

EQUATION SHEET

Principles of Finance

Exam 3

Cost of Capital

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

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

$$\text{Component cost of retained earnings} = r_s = r_{RF} + (r_M - r_{RF}) \times \frac{\hat{D}_1}{P_0} + g = \hat{r}_s$$

$$\text{Component cost of new equity} = r_e = \frac{\hat{D}_1}{P_0(1-F)} + g = \frac{\hat{D}_1}{NP} + g$$

$$\begin{aligned} \text{WACC} &= \left[\left(\text{Proportion of debt} \right) \times \left(\text{After-tax cost of debt} \right) \right] + \left[\left(\text{Proportion of preferred stock} \right) \times \left(\text{Cost of preferred stock} \right) \right] + \left[\left(\text{Proportion of common equity} \right) \times \left(\text{Cost of common equity} \right) \right] \\ &= w_{dT} r_{dT} + w_{ps} r_{ps} + w_s (r_s \text{ or } r_e) \end{aligned}$$

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

Capital Structure

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

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

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

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

When there is no preferred stock.

$$\text{Degree of total leverage} = \text{DTL} = \frac{\left(\frac{\Delta \text{EPS}}{\text{EPS}}\right)}{\left(\frac{\Delta \text{Sales}}{\text{Sales}}\right)} = \frac{\left(\frac{\Delta \text{EBIT}}{\text{EBIT}}\right)}{\left(\frac{\Delta \text{Sales}}{\text{Sales}}\right)} \times \frac{\left(\frac{\Delta \text{EPS}}{\text{EPS}}\right)}{\left(\frac{\Delta \text{EBIT}}{\text{EBIT}}\right)} = \text{DOL} \times \text{DFL}$$

$$\begin{aligned} \text{DTL} &= \frac{\text{Gross Profit}}{\text{EBIT}} \times \frac{\text{EBIT}}{\text{EBIT} - [\text{Financial BEP}]} = \frac{\text{Gross Profit}}{\text{EBIT} - [\text{Financial BEP}]} \\ &= \frac{S - VC}{\text{EBIT} - I} = \frac{Q(P - V)}{[Q(P - V) - F] - I} \end{aligned}$$

Dividend Policy

$$\text{Dollars transferred from retained earnings} = \left[\left(\text{Number of shares outstanding} \right) \times \left(\text{Percent stock dividend stated as a decimal} \right) \right] \times \left(\text{Market price of the stock} \right)$$

Planning and Control

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

Operating Breakeven Analysis

$$\begin{aligned} \text{Sales revenues} &= \text{Total operating costs} = \text{Total variable costs} + \text{Total fixed costs} \\ (P \times Q) &= \text{TOC} = (V \times Q) + F \end{aligned}$$

$$Q_{\text{OpBE}} = \frac{F}{P - V} = \frac{F}{\text{Contribution margin}} \qquad S_{\text{OpBE}} = \frac{F}{1 - \left(\frac{V}{P}\right)} = \frac{F}{\text{Gross profit margin}}$$

Degree of operating leverage—see the equations in the capital structure section

Financial Breakeven Analysis

$$\text{EPS} = \frac{\text{Earnings available to common stockholders}}{\text{Number of common shares outstanding}} = \frac{(\text{EBIT} - I)(1 - T) - D_{\text{ps}}}{\text{Shrs}_C} = 0$$

$$\text{EBIT}_{\text{FinBE}} = I + \frac{D_{\text{ps}}}{(1 - T)}$$

Degree of financial leverage—see the equations in the capital structure section

Degree of total leverage—see the equations in the capital structure section

Rates/Taxes

$$\text{Equivalent pretax yield on a taxable investment} = \frac{\text{Yield on tax-free investment}}{1 - \text{Marginal tax rate}}$$

$$\text{Equivalent yield on tax-free investment} = \text{After-tax yield on a taxable investment} = \left(\text{Pretax yield on taxable investment} \right) \times (1 - \text{Marginal tax Rate})$$