**Chapter 10**  
**The Cost of Capital**

**Cost of Capital** is the firm’s average cost of funds, which is the average return required by the firm’s investors.

**Firms use various sources of long-term capital:**  
Long-term debt  
Preferred stock  
Common equity

Focus on after-tax rather before-tax capital costs. Focus on new (marginal) costs rather than historical (embedded) costs.

**Weighted Average Cost of Capital (WACC)**  
**COST OF DEBT AND PREFERRED STOCK**

Cost of debt

\[
\begin{align*}
    r_d & \approx \frac{INT + \left( \frac{M - P_B}{n} \right)}{2(P_B) + M} \\
    & \approx \frac{2(P_B) + M}{3}
\end{align*}
\]

**Example:**  
A company has a 15-year, 12% coupon bond that sells for $1,153.72. The bond pays interest semiannually. What is \( k_d \)?

After-tax cost of debt = \( r_d(1 - T) \)  
Flotation costs for debt are small, so ignore.

**Cost of Preferred Stock**

\[
    r_p = \frac{D_p}{P_p}
\]

**Example:**  
Suppose a company’s preferred stock sells for $113.10; has a par value of $100; pays a 10% (of par value) dividend; and will experience a $2 per share flotation charge if it issues new preferred stock. What is the company’s cost of preferred?
Note:
Flotation costs for preferred are significant, so are reflected. Use net price: price - flotation costs.
Preferred dividends are not tax-deductible, so no tax adjustment. Just $r_p$

COST OF EQUITY
Companies can “raise” equity in two ways
1. Companies can issue new shares of common stock.
2. Companies can retain earnings.

Why is there a cost for retained earnings?

Earnings can be reinvested or paid out as dividends.
If paid out, then investors can buy other securities, earn a return.
So, there is an opportunity cost if earnings are retained.

Opportunity cost: The return stockholders can earn on alternative investments of equal risk.

Common stockholders can buy similar stocks and earn $r_s$, or the company can repurchase its own stock and earn $r_s$. So, $r_s$ is the cost of retained earnings and it is the cost of common equity.

The CAPM Approach

$$r_s = r_{rf} + (r_{m} - r_{rf})\beta =$$

Example:
Assume a risk-free rate of 7%, a return on the market portfolio for 13%. If this company has $\beta$=1.2, what is the cost of equity based on the CAPM?

Discounted Cash Flow (DCF) Approach

$$r_s = \frac{D_t}{P_0} + g$$

Example:
The firm just paid a dividend of $4.19, has a dividend growth rate of 5%, and is currently selling for $50, what is the DCF cost of equity?
Bond-Yield-plus-Risk Premium Approach

\[ r_s = r_d + \text{risk premium} \]

Example:
If the company's cost of debt, \( r_d \), is 10% and it believes that the cost of equity is generally 4 percentage points higher than \( r_d \) (in other words, risk premium \( = 4\% \)), what is \( r_s \) using the bond-yield-plus-risk-premium method?

Note:
This risk premium \( \neq \) CAPM risk premium, \((r_m - r_f)\),
Produces ballpark estimate of \( r_s \). Useful check.

We have three differing estimates of the cost of equity--What’s a reasonable final estimate of \( r_s \)?

<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>( r_d + \text{RP} )</td>
<td>14.0%</td>
</tr>
<tr>
<td>Average</td>
<td>14.0%</td>
</tr>
</tbody>
</table>

External equity (or new common stock)
Is the cost of newly issued common stock, \( r_e \), the same as the cost of retained earnings?

Our method for determining the cost of external equity, \( r_e \), is based on the cost of retained earnings. It is adjusted for flotation costs.

\[
r_e = \frac{D_1}{P_{Net}} + g = \frac{D_1}{P_0 (1 - F)} + g
\]

Example.
The firm just paid a dividend of $4.19, has a dividend growth rate of 5%, and is currently selling for $50. Issuance costs for new common are $2 per share for this company. What is this company's cost of external equity?
**Optimal Capital Structure**
Is the percentage of debt, preferred stock, and common equity that will maximize the price of the firm’s stock

For our example, let’s assume this company’s optimal capital structure is 30% debt, 10% preferred stock, and 60% common equity

**Weighted Average Cost of Capital (WACC)** is the weighted average of the component costs of debt, preferred stock, and common equity

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

where \( w \) is the proportion of each component in the capital structure. Note: the \( w \)'s must sum to 1.0.

**Example:**
Assuming our example company uses retained earnings for common equity, what’s its WACC?

**Marginal Cost of Capital (MCC)**
is the cost of obtaining another dollar of new capital—the weighted average cost of the last dollar of new capital raised.

Can the company raise an unlimited amount of new capital at the 11.1% cost? Probably not. As a company raises larger and larger amounts of funds during a given time period, the costs of those funds begin to rise.
**MCC Schedule.** Marginal cost of capital schedule is a graph that relates the firm's weighted average cost of each dollar of capital to the total amount of new capital raised. It reflects changing costs depending on amounts of capital raised.

![WACC Graph](image)

A "Break Point" is the dollar value of new capital that can be raised before an increase in the firm’s weighted average cost of capital occurs.

**Example:**
Suppose that the company anticipates retaining $60 million dollars in the coming year--how much can be spent on capital investments before external equity must be sold?

\[ \text{Retained earnings} = 60\% \text{ of the capital structure} \]
\[ \text{Retained earnings} = 60\% \times X \]
\[ X = \text{equation for a retained earnings break point:} \]

\[ \text{Breakpoint} = \frac{\text{addition to retained earnings for the year}}{\text{equity fraction}} \]

MCC Schedule and break points depend on capital structure used. The MCC schedule and Investment Opportunity Schedules can be combined to assist in determining which investments should be undertaken. Work ST-2 (p 327) as an example.