Chapter 15

- *Cost of Capital*

Key Concepts and Skills

- Know how to determine a firm's cost of equity capital
- Know how to determine a firm's cost of debt
- Know how to determine a firm's overall cost of capital

Cost of Capital

- Firm uses both debt and equity capital
- Capital structure – the mixture of debt and equity a firm chooses to employ.
- Cost of Capital
  – reflect the required return on the firm's asset as a whole.
  – will be the mixture of the returns needed to compensate its creditor & needed to compensate its stockholder.

Required Return vs. Cost of Capital

- Suppose that you can borrow all the money you need for a project at 6%. Does this means that 6% is our cost of capital for the project?

Cost of Capital

COST OF CAPITAL =
Cost of Debt Capital + Cost of Equity Capital

- ***COST OF EQUITY*** - There are two major methods for determining the cost of equity
  1. DIVIDEND GROWTH MODEL
     - Cost of Preferred Stock
  2. SML or CAPM
- ***COST OF DEBT*** - The cost of debt is the required return on our company's debt
  - We usually focus on the cost of long-term debt or bonds

The Dividend Growth Model Approach

- Start with the dividend growth model formula and rearrange to solve for R_E

$$P_0 = \frac{D_0(1+g)}{R_E - g} = \frac{D_1}{R_E - g}$$

$$R_E = \frac{D_1}{P_0} + g$$

D(0) is the dividend just paid
D(1) is the next period projected dividend
R(E) is the required return on the stock
Firms cost of Equity Capital

Cost of Preferred Stock

- Reminders
  - Preferred stock generally pays a constant dividend each period
  - Dividends are expected to be paid every period forever
- Preferred stock is a perpetuity, so we take the perpetuity formula, rearrange and solve for R_P
- $R_P = D / P_0$

Advantages and Disadvantages of Dividend Growth Model

- Advantage – easy to understand and use
- Disadvantages
  - Only applicable to companies currently paying dividends
  - Not applicable if dividends aren't growing at a reasonably constant rate
  - Extremely sensitive to the estimated growth rate – an increase in g of 1% increases the cost of equity by 1%
  - Does not explicitly consider risk (Unlike the SML approach, there is no direct adjustment for the riskiness of the investment)

The SML Approach

- The required or expected return on a risky investment depend on;
  - Risk-free rate, R_f
  - Market risk premium, $E(R_M) - R_f$
  - Systematic risk of asset relative to average, β

$$R_E = R_f + \beta_E(E(R_M) - R_f)$$

Advantages and Disadvantages of SML

- Advantages
  - Explicitly adjusts for systematic risk
  - Applicable to all companies, as long as we can estimate beta
- Disadvantages
  - Have to estimate the *expected* market risk premium, which does vary over time
  - Have to estimate beta, which also varies over time
  - We are using the past to predict the future, which is not always reliable

Cost of Debt

- The cost of debt is the required return on our company's debt
- We usually focus on the cost of long-term debt or bonds
- The required return is best estimated by computing the yield-to-maturity on the existing debt
- We may also use estimates of current rates based on the bond rating we expect when we issue new debt
- The cost of debt is NOT the coupon rate

Advantages and Disadvantages Cost of Debt

- Advantages
  - Tax Benefit - interest on tax is tax deductable
  - Added Descipline – debt allow firms to impose discipline on managers
- Disadvantages
  - Bankruptcy Cost – Possibility of default if CF from operations are insufficient to make interest payments
  - Agency Cost – Conflict of interest between stockholders and bondholders (Eg. Determine how much to pay as dividends, chose how to finance the project..etc.)

Bond

- **Face Value (Par Value):** Par value is usually $1000 for corporate bond
- **Bond Coupons:** Regular interest payments that corp. promise to pay every year
- **Coupon Rate:** $\frac{\text{The Annual Coupon Payment}}{\text{The Par Value of a Bond}}$
- **Maturity:** Specific date that the principal amount of a bond is made.
- **Yield to Maturity:** The interest rate required in the market on a bond

Present Value of Cash Flows as Rates Change

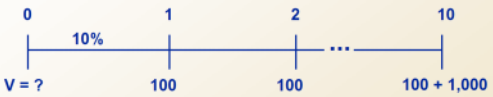
- Bond Value = PV of coupons + PV of par

The Bond-Pricing Equation

$$\text{Bond Value} = A\left[\frac{1 - \frac{1}{(1+r)^t}}{r}\right] + F\frac{1}{(1+r)^t}$$

Bond Valuation

Value of 10-year, 10% coupon bond, if YTM= 10%



$$V = \frac{\$100}{(1+r)^1} + \ldots + \frac{\$100}{(1+r)^{10}} + \frac{\$1{,}000}{(1+r)^{10}}$$

= $90.91 + ... + $38.55 + $385.54
= $1,000

= $100(PVIFA $_{10,10}$)+$1,000(PVIF $_{10,10}$)

Bond Prices: Relationship Between Coupon and Yield

- If YTM = coupon rate, then par value = bond price (Bond sells at par has a YTM equal to the coupon rate)
- If YTM > coupon rate, then par value > bond price
  - Selling at a discount, called a discount bond
- If YTM < coupon rate, then par value < bond price
  - Selling at a premium, called a premium bond

Example 15.1: Dividend Growth Model

- Suppose that your company is expected to pay a dividend of $1.50 per share next year. There has been a steady growth in dividends of 5.1% per year and the market expects that to continue. The current price is $25. What is the cost of equity?

Example 15.2: SML

- Suppose your company has an equity beta of .58 and the current risk-free rate is 6.1%. If the expected market risk premium is 8.6%, what is your cost of equity capital?

Example 15.3: Estimating the Dividend Growth Rate

- One method for estimating the growth rate is to use the historical average
  - Year Dividend Percent Change
  - 2000 1.23
  - 2001 1.30
  - 2002 1.36
  - 2003 1.43
  - 2004 1.50

Answer 15.3: Atithmetic Growth Rate

Answer 15.3: Geometric Growth Rate

Example 15.4: Cost of Equity

- Suppose our company has a beta of 1.5. The market risk premium is expected to be 9% and the current risk-free rate is 6%. We have used analysts' estimates to determine that the market believes our dividends will grow at 6% per year and our last dividend was $2. Our stock is currently selling for $15.65. What is our cost of equity?

Example 15.5: Cost of Preferred Stock

- Your company has preferred stock that has an annual dividend of $3. If the current price is $25, what is the cost of preferred stock?

Example 15.6: Cost of Debt

- Suppose we have a bond issue currently outstanding that has 25 years left to maturity. The coupon rate is 9% and coupons are paid semiannually. The bond is currently selling for $908.72 per $1000 bond. What is the cost of debt?
  - $45(PVIFA_{50,R})+1000(PVIF_{50,R}) = 908,72$
  - R_D = YTM = 5% (2) = 10%

Approximating the Cost

- The before-tax cost of debt, k_d, for a bond within a $1,000 par value can be approximated by using the following equation:

$$k_d = \frac{I + \frac{\$1,000 - N_d}{n}}{\frac{N_d + \$1,000}{2}}$$

Where,
I=Annual interest in dollars
N_d=Net proceeds from the sale of debt (bond)
n=Number of years to the bonds maturity

Answer 15.6

The Weighted Average Cost of Capital (WACC)

- We can use the individual costs of capital that we have computed to get our "average" cost of capital for the firm.
- This "average" is the required return on our assets, based on the market's perception of the risk of those assets
- The weights are determined by how much of each type of financing we use

- If a firm's WACC is 12%, what does this means?

Capital Structure Weights

- Notation
  - E = market value of equity = # of outstanding shares times price per share
  - D = market value of debt = # of outstanding bonds times bond price
  - V = market value of the firm = D + E
- Weights
  - w_E = E/V = percent financed with equity
  - w_D = D/V = percent financed with debt

Example 15.7: Capital Structure Weights

- Suppose you have a market value of equity equal to $500 million and a market value of debt = $475 million. What are the capital structure weights?

Taxes and the WACC

- We are concerned with after-tax cash flows, so we need to consider the effect of taxes on the various costs of capital
- Interest expense reduces our tax liability
  - This reduction in taxes reduces our cost of debt
  - After-tax cost of debt = $R_D(1-T_C)$
- Dividends are not tax deductible, so there is no tax impact on the cost of equity
- WACC = $w_E R_E + w_D R_D(1-T_C)$

- Why do we use an aftertax figure for cost of debt not for cost of equity figure?

Extended Example 15.8: WACC I

- Equity Information
  - 50 million shares
  - $80 per share
  - Beta = 1.15
  - Market risk premium = 9%
  - Risk-free rate = 5%
- Debt Information
  - 1 million in outstanding debt (face value)
  - Selling for = 110 % of par
  - Coupon rate = 9%, semiannual coupons
  - 15 years to maturity
- Tax rate = 40%

Answer 15.8

Answer 15.8

Table 15.1 Cost of Equity

I. The Cost of Equity, R_E

A. Dividend growth model approach (from Chapter 8):

$$R_E = D_1/P_0 + g$$

where D_1 is the expected dividend in one period, g is the dividend growth rate, and P_0 is the current stock price.

B. SML approach (from Chapter 13):

$$R_E = R_f + \beta_E \times (R_M - R_f)$$

where R_f is the risk-free rate, R_M is the expected return on the overall market, and β_E is the systematic risk of the equity.

Table 15.1 Cost of Debt

II. The Cost of Debt, R_D

A. For a firm with publicly held debt, the cost of debt can be measured as the yield to maturity on the outstanding debt. The coupon rate is irrelevant. Yield to maturity is covered in Chapter 7.

B. If the firm has no publicly traded debt, then the cost of debt can be measured as the yield to maturity on similarly rated bonds (bond ratings are discussed in Chapter 7).

Table 15.1 WACC

III. The Weighted Average Cost of Capital, WACC

A. The firm's WACC is the overall required return on the firm as a whole. It is the appropriate discount rate to use for cash flows similar in risk to those of the overall firm.

B. The WACC is calculated as:

$$WACC = (E/V) \times R_E + (D/V) \times R_D \times (1 - T_C)$$

where T_C is the corporate tax rate, E is the *market* value of the firm's equity, D is the *market* value of the firm's debt, and $V = E + D$. Note that E/V is the percentage of the firm's financing (in market value terms) that is equity, and D/V is the percentage that is debt.

Sugested Problems

- 1-7, 9, 10, 14, 15.