**FINANCIAL STATEMENT ANALYSIS**

Net cash flow = Net income + Depreciation and amortization

DuPont equation: ROA = Net profit margin × Total assets turnover

\[
\text{ROA} = \text{Net income} \times \frac{\text{Sales}}{\text{Total assets}}
\]

DuPont equation: ROE = ROA × Equity multiplier

\[
\text{ROE} = \text{Net income} \times \frac{\text{Total assets}}{\text{Common equity}}
\]

**THE FINANCIAL ENVIRONMENT**

Net amount of funds from issue = (Amount of issue) × (1 − Flotation costs)

Issue amount = \( \frac{\text{Amount needed}}{1 - \text{Flotation costs}} \)

**TIME VALUE OF MONEY**

*Lump-sum (single) payments:*

\[
FV_n = PV(1 + r)^n
\]

\[
PV = \frac{FV_n}{(1 + r)^n} = FV_n \left[ \frac{1}{(1 + r)^n} \right]
\]

*Annuity payments:*

\[
FVA_n = \text{PMT} \left[ \sum_{t=0}^{n-1} (1 + r)^t \right] = \text{PMT} \left[ \frac{(1 + r)^n - 1}{r} \right]
\]

\[
FVA(\text{DUE})_n = \text{PMT} \left[ \sum_{t=0}^{n-1} (1 + r)^t \times (1 + r) \right] = \text{PMT} \left[ \frac{(1 + r)^n - 1}{r} \times (1 + r) \right]
\]

\[
PVA_n = \text{PMT} \left[ \sum_{t=1}^{n} \frac{1}{(1 + r)^t} \right] = \text{PMT} \left[ \frac{1 - \frac{1}{(1 + r)^n}}{r} \right]
\]
PVA(DUE)_n = PMT \left[ \sum_{t=1}^{n} \frac{1}{(1+r)^t} \right] \times (1+r) = PMT \left[ \frac{1 - \frac{1}{(1+r)^n}}{r} \right] \times (1+r)

**Perpetuities:**

Present value of a perpetuity = PVP = \frac{\text{Payment}}{\text{Interest rate}} = \frac{PMT}{r}

**Uneven cash flow streams:**

FV CF_n = CF_0(1+r)^{n-1} + ... + CF_n(1+r)^0 = \sum_{t=0}^{n-1} CF_t(1+r)^t

PV CF_n = CF_0 \left[ \frac{1}{(1+r)^1} \right] + ... + CF_n \left[ \frac{1}{(1+r)^n} \right] = \sum_{t=1}^{n} CF_t \left[ \frac{1}{(1+r)^t} \right]

**Interest rates (yields):**

Periodic rate = r_{PER} = \frac{\text{Stated annual interest rate}}{\text{Number of interest payments per year}} = \frac{r_{SIMPLE}}{m}

Number of interest periods = n_{PER} = \left( \frac{\text{Number of years}}{\text{Number of interest payments per year}} \right) = n_{YRS} \times m

Effective annual rate = EAR = r_{EAR} = \left( 1 + \frac{r_{SIMPLE}}{m} \right)^m - 1 = (1+r_{PER})^m - 1.0

Annual percentage rate = APR = r_{PER} \times m

**COST OF MONEY**

Dollar return = (Dollar income) + (Capital gains)

= (Dollar income) + (Ending value - Beginning value)

Yield = \frac{\text{Dollar return}}{\text{Beginning value}} = \frac{\text{Dollar income} + \text{Capital gains}}{\text{Beginning value}}

= \frac{\text{Dollar income} + (\text{Ending value} - \text{Beginning value})}{\text{Beginning value}}

Rate of return = r = \text{Risk-free rate} + \text{Risk premium} = r = r_{RF} + RP

Rate of return = r = r_{RF} + RP = r_{RF} + [\text{DRP} + \text{LP} + \text{MRP}]

= [r^* + IP] + [\text{DRP} + \text{LP} + \text{MRP}]

r_{Treasury} = r_{RF} + \text{MRP} = [r^* + IP] + \text{MRP}

Yield on a 2-year bond = \frac{\text{Interest rate in Year 1}}{2} + \frac{\text{Interest rate in Year 2}}{2} = \frac{R_1 + R_2}{2}
Value of an asset
\[ V = \frac{CF_1}{1+r^t} + \frac{CF_2}{(1+r)^2} + \cdots + \frac{CF_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{CF_t}{(1+r)^t} \]

Valuation Concepts

**General valuation model:**

\[ V_0 = PV \text{ of } CF = \frac{\hat{CF}_1}{1+r^t} + \cdots + \frac{\hat{CF}_n}{(1+r)^n} = \sum_{t=1}^{n} \frac{\hat{CF}_t}{(1+r)^t} \]

**Bond Valuation:**

\[ V_d = \frac{\text{INT}}{(1+YTM)^t} + \cdots + \frac{\text{INT} + M}{(1+YTM)^N} = \text{INT} \left[ \frac{1 - \frac{1}{(1+r_d)^N}}{r_d} \right] + M \left[ \frac{1}{(1+r_d)^N} \right] \]

Adjust \( r_d, N \), and \( \text{INT} \) if interest is paid more than once per year.

\[ YTM = \text{Yield to maturity} \]

\[ YTC = \text{Yield to call} \]

\[ r_d = YTM = \text{Bond yield} = \frac{\text{Current yield} + \text{Capital gains yield}}{V_{d_0}} + \frac{V_{d_1} - V_{d_0}}{V_{d_0}} \]

**Stock Valuation:**

\[ V_s = \frac{\hat{D}_0}{(1+r_s)} + \cdots + \frac{\hat{D}_\infty}{(1+r_s)^\infty} = \sum_{t=1}^{\infty} \frac{\hat{D}_t}{(1+r_s)^t} \]

Constant growth stock: \( P_0 = \frac{D_0 (1+g)}{r_s - g} = \frac{\hat{D}_1}{r_s - g} \)

Nonconstant growth stock: \( P_0 = \frac{\hat{D}_1}{(1+r_s)} + \frac{\hat{D}_2}{(1+r_s)^2} + \cdots + \frac{\hat{D}_n + \hat{P}_n}{(1+r_s)^n} \), where \( \hat{P}_n = \frac{\hat{D}_n (1+g_{\text{norm}})}{r_s - g_{\text{norm}}} \) \( g_{\text{norm}} = \text{normal, or constant} \)

\[ \hat{r}_s = \text{Stock yield} = \left( \frac{\text{Dividend yield}}{\text{Capital gains yield}} \right) = \frac{\hat{D}_1}{P_0} + g = \left( \frac{\hat{D}_1}{P_0} \right) + \left( \frac{\hat{P}_1 - P_0}{P_0} \right) \]

Economic value added = EVA = EBIT \((1-T)\) - \[ \left( \frac{\text{Average cost of funds}}{\text{Invested capital}} \right) \]

Risk and Rates of Return

Expected rate of return \( \hat{r} = P_{r_1}r_1 + P_{r_2}r_2 + \cdots + P_{r_n}r_n = \sum_{t=1}^{n} P_{r_t} \)
Variance = \( \sigma^2 = \sum_{i=1}^{n} (r_i - \bar{r})^2 P_i \)

Standard deviation = \( \sigma = \sqrt{\sigma^2} = \sqrt{\sum_{i=1}^{n} (r_i - \bar{r})^2 P_i} \)

Estimated \( \sigma = s = \sqrt{\frac{\sum_{i=1}^{n} (\hat{r}_i - \bar{r})^2 P_{\hat{r}_i}}{n-1}} \)

Coefficient of variation = \( CV = \frac{\text{Risk}}{\text{Return}} = \frac{\sigma}{\bar{r}} \)

\( \hat{r}_p = w_1 \hat{r}_1 + w_2 \hat{r}_2 + \ldots + w_N \hat{r}_N = \sum_{j=1}^{N} w_j \hat{r}_j \)

\( \beta_p = w_1 \beta_1 + w_2 \beta_2 + \ldots + w_N \beta_N = \sum_{j=1}^{N} w_j \beta_j \)

Return = Risk-free return + Risk Premium = \( r_{RF} + RP \)

\( RP = \text{Return} - r_{RF} \)

\( RP_{\text{Investment}} = RP_M \times \beta_{\text{Investment}} \)

\( r_{\text{Investment}} = r_{RF} + RP_{\text{Investment}} \)

\( r_{\text{Investment}} = r_{RF} + (RP_M)\beta_{\text{Investment}} \)

\( r_{\text{Investment}} = r_{RF} + (r_M - r_{RF})\beta_{\text{Investment}} \)

**Capital Budgeting**

**Evaluation techniques:**

Payback = \left( \frac{\text{Number of years just before full recovery of original investment}}{\text{Total cash flow generated during the recovery year}} \right) + \left( \frac{\text{Amount of the initial investment that is unrecovered at the start of therecovery year}}{\text{Total cash flow generated during the recovery year}} \right)

Traditional payback—unadjusted cash flows are used

Discounted payback—discounted cash flows, or present values, are used

\[\text{NPV} = CF_0 + \frac{\hat{CF}_1}{(1+r)^1} + \ldots + \frac{\hat{CF}_n}{(1+r)^n} = \sum_{t=0}^{n} \frac{\hat{CF}_t}{(1+r)^t} \]

\[\hat{CF}_0 + \frac{\hat{CF}_1}{(1+IRR)^1} + \ldots + \frac{\hat{CF}_n}{(1+IRR)^n} = \sum_{t=0}^{n} \frac{\hat{CF}_t}{(1+IRR)^t} = 0 \]

IRR = internal rate of return

\[\text{MIRR: \ PV of cash outflows} = \frac{\text{FV of cash inflows}}{(1+MIRR)^n} = \frac{\text{TV}}{(1+MIRR)^n}; \quad \sum_{t=0}^{n} \frac{\text{COF}_t}{(1+r)^t} = \sum_{t=0}^{n} \frac{\text{CIF}_t(1+r)^t}{(1+MIRR)^n} \]
Cash Flow Estimation

Net cash flow = Net income + Depreciation = Return on capital + Return of capital

Incremental operating cash flow, = \Delta Cash revenues, - \Delta Cash expenses, - \Delta Taxes, = \Delta NOI, \times (1 - T) + \Delta Depr, = (\Delta EBITDA, \times (1 - T) + T(\Delta Depr,)

Cost of Capital

After-tax component cost of debt = \left(\text{Bondholders' required rate of return}\right) \times \left(\text{Tax savings associated with debt}\right) = r_d \times r_d \times T = r_d (1 - T)

Component cost of preferred stock = r_{ps} = \frac{D_{ps}}{P_0(1 - F)} = \frac{D_{ps}}{NP_0}

Component cost of retained earnings = r_s = r_{RF} + (r_{RF} - r_{RF}) \beta_s = \frac{\hat{D}_s}{P_0} + g = \hat{r}_s

Component cost of new equity = r_e = \frac{\hat{D}_e}{P_0(1 - F)} + g = \frac{\hat{D}_e}{NP} + g

WACC = \left[ \left(\text{Proportion of debt}\right) \times \left(\text{After-tax cost of debt}\right) \right] + \left[ \left(\text{Proportion of preferred stock}\right) \times \left(\text{Cost of preferred stock}\right) \right] + \left[ \left(\text{Proportion of common equity}\right) \times \left(\text{Cost of common equity}\right) \right]

WACC = w_d r_d T + w_{ps} r_{ps} + w_s (r_s or r_e)

Break Point = \frac{\text{Total dollar amount of lower cost of capital of a given type}}{\text{Proportion of this type of capital in the capital structure}}

Planning and Control

Full capacity sales = \frac{\text{Sales level}}{\left(\text{Percent of capacity used to generate sales level}\right)}

Operating Breakeven Analysis

Sales = Total operating revenues = Total variable costs + Total fixed costs

\( P \times Q \) = TOC = \( V \times Q \) + F

\( Q_{OpBE} \) = \frac{F}{P \times V} = \frac{\text{Contribution margin}}{F}

\( S_{OpBE} \) = \frac{F}{1 - \left( \frac{V}{P} \right)} = \frac{\text{Gross profit margin}}{F}
Degree of operating leverage: 
\[ DOL = \frac{\text{Percentage change in NOI}}{\text{Percentage change in sales}} = \frac{\Delta NOI}{\Delta Sales} \]

\[ \frac{\Delta NOI}{\Delta Sales} = \frac{\Delta EBIT}{\Delta Sales} = \frac{\Delta EBIT}{\Delta NOI} \]

\[ DOL = \frac{(Q \times P) - (Q \times V)}{(Q \times P) - (Q \times V) - F} = \frac{S - VC}{S - VC - F} \]

\[ \text{Gross profit} = \frac{\text{EBIT}}{\text{EBIT}} \]

Financial Breakeven Analysis

\[ \text{EBIT} \times \text{Shrs} \]

\[ \text{EPS} = \frac{\text{Earnings available to common stockholders}}{\text{Number of common shares outstanding}} = \frac{(\text{EBIT} - I)(1 - T) - D_{ps}}{\text{Shrs}_{C}} \]

\[ \text{EBIT}_{\text{FinBE}} = I + \frac{D_{ps}}{1 - T} \]

\[ \text{DOL} = \frac{\text{Percentage change in NOI}}{\text{Percentage change in sales}} = \frac{\Delta NOI}{\Delta Sales} \]

\[ \text{DFL} = \frac{\text{Degree of financial leverage}}{\text{Percent change in EPS}} = \frac{\Delta EPS}{\Delta EBIT} \]

\[ \text{DFL} = \frac{\Delta EPS}{\Delta EBIT} = \frac{\text{EBIT}}{\text{EBIT} - I} = \frac{\text{EBIT}}{\text{EBIT} - \text{[Financial BEP]}} \]

\[ \text{Financial BEP} = I + \frac{D_{ps}}{(1 - T)} \]

\[ \text{DFL} = \frac{\text{EBIT}}{\text{EBIT} - I} \]

When there is no preferred stock.

\[ \text{Degree of total leverage} = \text{DTL} = \frac{\Delta EPS}{\Delta Sales} \times \frac{\Delta EBIT}{\Delta EPS} = \frac{\Delta EBIT}{\Delta NOI} \]

\[ \text{DTL} = \frac{\text{Gross Profit}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBIT} - \text{[Financial BEP]}} = \frac{\text{Gross Profit}}{\text{EBIT} - \text{[Financial BEP]}} \]

\[ = \frac{S - VC}{\text{EBIT} - I} = \frac{Q(P - V)}{[Q(P - V) - F] - I} \]

When there is no preferred stock.