Chapter 10

The Cost of Capital

The Cost of Capital
(def) - Cost of obtaining money to fund asset purchase - use as estimate of r (discount rate)

If we can earn more than the cost of capital (r) from a project than company should undertake.

Accept Project if: actual return > cost of capital (r)
Reject Project if: actual return < cost of capital (r)

Therefore: cost of capital (r) is minimum return we will accept

Calculating the cost of obtaining funds for a project

Use the average of the sources of funds (r_a)

Sources:
(1) debt (r_d)
(2) preferred stock (r_p)
(3) common stock
   - retained earnings (r_s)
   - new issue of common stock (r_e)

Cost of Debt (r_d)

Use after tax yield-to-maturity of bond net of issuance costs [flotation costs (f)]

Yield-to-maturity is the rate of return paid to bondholders over the life of a bond
Cost of Debt ($r_d$)

Example:

sell bond for $1,000 (V_b = $1,000)
flotation costs = 3% ($f_d = 3\%)$
coupon rate = 10%
n = 30 (annual coupon payments)
solve for $i = r_d = 10.32\%$

After-tax Cost of Debt ($r_d$)

But from a company’s viewpoint their cost is net of taxes because they can deduct bond interest from tax return.

After-tax cost of debt = $r_d(1-t)$

If $t = 40\%$ then

$r_d(1-t) = 10.32 \times .60 = 6.2\%$

Cost of Debt ($r_d$) - Problem

Answer the following questions based on the WSJ bond quote for Microsoft, Incorporated (assume coupons are paid on a semi-annual basis).

Company (ticker) | Microsoft, Inc. (MSFT)
---|---
Coupon | 7.875
Maturity | July 15, 2031
Last Price | 95.158
Last Yield | ???
Est Spread | 115
UST | 30
Est $ Vol (000's) | 71,874

1. What is the YTM for this Microsoft, Inc. Corporate Bond? (Assume today is July 15, 2011)

2. If Microsoft, Inc. is subject to flotation costs of 2% on a new issue of bonds and have a marginal tax rate of 33%, what is Microsoft’s after-tax cost of debt?

Cost of Preferred Stock ($r_p$)

$r_p = \frac{D_p}{V_p (1-f_p)}$

Again, $f_p = $flotation costs
**Cost of Preferred Stock** \((r_p)\)

Example:

\[
\begin{align*}
D_p &= 10; & V_p &= 100; & f_p &= 2.5\% \\
\frac{r_p}{100(0.975)} &= 1.026\% \\
\text{after-tax cost of preferred stock} &= \text{before-tax cost of preferred stock}
\end{align*}
\]

**Cost of Retained Earnings** \((r_s)\)

\(r_s\) is the rate of return that current shareholders demand

How to calculate:

1. **CAPM approach**
   
   \[r_s = r_{RF} + \beta (r_M - r_{RF})\]

2. **Discounted Cash Flow Method (DCF)**
   
   \[r_s = \frac{D_1}{P_0} + g\]

3. **Bond Yield Plus Risk Premium Approach**
   
   \[r_s = r_d + \text{risk premium}\]

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**Cost of Retained Earnings (rs)**

Use the following information for Lyons Incorporated to answer parts A and B of this question. For the general marketplace the risk-free rate is 4 percent \((r_{RF} = 4\%)\) and the average rate of return on the market is 10 percent \((rm = 10\%)\). Lyons has a beta of 1.6. The dividends of Lyons Inc. are expected to grow at 6 percent per year in the future. Lyons’s common stock sells for $23.50 per share and the company just paid a dividend of $1.50 per share \((D_0=$1.50)\).

1. Using the discounted cash flow (DCF) approach, what is its cost of common stock?

2. What will be the firm’s cost of common stock using the CAPM approach?

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**Cost of Newly Issued Common Stock** \((r_e)\)

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

Again, \(f_e\) = flotation costs
Cost of Newly Issued Common Stock ($r_e$)

Example:

\[ D_1 = $2; P_0 = $50; f_e = 7%; g = 10\% \]

\[
r_e = \frac{2}{50(1-.07)} + .10 = 14.3\%
\]

Cost of Equity - Problem

Las Vegas Sand’s stock currently sells for $30 per share, expects to pay a dividend of $2.25 next year ($D_1=$2.25), has a growth rate of 6% that is expected to continue, and new issues of common stock are subject to flotation costs of 7%.

1. What is Las Vegas Sand’s cost of retained earnings?
2. What is Las Vegas Sand’s cost of new common stock?
3. Why is the cost of new common stock typically higher than the cost of retained earnings?

Weighted Average Cost of Capital (WACC = $r_a$)

Now we take the average of rd(1-t), rp, rs, and re to find our weighted average cost of capital (WACC) - We will use the WACC to evaluate projects.

\[
WACC = r_a = w_d(rd(1-t)) + w_p(rp) + w_s(rs) + w_e(re)
\]

where, \(w_d\) is the percent of funds raised through debt, \(w_p\) is the percent of funds raised through preferred stock, \(w_s\) is the percent of funds raised through retained earnings or through new common stock.

Notes:
1. we assume that we use all cash available from retained earnings before we issue new common stock.
2. we assume that we raise funds from sources according to some target capital structure.

Facts:
\[ r_d (1-t) = 6%; r_p = 10%; r_s = 14%; r_e = 15%; \]

Retained Earnings = $5,000,000

Target Capital Structure: 50% debt, 10% preferred stock, 40% common stock

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>COST</th>
<th>IRR</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) New Warehouse</td>
<td>$7.5M</td>
<td>14%</td>
</tr>
<tr>
<td>(2) Auto Fleet</td>
<td>$5M</td>
<td>12%</td>
</tr>
<tr>
<td>(3) Computers</td>
<td>$6M</td>
<td>11%</td>
</tr>
<tr>
<td>(4) Phone System</td>
<td>$4M</td>
<td>9%</td>
</tr>
</tbody>
</table>
What is the WACC????

WACC will change - WACC$_1$ uses cheapest sources

WACC$_1 = k_{a1} = \text{use cheapest debt, cheapest preferred stock, and cheapest common stock}

WACC$_1 = w_d r_d (1-t) + w_p r_p + w_e r_e
= .50(6\%) + .10(10\%) + .40(14\%)
= 9.6\%

Breakpoint

When WACC$_1$ runs out we use WACC$_2$. When does WACC$_1$ run out?

Assume $r_d$ and $r_p$ do not change. Therefore, we only run out of $r_e$. When $r_e$ is gone use $r_e$.

Breakpoint one = when WACC$_1$ is used up
= RE / (% cs in capital structure)
= $5,000,000/.40 = $12,500,000

Therefore, first $12.5$ million costs the firm $9.6\%$

What is the WACC$_2$

Money raised over $12.5$ million costs WACC$_2$

WACC$_2 = r_{a2} = w_d r_d (1-t) + w_p r_p + w_e r_e
= .50(6\%) + .10(10\%) + .40(15\%)
= 10.0\%

Therefore, money over $12.5$ million costs $10.0\%$

Which projects should the firm take?

Rank projects and accept according to the following rule

Rule: Accept if project return > WACC

Accept a project if we receive a higher return from project than its cost
Which projects should the firm take?

<table>
<thead>
<tr>
<th>Project</th>
<th>Cost</th>
<th>Return</th>
<th>WACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>$7.5M</td>
<td>14%</td>
<td>9.6%</td>
</tr>
<tr>
<td>(2)</td>
<td>$5M</td>
<td>12%</td>
<td>9.6%</td>
</tr>
<tr>
<td>(3)</td>
<td>$6M</td>
<td>11%</td>
<td>10.0%</td>
</tr>
<tr>
<td>(4)</td>
<td>$4M</td>
<td>9%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

WACC - Problem

PurchasePro.com desires to finance all projects with funds acquired according to their target capital structure of 25% debt, 10% preferred stock, and 65% equity. PurchasePro.com can issue debt at a before tax cost of 8.6%, indefinitely, issue preferred stock at a cost of 10.21%, has $13,650,000 of retained earnings at a cost of 13.4%, and can issue new common stock at a cost of 15.7%. PurchasePro.com's marginal tax rate is 28%.

1. What is PurchasePro.com's first weighted average cost of capital (where the cheapest sources of funds are used)?
2. What is the breakpoint for PurchasePro.com's where their cheapest source of funds is exhausted?
3. What is PurchasePro.com's second weighted average cost of capital (after the cheapest sources of funds are exhausted)?

Finding a target capital structure

Peterson Inc. has 50,000 bonds outstanding with a market price at 78% of par. Peterson also has 1,000,000 shares of common stock outstanding at a market price of $26 and 400,000 shares of preferred stock outstanding at a market price of $22. Peterson's tax rate is 24% and they have $24,000,000 in retained earnings. What are the market value weights of debt, preferred stock, and common stock in Peterson's capital structure?