Capital Budgeting

Evaluation techniques:

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

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

\[ \text{NPV} = \sum_{t=0}^{n} \left( \frac{\hat{\text{CF}}_t}{(1+r)^t} \right) = \sum_{t=0}^{n} \left( \frac{\hat{\text{CF}}_t}{(1+\text{IRR})^t} \right) \]

\[ \text{IRR} = \text{internal rate of return} \]

Cash Flow Estimation

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

Supplemental operating cash flow = \Delta \text{Cash revenues}_t - \Delta \text{Cash expenses}_t - \Delta \text{Taxes}_t

= \Delta \text{NOI}_t \times (1 - T) + \Delta \text{Depr}_t

= (\Delta \text{NOI}_t + \Delta \text{Depr}_t) \times (1 - T) + T(\Delta \text{Depr}_t)

Cost of Capital

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

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

Component cost of retained earnings = r_s = r_{RF} + (r_m - r_{RF}) \beta_s = \frac{\hat{D}_s}{P_0} + g = \hat{r}_s
Component cost of new equity $r_e = \frac{\hat{D}_t}{P_0(1-F)} + g = \frac{\hat{D}_t}{NP} + g$

WACC = $\left[ \frac{\text{Proportion of debt}}{\text{Cost of debt}} \right] + \left[ \frac{\text{Proportion of preferred stock}}{\text{Cost of preferred stock}} \right] + \left[ \frac{\text{Proportion of common equity}}{\text{Cost of common equity}} \right]$

WACC = $w_d r_d + w_p r_p + w_s (r_s$ or $r_e$)

Planning and Control

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

Operating Breakeven Analysis

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

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

$Q_{OpBE} = \frac{F}{P-V} = \frac{F}{\text{Contribution margin}}$

$S_{OpBE} = \frac{F}{1 - \frac{V}{P}} = \frac{F}{\text{Gross profit margin}}$

Degree of operating leverage = DOL = \frac{\text{Percentage change in NOI}}{\text{Percentage change in sales}} = \frac{\Delta\text{NOI}}{\Delta\text{sales}} = \frac{\Delta\text{EBIT}}{\Delta\text{Sales}} = \frac{\Delta\text{EBIT}}{\Delta\text{Q}}$

$DOL = \frac{(Q \times P) - (Q \times V)}{(Q \times P) - (Q \times V) - F} = \frac{S - VC}{S - VC - F} = \frac{\text{Gross profit}}{\text{EBIT}}$

Financial Breakeven Analysis

$\Delta\text{EPS} = Earnings \ text{available to common stockholders} = \frac{(EBIT-I)(1-T) - D_p}{\text{Number of common shares outstanding}}$

$\Delta\text{EBIT} = EBIT = \frac{D_p}{(1 - T)}$

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

$DFL = \frac{\text{EBIT}}{\text{EBIT}} = \frac{\text{EBIT}}{\text{EBIT} - \text{[Financial BEP]}}$

Financial BEP = $\frac{D_p}{(1 - T)}$
\[
\text{DFL} = \frac{\text{EBIT}}{\text{EBIT} - I}
\]

When there is no preferred stock.

Degree of total leverage
\[
\text{DTL} = \frac{\Delta \text{EPS}}{\Delta \text{EPS}} = \frac{\Delta \text{EBIT}}{\Delta \text{EBIT}} x \frac{\Delta \text{EPS}}{\Delta \text{EPS}} = \text{DOL} x \text{DFL}
\]

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

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

When there is no preferred stock.