Chapter 11  
The Cost of Capital 

### Solutions to Problems 

**P11-1. LG 1: Concept of Cost of Capital**  

**Basic** 

(a) The firm is basing its decision on the cost to finance a particular project rather than the firm’s combined cost of capital. This decision-making method may lead to erroneous accept/reject decisions. 

(b) 

\[ k_a = w_d k_d + w_e k_e \]

\[ k_a = 0.40 \times 7\% + 0.60 \times 16\% \]

\[ k_a = 2.8\% + 9.6\% \]

\[ k_a = 12.4\% \]

(c) Reject project 263. Accept project 264.

(d) Opposite conclusions were drawn using the two decision criteria. The overall cost of capital as a criterion provides better decisions because it takes into consideration the long-run interrelationship of financing decisions.

**P11-2. LG 2: Cost of Debt Using Both Methods**  

**Intermediate** 

(a) Net Proceeds: \( N_d = 1,010 - 30 \)

\[ N_d = 980 \]

(c) Cost to Maturity:

\[ \text{Bond Value} = \sum_{t=1}^{n} \frac{1}{(1+k)^t} + \frac{M}{(1+k)^n} \]

\[ \text{Bond Value} = 980 \]

\[ $120 \times (6.811) + 1,000 \times (0.183) \]

\[ V = 817.32 + 183 \]

\[ V = 1,000.32 \]

(Due to rounding of the PVIF, the value of the bond is 32 cents greater than expected. At the coupon rate, the value of a $1,000 face value bond is $1,000.)
Try 13%:

\[ V = 120 \times (6.462) + 1,000 \times (0.160) \]
\[ V = 775.44 + 160 \]
\[ V = $935.44 \]

The cost to maturity is between 12% and 13%.

**Step 2:** $1,000.32 − $935.44 = $64.88

**Step 3:** $1,000.32 − $980.00 = $20.32

**Step 4:** $20.32 ÷ $64.88 = 0.31

**Step 5:** 12 + 0.31 = 12.31% = before-tax cost of debt

\[ 12.31 \times (1 − 0.40) = 7.39\% = \text{after-tax cost of debt} \]

Calculator solution: 12.30%

(d) Approximate before-tax cost of debt

\[ k_d = \frac{1 + \frac{\text{FV}}{N_d + \$1,000}}{2} - \frac{\text{PV}}{N_d + \$1,000} \]

\[ k_d = \frac{1 + \frac{120}{15}}{2} - \frac{1}{15} \]

\[ k_d = \frac{121.33}{990.00} \]

\[ k_d = 12.26\% \]

Approximate after-tax cost of debt = 12.26% × (1 − 0.4) = 7.36%

(e) The interpolated cost of debt is closer to the actual cost (12.2983%) than using the approximating equation. However, the short cut approximation is fairly accurate and expedient.

P11-3. LG 2: Cost of Debt—Using the Approximation Formula:

Basic

\[ k_d = \frac{1 + \frac{\text{FV}}{N_d + \$1,000}}{2} - \frac{\text{PV}}{N_d + \$1,000} \]

\[ k_i = k_d \times (1 − T) \]

Bond A
\[
k_i = \frac{92.25}{977.50} = 9.44\% \\
\]

Bond B

\[
k_i = 9.44\% \times (1 - 0.40) = 5.66\% \\
\]

Bond C

\[
k_i = 10.34\% \times (1 - 0.40) = 6.20\% \\
\]

Bond D

\[
k_i = 12.58\% \times (1 - 0.40) = 7.55\% \\
\]

Bond E

\[
k_i = 11.84\% \times (1 - 0.40) = 7.10\% \\
\]
P11-4. LG 2: The Cost of Debt Using the Approximation Formula

Intermediate

\[ I + \frac{\$1,000 - \text{Nd}}{\text{Nd} + \$1,000} \]

\[ k_d = \frac{n}{2} \]

\[ k_i = k_d \times (1 - T) \]

**Alternative A**

\[ \frac{\$90 + \frac{\$1,000 - \$1,220}{16}}{\frac{\$1,220 + \$1,000}{2}} = \frac{\$76.25}{\$1,110} = 6.87\% \]

\[ k_i = 6.87\% \times (1 - 0.40) = 4.12\% \]

**Alternative B**

\[ \frac{\$70 + \frac{\$1,000 - \$1,020}{5}}{\frac{\$1,020 + \$1,000}{2}} = \frac{\$66.00}{\$1,010} = 6.54\% \]

\[ k_i = 6.54\% \times (1 - 0.40) = 3.92\% \]

**Alternative C**

\[ \frac{\$60 + \frac{\$1,000 - \$970}{7}}{\frac{\$970 + \$1,000}{2}} = \frac{\$64.29}{\$985} = 6.53\% \]

\[ k_i = 6.53\% \times (1 - 0.40) = 3.92\% \]

**Alternative D**

\[ \frac{\$50 + \frac{\$1,000 - \$895}{10}}{\frac{\$895 + \$1,000}{2}} = \frac{\$60.50}{\$947.50} = 6.39\% \]

\[ k_i = 6.39\% \times (1 - 0.40) = 3.83\% \]

P11-5. LG 2: Cost of Preferred Stock: \( k_p = \frac{D_p}{N_p} \)

**(a)** \( k_p = \frac{\$12.00}{\$95.00} = 12.63\% \)

**(b)** \( k_p = \frac{\$10.00}{\$90.00} = 11.11\% \)
P11-6. LG 2: Cost of Preferred Stock: \( k_p = \frac{D_p}{N_p} \)

Basic

<table>
<thead>
<tr>
<th>Preferred Stock</th>
<th>Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>( k_p = \frac{$11.00}{$92.00} = 11.96% )</td>
</tr>
<tr>
<td>B</td>
<td>( k_p = \frac{3.20}{34.50} = 9.28% )</td>
</tr>
<tr>
<td>C</td>
<td>( k_p = \frac{5.00}{33.00} = 15.15% )</td>
</tr>
<tr>
<td>D</td>
<td>( k_p = \frac{3.00}{24.50} = 12.24% )</td>
</tr>
<tr>
<td>E</td>
<td>( k_p = \frac{1.80}{17.50} = 10.29% )</td>
</tr>
</tbody>
</table>

P11-7. LG 3: Cost of Common Stock Equity–CAPM

Intermediate

\( k_s = R_F + [b \times (k_m - R_F)] \)

\( k_s = 6\% + 1.2 \times (11\% - 6\%) \)

\( k_s = 6\% + 6\% \)

\( k_s = 12\% \)

(a) Risk premium = 6\%

(b) Rate of return = 12\%

(c) After-tax cost of common equity using the CAPM = 12\%

P11-8. LG 3: Cost of Common Stock Equity: \( k_a = \frac{D_1 + g}{N_n} \)

Intermediate

(a) \( g = \frac{D_{2006}}{D_{2002}} = \text{FVIF}\%_{4} \)

\( g = \frac{\$3.10}{\$2.12} = 1.462 \)

From FVIF table, the factor closest to 1.462 occurs at 10\% (i.e., 1.464 for 4 years).

Calculator solution: 9.97\%

(b) \( N_n = \$52 \) (given in the problem)

(c) \( k_r = \frac{\$3.40}{\$57.50} + 0.10 = 15.91\% \)

(d) \( k_r = \frac{\$3.40}{\$55.00} + 0.10 = 16.54\% \)
P11-9. LG 3: Retained Earnings versus New Common Stock

Intermediate

\[ k_r = \frac{D_t}{P_0} + g \]
\[ k_n = \frac{D_t}{N_a} + g \]

<table>
<thead>
<tr>
<th>Firm</th>
<th>Calculation</th>
</tr>
</thead>
</table>
| A    | \( k_r = (\frac{\$2.25}{\$50.00}) + 8\% = 12.50\% \)  
      |             | \( k_n = (\frac{\$2.25}{\$47.00}) + 8\% = 12.79\% \)  |
| B    | \( k_r = (\frac{\$1.00}{\$20.00}) + 4\% = 9.00\% \)  
      |             | \( k_n = (\frac{\$1.00}{\$18.00}) + 4\% = 9.56\% \)  |
| C    | \( k_r = (\frac{\$2.00}{\$42.50}) + 6\% = 10.71\% \)  
      |             | \( k_n = (\frac{\$2.00}{\$39.50}) + 6\% = 11.06\% \)  |
| D    | \( k_r = (\frac{\$2.10}{\$19.00}) + 2\% = 13.05\% \)  
      |             | \( k_n = (\frac{\$2.10}{\$16.00}) + 2\% = 15.13\% \)  |

P11-10. LG 2, 4: The Effect of Tax Rate on WACC

Intermediate

(a)  \[ \text{WACC} = (0.30)(11\%)(1 - 0.40) + (0.10)(9\%) + (0.60)(14\%) \]
\[ \text{WACC} = 1.98\% + 0.9\% + 8.4\% \]
\[ \text{WACC} = 11.28\% \]

(b)  \[ \text{WACC} = (0.30)(11\%)(1 - 0.35) + (0.10)(9\%) + (0.60)(14\%) \]
\[ \text{WACC} = 2.15\% + 0.9\% + 8.4\% \]
\[ \text{WACC} = 11.45\% \]

(c)  \[ \text{WACC} = (0.30)(11\%)(1 - 0.25) + (0.10)(9\%) + (0.60)(14\%) \]
\[ \text{WACC} = 2.48\% + 0.9\% + 8.4\% \]
\[ \text{WACC} = 11.78\% \]

(d)  As the tax rate decreases, the WACC increases due to the reduced tax shield from the tax-deductible interest on debt.

P11-11. LG 4: WACC–Book Weights

Basic

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Book Value</th>
<th>Weight</th>
<th>Cost</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-T Debt</td>
<td>$700,000</td>
<td>0.500</td>
<td>5.3%</td>
<td>2.650%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>50,000</td>
<td>0.036</td>
<td>12.0%</td>
<td>0.432%</td>
</tr>
<tr>
<td>Common stock</td>
<td>650,000</td>
<td>0.464</td>
<td>16.0%</td>
<td>7.424%</td>
</tr>
<tr>
<td></td>
<td>$1,400,000</td>
<td>1.000</td>
<td></td>
<td>10.506%</td>
</tr>
</tbody>
</table>

(b)  The WACC is the rate of return that the firm must receive on long-term projects to maintain the value of the firm. The cost of capital can be compared to the return for a project to determine whether the project is acceptable.
P11-12. LG 4: WACC–Book Weights and Market Weights  
Intermediate

(a) Book value weights:

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Book Value</th>
<th>Weight</th>
<th>Cost</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-T Debt</td>
<td>$4,000,000</td>
<td>0.784</td>
<td>6.00%</td>
<td>4.704%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>40,000</td>
<td>0.008</td>
<td>13.00%</td>
<td>0.104%</td>
</tr>
<tr>
<td>Common stock</td>
<td>1,060,000</td>
<td>0.208</td>
<td>17.00%</td>
<td>3.536%</td>
</tr>
<tr>
<td>$5,100,000</td>
<td></td>
<td></td>
<td></td>
<td>8.344%</td>
</tr>
</tbody>
</table>

(b) Market value weights:

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Market Value</th>
<th>Weight</th>
<th>Cost</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-T Debt</td>
<td>$3,840,000</td>
<td>0.557</td>
<td>6.00%</td>
<td>3.342%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>60,000</td>
<td>0.009</td>
<td>13.00%</td>
<td>0.117%</td>
</tr>
<tr>
<td>Common stock</td>
<td>3,000,000</td>
<td>0.435</td>
<td>17.00%</td>
<td>7.395%</td>
</tr>
<tr>
<td>$6,900,000</td>
<td></td>
<td></td>
<td></td>
<td>10.854%</td>
</tr>
</tbody>
</table>

(c) The difference lies in the two different value bases. The market value approach yields the better value since the costs of the components of the capital structure are calculated using the prevailing market prices. Since the common stock is selling at a higher value than its book value, the cost of capital is much higher when using the market value weights. Notice that the book value weights give the firm a much greater leverage position than when the market value weights are used.

P11-13. LG 4: WACC and Target Weights  
Intermediate

(a) Historical market weights:

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Weight</th>
<th>Cost</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-T Debt</td>
<td>0.25</td>
<td>7.20%</td>
<td>1.80%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>0.10</td>
<td>13.50%</td>
<td>1.35%</td>
</tr>
<tr>
<td>Common stock</td>
<td>0.65</td>
<td>16.00%</td>
<td>10.40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13.55%</td>
</tr>
</tbody>
</table>

(b) Target market weights:

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Weight</th>
<th>Cost</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>L-T Debt</td>
<td>0.30</td>
<td>7.20%</td>
<td>2.160%</td>
</tr>
<tr>
<td>Preferred Stock</td>
<td>0.15</td>
<td>13.50%</td>
<td>2.025%</td>
</tr>
<tr>
<td>Common Stock</td>
<td>0.55</td>
<td>16.00%</td>
<td>8.800%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12.985%</td>
</tr>
</tbody>
</table>

(c) Using the historical weights the firm has a higher cost of capital due to the weighting of the more expensive common stock component (0.65) versus the target weight of (0.55). This over-weighting in common stock leads to a smaller proportion of financing coming from the significantly less expense L-T debt and the lower costing preferred stock.
P11-14. LG 4, 5: Cost of Capital and Break Point

Challenge

(a) Cost of Retained Earnings

\[ k_r = \frac{\$1.26(1 + 0.06)}{\$40.00} + 0.06 = \frac{\$1.34}{\$40.00} = 3.35\% + 6\% = 9.35\% \]

(b) Cost of New Common Stock

\[ k_s = \frac{\$1.26(1 + 0.06)}{\$40.00 - \$7.00} + 0.06 = \frac{\$1.34}{\$33.00} = 4.06\% + 6\% = 10.06\% \]

(c) Cost of Preferred Stock

\[ k_p = \frac{\$2.00}{\$25.00 - \$3.00} - \frac{\$2.00}{\$22.00} = 9.09\% \]

(d) Cost of Debt

\[ k_d = \frac{\$100 + \frac{\$1,000 - \$1,175}{5}}{\frac{\$1,175 + \$1,000}{2}} = \frac{\$65.00}{\$1,087.50} = 5.98\% \]

\[ k_i = 5.98\% \times (1 - 0.40) = 3.59\% \]

(e) Break Point of Common Equity

\[ B_{\text{common equity}} = \frac{\$4,200,000 - (\$1.26 \times 1,000,000)}{0.50} = \frac{\$2,940,000}{0.50} = \$5,880,000 \]

(f) Weighted Average Cost of Capital (WACC)

\[ WACC = (0.40)(3.59\%) + (0.10)(9.09\%) + (0.50)(9.35\%) \]

\[ WACC = 1.436 + 0.909 + 4.675 \]

\[ WACC = 7.02\% \]

This WACC applies to projects with a cumulative cost between 0 and $5,880,000.

(g) WACC

\[ WACC = (0.40)(3.59\%) + (0.10)(9.09\%) + (0.50)(9.44\%) \]

\[ WACC = 1.436 + 0.909 + 4.72 \]

\[ WACC = 7.07\% \]

This WACC applies to projects with a cumulative cost over $5,880,000.
P11-15. LG 2, 3, 4, 5: Calculation of Specific Costs, WACC, and WMCC

Challenge

(a) Cost of Debt: (approximate)

\[ k_d = \frac{1 + \frac{\left(\$1,000 - N_d\right)}{\left(N_d + \$1,000\right)}}{2} \]

\[ k_d = \frac{100 + \frac{\left(\$1,000 - \$950\right)}{10}}{\frac{\left(\$950 + \$1,000\right)}{2}} = \frac{\$100 + \$5}{\$975} = 10.77\% \]

\[ k_i = 10.77 \times (1 - 0.40) \]

\[ k_i = 6.46\% \]

Cost of Preferred Stock: \( k_p = \frac{D_p}{N_p} \)

\[ k_p = \frac{\$8}{\$63} = 12.70\% \]

Cost of Common Stock Equity: \( k_s = \frac{D_s}{P_0} + g \)

\[ g = \frac{D_{2007}}{D_{2002}} = \text{FVIF}_{4.4} \]

\[ g = \frac{\$4.00}{\$2.85} = 1.403 \]

From FVIF table, the factor closest to 1.403 occurs at 7% (i.e., 1.404 for 5 years). Calculator solution: 7.01%

\[ k_s = \frac{\$4.00}{\$50.00} + 0.07 = 15.00\% \]

Cost of New Common Stock Equity:

\[ k_n = \frac{\$4.00}{\$42.00} + 0.07 = 16.52\% \]

(b) Breaking point = \( \frac{AF_j}{W_j} \)

\[ \text{BP}_{\text{common equity}} = \frac{\left[\$7,000,000 \times (1 - 0.6^*)\right]}{0.50} = \$5,600,000 \]

Between $0 and $5,600,000, the cost of common stock equity is 15% because all common stock equity comes from retained earnings. Above $5,600,000, the cost of common stock equity is 16.52%. It is higher due to the flotation costs associated with a new issue of common stock.

* The firm expects to pay 60% of all earnings available to common shareholders as dividends.
(c) WACC—$0 to $5,600,000:  
L-T Debt \[ 0.40 \times 6.46\% \] \[ = 2.58\% \]
Preferred stock \[ 0.10 \times 12.70\% \] \[ = 1.27\% \]
Common stock \[ 0.50 \times 15.00\% \] \[ = 7.50\% \]
WACC \[ = 11.35\% \]

(d) WACC—above $5,600,000:  
L-T Debt \[ 0.40 \times 6.46\% \] \[ = 2.58\% \]
Preferred stock \[ 0.10 \times 12.70\% \] \[ = 1.27\% \]
Common stock \[ 0.50 \times 16.52\% \] \[ = 8.26\% \]
WACC \[ = 12.11\% \]

P11-16. LG 2, 3, 4, 5: Calculation of Specific Costs, WACC, and WMCC

Challenge

(a) Debt: (approximate)

\[
k_d = \frac{1 + (\$1,000 - N_d)}{(N_n + \$1,000)} \]

\[
k_d = \frac{\$80 + (\$1,000 - \$940)}{(\$940 + \$1,000)} = \frac{\$80 + \$3}{\$970} = 8.56\%
\]

\[
k_i = k_d \times (1 - t)
\]

\[
k_i = 8.56\% \times (1 - 0.40)
\]

\[
k_i = 5.1\%
\]

Preferred Stock:

\[
k_p = \frac{D_p}{N_p}
\]

\[
k_p = \frac{\$7.60}{\$90} = 8.44\%
\]

Common Stock:

\[
k_n = \frac{D_n}{P_n} + g
\]

\[
k_n = \frac{\$7.00}{\$78} = 0.06 = 0.1497 = 14.97\%
\]

Retained Earnings:

\[
k_r = \frac{D_r}{P_r} + g
\]

\[
k_r = \frac{\$7.00}{\$90} = 0.06 = 0.1378 = 13.78\%
\]
(b) Breaking point = \( \frac{AF_j}{W_i} \)

\[
(1) \quad BP_{\text{common equity}} = \frac{[$100,000]}{0.50} = $200,000
\]

<table>
<thead>
<tr>
<th>Type of Capital</th>
<th>Target Capital Structure %</th>
<th>Cost of Capital Source</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term debt</td>
<td>0.30</td>
<td>5.1%</td>
<td>1.53%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>0.20</td>
<td>8.4%</td>
<td>1.68%</td>
</tr>
<tr>
<td>Common stock equity</td>
<td>0.50</td>
<td>13.8%</td>
<td>6.90%</td>
</tr>
</tbody>
</table>

WACC = 10.11%

(2) WACC equal to or below $200,000 BP:

(3) WACC above $200,000 BP:

<table>
<thead>
<tr>
<th>Source of Capital</th>
<th>Cost %</th>
<th>Range of New Financing</th>
<th>Breaking Point</th>
<th>Range of Total New Financing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term debt</td>
<td>6</td>
<td>$0–$320,000</td>
<td>$320,000 ÷ 0.40 = $800,000</td>
<td>$0–$800,000</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>$320,001 and above</td>
<td></td>
<td>Greater than $800,000</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>17</td>
<td>$0 and above</td>
<td></td>
<td>Greater than $0</td>
</tr>
<tr>
<td>Common stock equity</td>
<td>20</td>
<td>$0–$200,000</td>
<td>$200,000 ÷ 0.40 = $500,000</td>
<td>$0–$500,000</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>$200,001 and above</td>
<td></td>
<td>Greater than $500,000</td>
</tr>
</tbody>
</table>

(a) **Breaking Points and Ranges:**

(b) WACC will change at $500,000 and $800,000.
(c) **WACC**

<table>
<thead>
<tr>
<th>Range of Total New Financing</th>
<th>Source of Capital</th>
<th>Target Proportion</th>
<th>Cost %</th>
<th>Weighted Cost (2) × (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0–$500,000</td>
<td>Debt</td>
<td>0.40</td>
<td>6</td>
<td>2.40%</td>
</tr>
<tr>
<td></td>
<td>Preferred</td>
<td>0.20</td>
<td>17</td>
<td>3.40%</td>
</tr>
<tr>
<td></td>
<td>Common</td>
<td>0.40</td>
<td>20</td>
<td>8.00%</td>
</tr>
<tr>
<td>WACC = 13.80%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$500,000–$800,000</td>
<td>Debt</td>
<td>0.40</td>
<td>6%</td>
<td>2.40%</td>
</tr>
<tr>
<td></td>
<td>Preferred</td>
<td>0.20</td>
<td>17%</td>
<td>3.40%</td>
</tr>
<tr>
<td></td>
<td>Common</td>
<td>0.40</td>
<td>24%</td>
<td>9.60%</td>
</tr>
<tr>
<td>WACC = 15.40%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greater than $800,000</td>
<td>Debt</td>
<td>0.40</td>
<td>8%</td>
<td>3.20%</td>
</tr>
<tr>
<td></td>
<td>Preferred</td>
<td>0.20</td>
<td>17%</td>
<td>3.40%</td>
</tr>
<tr>
<td></td>
<td>Common</td>
<td>0.40</td>
<td>24%</td>
<td>9.60%</td>
</tr>
<tr>
<td>WACC = 16.20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(d) **IOS Data for Graph**

<table>
<thead>
<tr>
<th>Investment</th>
<th>IRR</th>
<th>Initial Investment</th>
<th>Cumulative Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>23%</td>
<td>$200,000</td>
<td>$200,000</td>
</tr>
<tr>
<td>C</td>
<td>22%</td>
<td>$100,000</td>
<td>$300,000</td>
</tr>
<tr>
<td>G</td>
<td>21%</td>
<td>$300,000</td>
<td>$600,000</td>
</tr>
<tr>
<td>A</td>
<td>19%</td>
<td>$200,000</td>
<td>$800,000</td>
</tr>
<tr>
<td>H</td>
<td>17%</td>
<td>$100,000</td>
<td>$900,000</td>
</tr>
<tr>
<td>I</td>
<td>16%</td>
<td>$400,000</td>
<td>$1,300,000</td>
</tr>
<tr>
<td>B</td>
<td>15%</td>
<td>$300,000</td>
<td>$1,600,000</td>
</tr>
<tr>
<td>D</td>
<td>14%</td>
<td>$600,000</td>
<td>$2,200,000</td>
</tr>
<tr>
<td>F</td>
<td>13%</td>
<td>$100,000</td>
<td>$2,300,000</td>
</tr>
</tbody>
</table>
(e) The firm should accept investments E, C, G, A, and H, since for each of these, the internal rate of return (IRR) on the marginal investment exceeds the weighted marginal cost of capital (WMCC). The next project (i.e., I) cannot be accepted since its return of 16% is below the weighted marginal cost of the available funds of 16.2%.

P11-18. LG 4, 5, 6: Integrative–WACC, WMCC, and IOC

Challenge

(a) WACC: 0 to $600,000
   \[= (0.5)(6.3\%) + (0.1)(12.5\%) + (0.4)(15.3\%)\]
   \[= 3.15\% + 1.25\% + 6.12\%\]
   \[= 10.52\%\]

WACC: $600,001–$1,000,000
   \[= (0.5)(6.3\%) + (0.1)(12.5\%) + (0.4)(16.4\%)\]
   \[= 3.15\% + 1.25\% + 6.56\%\]
   \[= 10.96\%\]

WACC: $1,000,001 and above
   \[= (0.5)(7.8\%) + (0.1)(12.5\%) + (0.4)(16.4\%)\]
   \[= 3.9\% + 1.25\% + 6.56\%\]
   \[= 11.71\%\]

See part (c) for the WMCC schedule.

(b) All four projects are recommended for acceptance since the IRR is greater than the WMCC across the full range of investment opportunities.

(c) See part (c) for the WMCC schedule.

(d) In this problem, projects H, G, and K would be accepted since the IRR for these projects exceeds the WMCC. The remaining project, M, would be rejected because the WMCC is greater than the IRR.
P11-19. Ethics Problem

Intermediate

Analysts familiar with WorldCom complained that much of the $105 billion of its assets consisted of intangibles and goodwill amassed in the process of nearly 70 acquisitions. As a result, precise valuation of its assets was almost impossible. Many feared that assets were equally inflated as WorldCom’s income statements. Indeed, after declaring Chapter 11, the company wrote off $35 billion in plant and equipment in addition to $45 billion in goodwill wiping out any equity left from the books.