CAIIB Exam

Most Important Formulas of ABFM

- **CHAPTER 8 (FINANCIAL AND OPERATING LEVERAGES):**

Key Point:

- ❖ EARNING BEFORE INTEREST & TAX [EBIT]
- ❖ EARNING BEFORE TAX [EBT]
- ❖ EARNING AFTER TAX [EAT]
- ❖ EARNING PER SHARE [EPS]

Formula:

- ➢ EARNING PER SHARE [EPS] = $\frac{\text{EAT}}{\text{No of Equity Shares}}$

- ➢ Degree of Operating Leverage (DOL) = $\frac{\%\text{ change in EBIT}}{\%\text{ change in Sales}}$

- ➢ Impact of Fixed Cost:

$$\text{DOL} = \frac{\text{Contribution}}{\text{EBIT}}$$

- ➢ Degree of Financial Leverage (DFL) = $\frac{\%\text{ change in EPS}}{\%\text{change in EBIT}}$

- **Impact of Interest Cost:**

$$DFL = \frac{EBIT}{EBT}$$

- **Degree of Combined Leverage (DCL)**

OR

Degree of Total Leverage (DTL)

$$\text{Degree of Combined Leverage (DCL)} = \frac{\%\ \text{change in EPS}}{\%\text{change in Sal}}$$

- **Impact of Interest Cost and Fixed Cost:**

$$DCL = \frac{\text{Contribution}}{EBT}$$

- **Break-Even Formula:**

$$\text{Break- Even Point} = \frac{\text{Fixed Cost}}{\text{Contribution per Unit}}$$

- **CHAPTER 9 (CAPITAL INVESTMENT DECISIONS):**

PAY BACK PERIOD FORMULA:

- **Pay Back Period** $= \frac{\text{Initial Investment}}{\text{Annual Cash Inflow}}$

Key Point:

- **Cash Inflow After Tax (CFAT)**

➢ **PRESENT VALUE FORMULA:**

$$F = P * (1 + r)^n$$

➢ **PVF OR PVIF FORMULA:**

$$\text{PVF OR PVIF} = \frac{1}{(1+r)^n}$$

Key Point:

if NPV ≥ 0 :- Accept the Proposal

if NPV ≤ 0 :- Reject the Proposal

➢ **NPV FORMULA:**

Net Present Value (NPV) =

Present value of net cash inflow - Total net initial investment.

- **Accounting Rate of Return (ARR) FORMULA:**

$$\text{ARR} = \frac{\text{Average Annual Net Earning after Taxes}}{\text{Average Investment}} \times 100\%$$

$$\text{ARR} = \frac{\text{Average Profit}}{\text{Average Investment}} \times 100\%$$

$$\text{Average profit made yearly} = \frac{\text{Total Profit}}{\text{No.of Years}}$$

Where, Yearly Profit = Profit after Depreciation and Tax

$$\text{Average Investment} = \frac{\text{Initial Investment} - \text{Scrap}}{2} + \text{Scrap Value}$$

$$\text{Average Investment} = \frac{\text{Initial Investment} + \text{Scrap Value}}{2}$$

$$\text{Average Investment} = \frac{\text{Initial Investment} - \text{Salvage Value}}{2} + \text{Salvage Value}$$

Version 1 Annual Basis:

$$\text{ARR} = \frac{\text{Profit After Depreciation}}{\text{Investment in the beginning of the year}} \times 100\%$$

Version 2 Total Investment Basis:

$$\text{ARR} = \frac{\text{Average Annual Profit}}{\text{Investment in the beginning of the year}} \times 100\%$$

Version 3 Average Investment Basis:

$$\text{ARR} = \frac{\text{Average Annual Profit}}{\text{Average Investment}} \times 100\%$$

- **Depreciation Formula:**

  - Deprecation per year= $\frac{\text{Price of Machine} - \text{Salvage Value}}{\text{Life of Machine (Year)}}$

- **NPV FORMULA NET CASH FLOW:**

$$\text{NPV} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4} + \cdots - C_0$$

- **PROFITABILITY INDEX FORMULA:**

$$\text{Profitability Index (PI)} = \frac{\text{Sum of discounted cash inflow}}{\text{Initial cash outlay}}$$

$$= \frac{\text{PV of cash inflow}}{\text{Intial cash outlay}}$$

$$\text{Profitability Index (PI)} = \frac{\text{Sum of discounted cash inflow}}{\text{Total discounted cash outflow}}$$

$$= \frac{\text{PV of cash inflow}}{\text{Total discounted cash outflow}}$$

$$\text{NPV} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4} + \cdots - C_0$$

$$\text{PI} = \frac{\text{PV of all future cash inflow}}{\text{Initial cash outlay}}$$

$$= \frac{\frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4} + \cdots}{C_0}$$

- **INTERNAL RATE OF RETURN (IRR) FORMULA:**

$$\text{NPV} = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4} + \cdots - C_0$$

Now NPV = 0 So,

$$C_0 = \frac{C_1}{(1+r)^1} + \frac{C_2}{(1+r)^2} + \frac{C_3}{(1+r)^3} + \frac{C_4}{(1+r)^4}$$

Or,

$$\sum_{t=1}^{T} \frac{C_t}{(1+\text{IRR})^t} - C_0 = 0$$

Where:

C_t = **Net cash inflow during the period t.**

C_0 = **Total initial investment costs.**

IRR= The internal rate of return.

T= The number of time periods.

- **MODIFIED INTERNAL RATE OF RETURN(MIRR) FORMULA:**

➢ **TERNMINAL VALUE(TV):**

$$TV = FV_1 + FV_2 + FV_3$$

$$= PV_1(1 + r)^{n_1} + PV_2(1 + r)^{n_2} + PV_3(1 + r)^{n_3}$$

➢ **PRESENT VALUE OF COST (PVC) FORMULA:**

$$PVC = \frac{TV}{(1+MIRR)^n}$$

➢ **FACE VALUE AND PRESENT VALUE FORMULA:**

$$FV = PV * (1 + r)^n$$

$$PV = \frac{FV}{(1+r)^n}$$

- **CHAPTER 10 (CAPTIAL BUDGETING FOR INTERNATIONAL PROJECT INVESTMENT DECISIONS):**

➢ **CAPITAL ASSET PRICING MODEL (CAPM) FORMULA:**

Key Point:

COST OF EQUITY (Re) OR (Ke)

FORMULA:

COST OF EQUITY $(R_e) = R_f + \beta L \times (R_m - R_f)$

Where,

R_f = risk-free rate

βL = levered beta

R_m = expected return on the market

$R_m - R_f$ = Market Risk Premium(mrp)

➢ **RISK ADJUSTED DISCOUNT RATE FORMULA:**

$$(1 + r_a) = (1 + r_f) \times (1 + r_p)$$

Where,

r_a = is the risk-adjusted discount rate.

r_f = is the risk-free discount rate and

r_p = is the risk premium

- **SPOT RATE FORMULA:**

$$S_t = S_0 \times \left[\frac{(1+r_h)}{(1+r_f)}\right]^t$$

Where,

S_t = is the spot rate of US$ at time t

S_0 = is the spot rate today.

r_h = is the notional risk-free interest rate in India,

r_f = is the risk-free interest rate in Foreign Country

- **NPV FORMULA:**

NPV = PV – I

- **CHAPTER 12 (DECISION MAKING):**

- **Break-even Point (per month in units) =** $\frac{\text{Fixed Cost p.m.}}{\text{Contribution p.u.}}$

- **Profit per month=** {Monthly demand (units) ×Contribution per unit} – Fixed Cost per month

- **Break-even Point (per month in units) =**

$$\frac{(\text{Fixed Cost p.}m.+\text{number of setups} \times \text{cost per setu}p)}{\text{Contribution p.u.}}$$

- **Profit per month =** $\{\text{Monthly demand (units)} \times \text{Contribution per unit}\} - \text{Fixed Cost per month} + \text{setup cost per month}$

- **COST DRIVER FORMULA:**

- **Activity cost driver rate =** $\frac{\text{Total cost of activity}}{\text{Activity driver}}$

- **OVERHEAD RATE FORMULA:**

$$\frac{\text{Total cost in the activity pool}}{\text{Base}}$$

- **CHAPTER 13 (CORPORATE VALUATION):**

- **WEIGHTED AVERAGE COST OF CAPITAL FORMULA:**

$$\text{WACC} = w_d r_d + w_p r_p + w_e r_e$$

- **POST-TAX AVERAGE COST OF ADDITIONAL BEDT FORMULA:**

$$CD = \text{Total Interest} \times \frac{(1 - T_C)}{\text{Total Debt}}$$

- **COST OF EQUITY FORMULA:**

$$C_E = EPS \times \frac{\text{Payout}}{MP} + G$$

- **COST OF RETAINED EARNINGS FORMULA:**

$$C_R = C_E(1 - T_P)$$

- **CHAPTER 14 (DISCOUNTED CASH FLOW VALUATION):**

➢ **CONSTANT GROWTH MODEL FORMULA:**

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_1(1+g)}{(1+r)^2} + \cdots \frac{D_1(1+g)^n}{(1+r)^{n+1}} + \cdots$$

Where,

P_0= Is the current fair price of the share or intrinsicvalue of share.

D_1= is the expected dividend one year from now

r = is the rate of return required by the investor.

n= represents any particular year and can be any number between 0 and infinity.

➢ **SUM OF GEOMETRIC PROGRESSION OF THIS FORMULA:**

$$P_0 = \frac{D_1}{(r-g)}$$

- **ZERO GROWTH MODEL FORMULA:**

$$P_0 = \frac{D}{r}$$

- **TWO STAGE MODEL FORMULA:**

$$P_0 = \frac{D_1}{(1+r)} + \frac{D_1(1+g_1)}{(1+r)^2} + \frac{D_1(1+g_1)^2}{(1+r)^3} \ldots + \frac{D_1(1+g_1)^{n-1}}{(1+r)^n} + \frac{P_n}{(1+r)^n}$$

Where,

P_0 = is the present price of the equity share.

g_1 = is the extraordinary growth rate that is valid forn years

P = is the price of the equity share at the end ofyear n

$$P_0 = D_1\left(\frac{1-\left(\frac{1+g_1}{1+r}\right)^n}{r-g_1}\right) + \frac{P_n}{(1+r)^n}$$

- **Two-stage growth model assumes that the growth rate after n years remains constant, P_n will be equal to:**

$$P_n = \frac{D_{n+1}}{r - g_2}$$

Where D_{n+1} the dividend is for year n+ 1 and g_2 is thegrowth rate in the second period

D_{n+1} The dividend for year n+1 may be expressed in termsof the dividend in the first stage.

$$D_{n+1} = D_1(1 + g_1)^{n-1}\ (1 + g_2)$$

Substituting the above expression, we get

$$P_0 = D_1\left(\frac{1 - \left(\frac{1+g_1}{1+r}\right)^n}{r - g_1}\right) + \left(\frac{D_1(1+g_1)^{n-1}\ (1+g_2)}{r - g_2}\right)\left(\frac{1}{(1+r)^n}\right)$$

- **H MODEL FORMULA:**

$$P_0 = \frac{D_0[(1 + g_n) + H\ (g_a - g_n)]}{r - g_n}$$

where r is the rate of return needed by investors,

P_0 is the intrinsic value of each share,

D_0 is the current dividend per share,

g_n is the expected long-term growth rate (n is normalgrowth rate),

g_a is the current growth rate (a is abnormal growth rate),and

H is the one half of duration during which g_a levels out to g_n.

$$P_0 = \frac{D_0(1+g_n)}{r-g_n} + \frac{D_0\,H\,(g_a-g_n)}{r-g_n}$$

- **NORMAL GRWOTH RATE FORMULA:**

$$\frac{D_0(1+g_n)}{r-g_n}$$

- **SECOND TERM ANOMALOUS GROWTH RATE FORMULA:**

$$\frac{D_0\ H\ (g_a-g_n)}{r-g_n}$$

- **CHAPTER 15 (OTHER NON-DCF VALUATION MODELS):**

FORMULA:

- **EBITDA Basis:**

$$\frac{EV}{EBITDA}$$

- **Book Value Basis:**

$$\frac{EV}{Book\ Value}$$

- **Seles Basis:**

$$\frac{EV}{Sales\ Value}$$

- **P/E Multiple:**

$$\frac{Market\ price\ per\ share}{Earnings\ per\ share}$$

- **Price-earnings multiple**

$$\frac{P_0}{E_1}$$

- **Fundamental Determinants of the P/E Multiple:**

$$\frac{P_0}{E_1} = \frac{(1-b)}{r - ROE * b}$$

Where (1-b) is the dividend payout ratio, r is the cost ofequity, ROE is the return on equity, and b is the plough back ratio or retention ratio.

g= b * ROE

$$\frac{P_0}{E_1} = \frac{(1-b)}{r-g}$$

- **P/B Multiple:**

The book value per share (B) = $\frac{(\text{Shareholders funds} - \text{Preference capital})}{\text{Number of outstanding equity shars}}$

$$\frac{P_0}{B_0} = \frac{ROE\ (1-b)}{r-g}$$

- **Basic P/S Determinants:**

$$\frac{P_0}{S_0} = \frac{NPM\ (1+g)(1-b)}{r-g}$$

- **EV to EBITDA Multiple:**

$$\frac{\text{Enterprise value (EV)}}{\text{Earnings before Interest, Taxes, Depreciation, and Amortization}}$$

$$\frac{EV}{EBITDA} = \frac{(ROIC - g) \times (1 - DA) \times (1 - t)}{ROIC \times (WACC - g)}$$

- **EV/EBIT Multiple:**

$$\frac{\text{Enterprise value (EV)}}{\text{Earnings before Interest, Taxes, (EBIT)}}$$

$$\frac{EV_0}{EBIT_1} = \frac{(1 - t) \times (1 - \text{reinvestment rate})}{(WACC - g)}$$

- **EV/FCFF Multiple:**

$$\frac{\text{Enterprise value (EV)}}{\text{Free cash flow to firm(FCFF)}}$$

$$\frac{EV_0}{FCFF_1} = \frac{1}{(WACC - g)}$$

- **EV/BV Multiple:**

$$\frac{\text{Enterprise value (EV)}}{\text{Book value of assets (BV)}}$$

$$\frac{EV}{BV} = \frac{(ROIC - g)}{(WACC - g)}$$

- **EV/Sales Multiple:**

$$\frac{\text{Enterprise value (EV)}}{\text{Sales(S)}}$$

$$\frac{EV}{BV} = \frac{[\text{After tax operating margin } (1+g) \times (1 - \text{reinvestment rate})]}{(WACC - g)}$$