Chapter 14
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
• Know how to handle flotation costs
• Understand pitfalls of overall cost of capital and how to manage them

Chapter Outline
• The Cost of Capital: Some Preliminaries
• The Cost of Equity
• The Costs of Debt and Preferred Stock
• The Weighted Average Cost of Capital
• Divisional and Project Costs of Capital
• Flotation Costs and the Weighted Average Cost of Capital
Why Cost of Capital Is Important

- We know that the return earned on assets depends on the risk of those assets
- The return to an investor is the same as the cost to the company
- Our cost of capital provides us with an indication of how the market views the risk of our assets
- Knowing our cost of capital can also help us determine our required return for capital budgeting projects

Required Return

- The required return is the same as the appropriate discount rate and is based on the risk of the cash flows
- We need to know the required return for an investment before we can compute the NPV and make a decision about whether or not to take the investment
- We need to earn at least the required return to compensate our investors for the financing they have provided

WACC

- \( \text{WACC} = w_E R_E + w_P R_P + w_D R_D (1-T_C) \)
- WACC = Weighted Average Cost of Capital
- \( w \) = weight %
- \( R \) = return %
- \( E \) = Equity, \( P \)=Preferred, \( D \)=Debt
- \( T_C \)=Tax rate of the corporation
Computing WACC

- WACC = \( w_E R_E + w_P R_P + w_D R_D(1-T_C) \)
- \( w_E = \frac{E}{(E+P+D)}, \) or will be given
  - \( w_P = \frac{P}{(E+P+D)} \)
  - \( w_D = \frac{D}{(E+P+D)} \)
- \( R_E = R_f + B(MRP) = R_f + B(Rm-R_f) = \frac{D_1}{P_0} + g = \frac{(D_0(1+g))}{P_0} + g \)
- \( R_P = \) Dividend/ Price
- \( R_D = \) Yield to maturity on debt
- \( T_C, \) will be given

WACC relation to risk

- Assets = Liabilities + Equity
- Implies
  - Return on (Assets) = Return on (Liabilities + Equity)
  - Risk (Assets) = Risk (Liabilities + Equity)

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- \( R_P \) = Dividend/ Price
- \( R_D \) = Yield to maturity on debt
- \( T_C \), will be given
Cost of Equity

- The cost of equity is the return required by equity investors given the risk of the cash flows from the firm
  - Business risk
  - Financial risk
- There are two major methods for determining the cost of equity
  - Dividend growth model
  - SML, or CAPM

The Dividend Growth Model Approach

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

\[ P_0 = \frac{D_1}{R_E - g} \]
\[ R_E = \frac{D_1}{P_0} + g \]

Example: 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?

\[ R_E = \frac{1.50}{25} + .051 = .111 = 11.1\% \]
Example: Estimating the Dividend Growth Rate

- One method for estimating the growth rate is to use the historical average.

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend</th>
<th>Percent Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>1.23</td>
<td>-</td>
</tr>
<tr>
<td>2009</td>
<td>1.30</td>
<td>(1.30 – 1.23) / 1.23 = 5.7%</td>
</tr>
<tr>
<td>2010</td>
<td>1.36</td>
<td>(1.36 – 1.30) / 1.30 = 4.6%</td>
</tr>
<tr>
<td>2011</td>
<td>1.43</td>
<td>(1.43 – 1.36) / 1.36 = 5.1%</td>
</tr>
<tr>
<td>2012</td>
<td>1.50</td>
<td>(1.50 – 1.43) / 1.43 = 4.9%</td>
</tr>
</tbody>
</table>

Average = (5.7 + 4.6 + 5.1 + 4.9) / 4 = 5.1%

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

The SML Approach

- Use the following information to compute our cost of equity
  - Risk-free rate, $R_f$
  - Market risk premium, $E(R_M) – R_f$
  - Systematic risk of asset, $\beta$

$$R_E = R_f + \beta (E(R_M) – R_f)$$
Example - 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?
  - \( R_E = 6.1 + .58(8.6) = 11.1\% \)
• Since we came up with similar numbers using both the dividend growth model and the SML approach, we should feel good about our estimate.

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

Example – 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?
  - Using SML: \( R_E = 6\% + 1.5(9\%) = 19.5\% \)
  - Using DGM: \( R_E = \frac{2(1.06)}{15.65} + .06 = 19.55\% \)
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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

Example: 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 $1,000 bond. What is the cost of debt?
  - N = 50; PMT = 45; FV = 1000; PV = -908.72;
  - CPT I/Y = 5%; YTM = 5(2) = 10%
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 \( R_p \)
    - \( R_p = \frac{D}{P_0} \)

Example: 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?
- \( R_p = \frac{3}{25} = 12\% \)

The Weighted Average Cost of Capital

- 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 the firm's 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 is used
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**
  - \( w_E = \frac{E}{V} \) = percent financed with equity
  - \( w_D = \frac{D}{V} \) = percent financed with debt

Example: Capital Structure Weights

- Suppose you have a market value of equity equal to \$500 million and a market value of debt equal to \$475 million.
  - What are the capital structure weights?
    - \( V = 500 \text{ million} + 475 \text{ million} = 975 \text{ million} \)
    - \( w_E = \frac{E}{V} = \frac{500 \text{ / } 975} = .5128 = 51.28\% \)
    - \( w_D = \frac{D}{V} = \frac{475 \text{ / } 975} = .4872 = 48.72\% \)

Taxes and the WACC

- We are concerned with after-tax cash flows, so we also 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 = \( R_D(1-T) \)
- Dividends are not tax deductible, so there is no tax impact on the cost of equity
- \( WACC = w_E R_E + w_D R_D(1-T) \)
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WACC relation to risk

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Extended Example: WACC - I

- Equity Information
  - 50 million shares
  - $80 per share
  - Beta = 1.15
  - Market risk premium = 9%
  - Risk-free rate = 5%

- Debt Information
  - $1 billion in outstanding debt (face value)
  - Current quote = 110
  - Coupon rate = 9%, semiannual coupons
  - 15 years to maturity
  - Tax rate = 40%
Extended Example: WACC - II

• What is the cost of equity?
  \[ R_E = 5 + 1.15(9) = 15.35\% \]

• What is the cost of debt?
  \[ N = 30; PV = -1,100; PMT = 45; FV = 1,000; \\
  CPT I/Y = 3.9268 \]
  \[ R_D = 3.927(2) = 7.854\% \]

• What is the after-tax cost of debt?
  \[ R_D(1-T_C) = 7.854(1-.4) = 4.712\% \]

Extended Example: WACC - III

• What are the capital structure weights?
  \[ E = 50 \text{ million} (80) = 4 \text{ billion} \]
  \[ D = 1 \text{ billion} (1.10) = 1.1 \text{ billion} \]
  \[ V = 4 + 1.1 = 5.1 \text{ billion} \]
  \[ w_E = E/V = 4 / 5.1 = .7843 \]
  \[ w_D = D/V = 1.1 / 5.1 = .2157 \]

• What is the WACC?
  \[ \text{WACC} = .7843(15.35\%) + .2157(4.712\%) = 13.06\% \]

Eastman Chemical I

• Click on the web surfer to go to Yahoo! Finance to get information on Eastman Chemical (EMN)

• Under Profile and Key Statistics, you can find the following information:
  • # of shares outstanding
  • Book value per share
  • Price per share
  • Beta

• Under analysts estimates, you can find analysts estimates of earnings growth (use as a proxy for dividend growth)

• The Bonds section at Yahoo! Finance can provide the T-bill rate

• Use this information, along with the CAPM and DGM to estimate the cost of equity
Eastman Chemical II
• Go to FINRA to get market information on Eastman Chemical’s bond issues
  ▪ Enter Eastman Ch to find the bond information
  ▪ Note that you may not be able to find information on all bond issues due to the illiquidity of the bond market
• Go to the SEC website to get book value information from the firm’s most recent 10Q

Eastman Chemical III
• Find the weighted average cost of the debt
  ▪ Use market values if you were able to get the information
  ▪ Use the book values if market information was not available
  ▪ They are often very close
• Compute the WACC
  ▪ Use market value weights if available

Example: Work the Web
• Find estimates of WACC at www.valuepro.net
• Look at the assumptions
  ▪ How do the assumptions impact the estimate of WACC?
### Table 14.1 Cost of Equity

<table>
<thead>
<tr>
<th>The Cost of Equity, Re</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Dividend growth model approach (from Chapter 8):</td>
</tr>
<tr>
<td>Re = D1 / P0 + g</td>
</tr>
<tr>
<td>where D1 is the expected dividend in one period, g is the dividend growth rate, and P0 is the current stock price;</td>
</tr>
<tr>
<td>B. SML approach (from Chapter 10):</td>
</tr>
<tr>
<td>Re = Rf + βe * (Rm - Rf)</td>
</tr>
</tbody>
</table>
| where Rf is the risk-free rate, Re is the expected return on the overall market, and βe is the systematic risk of the equity.

### Table 14.1 Cost of Debt

<table>
<thead>
<tr>
<th>The Cost of Debt, Rd</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. For a firm with publicly traded 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 9;</td>
</tr>
</tbody>
</table>
| B. For publicly traded debt, the cost of debt can be measured as the yield to maturity on similarly rated bonds (bond ratings are discussed in Chapter 7).

### Table 14.1 WACC

<table>
<thead>
<tr>
<th>The Weighted Average Cost of Capital, WACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. The firm's WACC is the overall expected return on the firm as a whole, i.e., the appropriate discount rate to use for cash flows similar in risk to those of the overall firm:</td>
</tr>
<tr>
<td>WACC = (E/V) * Re + (D/V) * Rd</td>
</tr>
<tr>
<td>B. The WACC is calculated as:</td>
</tr>
<tr>
<td>WACC = (E/V) * Re + (D/V) * Rd</td>
</tr>
</tbody>
</table>
| where E/V 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.
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Divisional and Project Costs of Capital

- Using the WACC as our discount rate is only appropriate for projects that have the same risk as the firm’s current operations
- If we are looking at a project that does NOT have the same risk as the firm, then we need to determine the appropriate discount rate for that project
- Divisions also often require separate discount rates

WACC relation to risk

- Assets = Liabilities + Equity
- Implies
  - Return on (Assets) = Return on (Liabilities + Equity)
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Example: Using WACC for All Projects

- What would happen if we use the WACC for all projects regardless of risk?
- Assume the WACC = 15%

<table>
<thead>
<tr>
<th>Project</th>
<th>Required Return</th>
<th>IRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20%</td>
<td>17%</td>
</tr>
<tr>
<td>B</td>
<td>15%</td>
<td>18%</td>
</tr>
<tr>
<td>C</td>
<td>10%</td>
<td>12%</td>
</tr>
</tbody>
</table>

The Pure Play Approach

- Find one or more companies that specialize in the product or service that we are considering
- Compute the beta for each company
- Take an average
- Use that beta along with the CAPM to find the appropriate return for a project of that risk
- Often difficult to find pure play companies

Subjective Approach

- Consider the project’s risk relative to the firm overall
- If the project has more risk than the firm, use a discount rate greater than the WACC
- If the project has less risk than the firm, use a discount rate less than the WACC
- You may still accept projects that you shouldn’t and reject projects you should accept, but your error rate should be lower than not considering differential risk at all
### Example: Subjective Approach

<table>
<thead>
<tr>
<th>Risk Level</th>
<th>Discount Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Low Risk</td>
<td>WACC – 8%</td>
</tr>
<tr>
<td>Low Risk</td>
<td>WACC – 3%</td>
</tr>
<tr>
<td>Same Risk as Firm</td>
<td>WACC</td>
</tr>
<tr>
<td>High Risk</td>
<td>WACC + 5%</td>
</tr>
<tr>
<td>Very High Risk</td>
<td>WACC + 10%</td>
</tr>
</tbody>
</table>

### Flotation Costs
- The required return depends on the risk, not how the money is raised.
- However, the cost of issuing new securities should not just be ignored either.
- Basic Approach
  - Compute the weighted average flotation cost
  - Use the target weights because the firm will issue securities in these percentages over the long term

### Example: NPV and Flotation Costs
- Your company is considering a project that will cost $1 million. The project will generate after-tax cash flows of $250,000 per year for 7 years. The WACC is 15%, and the firm’s target D/E ratio is 0.6. The flotation cost for equity is 5%, and the flotation cost for debt is 3%. What is the NPV for the project after adjusting for flotation costs?
  - \( f_A = (0.375)(3\%) + (0.625)(5\%) = 4.25\% \)
  - PV of future cash flows = \( 1,040,105 \)
  - NPV = \( 1,040,105 - 1,000,000/(1-0.0425) = -4,281 \)
- The project would have a positive NPV of 40,105 without considering flotation costs.
- Once we consider the cost of issuing new securities, the NPV becomes negative.
Quick Quiz

• What are the two approaches for computing the cost of equity?
• How do you compute the cost of debt and the after-tax cost of debt?
• How do you compute the capital structure weights required for the WACC?
• What is the WACC?
• What happens if we use the WACC for the discount rate for all projects?
• What are two methods that can be used to compute the appropriate discount rate when WACC isn’t appropriate?
• How should we factor flotation costs into our analysis?

Ethics Issues

• How could a project manager adjust the cost of capital (i.e., appropriate discount rate) to increase the likelihood of having his/her project accepted?
  ▪ Is this ethical or financially sound?

Comprehensive Problem

• A corporation has 10,000 bonds outstanding with a 6% annual coupon rate, 8 years to maturity, a $1,000 face value, and a $1,100 market price.
• The company’s 100,000 shares of preferred stock pay a $3 annual dividend, and sell for $30 per share.
• The company’s 500,000 shares of common stock sell for $25 per share and have a beta of 1.5. The risk free rate is 4%, and the market return is 12%.
• Assuming a 40% tax rate, what is the company’s WACC?
Comprehensive Problem

What is the company’s WACC?

- MV of debt = 10,000 x $1,100 = $11,000,000, Cost of debt = YTM: 8 N; -1,100 PV; 60 PMT; 1,000 FV; CPT I/Y = 4.48%
- MV of preferred = 100,000 x $30 = $3,000,000, Cost of preferred = 3/30 = 10%
- MV of common = 500,000 x $25 = $12,500,000, Cost of common = .04 + 1.5 x (.12 - .04) = 16%
- Total MV of all securities = $11M + $3M + $12.5M = 26.5M
  - Weight of debt = 11M/26.5M = .4151
  - Weight of preferred = 3M/26.5M = .1132
  - Weight of common = 12.5M/26.5M = .4717

- WACC = .4151 x .0448 x (1 - .4) + .1132 x .10 + .4717 x .16 = .0979 = 9.8%

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