**ECO 4368**  
**Instructor: Saltuk Ozerturk**

Capital Budget: $B$  
Net Earnings: $I$  
Dividend Payout Ratio: $x$

Target Capital Structure  
• $w_d\%$ debt and $w_e\%$ equity

External equity  
Internal equity

- If retained earnings are greater than the size of the capital budget to be financed by equity, then equity is raised internally:

  \[ I(1-x) \geq w_e B \Rightarrow \text{internal equity.} \]

  In this case, cost of equity can be computed as

  \[ r_e = \frac{D_0(1+g)}{P_0} + g \]

  or

  \[ r_e = r_{RF} + \beta(r_M - r_{RF}). \]

- If retained earnings are LOWER than the size of the capital budget to be financed by equity, then equity is raised externally:

  \[ I(1-x) < w_e B \Rightarrow \text{external equity.} \]

  In this case, the cost of equity can be computed as

  \[ r_{e external} = \frac{D_0(1+g)}{P_0(1-F)} + g \]

  where $F$ is the flotation cost on external equity.

- The company’s WACC is then given by

  \[ WACC = w_d(1-T)r_d + w_e r_e \quad \text{IF EQUITY IS INTERNAL.} \]

  \[ WACC = w_d(1-T)r_d + w_e r_{e external} \quad \text{IF EQUITY IS EXTERNAL} \]
Exercises on WACC (Weighted Average Cost of Capital)

- **Exercise 1**: An online book retailer recently decided to extend its business to audio books. The change in strategy is regarded as risky by the market and its beta increased from 1.5 to 2.00. The current capital structure is 50 percent debt and 50 percent internal equity. The required return rate on the company’s debt was 7% and after re-evaluation of company risk, it increased to 9%. The tax rate on the company is 30%. The risk free rate of return is 4 percent and the return on the market portfolio is 6%. What is the company’s WACC after re-evaluation?

- **Answer**:

  \[
  r_{e}^{\text{new}} = 4\% + 2(6\% - 4\%) = 8\%
  \]

  \[
  WACC^{\text{new}} = 0.5(0.08) + 0.5(1 - 0.30)0.09 = 7.15\%
  \]

- **Exercise 2**: A company has a weighted average cost of capital of 11.5%. Its capital structure is 55% equity and 45% debt. The company has sufficient retained earnings to fund the equity portion of its capital budget (i.e., equity is internal). The before-tax cost of debt is 9 percent. Company’s tax rate is 30%. Their next expected dividend is \( D_1 = 5 \), and current stock price is $45. What is the company’s dividend growth rate?

- **Answer**:

  \[
  WACC = 0.115 = 0.55r_e + 0.45(1 - 0.30)0.09
  \]

  \[
  \Rightarrow r_e = 15.75\%
  \]

  Now we can find \( g \) from

  \[
  r_e = 15.75\% = \frac{D_1}{P_0} + g
  \]

  \[
  \Rightarrow 15.75\% = \frac{5}{45} + g \Rightarrow g = 4.64\%
  \]
- **Exercise 3:** A company finances its operations with 60 percent debt and 40 percent equity. Its net income is $100 million and it has a dividend payout ratio of 10 percent. Due to an increasing market share, company’s capital budget is $120 million this year. The required rate of return on company’s debt is 11 percent. The company’s common stock trades at $40 per share, and its last dividend of $4.00 per share is expected to grow at a constant rate of 5% a year. The flotation cost of external equity is 10 percent. The company’s tax rate is 40 percent. What is the company’s WACC?

  - **Answer:** First, let’s see if equity will be internal or external:

    \[ I(1 - x) = 100 \text{ million}(0.90) = 90 \text{ million}. \]
    \[ w_e B = (0.40)\$120 \text{ million} = 48 \text{ million}. \]

    Therefore, we have

    \[ \text{If } I(1 - x) > w_e B \Rightarrow \text{internal equity.} \]

    Now let’s find the cost of equity:

    \[ r_e = \frac{D_0(1 + g)}{P_0} + g = \frac{4(1 + 0.05)}{40} + 0.05 \]

    \[ \Rightarrow r_e = 15.5\% \]

    Accordingly,

    \[ WACC = w_d(1 - T)r_d + w_e r_e \]

    \[ = 0.6(1 - 0.4)(0.11) + 0.4(0.155) = 10.16\% \]

- **Exercise 4:** A company finances its operations with 80 percent debt and 20 percent equity. Its net income is $20 million and it has a dividend payout ratio of 20 percent. Its capital budget is $30 million this year. The required rate on company’s debt is 8 percent and the company’s tax rate is 40 percent. The company’s common stock trades at $88 per share, and its current dividend of $4 per share is expected to grow at a constant rate of 10% a year. The flotation cost of external equity is 10 percent. What is the company’s WACC?
• **Exercise 5**: A company just paid a $D_0 = 6$ per share dividend on its common stock. The stock currently sells for $50$ a share. If the company issues additional stock, it must pay its investment banker a flotation cost of 20%. If the cost of external equity is 25%, what is the company’s dividend growth rate?

**Answer:**

$$0.25 = \frac{6(1+g)}{50(0.80)} + g \implies g = 8.69\%$$

• **Exercise 6**: Santorum Co. has a capital structure which consists of $w_d\%$ debt and $1-w_d\%$ internal equity. After tax cost of debt is $r_d(1-T) = 7\%$, and cost of internal equity is $r_e = 10\%$. Company’s WACC is 8.5\%. The company’s net income is reported to be $I = \$1$ million. The company pays out 25 percent of its net income as dividends. How large of a capital budget (B) can the company have without having to issue external equity given its capital structure?

**Answer**: First find the capital structure from

$$WACC = 0.085 = w_d(0.07) + (1-w_d)(0.10) \implies w_d = 50\%$$

Therefore, capital structure is $w_d = 50\%$ debt and $w_e = 50\%$ equity. Now note that for internal equity we need

$$I(1-x) \geq w_eB \implies B \leq \frac{I(1-x)}{w_e} \implies B \leq \frac{\$1\text{ million}(1-0.25)}{0.5} = \$1.5\text{ million}.$$  

• **Exercise 7**: Suppose a company uses only debt and internal equity to finance its capital budget and uses CAPM to compute its cost of equity. Company estimates that its WACC is 12\%. The capital structure is 75\% debt and 25\% internal equity. Before tax cost of debt is 12.5 \% and tax rate is 20\%. Risk free rate is $r_{RF} = 6\%$ and market risk premium $(r_m - r_{RF}) = 8\%$. What is the beta of the company?

**Answer**:

$$0.12 = (0.75)(1-0.80)(0.125) + (0.25)r_e$$

$$\implies r_e = 0.18$$

Then

$$r_e = 0.18 = 0.06 + \beta(0.08) \implies \beta = 1.5$$