Chapter 12
The Cost of Capital

Topics
- Thinking through Frankenstein Co.’s cost of capital
- Weighted Average Cost of Capital: WACC
- Measuring Capital Structure
- Required Rates of Return for individual types of capital.
- (Real Company) WACC
- Flotation Costs

Cost of Capital

Cost of Capital - The return the firm’s investors could expect to earn if they invested in securities with comparable degrees of risk.

Capital Structure - The firm’s mix of long term financing and equity financing.
Frankenstein Co.’s Cost of Capital

- Dr. Frederick Frankenstein is considering expanding his company’s business and has asked his assistant Igor to estimate the company’s cost of capital.
- The company has 1 million shares of common stock outstanding at a market price of $8 per share. According to Frau Bluker, another Dr. Frankenstein assistant, stockholders demand a 22% return on the company’s stock.
- Igor’s initially estimates that Frankenstein’s cost of capital is the stockholders 22% required return under the assumptions.
  - company’s value = value of its stock
  - risk of company = risk of its stock
  - investors’ required return from company = investors’ required return on stock. However,…

What about debt?

- Upon further investigation, Igor discovers that Frankenstein Co. has bonds with a market value of $2 million outstanding and the company’s bondholders require a 12% return on this debt.
- Now Igor is thinking the following:
  - Value of company = value of portfolio of all the firm’s debt & equity securities
  - Risk of company = risk of portfolio
  - Rate of return on company = rate of return on portfolio
  - Investors’ required return on company (company cost of capital) = investors’ required return on portfolio

Frankenstein Co.’s Capital Structure

- Market Value of Debt $2 million
- Market Value of Equity $8 million
- Market Value of Assets $10 million
- The company uses 20% debt financing and 80% equity financing, and Igor assumes the company will maintain this capital structure.
- Igor decides the cost of debt is the bondholders’ required return of 12% and the cost of equity is the stockholders’ required return of 22%.
- Igor decides that Frankenstein’s cost of capital is equal to the return of an investor owning a portfolio of all the company’s debt and equity, which is .2(12%) + .8(22%) = 20%.
What about taxes from Frankenstein’s perspective?

- Igor’s logic is close but not quite right because he is forgetting that interest paid on debt is tax deductible for a corporation.
- Consider these two companies with a 35% tax rate: Abby has no debt, Normal has $1000 in debt with a 10% interest rate.

<table>
<thead>
<tr>
<th>Company</th>
<th>Abby</th>
<th>Normal</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Interest Exp.</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Pre-tax income</td>
<td>1000</td>
<td>900</td>
</tr>
<tr>
<td>Taxes (35%)</td>
<td>350</td>
<td>315</td>
</tr>
<tr>
<td>Net Income</td>
<td>650</td>
<td>585</td>
</tr>
</tbody>
</table>

- Normal’s interest expense saves 35 in taxes and has an after-tax cost of 65, which makes their after-tax interest rate 65/1000 or 6.5% = 10%(1-.35). Igor needs to incorporate this into his estimate.

Igor’s final Cost of Capital estimate

- Frankenstein has a tax rate of 35%, uses 20% debt financing with a cost of 12% (before-tax) and 80% equity financing.
- Frankenstein Co.’s weighted average cost of capital:

\[
WACC = 0.2(12\%)(1-.35) + 0.8(22\%) = 0.1916
\]

- If the company’s expansion is expected to earn more than 19.16%, the company should proceed with this investment.

Does Frankenstein’s 19.16% WACC work?

- Say Frankenstein’s expansion would cost $1,000,000 today and would increase the company’s cash flow by $200,000 per year into perpetuity.
- NPV = $200,000/0.1916 - $1,000,000 = $43,841. IRR = 200,000/1,000,000 = 20%
- 20% or $200,000 of this cost would be raised through debt with an after-tax cost of 12%(1-.35) = 7.8%, which is $15,600 (7.8% of $200,000) per year needed for the company’s creditors.
- 80% or $800,000 of this cost would be raised through equity with a return of 22%, which is $176,000 per year expected by the company’s stockholders.
- This means Frankenstein’s investors need $15,600 + $176,000 = $191,600 per year on their investment (19.16%).
- Since the expansion’s annual cash flow exceeds its financing requirements, it adds value to the company and should be accepted.
WACC

**Weighted Average Cost of Capital (WACC).** The expected rate of return on a portfolio of all the firm’s securities.

Company cost of capital = Weighted average of debt and equity returns.

\[
WACC = \frac{\text{total income}}{\text{value of investments}}
\]

\[
r_{\text{assets}} = \frac{(D \times r_{\text{debt}}) + (E \times r_{\text{equity}})}{V}
\]

\[
r_{\text{assets}} = \left( \frac{D}{V} \times r_{\text{debt}} \right) + \left( \frac{E}{V} \times r_{\text{equity}} \right)
\]

WACC

- Taxes are an important consideration in the company cost of capital because interest payments are deducted from income before tax is calculated.

\[
\text{After-tax cost of debt} = \text{pretax cost} \times (1 - \text{tax rate})
\]

\[
= r_{\text{debt}} \times (1 - T_c)
\]
WACC

Weighted-average cost of capital =

\[
WACC = \left( \frac{D}{V} \times (1 - T_c) \right) r_{debt} + \left( \frac{E}{V} \times r_{equity} \right)
\]

Three Steps to Calculating Cost of Capital

1. Calculate the value of each security as a proportion of the firm’s market value.
2. Determine the required rate of return on each security.
3. Calculate a weighted average of these required returns.

Measuring Capital Structure

- In estimating WACC, do not use the Book Value of securities.
- In estimating WACC, use the Market Value of the securities.
- Book Values often do not represent the true market value of a firm’s securities.
Measuring Capital Structure

**Market Value of Bonds** - PV of all coupons and par value discounted at the current interest rate.

**Market Value of Equity** - Market price per share multiplied by the number of outstanding shares.

Pittsburgh Perfect Pumpkin Pie’s (4P for short) Capital Structure and WACC

- 4P has bonds with at total par value of $10 million, 10 years to maturity, and a 10% annual coupon. Also, 4P has 5 million shares of common stock with a par value of $1 per share and $5 million of retained earnings.

<table>
<thead>
<tr>
<th>Balance Sheet (book value) in $million</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term Bonds</td>
<td>10</td>
</tr>
<tr>
<td>Common Stock</td>
<td>5</td>
</tr>
<tr>
<td>Retained Earnings</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
</tr>
</tbody>
</table>
Pittsburgh Perfect Pumpkin Pie’s (4P for short) Capital Structure and WACC

- 4P’s bonds have a YTM (required return) of 8%. The common stock sells for $5 per share with an expected return of 15%. What is the market value of these securities and 4P’s WACC if their tax rate is 40%?
- Market Value of Bonds: 10 years to maturity = N, par value = 10 = PV, coupon rate = 10% of 10 = annual coupon of 1 = PMT, 8% = I/Y, CPT PV = $11.34M.
- Market Value of Equity: 5 million shares x $5/share = $25M.

<table>
<thead>
<tr>
<th>4P’s Market Value($mil)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debt</td>
</tr>
<tr>
<td>11.34</td>
</tr>
<tr>
<td>31.2%</td>
</tr>
<tr>
<td>Equity</td>
</tr>
<tr>
<td>25.00</td>
</tr>
<tr>
<td>68.8%</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>36.34</td>
</tr>
<tr>
<td>100%</td>
</tr>
</tbody>
</table>

WACC = .312(8%)(1-0.4) + .688(15%) = 11.8%

If book value weights (50/50) were used, WACC would have been understated!

Required Rates of Return

- **Bonds**
  \[ r_d = \text{YTM} \]

- **Common Stock**
  \[ r_e = \text{CAPM} \]
  \[ = r_f + B(r_m - r_f) \]

Issues in Implementing CAPM:

- Must obtain estimates of \( r_f, B, \) and \( r_m - r_f \) or market risk premium.
- Can use Treasuries to estimate \( r_f \). But what time to maturity?
  - For financial investments like stocks, 3-month T-bills are usually used. (Current rate ~ 1%)
  - Since capital budgeting involves long-term investments, some argue 10 or 20 year T-bond rates make sense. (Current 10-yr T-bond rate ~ 4%)
- Many published sources of B estimates.
  - Value Line Investment Survey, Standard & Poor’s, Yahoo Finance and Merrill Lynch.
- For \( r_m - r_f \) can use historical difference between market return and T-bills (8 to 9%) or market return and long-term T-bonds (7 to 8%).
Required Rates of Return

**Dividend Discount Model Cost of Equity**

Perpetuity Growth Model =

\[ P_0 = \frac{\text{Div}_1}{r_e - g} \]

solve for \( r_e \)

\[ r_e = \frac{\text{Div}_1}{P_0} + g \]

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**The Dividend Discount Model**

- The expected return formula derived from the constant growth stock valuation model.
- \( r_{\text{equity}} = \frac{\text{Div}_0}{P_0} + g = \frac{\text{Div}_0(1+g)}{P_0} + g \)
- In practice: The tough part is estimating \( g \).
- Security analysts’ projections of \( g \) can be used.
- According to the journal, Financial Management, these projections are a good source for growth rate estimates.
- Possible Sources for \( g \): Value Line Investment Survey and Institutional Brokers’ Estimate System (I/B/E/S)

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**Expected Return on Preferred Stock**

Price of Preferred Stock =

\[ P_0 = \frac{\text{Div}}{r_{\text{preferred}}} \]

solve for \( r_{\text{preferred}} \)

\[ r_{\text{preferred}} = \frac{\text{Div}}{P_0} \]
Proctor & Gamble: Let’s try finding WACC for real.

- We will work this out together. Here’s some information we need to gather and use.
  - Gives us preferred stock, capital structure information, beta, growth rate estimates and quarterly dividend information
- Corporate Bond info:
  - Bond rating: www.moodys.com
  - Treasury yield and yield spreads: www.bondsonline.com

Recall what we need to do for P&G.

Three Steps to Calculating Cost of Capital
1. Calculate the value of each security as a proportion of the firm’s market value.
2. Determine the required rate of return on each security.
3. Calculate a weighted average of these required returns.

To use WACC, or not to use WACC

- A company’s WACC is for average risk projects for a firm.
- Most financial managers adjust WACC upward for riskier than average projects and downward for safer than average projects.
- Also, companies with diverse divisions might use industry average WACCs for other companies in the same line of business as their individual corporate divisions.
**What to keep in mind about WACC.**

- WACC is the correct discount rate for a company to use for average-risk capital investment projects.
- WACC is the return the company needs to earn after tax in order to satisfy all its security holders.
- Since the after-tax cost of debt is usually the cheapest source of financing for a firm, a firm may be tempted to increase their debt ratio. However, this will increase the risk associated with both debt & equity financing and a higher required rate of return on both sources of financing.
  - More on this issue in Chapter 15, Debt Policy.

**Flotation Costs**

- The cost of implementing any financing decision must be incorporated into the cash flows of the project being evaluated.
- Only the incremental costs of financing should be included.
- This is sometimes called Adjusted Present Value.