CHAPTER 10
The Cost of Capital

- Sources of capital
- Component costs
- WACC
- Adjusting for flotation costs
- Adjusting for risk

What sources of long-term capital do firms use?

Long-Term Capital
  - Long-Term Debt
  - Preferred Stock
  - Common Stock
    - Retained Earnings
    - New Common Stock
Major determinant of the cost of capital

Regardless the type of capital, the main determinant of cost is the required return for investors.

The required return must be met to entice market participants to place funds in the firm whether the security is debt, preferred stock, or common stock.

Should we focus on before-or after-tax capital costs?

- Tax effects associated with financing can be incorporated either in capital budgeting cash flows or the cost of capital.

- Most firms incorporate tax effects in the cost of capital. Therefore, we focus on after-tax costs.
Only the cost of debt needs to be adjusted.

- Interest payments (the amounts paid to debtholders) are tax deductible.

- Dividend payments (the amounts paid to preferred and common stockholders) are not deductible.

Historical vs. Marginal Cost?

- The cost of capital is used primarily to make decisions which involve raising and investing new capital.
- So, we focus on marginal costs.
- It is the cost of the next dollar of capital raised which is the relevant concern.
**Flotation costs**

- Total costs of issuing a security reduce the net proceeds from the sale.
- This reduction in fund flowing to the firm is an additional cost that should be considered (although for larger firms the flotation costs may be small for some types of capital).

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**Component Cost of Debt**

- The yield to maturity on outstanding long-term debt is used as a measure of the before-tax cost of debt ($k_d$).
- If flotation costs are substantial, we replace the bond’s price with the price minus flotation costs (net proceeds).
- Interest is tax deductible, so the cost of debt must be adjusted to reflect the tax savings.

$$k_{d\text{AT}} = k_{d\text{BT}}(1 - T)$$
Calculate before-tax cost of debt

<table>
<thead>
<tr>
<th>N</th>
<th><em>I</em></th>
<th>PV</th>
<th>FV</th>
<th>Pmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of coupon pmts</td>
<td>Cost of debt before taxes</td>
<td>Price minus flotation costs</td>
<td>Par value</td>
<td>Coupon payment each period</td>
</tr>
</tbody>
</table>

After-tax cost of debt

\[
\text{after - tax cost of debt} = \text{before - tax cost of debt} \left(1 - \text{tax rate}\right)
\]
Example Problem

BBB’s bonds have a par value of $1,000, a maturity of 25 years, and an annual coupon rate of 12%. Investors will expect an 11% rate of return for these bonds. The flotation costs will equal 4% of the market value of the bonds. The firm’s marginal tax rate is 40%. What is the true cost of the bonds?

Calculate Price

To calculate the cost of debt, we first need to determine the price of the bond.

<table>
<thead>
<tr>
<th>N</th>
<th>I</th>
<th><em>PV</em></th>
<th>FV</th>
<th>Pmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>11</td>
<td>-1084.22</td>
<td>1000</td>
<td>120</td>
</tr>
</tbody>
</table>
The after-tax cost is calculated as the before-tax cost times one minus the marginal tax rate.

After-tax cost of debt = 11.5% \times (1 - 0.40) = 6.9%

Component Cost of Preferred Stock

- $k_p$ is the marginal cost of preferred stock which is the rate of return investors require on the firm’s preferred stock adjusted for flotation costs.

- Preferred dividends are not tax deductible, so no tax adjustment.
Cost of preferred stock

Use this formula:

\[(V_p - F) = \frac{D}{k_p}\]

\[k_p = \frac{D}{V_p - F}\]

What’s the cost of preferred stock?
The current price is $111.10 with a par of $100 and a 10% dividend. Flotation costs are 5% of the price.

\[k_p = \frac{0.10(100)}{111.10 - (0.05)(111.10)}\]

\[k_p = 0.09475 = 9.475\%\]
Using the calculator:

- You may solve for the cost of preferred using the calculator.

- Let: \( n = \) some large number (1000); \( I/yr = \) cost of preferred (variable solved for; \( PV = \) negative of net proceeds; \( PMT = \) preferred dividend

\[ PV = (111.10) - (0.05)(111.10) = 105.545 \]

\[ PMT = (0.10)(100) = 10 \]

<table>
<thead>
<tr>
<th>N</th>
<th><em>I</em></th>
<th>PV</th>
<th>FV</th>
<th>Pmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td>9.475</td>
<td>-105.545</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>
Is preferred stock more or less risky to investors than debt?

- More risky; company not required to pay preferred dividend.
- However, firms try to pay preferred dividend. Otherwise, (1) cannot pay common dividend, (2) difficult to raise additional funds, (3) preferred stockholders may gain control of firm.

Component Cost of Equity

- Retained earnings: New equity can be generated by reinvesting profits. Since profits belong to the common shareholder, reinvested profits increase the shareholders’ investment in the firm.
- New stock issues: New equity can also be raised through new issues.
Component Cost of Equity

- $k_s$ is the marginal cost of common equity using retained earnings (no flotation costs).
- The rate of return investors require on the firm’s common equity using new equity is $k_e$ (flotation costs are positive).

Why is there a cost for retained earnings?

- Earnings can be reinvested or paid out as dividends.
- Investors could buy other securities, earn a return.
- Thus, there is an opportunity cost if earnings are retained.
- **Opportunity cost**: The return stockholders could earn on alternative investments of equal risk.

- They could buy similar stocks and earn $k_s$, or company could repurchase its own stock and earn $k_s$. So, $k_s$ is the cost of retained earnings.

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**Three ways to determine cost of common equity, $k_s$:**

1. **CAPM**: $k_s = k_{RF} + (k_M - k_{RF})b$

2. **DCF**: $k_s = D_1/P_0 + g$

3. **Own-Bond-Yield-Plus-Risk Premium**: $k_s = k_d + RP$
What’s the cost of common equity based on the CAPM?

\[ k_{RF} = 7\%, \ RP_M = 6\%, \ b = 1.2. \]

\[ k_s = k_{RF} + (k_M - k_{RF})b \]

\[ = 7.0\% + (6.0\%)1.2 = 14.2\% \]

What’s the DCF cost of common equity, \( k_s \)? Given: \( D_0 = \$4.19; \ P_0 = \$50; \ g = 5\%. \)

\[ k_s = \frac{D_1}{P_0} + g = \frac{D_0(1 + g)}{P_0} + g \]

\[ = \frac{\$4.19(1.05)}{\$50} + 0.05 \]

\[ = 0.088 + 0.05 \]

\[ = 13.8\%. \]
The three most common ways to estimate the growth rate:

- Historical estimate
- Retention growth rate
- Analysts’ forecasts

Suppose the company has been earning 15% on equity (ROE = 15%) and retaining 35% (dividend payout = 65%), and this situation is expected to continue.

What’s the expected future $g$?
Retention growth rate:

\[ g = (1 - \text{Payout})(\text{ROE}) = 0.35(15\%) = 5.25\%. \]

\((1 - \text{Payout}) = \text{Fraction retained}\)

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Could DCF methodology be applied if \( g \) is not constant?

- **YES**, nonconstant \( g \) stocks are expected to have constant \( g \) at some point, generally in 5 to 10 years.
- But calculations get complicated.
Find $k_s$ using the own-bond-yield-plus-risk-premium method. ($k_d = 10\%, \ RP = 4\%$.)

$k_s = k_d + \ RP$

$= 10.0\% + 4.0\% = 14.0\%$

- This $\ RP \neq \text{CAPM } \ RP$.  
- Produces ballpark estimate of $k_s$. Useful check.

What’s a good final estimate of $k_s$?

- First, look for reasonableness of estimates. (Do they models generally agree and give you widely varying results?)
- If close, maybe use average.
- If very different, you have to look for justification for one model over another.
What’s a reasonable final estimate of $k_s$?

<table>
<thead>
<tr>
<th>Method</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAPM</td>
<td>14.2%</td>
</tr>
<tr>
<td>DCF</td>
<td>13.8%</td>
</tr>
<tr>
<td>$k_d + RP$</td>
<td>14.0%</td>
</tr>
<tr>
<td>Average</td>
<td>14.0%</td>
</tr>
</tbody>
</table>

Why is the cost of retained earnings cheaper than the cost of issuing new common stock?

1. When a company issues new common stock they also have to pay flotation costs to the underwriter.
2. Issuing new common stock may send a negative signal to the capital markets, which may depress stock price.
Two approaches that can be used to account for flotation costs:

- Include the flotation costs as part of the project’s up-front cost. This reduces the project’s estimated return.

- Adjust the cost of capital to include flotation costs. This is most commonly done by incorporating flotation costs in the DCF model.

Suppose new common stock had a flotation cost of 15%. What is $k_e$?

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

\[
= \frac{4.19(1.05)}{50(1 - 0.15)} + 5.0\% \\
= \frac{4.40}{42.50} + 5.0\% = 15.4\%.
\]
Comments about Flotation Costs

- Flotation costs depend on the risk of the firm and the type of capital being raised.
- The flotation costs are highest for common equity. However, since most firms issue equity infrequently, the per-project cost is fairly small.
- Companies frequently ignore flotation costs when calculating cost of capital.

Weighted Average Cost of Capital

- Most operate with a target in mind regarding the relative amount of debt versus equity they intend to use.
- This target capital structure is the basis upon which the firm’s cost of capital is based.
For all purposes, the cost of capital for the firm should be estimated based on the target percentage of funds expected to come from all sources.

This is true even if a particular project is financed with only one type of funds.

Using more of one type of funds than the target weights merit implies that in the future you will have to use more of the other types of funds to reach your target.

Thus, the firm’s cost of capital is the weighted average of the component costs.
Firms obtain capital in lumps but use many different types at the same time.

The different types of financing are interrelated. (e.g. adding debt may increase the cost of other types of financing as well.)

How do you calculate the weighted average cost of capital?

WACC = \( w_d k_d (1 - T) + w_p k_p + w_c k_s \).

- The \( w \)'s refer to the capital structure weights.
- The \( k \)'s refer to the cost of each component.
How do you determine the weights?

\[ \text{WACC} = w_d k_d (1 - T) + w_p k_p + w_s k_s \]

- Use accounting numbers or market value (book vs. market weights).
- Use actual numbers or target capital structure.

Suppose you have the following inputs:

- before-tax cost of debt = 9%
- marginal tax rate = 40%
- cost of preferred = 8%
- cost of equity = 13.1%
- Target structure: Debt = 30%; Pref = 10%; Equity = 60%
What is the WACC using retained earnings for the equity component?

\[
\text{WACC} = w_d k_d (1-t) + w_p k_p + w_s k_s
\]

\[
= .3 (5.4\%) + .1(8\%) + .6(13.1\%)
\]

\[
= 10.3\%
\]

Would the weighted average cost of capital remain constant?

NO.

- As more and more new capital is required in any year, the company’s component costs of capital would change.

- This would cause the WACC to rise.
Would the weighted average cost of capital remain constant?

There can be multiple WACCs due to changes in any of the component costs.
Each WACC is often called a marginal cost of capital (MCC) to indicate more than one is possible.
For this reason, we need to be able to determine “where” the cost of capital changes.

MCC Breakpoint

We need to calculate the breakpoints (BP) in the marginal cost of capital (this is where the WACC changes).

\[
BP = \frac{\text{amount of type of funds available}}{\text{fraction that type of funds is of total capital}}
\]
Suppose you have the following inputs:

- before-tax cost of debt = 9%
- marginal tax rate = 40%
- cost of preferred = 8%
- cost of equity:
  - Ret. earnings = 13.1% ($120 mil avail.)
  - New stock = 13.85%
- Target structure:
  - Debt = 30%; Pref = 10%; Equity = 60%

\[
\text{WACC}_{1} = W_d k_d (1-t) + W_p k_p + W_s k_s
\]
\[
= .3 (5.4\%) + .1(8\%) + .6(13.1\%)
\]
\[
= 10.3\%
\]
\[
\text{Cost of new capital until the retained earnings is depleted.}
\]
WACC with new common equity?

\[
WACC_2 = W_d k_d (1-t) + W_p k_p + W_e k_e
\]

\[
= .3(5.4\%) + .1(8\%) + .6(13.85\%)
\]

\[
= 10.7\%
\]

Summary to this point:

<table>
<thead>
<tr>
<th>k_S or k_e</th>
<th>WACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.10%</td>
<td>10.3%</td>
</tr>
<tr>
<td>13.85%</td>
<td>10.7%</td>
</tr>
</tbody>
</table>

WACC rises because new stock costs more.
Find retained earnings breakpoint (where the WACC changes).

Optimal proportion of equity = 60%
Amount of retained earnings available = $120 million

\[ B_{RE} = \frac{\text{Dollars of RE}}{\text{Fraction of equity}} \]

\[ = \frac{($120 \text{ mil})}{(0.60)} = $200 \text{ mil} \]

How would the company raise the $500,000 of new capital?

\[ .3(200\text{mil}) = $60 \text{ mil Debt} \]
\[ .1(200\text{mil}) = $20 \text{ mil Preferred} \]
\[ .6(200\text{mil}) = $120 \text{ mil Ret. Earnings} \]
\[ $200 \text{ mil Total} \]
What is the MCC schedule?

A plot of the firms WACC versus new dollars of capital raised.

Shows the cost of each additional, or marginal, dollar raised.

<table>
<thead>
<tr>
<th>$ of New Capital ($000)</th>
<th>WACC %</th>
</tr>
</thead>
<tbody>
<tr>
<td>$200 mil</td>
<td>10.3%</td>
</tr>
<tr>
<td></td>
<td>10.7%</td>
</tr>
</tbody>
</table>
You can have multiple breakpoints. Suppose:

- after-tax cost of debt:
  - 6% (up to $90 million borrowed)
  - 8% (over $90 million borrowed)
- marginal tax rate = 40%
- cost of preferred = 9%
- cost of equity:
  - Ret earnings = 12%  ($120 mil avail)
  - New stock = 14%
- Target structure: Debt = 30%; Pref = 10%; Equity = 60%

Solving a problem with multiple breakpoints

First, note that there is a breakpoint each time the cost of a type of capital changes.

Second, note that there will be one more WACC than there are breakpoints.
Steps:

1. Calculate all breakpoints.
2. Rank the breakpoints from lowest to highest.
3. Calculate the WACC below the lowest breakpoint using the lowest cost of each type of capital, and then calculate each succeeding WACC by changing the cost of the type of capital associated with each breakpoint.

Our example: Step 1
Calculate Breakpoints

Breakpoint (debt):
BP(debt) = ($90 million)/(0.30) = $300 million

Breakpoint(equity):
BP(eq) = ($120 million)/(0.60) = $200 million
Our example: Step 2  
Rank Breakpoints

BP(debt) = $300 million  
BP(eq) = $200 million

Our example: Step 3  
Calculate WACCs

WACC_3 = (0.30)(8%)+(0.10)(9%)+(0.60)(14%) = 11.7%

---------------------BP(debt) = $300 million---------------------

WACC_2 = (0.30)(6%)+(0.10)(9%)+(0.60)(14%) = 11.1%

---------------------BP(eq) = $200 million---------------------

WACC_1 = (0.30)(6%)+(0.10)(9%)+(0.60)(12%) = 9.9%
Would what the company planned to do with the money it raised have any effect on the WACC?

- It might. We have implicitly assumed that the company would invest in assets with equal risk as existing assets.

- If the company planned to invest in riskier assets, this would raise the cost of capital.

What factors influence a company’s composite WACC?

- Market conditions.
- The firm’s capital structure and dividend policy.
- The firm’s investment policy. Firms with riskier projects generally have a higher WACC.
Should the company use the composite WACC as the hurdle rate for each of its projects?

- NO! The composite WACC reflects the risk of an average project undertaken by the firm. Therefore, the WACC only represents the “hurdle rate” for a typical project with average risk.
- Different projects have different risks. The project’s WACC should be adjusted to reflect the project’s risk.

What procedures are used to determine the risk-adjusted cost of capital for a particular project or division?

- Subjective adjustments to the firm’s composite WACC.
- Attempt to estimate what the cost of capital would be if the project/division were a stand-alone firm. This requires estimating the project’s beta.
What are the three types of project risk?

- Stand-alone risk
- Corporate risk
- Market risk

How is each type of risk used?

- Market risk is theoretically best in most situations.
- However, creditors, customers, suppliers, and employees are more affected by corporate risk.
- Therefore, corporate risk is also relevant.