CMA Final

SFM

Formula Sheet

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Strategic Financial Management (SFM)

FORMULA SHEET

CAPITAL BUDGETING

1. **Net Present Value (NPV):**

   a. NPV = PV of Annual Cfs + PV of Terminal Cfs − Initial Investments.

   b. If NPV > 0 : Accept
      NPV < 0 : Reject

2. **Non-discounted CF Methods:**

   a. ARR (Average) = $\frac{\text{Avg. PAT}}{\text{Avg Invt}} \times 100$.

   b. Payback Period

   c. Payback Reciprocal = $\frac{\text{Annual cfs}}{\text{Initial Invt}} \times 100$.

   d. Payback Profitability = Inflows − Outflows.

3. **Discounted CF Methods:**

   a. Discounted payback period.

   b. NPV Method.

   c. Profitability Index = $\frac{\text{PV of Cashinflows}}{\text{Outflows}}$

      = $1 + \frac{\text{NPV}}{\text{Initial Invt}}$

   d. IRR

   e. Adjusted NPV

   f. MIRR

   g. MNPV

4. **Adjusted NPV:**

Step 1: Calculate Base Case NPV.
[use cost of equity (Ke) as disc. rate].

Step 2: Calculate PV of Interest Tax shield
[Debt x IntRate x Tax Rate x PVIFA(Kd, n)]

Step 3: Calculate PV of floatation cost of equity

Step 4: Step 1 + Step 2 − Step 3.

5. **Modified IRR & NPV:**

a. $MIRR = \left(\frac{\text{FV of Cash inflows}}{\text{Initial Invt}}\right)^{1/n} - 1.$

b. **MNPV**

Step 1: Calculate fv of cashinflows using the reinvestment rate.

Step 2: Calculate PV of Step 1 using the cost of capital (Ko).

Step 3: MNPV = Step 2 − Initial Investment.

6. **Life disparity:**

Compute EACF (NPV ÷ PVIFA).
for maximisation, pick project with highest EACF.
for minimisation, pick project with lowest EACF.

7. **Abandonment Option:**

Step 1: Calculate NPV assuming full life of the project under favourable & unfavourable circumstance.

Step 2: Calculate NPV assuming exercising of abandonment under unfavourable situation

and continuation under favourable situation.

Step 3: Value of abondoment option = Step 2 - Step 1.

8. Impact of Inflation in Capital Budgeting:

Approach 1: Real CF x (1 + Inf Rate) = Nominal CF.

↳ Discount using nominal disc rate.

Approach 2: Real disc rate = $\left(\frac{1 + \text{Nominal}}{1 + \text{Inflation}}\right) - 1$

↳ Disc real cfs with real disc rate.

9. Replacement Decision:

Step 1: Incremental Initial Outlay

Inc I/o = Cost of new machine + Δ W/cap. − [Salvage of old machine − Tax payable on sale of old machine]

Step 2: Incremental Annual cf:

Inc. ACF = Δ PAT + Δ Dep.

Step 3: Incremental Terminal cf:

Inc TCF = (Salvage of new machine − Tax on sale of new machine) − Salvage of old machine + Δ W/Capital

Step 4: NPV

If NPV > 0 : Replace.

NPV < 0 : Don't Replace.

RISKY PROPOSALS

1. **Certainty - Equivalent Approach:**

   Step 1: Convert uncertain cfs → Certain Cfs.

   Certain Cf = Uncertain Cf × C.E. Coefficient.

   Step 2: Discount certain cfs using Rf rate.

2. **Risk Adjusted Discount Rate (RADR):**

   Step 1: Calculate RADR

   RADR = Rf + Risk premium.

   Step 2: Calculate PV of uncertain cfs using RADR.

3. **Expected Value & Standard Deviation:**

   a. Expected value = $\Sigma Cf_i \times P_i$

   b. Standard deviation = $\sqrt{\Sigma P_i (x_i - \bar{x})^2}$

4. **Hillers Rule:**

$$S.D. = \sqrt{\frac{Var_1}{(1+r)^2} + \frac{Var_2}{(1+r)^4} + \frac{Var_3}{(1+r)^6} + \cdots \frac{Var_n}{(1+r)^n}}$$

5. **Application of Probability Distribution:**

   Step 1: Calculate $z = \frac{x - \mu}{\sigma}$

   Step 2: Calculate probabilities using the z-table.

   Note: Practice atleast 1 question here.

6. **Other techniques:**

   a. Decision tree analysis
   b. Sensitivity analysis
   c. Scenario analysis
   d. BSM application [III #12; Page 91]
   e. Simulation analysis.

LEASING DECISIONS

1. **Lease vs. Buy Option:**

   a. PV of Buying option
      = PV of instalments − PV of ITS − PV of DTS
        − PV of residual value.

   b. PV of leasing option
      = PV of Lease rentals

   c. Breakeven lease rental can be calculated by equating (a) & (b).

2. **Discount Rate ?**

   Disc rate = Interest rate (1-t) or K_D (if given).

1. Convertible Preference Shares

a. Conversion ratio = No. of shares per preference share.

b. Conversion price = $\frac{\text{Face value of Preference sh.}}{\text{Conversion ratio}}$.

c. Conversion value = Conversion ratio × CMP of Eq. Shares

d. Straight value of preferred stock = $\frac{\text{Dividend}}{\text{KP}}$.

e. Conversion premium = MKt price of convertible pref. share − Conversion price or Straight value per share [HIGHER OF ABOVE]

Conversion premium % = $\frac{\text{Conversion premium}}{\text{Conv. price or Straight value (higher of above)}} \times 100$

2. Convertible Bonds:

a. Conversion ratio = No. of shares per bond.

b. Conversion price = $\frac{\text{face value of the bond}}{\text{Conversion ratio}}$.

c. Conversion value = Conversion ratio × CMP of Equity share

d. Straight Value = IV_0 at prevailing market yield.

e. % of downside risk

$$= \frac{\text{Current price of Conv. Bond} - \text{Straight Value of the bond}}{\text{Straight Value of the bond}} \times 100$$

f. Conversion premium

$$= \frac{\text{Current price of Conv. Bond}}{\text{Conversion ratio}} - \text{CMP of Equity shares}$$

g. Conversion premium (%) = $\frac{\text{Conv. premium}}{\text{CMP of Eq. Share}} \times 100$.

h. Conversion parity price of the stock (Market Conv. price) = $\frac{\text{Current price of Conv. Bond}}{\text{Conversion ratio}}$

i. Income differential per share = $\frac{\text{Coupon per bond}}{\text{conversion ratio}} - \text{DPS}$

j. Premium payback period = $\frac{\text{Income differential p.s.}}{\text{Dividend per share}}$.

3. Rights Shares:

a. Ex-Right price per share = $\frac{NP_0 + SR}{N+R}$

Here, N = Existing no. of shares.
P_0 = Market price per share (cum rights).
S = Rights price.
R = No. of rights offered.

b. Value of Rights Alone = $\frac{\text{Ex-Right Price per share} - \text{Rights sub. Price}}{\text{No. of Rights offered}}$

c. **Shareholders' Wealth:**

(i) Before rights : NP_0

(ii) After rights : (No. of shares x Ex-Right per share) + (Rights offered x Value of rights).

4. Value of Equity shares:

a. $P_0 = \frac{D_1}{(1+ke)^1} + \frac{D_2}{(1+ke)^2} + \dots + \frac{D_n + P_n}{(1+ke)^n}$

Here, $P_n = \frac{D_{n+1}}{ke-g}$

b. P_0 = E_0 x P/E Ratio.

5. Value of Bonds:

IV_0 = Coupon x PVIFA(YTM, n) + $\frac{\text{Face Value}}{(1+YTM)^n}$.

MUTUAL FUNDS

1. **Net Asset Value (NAV):**

a. NAV = MV of Investments + Accrued Income + Other Assets − Other Liabs − Accrued Exp.

b. NAV per unit = $\frac{\text{Net Assets Value}}{\text{No. of units outstanding}}$.

c. Ending NAV
= Beginning NAV + Δ Value of Securities Held + P/L on sale of securities + Receipt of dividend + Receipt of Interest − Scheme recurring exp. − Service tax on recurring exp.

2. **Expense Ratio:**

Expense ratio = $\frac{\text{Expense p.u.}}{\text{Avg. Net Assets}}$

3. **Performance Measures:**

a. Sharpe Ratio = $\frac{R_p - R_f}{\sigma_p}$.

b. Treynor Ratio = $\frac{R_p - R_f}{\beta_p}$.

c. Jensen's Alpha = $R_p - E(R)$

Here, $E(R) = R_f + (R_m - R_f)\beta$.

4. Return Calculations:

a. Return $= \dfrac{NAV_1 - NAV_0 + CG \& Div\ Distn}{NAV_0} \times 100.$

b. Annualized Return $= \dfrac{\text{Ending Value} - \text{Beginning Value}}{\text{Beginning value}} \times 100 \times \dfrac{12}{n}.$

c. MWROR / IRR / CAGR $= \left(\dfrac{\text{Ending Value}}{\text{Beginning value}}\right)^{1/n} - 1.$

5. FAMA Net Selectivity:

Step 1: Calculate desired risk premium
$= (Rm - Rf) \times \dfrac{\sigma p}{\sigma m}.$

Step 2: Calculate actual risk premium
$= Rp - Rf.$

Step 3: Calculate net gain
= Actual risk prem − Desired risk prem.

Step 4: Total Gain = Jensen's Alpha.

Step 5: Systematic risk = $\sigma p \times \beta p$.

Step 6: Unsystematic risk = σp − Systematic risk.

PORTFOLIO MANAGEMENT

1. Portfolio Return & Risk:

a. Expected Return on the portfolio : $E(R_p) = \sum W_i R_i$

ie $E(R_p) = W_A R_A + W_B R_B$ (for two asset portfolio).

b. Variance $(\sigma_p^2) = (W_A \times \sigma_A)^2 + (W_B \times \sigma_B)^2 + 2 W_A W_B Cov_{AB}$

Here, $Cov_{AB} = Corr_{AB} \times \sigma_A \times \sigma_B$.

c. $\sigma_p^2 = (W_A \sigma_A)^2 + (W_B \sigma_B)^2 + (W_C \sigma_C)^2 + 2 W_A W_B Cov_{AB} + 2 W_B W_C Cov_{BC} + 2 W_A W_C Cov_{AC}$.

d. $\sigma_p = \sqrt{\sigma_p^2}$ ie Standard dev = $\sqrt{\text{variance}}$.

e. $Beta_A = \frac{Covariance_{A,M}}{Variance_M} = r_{AM} \times \frac{\sigma_A}{\sigma_m}$.

2. Systematic & Unsystematic Risk:

a. Systematic risk = $\beta^2 \sigma_m^2$

b. Unsystematic risk = σ_p^2 − Unsystematic risk.

= $\sum W_i^2 \sigma_{ei}^2$

3. Covariance:

a. $Cov_{AB} = \sum P_i (A_i - \bar{A})(B_i - \bar{B})$

b. $Cov_{AB} = Corr_{AB} \times \sigma_A \times \sigma_B$.

c. $Cov_{AB} = \beta_A \times \beta_B \times \sigma_m^2$.

4. Coefficient of variance (CV):

$CV = \frac{SD}{mean}$

5. **Minimum Variance Portfolio:**

$$W_A = \frac{\sigma_B^2 - Cov_{AB}}{\sigma_A^2 + \sigma_B^2 - 2Cov_{AB}} \quad ; \quad W_B = 1 - W_A.$$

6. **TWROR & MWROR:**

a. TWROR = Geometric mean.

$$= [(1+R_1)(1+R_2)\dots(1+R_n)]^{1/n} - 1.$$

b. MWROR = IRR.

7. **Sharpe Index Model:**

$$\sigma_p^2 = (\beta_p \sigma_m)^2 + \Sigma W_i^2 \sigma_{ei}^2$$

↓ explained variance (systematic)

↓ Unexplained variance (unsystematic)

8. **Market Model:**

$$E(R) = R_f + (\lambda \times \sigma_p)$$

Here, $\lambda = \frac{R_m - R_f}{\sigma_m}$.

} Equation of CML

9. **Characteristic Line:**

Step 1: Calculate β: $\beta = \frac{Cov_{AM}}{\sigma_m^2}$

Step 2: Calculate 'α':

$$\alpha = \bar{R}_p - \beta \bar{R}_m$$

Step 3: $R_{pi} = \alpha + \beta R_{mi}$

10. Portfolio Performance Attribution Analysis:

(a) Asset allocation = $\Delta W_i R_{Bi}$

(b) Security selection = $\Delta R_i W_{pi}$

11. Risk Penalty & Utility:

a. Risk penalty = $(\text{Risk})^2 \div$ Risk tolerance.

b. Utility = ER_p - Risky penalty.

12. Arbitrage Pricing Theory (APT):

$$R_e = R_f + \beta_1 \lambda_1 + \beta_2 \lambda_2 + \beta_3 \lambda_3$$

Here, λ_i = Risk premium.

DERIVATIVES

1. Pricing of forward / futures Contract:

(a) $F = S_0 \times e^{rt}$

Here, S_0 = Spot price
r = Risk free rate
t = No. of years = $n/12$.

(b) Arbitrage Process:

→ If F > Theoretical Price : Short futures
Borrow + Long Spot.

→ If F < Theoretical Price : Long futures
Short Spot + Invest in Rf

(c) $F = (S_0 - PVD) \times e^{rt}$

Here, PVD = Present value of dividend.

(d) $F = S_0 \times e^{(r-\theta)t}$

Here, θ = Continuous dividend rate.

(e) $F = (S_0 - PV \text{ of Conv. Yield} + PV \text{ of Storage}) \times e^{rt}$

(f) $F = S_0 \times e^{(r-\theta+c)t}$

Here, c = Convenience yield (Cont. rate).

How to calculate e^x ?

Step 1: Type 'x'.
Step 2: Divide by 4095.
Step 3: Add "1" & press "=".
Step 4: Press "x" + "=", 12 times.

2. Valuation of forward / futures Contract:

(a) $V_0 = S_0 - \frac{f_0(T)}{e^{rT}} = 0$ (always)

(b) $V_t = S_t - \frac{f_0(T)}{e^{r(T-t)}}$

(c) $V_T = S_T - f_0(T)$

3. Risk management using futures Contracts:

$$\text{No. of Contracts to LONG/(SHORT)} = \frac{V_p \times (\beta_T - \beta_P)}{F \times \text{Lot Size}}$$

4. Payoff & Profit on Options:

Position	Payoff	Profit	Breakeven
Long Call	$\max(0, S_T - X)$	Payoff $- C_0$	$X + C_0$
Long Put	$\max(0, X - S_T)$	Payoff $- P_0$	$X - P_0$
Short Call	$-\max(0, S_T - X)$	C_0 - Payoff	$X + C_0$
Short Put	$-\max(0, X - S_T)$	P_0 - Payoff	$X - P_0$

5. Moneyness of Options:

Condition	Moneyness (Call)	Moneyness (Put)
$S_T > X$	IN	OUT
$S_T = X$	AT	AT
$S_T < X$	OUT	IN

6. Value of Call options:

Min Value $= \max\left[0, S_t - \frac{X}{e^{r(T-t)}}\right]$

Max Value $= S_t$

7. **Value of Put Options:**

Min Value = $\max\left[0, \frac{X}{e^{r(T-t)}} - S_t\right]$

Max Value = $\frac{X}{e^{r(T-t)}}$

8. **Put-Call Parity:**

$P_0 + S_0 = C_0 + \frac{X}{e^{rT}}$

(Protective Put) (Fiduciary Call)

9. **Binomial Model:**

a. Prob. of upside = $\frac{e^{rT} - d}{u - d}$

Here, $u = \frac{S_1^u}{S_0}$; $d = \frac{S_1^d}{S_0}$

b. Prob. of downside = 1 − Prob. of upside.

c. $C_0 = \frac{[\max(0, S_1^u - X) \times P(u)] + [\max(0, S_1^d - X) \times P(d)]}{e^{rT}}$

d. $P_0 = \frac{[\max(0, X - S_1^u) \times P(u)] + [\max(0, X - S_1^d) \times P(d)]}{e^{rT}}$

10. **Delta Hedging Method:**

Call Option	Put Option
$h = \frac{C_1^u - C_1^d}{S_1^u - S_1^d}$	$h = \frac{P_1^u - P_1^d}{S_1^u - S_1^d}$
$C_0 = h\left[S_0 - \frac{S_1^d}{e^{rT}}\right]$	$P_0 = h\left[S_0 - \frac{S_1^u}{e^{rT}}\right]$

11. Black - Scholes Model:

Call Option

Step 1: Calculate d_1 and d_2.

$$d_1 = \frac{\ln(S/X) + \left[r + \frac{\sigma^2}{2}\right]T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln(S/X) + \left[r - \frac{\sigma^2}{2}\right]T}{\sigma\sqrt{T}}$$

How to calculate $\ln(x)$?

Step 1: Type 'x'.
Step 2: Press '$\sqrt{}$', 12 times.
Step 3: Deduct 1
Step 4: Multiply by 4095

Step 2: Calculate $N(d_1)$ & $N(d_2)$ using z - table.

Step 3: $C = S * N(d_1) - \frac{X}{e^{rT}} * N(d_2)$

Put option

Step 1: Calculate 'd_1' & 'd_2'
Step 2: Find $N(-d_1)$ & $N(-d_2)$.
Step 3: $P = \frac{X}{e^{rT}} * N(-d_2) - S * N(-d_1)$.

12. Forward Rate Agreement (FRA):

(a) Pricing the m x n FRA

$$\text{forward rate} = \left[\frac{1 + (r_n \times n/12)}{1 + (r_m \times m/12)} - 1\right] \times \frac{100}{n-m}$$

(b) Payoff on long FRA

$$= \frac{\text{Notional Principal} \times \left(\text{Ref. rate} - \text{FRA rate}\right) \times (n-m)/12}{1 + [\text{Ref Rate} \times (n-m)/12]}$$

(c) Payoff on short FRA

$$= \frac{\text{Notional Principal} \times \left(\text{FRA rate} - \text{Ref rate}\right) \times (n-m)/12}{1 + [\text{Ref Rate} \times (n-m)/12]}$$

13. Cap & Floor:

Cap

(a) Payoff = $\max [0, (\text{Ref} - X) * NP \times n/12]$

(b) P/L = Payoff - Premium [Long Cap]

= Premium - Payoff [Short Cap].

Floor

(a) Payoff = $\max [0, (X - \text{Ref}) * NP \times n/12]$

(b) P/L = Payoff - Premium (Long Put)

= Premium - Payoff (Short Put).

FOREX

1. Basic Concepts:

a. Direct quote = ₹/$ = $\frac{\text{Domestic currency}}{\text{foreign currency}}$

b. Indirect quote = $/₹

c. Bid-ask quotes:

Bid = Selling price of base currency.
Ask = Buying price of base currency.

Note: Ask ≥ Bid.

2. Cross Rates:

(a) A/B & B/C → A/C $A/C = A/B \times B/C$

(b) A/B & C/B → A/C $A/C = A/B \div C/B = A/B \times B/C$

(c) B/A & B/C → A/C $A/C = B/C \div B/A = B/C \times A/B$

(d) B/A & C/B → A/C $A/C = \frac{1}{C/A} = \frac{1}{C/B \times B/A}$

(e) A/B, B/C, C/D → A/D $A/D = A/B \times B/C \times C/D$.

(f) A/B, C/B, C/D → A/D $A/D = A/B \div C/B \times C/D$

(g) A/B, C/B, D/C → A/D $A/D = A/B \div C/B \div D/C$

Note: Apply diagonal rule when '÷' operation is required in case of bid-ask quotes.

3. **Arbitrage Process:**

(a) If, Quoted rate > Cross rate
↓
Sell to dealer + Buy from bank route.

(b) If, Quoted rate < Cross rate
↓
Buy from dealer + Sell from bank route.

4. **Forward Rates:**

(a) Swap points: Add if spread will widen.
Deduct if spread will narrow.

(b) **Interest Rate Parity**

$$If\ f(₹/\$) = S(₹/\$) \times \left[\frac{1+r(₹)}{1+r(\$)}\right]$$

Here, r = nominal rate of interest.

(c) **forward premium/discount**

→ always calculated for the base currency.

If $F > S$: Premium.
$F < S$: Discount.

→ forward prem/disc $= \frac{f-S}{S} \times 100 \times \frac{12}{n}$.

→ In case of bid/ask, calculate avg. quote and then calculate premium/discount.

→ forward prem. of one currency ≠ forward disc of the other currency.

(d) **Arbitrage Process:**

If, Dealer's quote > Theoretical forward rate
↳ Sell $ @ Dealer's quote + Borrow ₹ @ Rf
+ Buy $ immediately @ spot + Invest $ @ Rf

5. Purchasing Power Parity (PPP):

(a) $F = E(S_T)$

(b) $E(S_T) = S \times \frac{1 + Inf(₹)}{1 + Inf(\$)}$

6. Hedging foreign currency exposure:

a. Forward hedging
b. Money market hedging.
c. Currency options hedging.