price per share (i.e price to be expected in market after right issue)

↓

Existing mps × Existing No of shares + Right Issue × No of right shares / Existing No of shares + No of right shares.

(2) Theoretical value of a right

↓

(Theoretical ex right price − Right Issue price)

(3) Theoretical value of right per original share (It represent reduction in mps of share after right issue)

↓

Theoretical value of right / No of original shares reqd to buy 1 right share

OR

(Existing mps − Theoretical ex-right price)

(4) Effect of right issue on shareholder's wealth.

post page

↗ sale (+)
purchase (−)

(4) Effect of right issue on shareholder's wealth

(i) If shareholders exercise right issue ⇒ No change in wealth.

Value before right issue (original share × Existing mps)	xxx
Value after Right issue	
Total shares including Right shares ex-right/price	xxx
Less:- Payment for purchase of right-shares (No of right shares × Right issue price)	(xxx) / xxx

(ii) If shareholder sells the right → No change in wealth.

Value before right issue (original share × Existing mps)	xxx
Value after right issue (original share × ex-right price)	xxx
Add:- sale of right (No of right shares × Theoretical value of right)	xxx / xxx

(iii) If shareholders ignores the Right Issue → wealth will decline

(−) Value before right issue (original shares × Existing mps) xxx
Value after right issue (Orig. shares × ex-right price) xxx

Part III Valuation of Bonds (Fixed Income securities)

I Bond pricing → IV of bonds → PV of all future cash flows from the bond discounted using reqd. rate of return.

(1) Redeemable bonds
↓
V_0 = PV of interest + PV of redemption amount

OR

In formula terms
$V_0 = \frac{\text{Interest}}{(1+K_d)^1} + \frac{\text{Interest}}{(1+K_d)^2} \dots$

(2) Irredeemable Bonds
↓
$V_0 = \frac{\text{Interest}}{K_d}$

(3) Zero coupon bonds
↓
Bond which is issued at discount & redeemed at face value
V_0 = PV of redemption amt

⇒ Redemption amt (Face value) × PVF of redemption amt

OR

In formula terms
$V_0 = \frac{\text{Face value}}{(1+K_d)^n}$

Imp Notes → next page.

Beta = is security की risk comparison to Mkt

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Notes :- ① If FV (Nominal value) of bond is not given in question then assume it as ₹100

② If redemption amt is not given in ques. then assume it as redeemable at par (i.e on Face value)

③ Interest on bond is always calculated at face value. Interest rate is also known as coupon rate

④ Redemption amt means maturity time/period of bond.

⑤ ☆ If different yield rates (spot yield curve) is given for each year, then calculate PV of cash flow of each year using yield rate of that year.

⑥ (S.10) Calculation of expected market price on the basis of intrinsic value of the bond:- (Intrinsic value of bond (Vo) × Beta of bond)

⑦ Types of yield curve

Normal yield curve
↓
It happens in a market where long term bonds have high yield (i.e. market is in normal situation)

Inverted yield curve (short term यील्ड > long term yield)
↓
(i.e market is in recession situation) It happens in a market where short term bonds has higher yield in comparison to long term bonds (Mkt is in recession situation)

(8) If there is semi annual interest / coupon on bond then

→ convert interest rate into semi-annual rate (By dividing it by 2)

→ convert discounting rate into semi-annual rate (By dividing it by 2)

→ Convert years to maturity into Half Yearly basis (By multiplying it by 2)

II BONDS YIELD

- It is the return an investor gets on its investment on market price in a bond.
- Bond yield can be of 2 types :-
  - **current yield** → It considers only interest payments received on bonds ignoring redemption amount)
  - **yield to maturity (YTM):-** It considers total payments received on bond till maturity including redemption amount.
- It is calculated for each types of bond as follows :-

Bond yield

(1) Redeemable Bond
- current yield = $\frac{\text{Interest}}{\text{current mkt of bond}} \times 100$
- YTM → Rate at which PV of all future cash flows of bond is equal to CMP of bond.
- (It is calculated using trial and Error method)

(2) Irredeemable bond
- In this bond only interest payments are received as it is Not Redeemable Hence current yield & YTM will be same as Irredeemable bonds
- YTM = current yield = $\frac{\text{Interest} \times 100}{\text{CMP}}$
- as no interest is paid

(3) Zero Coupon Bond
- In this bond current yield cannot be calculated as there is No Interest payment Hence only YTM can be calculated for ZCB

$$YTM = \left[\frac{FV}{\text{CMP of bond}}\right]^{1/n} - 1$$

Note :- (i) If we discount the future cash flows from the bond using YTM, then we will get CMP of bond. ✓

(ii) current market price means price at which bond is currently trading in Market or Quoted price of bond

imp

= yield (mkt) की comparison में interest

(iii) If Question asks to calculate prevailing Interest or yield on similar bond, then it means we have to calculate YTM.

(iv) Spread of yield = ~~yield of~~ (YTM of our bond − yield of similar bond) (Q38)

(v) Realised yield:-
It means YTM calculated on the assumption that all coupon payments and redemption amount will be received together at End of maturity of bond.

It is calculated as follows:- (total Int + Red amt)

$$\text{Realised yield} = \left[\frac{\text{Total payments received on maturity}}{\text{current MP of bond}}\right]^{1/n} - 1$$

Total payment Received on maturity from bond ⇒ (All coupon payments + Redemption Amt)

[III] Bond Forward Rates
(Term Structure Theory)

This theory is based on the assumption that Interest rate in market is going to Increase every year.

Q42 (LOB)

→Q40

Accordingly, To get more return, any rational person should invest in a bond for 1 year and at end of 1st year, he should invest in bond again for 1 year at new interest rate & at end of 2nd year, he should invest in bond again for 1 year at new interest rate for 3rd year and this process continues ...

So in this case, intrinsic value of a bond will be calculated as follows:-
Har saal alag alag rate of Ret.

$$\left[V_0 = \frac{CF}{(1+R_1)^1} + \frac{CF_2}{(1+R_1)(1+R_2)} + \frac{CF}{(1+R_1)(1+R_2)(1+R_3)} + \ldots\right]$$

[IV] Bond Duration
① Macaulay's Duration
② Modified Duration
③ Convexity of Bond.

(I) Duration of Bond (Macaulay's duration):-

It represents average time taken by investor to recover his investment in a bond [i.e. weighted average life of bond]

Steps for calculation of duration of bonds:-

Step ① Find expected cash flows from bond in each year

Step ② calculate present value of each year cash flow using YTM → Sum of all → market price of bond

Step ③ Calculate weight of present value of each year cash flow using YTM:

$$\frac{PV \text{ of cash flow of each year}}{\text{sum of PV of total cash flow}}$$

Step ④ Year × weight of PV of cash flow of each year ⇒ sum of all → Duration of bond.

Format for calculation of Duration of bond:-

Year (1)	Cash flow (2)	PVF @ YTM (3)	PV (4)	weight of PV (5)	weight × Year (6)

• Bond having lower duration is better in comparison to other Bond. (because we can repaid at Early)

(II) Volatility of Bond (modified duration)

It represent % change in MP of Bond due to 1% change in yield rate or YTM

• Volatility of Bond = $\frac{\text{Duration of Bond}}{(1+YTM)}$

Here the current YTM (used in cal of duration) in decimals.

% change in mkt price of bond (due to change in YTM)

YTM घटेगी तो obviously MP बढ़ेगा — MP(%) (YTM change × volatility)

Q-A3

(Change in YTM in (%) × volatility)

, change in market price of Bond in ₹ = (current market price × % change in MP of bond)

. If YTM increases, MP will decrease & vice versa [YTM(↑) MP(↓)]

(III) Convexity of Bond :-

• Volatility does not provide accurate change in MP of bond resulting from change in YTM
• so, new concept of convexity is introduced. It is adjustment to (%) change in MP of bond calculated using volatility

• Convexity of Bond (%) = C × (change in YTM in decimals)^2 × 100

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

% change in MP of bond :-

If YTM (↓) → % change in mkt price of bond using volatility + convexity of Bond (value (x) आएगा)

If YTM (↑) → % change in mkt price of Bond using volatility − convexity of bond. (नकारात्मक value लेंगे)

weight Calculation

Liab duration = 1st Bond duration × wt + 2nd bond duration (1 − wt)

6 + 48

Calc amt of investment

IV

bond

VI BOND IMMUNIZATION.

We have to meet liability after sometime. For that we are making investment in Bonds so that we can get amt to settle the liability at that point of time

But there can be 2 types of Risks in a Bond which can affect the amount Receivable i.e Price risk and Reinvestment Risk

∴ So, there is a need to immunise the Bond for this we have to invest in atleast 2 Bonds proportionately so that their weighted duration (i.e duration of Bond portfolio) become equal to the duration of liab as follows:-

Duration of Bond portfolio = Duration of Liability

(Duration A × wt A + Duration B × wt B + Duration C × wt C)

↓

It will be equal to

(1) weight A + weight B + weight C = 1

Note (i) If in future duration of bond changes then we have to calculate Revised weights for each bond accordingly (running out portfolio of Bonds)

(ii) Amt to be invested initially in each bond on basis of weights calc above = PV of liab to be settled using Bond's wt × wt of Bonds

Liab @ PV × weight

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VII BONDS REFUNDING

- When interest rates in market is falling, comp may issue new bonds at lower coupon rate and refund the existing bonds issued earlier prior to its maturity date
- company is Required to pay existing Bondholders an amount higher than face value which is known as call premium to refund the old bonds.

call premium = (call price − face value) × no of old bonds.

OR

face value of old Bonds × call premium %

- Net present value (NPV) method is used to evaluate bond refunding decision as follows:-

Step ①	Step ②	Step ③	Step ④	Step ⑤
calculate initial cash Outflow	calculate annual cash on old bond	calculate annual cash on new bond:-	Calculate Annual saving	Calculate NPV
call premium XXX	Interest cost per year on old bond XXP	Int cost per year on new bond XXX	(−) Tax saving XXX	PV
(−) Tax × saving (XXP)	(−) Tax saving XXX	(−) Tax saving (XXX)	(2nd × Tax rate)	
(call prem × Tax rate) XXX	(2nd × Tax rate)	(2nd × Tax rate)	Tax saving on disc & flotation cost of New bond pay *	XXX

step ①

Issue cost (Floatation cost) of New bonds xxx

Tax saving on unamortised discount & floatation cost of old bonds (xxx)

$\left[\left(\frac{\text{Discount \& floatation cost of old bonds}}{\text{maturity period of old bonds}} \times \text{Rem period}\right) \times \text{Tax rate}\right]$

overlapping interest on old bond xxx

(-) Tax saving (overlapping Int x Tax rate) (xxx) xxx

xxx

Decision:-

If NPV is

↳ positive → Bond refunding is beneficial

↳ Negative → Bond refunding is Not beneficial

step ② (iii) Tax saving on discounted floatation cost of old Bond per year

$\left[\frac{\text{Disc \& floatation cost of old bonds}}{\text{maturity periods of old bonds}} \times \text{Tax rate}\right]$

step ③ same in step ②

step ④ Annual saving

= Annual cost on old bond − Annual cost on New bond

PV if for the period of New bonds by using discount

Note :- Discount

→ After Tax cost of debt (given in Qus)

→ otherwise After Tax interest rate of New bonds.

step ⑤ calculate NPV:-

PV of annual savings (as calculated in step ④) xxx

(-) Initial cash outflows (as calculated in step ①) (xxx)

xxx

VII Convertible Bonds :-

↳ In convertible Bond, option is given to Bondholders to convert the bonds in a fixed No of Eq shares

• some calculations Related to convertible bond for decision making :- (MCQS)

→ (1) Conversion Ratio - No of shares per bond on conversion

→ (2) Conversion value (Stock value of Bond) MCQ

Conversion ratio xxx per share

→ (3) Conversion premium :-

(i) Total conversion premium → (Market price of Bond − Conversion value)

(ii) Conversion premium or Ratio of conversion premium or premium over Conversion value (%)

$\frac{\text{MP of Bond} - \text{Conversion value}}{\text{Conversion value}} \times 100$

(iii) Conversion premium per share

MP of Bond − Conversion value / Conversion ratio

→ (4) Conversion parity price or market conversion price →

Market price of Bond / Conversion ratio OR Current MP of share + Conversion premium per share

(5) Favourable income differential per share:

$$\frac{\text{Coupon interest from bond} - (\text{Coupon conversion ratio} \times \text{Dividend})}{\text{Conversion ratio}}$$

(6) Premium payback period =

$$\frac{\text{Conversion premium per share}}{\text{Favourable income differential per share}}$$

(7) Straight value of bond →
PV of future cash flow from bond using without conversion option int rate

(8) Percentage of downside risk → (MCQ)

$$\frac{\text{market price of bond} - \text{straight value of bond}}{\text{MP of bond}} \times 100$$

(9) Premium over straight value →

$$\frac{\text{MP of bond} - \text{straight value of bond}}{\text{straight value of bond}} \times 100$$

(10) Investor will exercise conversion option only when conversion value of bond exceeds straight value of bond.

Revised

VIII) MONEY MARKET INSTRUMENTS

- It is a source of short-term borrowings (≤ 1 year).
- Eg:- Commercial paper (CP), certificate of deposits (CDs), Treasury Bills (T-Bills) etc
- It is issued at discount and redeemed @ Face value

Some calculations that are need to be done for Exam purpose:-

Q58 / Q60 (must practice)

(1) Nominal interest Rate on yield / Bond Equivalent yield

↓

$$y = \frac{F - P}{P} \times \frac{12 \text{ or } 365}{n} \times 100$$

(2) Discount yield

↓

Discount yield =

$$\frac{F - P}{F} \times \frac{12 \text{ or } 365}{n}$$

(3) Effective Annual Return / Interest (EAR/EAI)

↓

EAR/EAI =

$$\left[1 + y \times \frac{n}{12 \text{ or } 365}\right]^{\frac{12 \text{ or } 365}{n}} - 1$$

(4) Cost of funds calculated in case of CP only) Q61

$$\frac{[\text{Interest expense} + \text{issue exp}](1-T)}{\text{Net amt received by the co}} \times \frac{12 \text{ or } 365}{n} \times 100$$

Q62

Note:-
shortcut for calculation of 'P' (Issue price or investment amt) on given yield in Question

$$P = \frac{F}{1 + y \times \frac{n}{12 \text{ or } 365}}$$

Here take yield in decimals.

- **Repurchase agreement (Repo) transaction in money market:-**

→ In this transaction A Bank raises funds from another bank by selling government of India Bonds and also agrees to repurchase the bonds after a specified time by paying interest at Repo rate on the initially raised fund.

Q63

→ calculation of Amount Initially Raised (First leg or Start proceeds)

GOI Bonds sale amt (No of GOI bonds sold × Dirty price) XXX

(-) Initial margin (GOI bond sale amt × Initial margin %) (XXX)

XXX

Here No of GOI bond sold = Total face value of GOI bonds / Face value of single GOI bonds

(If face value of single GOI bond is not given in Question Assume it as ₹100

(Dirty price = Clean price + Accrued interest on GOI bond)

(*) clean price :- is the price of GOI bond at the time when last interest paid on the bond

(*) Accrued interest on GOI bond =)

Face value of single GOI Bond × Interest / coupon rate on GOI bond × Accrued interest days / 365/360

→ calculation of amt to be paid at the time of repurchase (second leg or Repayment at maturity)

Start proceeds (First leg) amount XXX

(+) Repo Interest [Start proceeds × Repo rate × No of days of repo tenure / 365/360] XXX

XXX

MEQ :-

Purpose is to reduce excess liquidity in the economy :- (Reverse Repo)

Q63 (i) Dirty price = clean price + Accrued interest (always in face value)

⇒ 99.42 + 7.277

⇒ 106.70

(ii) First leg :-

Nominal value × OP / 100 × 100

→ 8 Cr × 106.70 / 100

(-) TM (8 Cr × 2%)

8.536

0.7072

8.3652 8.

Part IV Miscellaneous Topics

Q64

Fund raising decision

- company needs funds for expansion of business which it wants to raise through debt or equity.
- company should choose the option in which market price of share (MPS) as per P/E multiple approach will be higher.

↓

(MP) - के basis पर decision लेना चाहिए। MPS काढ़ना - यापा P/E तरा

External fund requirement (EFR)

- It is the amt which co is required to raise from various sources to invest in comp's Total assets less payables & provisions when sales are expected to grow by a certain % for the next year.
- EFR is calc as follows:-

(Total assets - Payables & provisions) × sales growth (%)	xxx
(-) Retained earnings expected in the next years	(xxx)
EFR (i.e total amt to be raised from external sources)	xxx

Effect of new project or expansion scheme on price of share of company

↓

Next page

- calculation of amount to be raised ~~retained~~ from external source:-

New amt of Debt / Loan or equity as per given ratio in Ques	xxx
(-) Existing amt of debt / loan or equity in B/s	(xxx)
Amt to be raised from debt / loan or equity	xxx

Expected share price is calculated as follows:-

Market value of Existing shares (No of Existing shares × current share price)	xxx
(+) Expected NPV from new project / scheme	xxx
(+) Amt raised from equity share to finance the project	xxx
(-) Issue cost (Flotation cost) on amt raised from eq shares	(xxx)
(+) Any other benefit like Benefit on Early redemption of Bonds:-	
FV of Bonds (As of Today) xxx	
(-) Amt paid on Early redemption of Bonds (Facevalue + Penalty) (xxx)	xxx

Expected Total MV of shareholders xxx

(÷) No of Total equity shares xxx

(No of Existing shares + No of new shares issued)

Expected share price of company xxp