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SFM Theory Chapter → Formulas

Value at Risk :-

Max. loss = Amt of investment × σ × Table value

Time period change = Daily VAR × √Revised Time Period

VAR of Portfolio: $\sigma_{A+B} = \sqrt{\sigma_A^2 + \sigma_B^2 + 2\sigma_A \sigma_B}$

Max. loss = (Investment value × σ) × Table value

Security Analysis

Simple moving Avg = $\frac{\text{Add recent closing prices}}{\text{No. of periods}}$

Exponential moving Avg :-

EMA Today = EMA yesterday + a × (Price Today - EMA yesterday)

$a = \frac{2}{\text{Period} + 1}$

Run Test :-

Step ① n_1 = No. of +ve signs n_2 = no. of -ve sign

μ = no. of times sign changes.

Step ② $\sigma = \sqrt{\frac{2n_1 n_2 (2n_1 n_2 - n_1 - n_2)}{(n_1 + n_2)^2 (n_1 + n_2 - 1)}}$

Mean value of $\mu = \frac{2n_1 n_2}{n_1 + n_2} + 1$

Step ③ Standard Lower Limit = Mean value of μ - Table value × σ

Standard Upper Limit = mean value of μ + Table value × σ.

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Mutual funds

1. NAV = $\frac{TA - TL}{\text{No. Of units}}$

2. Exp. ratio = $\frac{\text{Exp. incurred per unit}}{\text{Avg. NAV}}$

3. HPR = $\frac{(NAV_1 - NAV_0) + Div + CG}{NAV_0}$

4. Return desired by Investor = (Return of Mutual fund − Recurring Exp.) (1 − Initial Exp)

5. % Change in value of security = − Modified duration × Chg. in YTM

6. Yield (Y.) p.a = $\frac{\text{Yield (Y.) till investment is held}}{\text{No. of days investment is held}} \times 365$

Corporate Valuation & EVA-MVA

1. Dividend Yield = $\frac{DPS}{MPS}$ ⇒ MPS = $\frac{DPS}{\text{Dividend yield}}$

2. MPS = $\frac{EPS}{\text{Earning yield}}$

3. Value of Business as per FMP = $\frac{Fmp}{\text{Discount rate}}$

4. PE Ratio model: MPS = EPS × PE Ratio

5. Value of Equity as per Risk Premium Approach:-
   VOE = $\frac{\text{Actual yield}}{\text{Expected yield}}$ × Paid up value / share
   Actual yield = $\frac{\text{Yield on ES}}{ES} \times 100$

6. Value of firm = VOE + VOD ⇒ $V_F = V_E + V_D$

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7. Avg. FV per share = $\frac{\text{Value/shares as per NAV} + \text{Value/share as per fmp}}{2}$

8. Equated annual loan Installment = $\frac{\text{Amt of loan}}{\text{PVAF}(r\%, n\text{ years})}$

9. NAV method : $\frac{TA - TEL}{\text{No. of shares}}$

10. Capital employed : $\frac{ESC + R\&S + PSC + Deb - misc\ exp.}{FA + (CA - CL)}$

11. Net Relizable Value : Equity shareholders' funds (BV) + Inc in value of assets - dec. in value of assets

12. Incremental value : Value of co. under new strategy − Value of co. under old strategy

13. NAV with profit adjustment : (TA − TEL) ⊕ Profits

14. Prbability of success : ($P_{year_1} \times P_{year_2} \times \dots \times P_{year_n}$)
failure : 1 − Prob. of success

15. Debt Ratio = $\frac{Debt}{Debt + Equity}$

16. Capital Gearing Ratio = $\frac{Debenture + PSC + long\ term\ loan}{ESC + R\&S}$

17. Int coverage ratio = $\frac{PAT + Interest}{Int + Pref\ dividend}$

18. Enterprise Value : MV of equity + MV of deb. − Cash & cash equivalents

19. EV/EBITDA Multiple : $\frac{EV}{EBITDA}$

20. Tax Rate (t) = $\frac{\text{Tax paid}}{PBT}$ (or) $\frac{PAT - PBT}{PBT}$

21. EVA = $\underset{NOPAT}{EBIT(1-tax)} - \underset{K_e w_e + K_d w_d + K_p w_p + K_d w_r}{C \times K_0}$

22. Financial Leverage = $\frac{EBIT}{EBT}$

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23. DPS as per EVA = $\frac{EVA}{No.\ of\ shares}$

24. Patents : Added to calculate CE

25. More than one Beta : Take highest beta.

26. Normal CE = ESC + R&S + PSC + Deb + SPR + SR + CR − Undervaluation − acc. losses − mfg. exp − fictitious assets

27. Operating CE = Normal CE − Non-trade investments − L&B held as investment − Adv. given on purchase of plant − Capital WIP

28. MVA : Equity approach = (MPS × No. of shares) − (Book value)
overall approach : (MV of equity + PSC + debt) − Book value

29. Treatment of provisions :-
EVA → Add back in NOPAT & operating CE
MVA → Book value Rs including prov.

Merger & Acquisition

A Ltd : Acquiring Co.
B Ltd : Target Co.

1. Share Exchange / Swap Ratio = $\frac{EPS\ of\ B\ Ltd.}{EPS\ of\ A\ Ltd.}$

$= \frac{MPS\ of\ B\ Ltd}{EPS\ of\ A\ Ltd.}$

$= \frac{NAV\ of\ B\ Ltd}{NAV\ of\ A\ Ltd}$

$= \frac{BVPS\ of\ B\ Ltd}{BVPS\ of\ A\ Ltd.}$

2. Total no. of Es after merger : $N_A + N_B \times ER$

3. EPS after merger : $EPS_{A+B} = \frac{E_A + E_B + Synergy}{N_A + N_B \times ER}$

4. MPS after merger : $MPS_{A+B} = EPS_{A+B} \times PE_{A+B}$, or
$\frac{Total\ MV\ after\ merger}{N_A + N_B \times ER}$

Assume $PE_{A+B} = PE_A$

5. MV of merged firm: $MV_{A+B} = MPS_{A+B}\,[N_A + (N_B \times ER)]$
$= MV_A + MV_B + \text{synergy}$

6. Equivalent EPS of B ltd after merger = $EPS_{A+B} \times ER$

7. " MPS " " " " = $MPS_{A+B} \times ER$

8. New no of ES = $N_B \times ER$

9. Decision on SER: A = lower the better
B = higher the better

10. % of holding in new co: $A = \frac{N_A}{N_A + (N_B \times ER)}$

$B = \frac{N_B \times ER}{N_A + (N_B \times ER)}$

11. Total earning after merger: —
Synergy in amt = $E_A + E_B + \text{Synergy}$
% = $E_A + E_B + (E_A + E_B)\text{Synergy}\ \%$

12. Free float MV: Freely in stock market

13. Cash Takeover: $N_{A+B} = N_A$

14. Gain/loss: —

	A ltd	B ltd
MPS/EPS after merger	xx	xx
MPS/EPS before merger	xx	xx
Gain/(loss)	xx	xx

15. Maximum EPS for A ltd: —

Base EPS: $EPS_A = EPS_{A+B}$

$EPS_A = \frac{E_A + E_B + \text{Synergy}}{N_A + N_B \times ER \rightarrow \max \cdot ER}$

Base MPS: $MPS_A = EPS_{A+B} \times PE_{A+B}$

$MPS_A = \left[\frac{E_A + E_B + \text{Synergy}}{N_A + N_B \times ER}\right] \times PE_{A+B}$

↳ max. ER

Base MPS if: $MPS_A = MPS_{A+B}$

PE_{A+B} is not given $MPS_A = \frac{MV_A + MV_B + \text{synergy}}{N_A + N_B \times ER}$

↳ max. ER

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16. Minimum EPS for B deal :-

Base EPS : $EPS_B = EPS_{A+B} \times ER$

$$EPS_B = \frac{E_A + E_B + Synergy}{N_A + N_B \times ER} \rightarrow \text{min. ER}$$

Base MPS : $MPS_B = [EPS_{A+B} \times PE_{A+B}] \times ER$

$$MPS_B = \left[\frac{E_A + E_B + Synergy}{N_A + N_B \times ER}\right] \times PE_{A+B} \times ER \rightarrow \text{min. ER}$$

Base MPS if PE Ratio not given : $MPS_B = MPS_{A+B} \times ER$

$$MPS_B = \frac{MV_A + MV_B + Synergy}{N_A + (N_B \times ER)} \times ER \rightarrow \text{Min. ER}$$

17. NPV : PV of cash inflows from B
- COA or PC

	xx
	(xx)
NPV	xx

18. Synergy = $E_{A+B} - (E_A + E_B)$

$MV_{A+B} - (MV_A + MV_B)$

19. Cash Takeover through Borrowed Funds :-

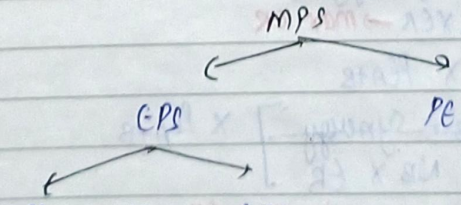
$$EPS_{A+B} = \frac{E_A + E_B + Synergy - [Int \times B.amt.](1-tax)}{N_A}$$

20. Cash Takeover through R.E :- $\frac{E_A + E_B + Synergy - [Cash\ paid \times OC\ of\ tax\ paid](1-ta}{N_A}$

21. Net cost of merger : Cash Takeover = Cash paid − MV_B acq.

Share Takeover = $(MV_{A+B} \times$ % holding to B $-$ MV_B acq.

22.



= Equity SH Funds / No. of ES

Earning for equity / Equity SH funds

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23. $BVPS_{A+B} = \frac{\text{Revised E\&S after merger} + \text{Revised R\&S after merger}}{N_A + N_B \times ER}$

24. Cal. of SER on basis of weights: $\left[\frac{BVPS_B}{BVPS_A} \times \text{Weight} + \frac{EPS_B}{EPS_A} \times \text{Weight} + \frac{MPS_B}{MPS_A} \times \text{Weight}\right]$

25. % of promoter holding after merger = $\frac{\text{Promoters of A} + \text{Promoters of B} \times ER)}{\text{Total no. of Es after merger} \rightarrow N_A + N_B \times ER}$

26. SER on basis of NPA: $\frac{\text{Gross NPA}_A}{\text{Gross NPA}_B}$

27. Gross NPA(%) = $\frac{\text{Gross NPA}(₹)}{\text{Advances}} \times 100$ (Lower the better.)

28. CRAR = $\frac{\text{Total capital}}{\text{Total RWA}}$

29. Benefit due to merger on basis of DCF approach: —
$PV_{A+B} - PV_A$

30. Min acceptable price to mgmt. not willing to loose their controlling int.:—
Value of shares held + mgt + PV of loss of remuneration
= $\frac{\text{Total value to be offered to mgmt.}}{\text{No. of shares held by mgmt.}}$

31. Calculation of PC:—
PC = MV of Es + Deb. + PSC + Payment of CL + Dissolution Exp − Proceeds realised from sale of assets
* FA → don't take * Always deduct cash & bank * Always add CL.

32. SER on basis of offer price: $\frac{\text{Offer Price}}{MPS_A}$

33. Total Funds Available for cash offer: Issue of new deb. xx
Sell marketable securities xx
xx

34. PV of growth opportunity: Price with growth − Price without growth

35. If NPV = 0, $PE_{A+B} = \frac{MPS_A}{EPS_{A+B}}$

36. Purchase Price Premium = $\frac{\text{offer price} - MPS_B}{MPS_B}$

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International Financial Management

1. Capital Budgeting :-

Home currency approach

(i) Compute FC cash flow
(ii) Convert into home currency
(iii) Compute HC discount rate
(iv) Compute HC NPV.

Foreign currency approach

(i) Compute FCCF
(ii) Compute FC discount rate
(iii) Compute FC NPV
(iv) Convert into HC.

2. RADR : $(1+RADR) = (1+R_f)(1+R_p)$

R_p → same in both approaches

3. NPV = PVOCI − PVOCO.

4. Profitability Index (PI) = $\frac{\text{PV of CI}}{\text{PV of CO.}}$

5. Payback Period (Equal cashflow) = $\frac{\text{Initial Investment}}{\text{Annual CI.}}$

6. Payback Period (Unequal Cashflow) = Completed years + $\frac{\text{Remaining amt}}{\text{Available amt.}}$

7. Discount PBP = CF are discounted & then calculate PBP

8. IRR = $LR + \frac{LRNPV}{LRNPV - HRNPV} \times (HR - LR)$

9. Treatment of Tax : CI & CO taken after tax.

10. No. of ADRs/GDRs = $\frac{\text{Issue realise}}{\text{Issue Price}}$

11. Cost of ADR/GDR : Issue Price $(1-f) = \frac{D_0(1+g)}{k_{gdr} - g}$

D_0 = FV + Div rate × No. of shares in each GDR

12. Unequal life of Projects : Equated Annual Amt = $\frac{\text{PVCO or PVCI or NPV}}{\text{PVAF}(r,n)}$

13. NPV in case of inflation :- Money cash flows = Real CF $(1 + \text{Inflation rate})^n$

14. Modified NPV = $\frac{\text{Terminal Value}}{(1+k)^n}$ − Initial CO

15. Modified IRR ⇒ $k = \sqrt[n]{\frac{\text{Terminal value}}{\text{Initial outlay}}} - 1$.

16. Overall Beta (without tax) = $\beta_B \times \frac{E}{E+D} + \beta_B \times \frac{D}{E+D}$.

With Tax = $\beta_B \times \frac{E}{E + D(1-\text{Tax})} + \beta_B \times \frac{D(1-\text{Tax})}{E + D(1-\text{Tax})}$

17. k_o of unlevered firm = k_e.

18. β_B of unlevered firm = β_B

19. Chg. in capital structure :- β_B will remain constant

20. Unlevered k_e = $R_f + \beta_B (R_m - R_f)$

21. Debt Beta = $\frac{\text{Beta}_m - \text{Beta}_{R_f}}{R_m - R_f}$

22. Bond Refunding :-

PV of Incremental Annual CI under new bond	xx
(−) Initial Incremental CO under new bond	(xx)
± Other Items	±xx
Incremental NPV	xxx

23. More than one overall Beta : Take average

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Foreign Exchange Risk Management

1. DQ → IDQ : Reciprocal of DQ $\Rightarrow 1\$ = ₹70 \Rightarrow 1₹ = \frac{1}{70}\$$

2. DQ → IDQ : $1\$ = ₹65 - ₹72$
(Two way Quote) $1₹ = \frac{\$1}{72} - \frac{\$1}{65}$

3. Exchange Margin : Buying margin = Bid Rate $(1 - \epsilon m)$
Selling margin = Ask rate $(1 + \epsilon m)$

4. PPP Theory : Spot Rate $\left(\frac{₹}{\$}\right) = \frac{\text{Current Price in India (₹)}}{\text{Current Price in USA (\$)}}$

5. PPPT : $\frac{FR\ (₹/\$)}{SR\ (₹/\$)} = \frac{1 + ₹ \text{ Inflation}}{1 + \$ \text{ Inflation}}$

6. IRPT : $\frac{FR\ (₹/\$)}{SR\ (₹/\$)} = \frac{1 + ₹ \text{ Int. rate}}{1 + \$ \text{ Int rate}}$

7. Currency & Inflation Rate → Inverse relation

8. currency rate & Interest rate → Inverse relation

9. Rate of Premium/discount $= \frac{FR - SR}{SR} \times \frac{12}{\text{forward period}} \times 100$

10. Expected Exchange Rate $= ER_1 \times Prob_1 + ER_2 \times Prob_2 + \ldots\ldots$

11. As per IRPT (No Arbitrage) :-
Diff. in Int. Rate = Premium/discount
Int. rate$_₹$ − Int rate$_\$$ $= \frac{FR(₹/\$) - SR(₹/\$)}{SR(₹/\$)} \times \frac{12}{\text{forward period}} \times 100$

12. Return of domestic investor :-
$\text{Return (\%)} = \frac{\text{Price}_{End} - \text{Price}_{Beg} + \text{Acq. Income}}{\text{Price}_{Beg}}$

13. Return of foreign investor :-
Only return figure taken out : Return $(1 \pm$ App/dep of currency$)$
When both return/principal : $(1 + \text{Return})(1 \pm \text{App/dep}) - 1$,
are taken out

14. Net Exposure = Net cash flow (CI − CO) × swap points (FR − SR)

15. Swap Points: FR − SR
increasing order → Add swap points
Decreasing order → Deduct swap points

16. Mid Rate = $\frac{\text{Ask Rate} + \text{Bid Rate}}{2}$

17. Modification of forward Contract

(a) Delivery on due date: Contract honored

(b) Cancellation on due date: Enter into reverse contract
Rate → Spot rate of due date

(c) Cancellation before due date: Reverse position
Rate → FR of due date prevailing on the date customer contacted bank

(d) Extension before due date: ① First, cancel the original contract
② Enter in new contract at new FR

(e) Extension on due date: ① First, cancel the original contract
② Enter in new contract

(f) Cancellation after due date: Reverse position
Rate → SR of Date of contacting bank, or SR on 3rd day after due date (whichever)

Swap loss = Bank will sell at SR (due date) xxx
Bank will buy nearest month FR xxx
Swap loss xxx

Swap loss (early delivery): Bank will sell at SR (date of contact) xx
Bank will buy at FR prevailing for due date xx
Swap loss xx

Interest on outlay of funds :-

Cancellation after due date = Bank will buy at Cover rate xx
Bank will sell at spot xy
(due date)
Int to be charged xx

Early Delivery = Bank will buy at original contract rate xx
Bank will sell spot (date of contract) xy
Int. to be charged xx

18. Broken Date Swap Points :-
Given for 2 & 3 months, need for 2 mths 15 days
① $3m - \frac{2m}{30} \times 15$
② Add into 2 months

19. Spread = Ask Rate - Bid Rate.

20. Money Market operation :-
Exporter : ① Borrow in foreign currency
② Convert Borrowed amt into HC using SR
③ Invest this amt in HC for given period.

Importer : ① ~~Borrow~~ Invest in FC.
② Borrow equivalent amt in HC.
③ Pay borrowed amt with interest.

21. Fisher effect : 1 + Money Int. Rate = (1 + Real Int Rate)(1 + Inf Rate)

Valuation of Equity

1. EPS = $\frac{\text{Total earning available for equity SH}}{\text{Total no. of ES}}$

2. DPS = $\frac{\text{Total dividend paid}}{\text{No. of ES}}$

3. MPS = $\frac{\text{Total MV of ES}}{\text{No. of ES}}$

4. Dividend Payout Ratio = $\frac{DPS}{EPS} \times 100$

5. Retention Ratio = $\frac{EPS - DPS}{EPS} \times 100$ (OR) 1 − DP Ratio

6. REPS = $\frac{\text{Total Retained earnings}}{\text{No. of ES}}$

7. Dividend Rate = $\frac{DPS}{\text{Face value}} \times 100$

8. Gordon / Dividend Discount Model: $P_0 = \frac{DPS_1}{K_e - g}$

9. Growth Rate (g) = Retention Ratio (b) × Return on Equity (r)

10. Optimum Dividend: $r > K_e$ — 0%
$r = K_e$ — Indifferent
$r < K_e$ — 100%

11. PE Ratio = $\frac{MPS}{EPS}$

12. ROE = $\frac{\text{Earning available for equity SH}}{\text{Equity SH funds}}$

13. BVPS = $\frac{\text{Equity SH funds}}{\text{No. of ES.}}$

14. EPS = BVPS × ROE

15. Variable Growth Model: $P_0 = \frac{D_1}{(1+K_e)^1} + \frac{D_2}{(1+K_e)^2} + \frac{D_3}{(1+K_e)^3} + \frac{D_4}{(1+K_e)^4} + \frac{1}{(1+K_e)^4} \left(\frac{D_5}{K_e - g} \right)$

16. AP > FP : Overvalued — Sell
AP = FP : Correct value — Hold
AP < FP : Undervalued — Buy

17. CAPM : $K_e = R_f + \text{Beta}(R_m - R_f)$

18. Holding Period Return = $\frac{(P_1 - P_0) + D_1}{P_0} \times 100$

19. $P_0 = \frac{D + P_1}{(1+K_e)^1}$

20. Negative Growth Rate : $P_0 = \frac{D_0(1-g)}{K_e + g}$

21. Ex-Dividend Price = Cum-dividend Price − Dividend

22. Zero Growth Rate : $P_0 = \frac{EPS}{K_e}$

23. $K_e = \frac{D_1}{P_0} = \frac{D_1}{P_0} + g = \frac{EPS_1}{P_0} = \frac{EPS_1}{P_0} + g = \frac{(P_1 - P_0) + D_1}{P_0}$

24. $K_e = \frac{1}{PE\ Ratio}$

25. $DPS_{Latest} = DPS_{Base}(1+g)^{n-1}$

26. How to solve a^b? → $\sqrt{a}$ 12 times -1 $\times b$ $+1$ $\quad x = 12$ times

27. Walter's model = $\frac{D + (E - D)\,r/K_e}{K_e}$

28. ~~EPS model~~ : 28. PE Ratio = $\frac{1}{ROE}$

Valuation of Pref. Shares

1. $PSC_0 = \frac{Div}{(1+K_p)^1} + \ldots + \frac{Div}{(1+K_p)^n} + \frac{MV}{(1+K_p)^n}$

2. Irredeemable : $PSC_0 = \frac{Div}{K_p}$

3. K_p of Redeemable PS = $\frac{Div + \left(\frac{MV - PSC_0}{Life}\right)}{\frac{MV + PSC_0}{2}}$

4. Kp of redeemable PSC = $\frac{\text{Dividend}}{\text{PLCO}}$

5. Conversion Value = MPS × No. of ES

6. Premium in case of convertible PSC = MV of convertible PSC − Conversion Price value

Value of Right Shares

1. MPS after right issue / Ex-Right Price = $\frac{\text{MPS before Right} \times \text{Existing shares} + \text{Offer Price} \times \text{No. of right}}{\text{Existing shares} + \text{Right shares}}$

2. Value of Right: Per share = Cum right Price − Ex right price
   Per lot = Per share × lot size

   Alt 2: Value of right per lot = Ex-Right Price − Offer Price
   Per share = $\frac{\text{Per Lot}}{\text{lot size}}$

3. Return on sale of Rights = SP of right − Buy Price of right

4. Right Shares used for investment :-
   MPS after right issue = $\frac{\text{Total MV after right} + \text{NPV}}{\text{Total shares after right}}$ (proceeds)

Buy Back of Shares

1. MPS after buy back = $\frac{\text{MV after buy back}}{\text{Existing shares} - \text{Buy back shares}}$

2. EPS after buy back = $\frac{\text{Earning after buy back}}{\text{Existing shares} - \text{Buy Back shares}}$

First leg (start Proceed) = Nominal value × $\frac{\text{Dirty Price}}{100}$ × $\frac{100 - \text{hm}}{100}$

second leg (Repayment at maturity) = Start Proceed × $\left[1 + \text{Repo rate} \times \frac{\text{No. of days}}{365}\right]$

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Valuation of Bonds

1. Value of Bond $(B_0) = \frac{Int}{(1+Kd)^1} + \frac{Int}{(1+Kd)^2} + \dots \frac{Int}{(1+Kd)^n} + \frac{MV}{(1+Kd)^n}$

2. Value of Perpetual Bond $= \frac{Int}{Kd}$

3. Value of ZCB $= \frac{MV}{(1+Kd)^n}$

4. Cost of Debt$(Kd) = \frac{Int + \left(\frac{MV - B_0}{n}\right)}{\frac{MV + B_0}{2}}$

5. Yield to call $= \frac{Int + \left(\frac{\text{Call value} - B_0}{n}\right)}{\frac{\text{Call value} + B_0}{2}}$

6. Yield to Put $= \frac{Int + \left(\frac{\text{Put value} - B_0}{n}\right)}{\frac{\text{Put value} + B_0}{2}}$

7. Kd of Perpetual Bond $= \frac{Int}{B_0}$

8. Dirty Price = Clean Price + accrued Interest

9. ICR $= \frac{EBIT}{\text{Interest}}$

10. Fair conversion value = MPS today × No. of ES on conversion

11. Downside Risk = MV of convertible bond − MV of non-convertible bond

$\% \frac{MV \text{ of } CB - MV \text{ of } NCB}{MV \text{ of } CB/NCB} \times 100$

12. Premium = Actual MV of CB − Fair conversion value of Bond

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13. Conversion Parity Price of CS = $\frac{\text{Actual MV of CB}}{\text{Conversion Ratio}}$
(Premium = 0)

14. Conversion Parity Price Premium = Parity Price − MPS prevailing

15. Favourable Income Diff/share = $\frac{\text{Coupon Int} - \text{Conv. Ratio} \times \text{DPS}}{\text{Conversion Ratio}}$

16. Premium Payback Period = $\frac{\text{Extra Initial Investment}}{\text{Extra annual CI}}$

17. Duration of Bond = $\frac{\Sigma t \times w}{\Sigma w\ (BO)}$

18. Coupon Rate missing :− Use Bo equation
Use DOB equation } Solve

19. Modified Duration = $\frac{DOB}{1 + Kd}$

% change in Bo = − Modified Duration × Change in Kd

20. Expected Bo = fair Bo × Beta

21. Value if entire Int & Principal recd at end of Bond life
= $\frac{\text{Face Value}\ (1+CR)^n}{(1+Kd)^n}$

22. Bond Immunization : Investor's Time Horizon = Weighted Avg. DOB

23. If coupon not reinvested → Bo = $\frac{\text{Coupon amt} \times n + \text{f.v}(n'v)}{(1+Kd)^n}$

24. Kd (Re-investment rate is given) : Bo = $\frac{\text{Future Value}}{(1+Kd)^n}$

25. Interest ↑ → ↓ DOB → Buy low Duration & sell high duration
Interest ↓ → ↑ DOB → " high " & " low "

26. Face value = $\frac{\text{Diff. b/w Bo (given)}}{\text{Diff. b/w Bo (FV = 1)}}$

27. Reinvested Int : Total amt recd on reinvestment − Amt invested

28. Min MPS at which conversion should be exercised = $\frac{\text{CMP of Bond}}{\text{Conversion Ratio}}$

29. Return before mgmt exp = $\frac{\text{Return after mgmt exp}}{1 - \text{mgmt exp}}$

30. Duration of Perpetual Bond = $\frac{1+K_d}{K_d}$

31. DOB of 2 CB = Maturity years

32. ↑ CR = ↓ DOB.

32. ↑ K_d = ↓ DOB

33. Convexity of Bond = $\frac{V_+ + V_- - 2V_0}{2V_0 (\Delta y)^2}$

Δy = Chg. in yield
V_0 = Initial Price
V_+ = Price if yield increases by Δy
V_- = " " " decreases " "

Portfolio management

1. Return (%) = $\frac{(\text{Price}_{end} - \text{Price}_{beg}) + \text{Income}}{\text{Price}_{beg}}$
2. Avg. Return = $\frac{\text{Return}_1 + \text{Return}_2 + \dots + \text{Return}_n}{n}$
3. Expected Return = $R_1 \times p_1 + R_2 \times p_2 + \dots + R_n \times p_n$
4. Standard Deviation (σ) = $\sqrt{\frac{\Sigma (YR - AR)^2}{n}}$
   $= \sqrt{\Sigma Prob \times (YR - ER)^2}$
5. Variance = σ^2
6. Co-efficient of variation (C.V.) = $\frac{\sigma}{\text{Avg. Return / Expected return}}$
7. Return of portfolio = $AR_A \times W_A + AR_B \times W_B + \dots$
   $= ER_A \times W_A + ER_B \times W_B + \dots$
8. $\sigma_{A+B} = \sqrt{\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2 + 2 \sigma_A \sigma_B W_A W_B \rho_{A,B}}$
9. ρ_{A+B} (Co-efficient of correlation) = $\frac{\text{Covariance } (A,B)}{\sigma_A \times \sigma_B}$
10. Co-variance (Past data) = $\frac{\Sigma (d_A \times d_B)}{n}$; $d_A = (YR_A - AR_A)$, $d_B = (YR_B - AR_B)$
    (Expected) = $\Sigma (Prob. \times d_A \times d_B)$.
11. Risk Reduction : $\sigma_{A+B} <$ weighted Avg. σ
12. ρ lies b/w -1 & $+1$ → max. risk; -1 → min. risk
13. When $\rho = +1$: $\sigma_{A+B} = \sigma_A W_A + \sigma_B W_B$
14. When $\rho = -1$: $\sigma_{A+B} = \sigma_A W_A - \sigma_B W_B$
15. When $\rho = 0$: $\sigma_{A+B} = \sqrt{\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2}$
16. $\sigma_{A+B+C} =$
    $\sqrt{\sigma_A^2 W_A^2 + \sigma_B^2 W_B^2 + \sigma_C^2 W_C^2 + 2 \sigma_A \sigma_B W_A W_B \rho_{A,B} + 2 \sigma_B \sigma_C W_B W_C \rho_{B,C} + 2 \sigma_C \sigma_A W_C W_A \rho_{C,A}}$
    $= \beta_A^2 \sigma_A^2 + \beta_B^2 \sigma_B^2 + \beta_C^2 \sigma_C^2$

17. $\sigma_{Risky+Rf} = \sigma_{Risky} \times w_{Risky}$ $[\sigma_{Rf} = 0]$

18. Invest more than 100% in market; additional amt is borrowed at Rf Rate: $R_p = R_m \times (1+w) - R_f \times w$

$Risk_p = \sigma_m \times (1+w)$

19. CAPM: Return = $R_f + \frac{\text{Beta security}}{\text{Beta market} \to 1} (R_m - R_f)$

$= R_f + \underbrace{\beta(R_m - R_f)}_{\text{Risk Premium}}$

20. Security Risk Premium = Beta security $(R_m - R_f)$

21. $R_m = \frac{(\text{Total } P_1 - \text{Total } P_0) + \text{Total Dividend}}{\text{Total } P_0}$

22. CAPM Return > AR — overvalued — Sell

" < AR — Undervalued — buy

" = AR — Correctly valued — Hold

23. Calculation of Beta:

① % chg formula = $\frac{\Delta \text{ security return}}{\Delta \text{ market return}}$

② Co-variance = $\frac{Cov(s,m)}{Var\,m.}$

③ Regression = $\frac{\Sigma XY - n\bar{X}\bar{Y}}{\Sigma X^2 - n(\bar{X})^2}$ X = mkt return, y = security return

④ correlation = $\frac{Cov(s,m)}{\sigma^2 m} = \frac{\rho_{s,m} \times \sigma_s \times \sigma_m}{\sigma_m^2}$

$Beta_s = \rho_{s,m} \times \frac{\sigma_s}{\sigma_m}$

24. Beta of portfolio = weighted avg beta

25. $Cov(A,A) = \frac{\Sigma d A^2}{n} = \sigma^2_A$

26. Beta (when prob. is given) = $\frac{Cov(s,m) \to \Sigma (\text{Prob} \times d_s \times d_m)}{\sigma_m^2 \to \Sigma (\text{prob} \times d_m^2)}$

27. Portfolio return = Rm × Beta of Portfolio
28. Rf Rate : Coupon amt / Investment amt × 100
29. Sharpe's Ratio : $\frac{R_p - R_f}{\sigma_p}$
30. Treynor's Ratio : $\frac{R_p - R_f}{B_p}$
31. Jensen's measure : Actual Return - CAPM Return
32. Security Market line : CAPM Return = $R_f + Beta_s \times (R_m - R_f)$
33. Capital Market line : CML Return = $R_f + \frac{\sigma_s}{\sigma_m} (R_m - R_f)$
34. Characteristic line : $\bar{R_s} = a + Beta \times \bar{Rm}$ a = Intercept
35. Slope of SML : $\frac{Rm - R_f}{Bm}$ [Treynor]
36. Slope of CML : $\frac{Rm - R_f}{\sigma_m}$ [
37. Slope of CL = B_s
38. More than 1 Rf Rate : Take average
39. Arbitrage Pricing Theory (APT) : R_f + (Beta × Risk Premium) of each factor
40. Beta in case of merger : $Beta_{A+B} = B_A W_A + B_B W_B$
41. Optimum weights : $W_A = \frac{\sigma_B^2 - r_{A,B} \times \sigma_A \times \sigma_B}{\sigma_A^2 + \sigma_B^2 - 2 r_{A,B} \times \sigma_A \times \sigma_B}$

$= \frac{\sigma_B^2 - COV(A,B)}{\sigma_A^2 + \sigma_B^2 - 2COV(A,B)}$

If $\mu = -1$, $W_A = \frac{\sigma_B}{\sigma_A + \sigma_B}$

42. $Beta_s = \frac{CAPM\ Return - R_f}{Rm - R_f}$
43. $COV(A,B) = Beta_A \times Beta_B \times \sigma_m^2 = \mu_{A,B} \times \sigma_A \times \sigma_B$
44. Systematic Risk (%) : Security : $Beta_s^2 \times \sigma_m^2$ ✓
Portfolio : $Beta_p^2 \times \sigma_m^2$

45. Unsystematic Risk: Total Risk − Systematic Risk.
$= USR_A^2 W_A^2 + USR_B^2 W_B^2$

46. Systematic Risk: $\rho_{s,m}^2 \times \sigma_s^2$
Unsystematic Risk: $(1 - \rho_{s,m}^2) \times \sigma_s^2$

$\rho_{s,m}^2 = \frac{\text{Explained variance}}{\text{Total variance}}$

47. Degree of elimination of USR:
Complete elimination — Partial elimination

48. Tracking error $= \sqrt{\frac{\Sigma (R_p - R_B)^2}{n-1}}$

49. σ of Portfolio $= \beta_p^2 \sigma_p^2 + \beta_A^2 \sigma_A^2 + \beta_B^2 \sigma_B^2 + \beta_C^2 \sigma_C^2$

50. Equation of critical line:-
$W_B = a + bW_A$
a → Slope, b → intercept

51. Optimum Portfolio:-

Step 1: Ranking of stocks on the basis of Excess Return To Beta Ratio. (Treynor Ratio)

Step 2: Calculate optimal cut-off. C^*
C^* is calculated by Trial & error method. It is the highest cut-off of stock. $[C_i]$

$$C_i = \frac{\sigma_m^2 \times \Sigma \left(\frac{R_s - R_f}{USR^2 \text{ variance}}\right)\beta}{1 + \sigma_m^2 \times \Sigma \frac{\beta^2}{USR^2 \text{ variance}}}$$

These stocks are selected whose Treynor's Ratio is higher than C^*.

Step 3: Calculate weights.

$$W_i = \frac{Z_i}{\Sigma Z} \; ; \; Z_i = \frac{\beta}{\sigma^2} \times \left[\frac{R_s - R_f}{\sigma} \times C^*\right]$$

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Derivatives : Futures

1. Calculation of AV when interest is compounded :-

Annually = $FV = PV\left(1+\frac{r}{1}\right)^{m}$

Half-Yearly = $FV = PV\left(1+\frac{r}{2}\right)^{m}$

Quarterly = $FV = PV\left(1+\frac{r}{4}\right)^{m}$

Monthly = $FV = PV\left(1+\frac{r}{12}\right)^{m}$

Daily = $FV = \left(1+\frac{r}{365}\right)^{m}$

Continuously = $FV = PV\left(1+\frac{r}{\infty}\right)^{\infty} = PV \times e^{rt}$

$PV = FV \times e^{-rt}$

m = no. of times compounding is done

t = time period in years

r = ROI p.a.

$e^{0} = 1$

2. Fair Future Price (No Dividend) = $CMP \times e^{rt}$
3. FFP (Dividend) = $(CMP - PV \text{ of Dividend}) \times e^{rt}$.
4. FFP (Income in %) = $CMP \times e^{(r-y)\times t}$ y = Dividend yield %
5. FFP (Storage cost) = $(CMP + PV \text{ of } SC) \times e^{rt}$
6. FFP (SC in %) = $CMP \times e^{(c+s)\times t}$
7. FFP (Convinience yield in %) = $CMP \times e^{(r-c)t}$
8. FFP (convenience yield) = $(CMP - CY) \times e^{rt}$
9. Arbitrage → Actual Future Price ≠ Fair Future Price
   AFP > FFP Overvalued → sell
   AFP < FFP Undervalued → Buy
10. If AFP > FFP : Sell in FM & Buy in Cash market (Borrow)
    Physical settlement / Net settlement
11. On expiry ⇒ Future Price = Cash Price

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12. If AFP < FFP : Buy in Fm & sell in cm (Invest)

13. Cost of carry = Future Price − Cash Price
= (Interest cost + storage cost + Insurance + other cost)
− (Dividend + convenience yield + other return)

14. More than one Div yield: Average

15. Complete Hedging : Value of Index Position = Current value of Portfolio × Existing Beta
= CV × EB

16. Partial Hedging : Value of Index Position = CV × EB × % rqd. to be hedged.

17. Risk
- Increase → CV × (DB − EB)
- Decrease → CV × (EB − DB)

18. No. of contracts = Total value of Index position / Value of 1 Index contract

19. Risk Free Rate = Arbitrage Profit / Initial Investment × 100

20. No. of future contracts = CV × (EB − DB) / Value of 1 contract

21. Revised Portfolio Beta = Change in portfolio return / Change in market return

22. Return (%) = NP in future Contract / Total Initial Investment × 100.

NP = GP − Brokerage − opportunity loss of dividend

23. Risk
- Increase → Borrow from R_f & invest in risky
- Decrease → Invest in R_f security

24. Hedge Ratio = $H_{s,f} \times \frac{\sigma_s}{\sigma_f}$

25. Initial margin = Daily Absolute change + $3 \times \sigma$

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Derivatives : Options

1. Option Premium = Paid by buyer to seller for purchasing the right.
2. Call Buyer will exercise : CMP as on expiry > Strike Price
   NP = CMP as on expiry − Strike Price − option Premium
   If not exercised : Net loss = OP paid
   Break even Price ⇒ CMP = EP + OP ⇒ P&L = 0
3. Put Buyer will exercise : CMP as on expiry < Exercise Price
   NP = EP − CMP − OP
   If not exercised : Loss = OP paid
   Break even price : CMP = EP − OP.
4. Max. Profit / Loss → Call :-

	Call Buyer	Call Seller
max. Profit	Unlimited	OP received
max. Loss	OP paid	Unlimited

5. max. Profit / Loss → Put :-

	Put Buyer	Put seller
Max. Profit	EP − OP	OP received
max. Loss	OP paid	EP − OP

6. Position to be Taken :-

	Call	Put
Price ↑	Buyer	seller
Price ↓	seller	Buyer

7. Calculation of Fair OP :-
   For call : Max. of [CMP − EP, 0] (on expiry)
   For Put : Max. of [EP − CMP, 0] (on expiry)

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Call (as on today) : CMP (today) − PV of EP
Put (as on today) : EP × e^{-rt} − CMP (today)

8. Risk Neutral Approach : Fair OP of call as on today
= [Fair OP of call as on expiry at high price × p ⊕ Fair OP of call as on expiry at low price × (1−p)] × e^{-rt}

p = prob. of high price
1−p = prob. of low price.

9. Calculation of p : $\frac{CMP(1+r) - S_2}{S_1 - S_2}$ or $\frac{(1+u) - d}{u - d}$
(NC)

In case of cc : $\frac{CMP\ e^{rt} - S_2}{S_1 - S_2}$ or $\frac{e^{rt} - d}{u - d}$

S_1 = high price d = 1 − % decrease in price r = ROI
S_2 = low price u = 1 + % increase in price

10. Risk Neutral Approach : Fair OP (Put) as on today
= [Fair OP of put on expiry at high price × p + Fair OP of put as on expiry at low price × (1−p)] × e^{-rt}

11. option strategy : Straddle

Long → Buy call & Buy put
Short → sell call & sell put

12. Hedge Technique : Call : OP as on today = (Δ × CMP) − Borrowing
13. $\Delta = \frac{C_1 - C_2}{S_1 - S_2}$

C_1 = Fair OP (expiry) at high price
C_2 = " " " low "
S_1 High price
S_2 low "

14. Borrowing = $\frac{1}{(1+r)}[\Delta \times S_1 - C_1]$ or $\frac{1}{(1+r)}[\Delta \times S_2 - C_2]$

15. Perfect Hedging : ① Buy shares at CMP today → Δ
② Sell one call option & receive OP.
③ Borrow net regd. Amt = $[\Delta \times CMP - OP]$

16. Value of holding / Cash flow position : At S_1 = $\Delta \times S_1 - C_1$
At S_2 = $\Delta \times S_2 - C_2$

17. Black & Scholes model :- (for call)
OP of call (today) = $CMP \times N(d_1) - EP \times e^{-rt} \times N(d_2)$

18. $d_1 = \dfrac{\ln\left[\frac{CMP}{EP}\right] + \left[r \times .50 \times \sigma^2\right] \times t}{\sigma \times \sqrt{t}}$

$d_2 = d_1 - \sigma \times \sqrt{t}$

19. BSM model (Put) : OP of Put (today) = $EP \times e^{-rt} \times [1 - N(d_2)] - CMP \times [1 - N(d_1)]$

20. Component of OP : For call :-
Intrinsic Value = Max. of $[CMP - EP, 0]$
Time Value = OP − IV

For Put : IV = Max. of $[EP - CMP, 0]$
TV = OP − IV

21. Rate of Return = $\dfrac{\text{OP at expiry} - \text{OP paid as on today}}{\text{OP paid as on today}} \times 100$

22. PCPT (Put Call Parity Theory) : $EP \times e^{-rt}$ + OP of call as on today = CMP as on today + OP of Put as on today

23. Delta of put option = $\dfrac{C_1 - C_2}{S_1 - S_2}$

24. P&L on PCPT : LHS > RHS ⇒ EP − Amt paid on borrowing
LHS < RHS ⇒ Amt rcd − EP.