CHAPTER 10
The Cost of Capital

Capital Components & Costs
WACC
Adjusting for Risk
Segmented Markets

Impact on value

\[ \text{Value} = \sum_{t=0}^{n} \frac{C_{F_t}}{(1 + \text{WACC})^t} \]

- Value depends on reliably estimating risk and the cost of capital.
- Failure to properly assess risk leads to valuation errors.
- WACC is used to value corporations, projects, etc.

Sources of long-term capital

- Debt
- Preferred stock
- Common stock
  - Retained earnings
  - New common stock

Weighted average cost of capital

\[ \text{WACC} = w_d r_d (1 - T) + w_{ps} r_{ps} + w_s r_s \]

- The required return on all of a firm’s securities.
- A marginal, after-tax cost of capital.
- Weighted average of the component costs of capital.
- Weights are determined by each component’s contribution to the capital structure.

Should our analysis focus on historical costs?

- No, WACC is used for decisions about raising new capital and making new investments.
- WACC focuses on marginal costs of raising an additional dollar of capital.

How are weights determined?

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- Usually based on market values of securities, rather than book values.

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Cost of debt \( (r_d) \)

\[
\text{WACC} = w_d r_d(1 - T) + w_{ps} r_{ps} + w_s r_s
\]

- \( r_d \) is the marginal cost of debt capital.
- The YTM on outstanding debt is usually used as a measure of \( r_d \).
- If the firm uses short-term, interest-bearing debt to finance its fixed assets, then a short-term debt component should be included.
- Relevant component cost is \( r_d(1 - T) \), because interest is a tax-deductible expense.

Calculating \( r_d \)

The first bond is selling at a discount and is not likely to be called, so it is expected to earn its YTM.

This second bond is selling at a premium and is likely to be called, so it is expected to earn its YTC.

The appropriate component cost of debt is: \( r_d(1 - T) = 6.67\%(1 - T) = 4.0\% \).

Calculating \( r_{ps} \)

- Preferred stock pays a perpetual $6 dividend and currently sells for $94.20. New preferred shares will incur a 2% flotation cost.

\[
r_{ps} = \frac{D_{ps}}{P_{ps}} = \frac{6}{(94.20 \times (1 - 0.02))} = 6.50\%
\]

- Should be greater than \( r_d(1 - T) \), because preferred stock is riskier than debt and its dividends are not tax-deductible.
- MRI’s preferred stock is non-callable and perpetual. Many firms are now choosing to issue finite sinking fund preferred stock.

Cost of preferred stock \( (r_{ps}) \)

\[
\text{WACC} = w_d r_d(1 - T) + w_{ps} r_{ps} + w_s r_s
\]

- \( r_{ps} \) is the marginal cost of preferred stock.
- The rate of return investors require on preferred stock.
- Preferred stock dividends are not tax-deductible, so no tax adjustments should be necessary.

Cost of equity \( (r_s) \)

\[
\text{WACC} = w_d r_d(1 - T) + w_{ps} r_{ps} + w_s r_s
\]

- \( r_s \) is the marginal cost of equity using retained earnings.
- Retained earnings have a cost because investors could earn returns on alternative investments.
- Three common estimation methods:
  - Bond-yield-plus-risk-premium approach
  - DCF approach
  - CAPM approach
Bond-yield-plus-risk-premium approach ($r_s$)

- The bond-yield-plus-risk-premium approach adds a subjective equity risk premium to provide a ballpark estimate of $r_s$.
- The risk premium for this firm ranges from 2% to 4%, and is expected to be 3%.

$$r_s = r_d + RP$$

$$= 6.67\% + 3.00\%$$

$$= 9.67\%.$$

- The range of $r_s$ estimates is between 8.67% and 10.67%.

DCF approach ($r_s$)

- The discounted cash flow (DCF) approach uses the consensus future dividend estimates with the stock price to determine the marginal investor’s required return ($r_s$) for a stock.
- If a firm does not currently pay a dividend or pays a sporadic dividend, it is expected to fall into a long-run state of constant growth at some point in the future.
- If a firm’s dividend experiences a period of non-constant growth, solving for $r_s$ is extremely difficult and usually requires a spreadsheet.

Calculating $r_s$ (DCF)

- A common stock, currently trading at $21 per share, does not currently pay a dividend, but is expected to pay a $0.50 dividend three years from now. The dividend is expected to grow 20% in the fourth year, 15% in the fifth year, and at a constant rate of 8%, thereafter.

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend</th>
<th>Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.50</td>
<td>20%</td>
</tr>
<tr>
<td>2</td>
<td>0.60</td>
<td>15%</td>
</tr>
<tr>
<td>3</td>
<td>0.69</td>
<td>8%</td>
</tr>
<tr>
<td>4</td>
<td>0.745</td>
<td>8%</td>
</tr>
<tr>
<td>5+</td>
<td>0.745</td>
<td>8%</td>
</tr>
</tbody>
</table>

Using Microsoft Excel, $r_s = 10.30\%$.

CAPM approach ($r_s$)

- The capital asset pricing model (CAPM) uses a stock’s exposure to market risk to find $r_s$.
- A common stock has a beta of 1.2 with respect to the domestic stock index. The risk-free rate is 4.75% and the domestic market risk premium ($RP_d$) is 6%.

$$r_s = r_{RF} + \beta (RP_d)$$

$$= 4.75\% + 1.2 (6\%)$$

$$= 11.95\%.$$

Global CAPM approach ($r_s$)

- If a firm operates in integrated international markets, the CAPM parameters should reflect global risk parameters.
- The risk-free rate is still 4.75%, but the world risk premium ($RP_W$) is 5%. The firm’s beta with respect to global index returns is 1.1.

$$r_s = r_{RF} + \beta (RP_W)$$

$$= 4.75\% + 1.1 (5\%)$$

$$= 10.25\%.$$

Global CAPM estimates

- Using any version of the CAPM, you must be aware of how sensitive estimates are to the inputs used.

<table>
<thead>
<tr>
<th>Beta</th>
<th>3%</th>
<th>4%</th>
<th>5%</th>
<th>6%</th>
<th>7%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.9</td>
<td>7.45%</td>
<td>8.35%</td>
<td>9.25%</td>
<td>10.15%</td>
<td>11.05%</td>
</tr>
<tr>
<td>1.0</td>
<td>7.75%</td>
<td>8.75%</td>
<td>9.75%</td>
<td>10.75%</td>
<td>11.75%</td>
</tr>
<tr>
<td>1.1</td>
<td>8.05%</td>
<td>9.15%</td>
<td>10.25%</td>
<td>11.35%</td>
<td>12.45%</td>
</tr>
<tr>
<td>1.2</td>
<td>8.35%</td>
<td>9.55%</td>
<td>10.75%</td>
<td>11.95%</td>
<td>13.15%</td>
</tr>
<tr>
<td>1.3</td>
<td>8.65%</td>
<td>9.95%</td>
<td>11.25%</td>
<td>12.55%</td>
<td>13.85%</td>
</tr>
</tbody>
</table>
Making a cost of equity estimate

- Don’t expect the different $r_e$ estimates to be equal, but they should not be radically different either.
- The bond-plus-risk-premium approach establishes a “ballpark” range of 8.67% to 10.67%.
- The DCF (10.30%) and Global CAPM (10.25%) estimates agree with the range for $r_e$.
- Can use an average of the three estimates (10.08%), but some prefer to use the appropriate CAPM estimate (10.25%), which is what we will do.

Flotation costs

- Our estimate of $r_e$ is the cost of retained earnings. If the firm issues new common stock, $r_e$ must be adjusted for flotation costs (e.g., underwriting and legal costs).
- Easiest way to determine the cost is to adjust the price used in the DCF method to reflect the net price (after flotation costs) and solve for $r_e$.
- No direct way to do this in the CAPM. You can determine the flotation cost using DCF, and add it to the CAPM estimate.

Calculating WACC

\[
WACC = w_d r_d (1 - T) + w_p r_p + w_s r_s
\]

- The firm’s target capital structure calls for 25% debt, 5% preferred stock, and 70% common stock.

\[
WACC = 0.25(6.67\%)(0.6) + 0.05(6.5\%) + 0.7(10.25\%) \\
= 1.00\% + 0.32\% + 7.18\% \\
= 8.50\%.
\]

Factors affecting WACC

- Choice of capital structure
  - Market value weights are preferred to book value weights.
  - If book value weights are used instead, the higher a firm’s M/B ratio, the more WACC will be underestimated.
- Distribution policy (dividends and repurchases vs. retained earnings)
- Investment policy

Using WACC

- WACC reflects the average risk of all of the firm’s operating assets, and therefore it reflects the risk of the average project.
- WACC should be used to evaluate projects of average risk.
  - Above-average projects should be treated with a higher risk-adjusted WACC, and vice versa.

Should you always use the WACC?

- If the company will only use retained earnings this year …
  - The firm should use the WACC to evaluate projects because we would expect the firm to issue securities in the future to keep from straying too much from the target capital structure.
- If evaluating different capital budgeting projects of different risk …
  - The WACC used to evaluate a project should reflect the project’s risk.
International effects on WACC

- Global CAPM works only if the firm is operating in countries that have access to integrated international markets.
- If the firm operates or is appraising a project in a developing nation, the firm is operating in a partially segmented market.
- New approaches are available to estimate the costs of capital.

Foreign-denominated debt

- The firm’s bolivar-denominated debt is expected to yield 6.67% in Venezuela.
- \( \Delta FX^e = -0.016615 \)
  - Spot exchange rate (VEB/$) = 1,598
  - Forward exchange rate (VEB/$) = 1,625
- Note: Must convert to direct quotations
- The appropriate cost of debt to the firm is:
  \[
  \text{Cost of debt} = \text{rd} \times (1 - T) \times (1 + \Delta FX^e) + \Delta FX^e \\
  = 6.67\% \times 0.6 \times (0.983385) - 0.016615 \\
  = 2.27\%.
  \]

Segmented CAPM

- Global CAPM uses RP\(_W\) and a firm/project’s risk exposure to find the cost of capital, but it assumes integrated international markets.
- Segmented CAPM adds an additional parameter to account for the risk due to the segmentation of markets.
- The segmented component (SRP\(_W\)) can represent either a specific country or geographic region’s risk.
- This method works especially well in Latin America.

Calculating segmented CAPM

- The firm is estimating the cost of capital for a project in Venezuela. The segmented premium is estimated to be 10%, and the Venezuelan project has a beta of 0.7 with respect to the segmented risk premium.
  \[
  r_s = r_{RF} + (RP_W) \times b_{W} + (SRP_W) \times b_{Seg} \\
  = 4.75\% + (5\%) \times 1.1 + (10\%) \times 0.7 \\
  = 17.25\%.
  \]

Country-spread approach

- Low returns correlations between emerging and developed markets cause Global CAPM estimates to be too low.
- Consulting firms developed the country-spread approach to handle this problem.
- Adds the spread between a specific country’s U.S. dollar-denominated sovereign bond yields and U.S. Treasury yields to the standard (domestic) CAPM.

Calculating the country-spread approach

- The country credit spread for Venezuela is 6.5% and the ratio of market standard deviation in Venezuela to market standard deviation in the U.S. is 0.38/0.19 = 2.0.
  \[
  r_s = r_{RF} + RP_W \times \sigma_W/c_\sigma_W + \text{CC spread} \\
  = 4.75\% + (6\%) \times [0.6 \times (0.38/0.19)] + 6.5\% \\
  = 18.45\%.
  \]
**Country-risk-rating approach**

- Estimates country level risk using bi-annual country risk ratings.
- Many political and economic risk factors affect the country-risk rating.
- A higher country-risk rating means a higher required return for investments in that country.
- The following regression model determines semiannual return for U.S. dollars in Country $j$.

$$ r_{sj}/2 = a + d_{cr} \ln(\text{country-risk rating}_j) $$

**Calculating the country-risk-rating approach**

- A regression across all countries yields the following parameters: $a = 0.31$, $d_{cr} = -0.06$.
- The latest survey indicates that Venezuela’s country-risk rating is 40.

$$ r_{sj}/2 = a + d_{cr} \ln(\text{country-risk rating}_j) $$

$$ = 0.31 - 0.06 \ln(40) $$

$$ = 8.87\% $$

- Therefore, the annual $r_s = 8.87\% \times 2 = 17.73\%$.

**Foreign cost of equity**

- All estimates fall into a reasonable range.
- Could use any of the individual estimates or an average of estimates.
- We will use an average:

<table>
<thead>
<tr>
<th>Method</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Segmented CAPM</td>
<td>17.25%</td>
</tr>
<tr>
<td>Country-spread approach</td>
<td>18.45%</td>
</tr>
<tr>
<td>Country-risk-rating</td>
<td>17.73%</td>
</tr>
</tbody>
</table>

$$ r_s = 17.81\% $$

**Foreign WACC**

- Venezuelan project will use a capital structure of 10% debt and 90% equity.

$$ WACC = w_d(A-T r_d) + w_er_s $$

$$ = 0.1(2.27\%) + 0.9(17.81\%) $$

$$ = 0.23\% + 16.03\% $$

$$ = 16.26\% $$

**Raising capital overseas**

- Firms often guarantee subsidiaries’ debt in order to keep interest rates down.
- Operations are often financed with different debt/equity mixes in different countries.
- Differences usually due to different interest rates, exchange rates, and tax situations.