11-1 LG 1: Concept of Cost of Capital

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.

11-2 LG 2: Cost of Debt Using Both Methods

a. Net Proceeds:
\[ N_d = $1,010 - $30 \]
\[ N_d = $980 \]

b. Cash Flows:
\[ \begin{array}{c|c}
   t & CF \\
   \hline
   0 & $980 \\
   1-15 & -120 \\
   15 & -1,000 \\
\end{array} \]

c. Cost to Maturity:
\[ B_0 = \left[ \sum_{t=1}^{n} \frac{I}{(1+k)^t} \right] + \left[ \frac{M}{(1+k)^n} \right] \]
\[ $980 = \left[ \sum_{t=1}^{15} \frac{-120}{(1+k)^t} \right] + \left[ \frac{-1,000}{(1+k)^{15}} \right] \]

Step 1: Try 12%
\[ V = 120 \times (6.811) + 1,000 \times (0.183) \]
\[ V = 817.32 + 183 \]
\[ V = $1,000.32 \]
Part 4 Long-Term Financial Decisions

(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%:

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

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 = .31

Step 5: 12 + .31 = 12.31% = before-tax cost of debt

12.31 (1 - .40) = 7.39% = after-tax cost of debt

Calculator solution: 12.30%

d. Approximate before-tax cost of debt

\[
k_d = \frac{1 + \frac{\$1,000 - N_d}{N_d + \$1,000}}{2} \times \frac{\$120 + \frac{($1,000 - $980)}{15}}{($980 + $1,000)}
\]
\[ k_d = \frac{\$121.33 + \$990.00}{2} \]
\[ k_d = 12.26\% \]

Approximate after-tax cost of debt = 12.26% x (1 - .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.

11-3 LG 2: Cost of Debt–Using the Approximation Formula:
Chapter 11  The Cost of Capital

\[
\begin{align*}
kd &= \frac{1 + \frac{1000 - Na}{n}}{Na + 1000} \\
\frac{1000 - Na}{n} &= k_i (1 - T)
\end{align*}
\]

Bond A

\[
k_d = \frac{90 + \frac{1000 - 955}{20}}{955 + 1000} = \frac{92.25}{977.50} = 9.44%
\]

\[
k_i = 9.44\% \times (1 - .40) = 5.66\%
\]

Bond B

\[
k_d = \frac{100 + \frac{1000 - 970}{16}}{970 + 1000} = \frac{101.88}{985} = 10.34%
\]

\[
k_i = 10.34\% \times (1 - .40) = 6.20\%
\]

Bond C

\[
k_d = \frac{120 + \frac{1000 - 955}{15}}{955 + 1000} = \frac{123}{977.50} = 12.58%
\]

\[
k_i = 12.58\% \times (1 - .40) = 7.55\%
\]

Bond D

\[
k_d = \frac{90 + \frac{1000 - 985}{25}}{985 + 1000} = \frac{90.60}{992.50} = 9.13%
\]

\[
k_i = 9.13\% \times (1 - .40) = 5.48\%
\]

Bond E

\[
k_d = \frac{110 + \frac{1000 - 920}{22}}{920 + 1000} = \frac{113.64}{960} = 11.84%
\]

\[
k_i = 11.84\% \times (1 - .40) = 7.10\%
\]

11-4   LG 2: The Cost of Debt Using the Approximation Formula
Part 4 Long-Term Financial Decisions

\[ k_d = \frac{I + \frac{1,000 - N_d}{n}}{N_d + 1,000} \]

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

**Alternative A**

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

\[ k_i = 6.87\% \times (1 - .40) = 4.12\% \]

**Alternative B**

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

\[ k_i = 6.54\% \times (1 - .40) = 3.92\% \]

**Alternative C**

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

\[ k_i = 6.53\% \times (1 - .40) = 3.92\% \]

**Alternative D**

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

\[ k_i = 6.39\% \times (1 - .40) = 3.83\% \]

11-5 **LG 2: Cost of Preferred Stock:** \( k_p = \frac{D_p}{N_p} \)

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

b. \( k_p = \frac{10.00}{90.00} = 11.11\% \)
11-6 LG 2: Cost of Preferred Stock: \( k_p = \frac{D_p}{N_p} \)

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

11-7 LG 3: Cost of Common Stock Equity–CAPM

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

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

\[
k_s = 6\% + 6\% = 12\%
\]

a. Risk premium = 6\%

b. Rate of return = 12\%

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

11-8 LG 3: Cost of Common Stock Equity: \( k_n = \frac{D_1 + g}{N_n} \)

a. \( g = \frac{D_{2003}}{D_{1999}} = \text{FVIF}_{k\%,4} \)

\[
g = \frac{3.10}{2.12} = 1.462
\]

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.

\[
k_r = \frac{D_{2004} + g}{P_0}
\]

\[
k_r = \frac{3.40}{57.50} + .10 = 15.91\%
\]

d.
Part 4 Long-Term Financial Decisions

\[ k_r = \frac{D_{2004}}{N_n} + g \]
\[ k_r = \frac{\$3.40}{\$55.00} + .10 = 16.54\% \]

11-9  LG 3: Retained Earnings versus New Common Stock

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

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

11-10  LG 2, 4: The Effect of Tax Rate on WACC

a. \( WACC = (.30)(11\%)(1 - .40) + (.10)(9\%) + (.60)(14\%) \)
   \( WACC = 1.98\% + .9\% + 8.4\% \)
   \( WACC = 11.28\% \)

b. \( WACC = (.30)(11\%)(1 - .35) + (.10)(9\%) + (.60)(14\%) \)
   \( WACC = 2.15\% + .9\% + 8.4\% \)
   \( WACC = 11.45\% \)

c. \( WACC = (.30)(11\%)(1 - .25) + (.10)(9\%) + (.60)(14\%) \)
   \( WACC = 2.48\% + .9\% + 8.4\% \)
   \( WACC = 11.78\% \)

d. As the tax rate decreases, the WACC increases due to the reduced tax shield from the tax-deductible interest on debt.
Chapter 11  The Cost of Capital

11-11 LG 4: WACC–Book Weights

a.  Type of Capital | Book Value | Weight | Cost | Weighted Cost
L-T Debt           | $700,000   | 0.500  | 5.3% | 2.650%
Preferred stock   | 50,000     | 0.036  | 12.0% | .432%
Common stock      | 650,000    | 0.464  | 16.0% | 7.424%

$1,400,000 1.000 10.506%

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.

11-12 LG 4: WACC–Book Weights and Market Weights

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%.104%</td>
<td>.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>
</tbody>
</table>

$5,100,000 8.344%

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>.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>
</tbody>
</table>

$6,900,000 10.854%

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.

11-13 LG 4: WACC and Target Weights

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>.25</td>
<td>7.20%</td>
<td>1.80%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>.10</td>
<td>13.50%</td>
<td>1.35%</td>
</tr>
</tbody>
</table>
Part 4 Long-Term Financial Decisions

<table>
<thead>
<tr>
<th>Common stock</th>
<th>.65</th>
<th>16.00%</th>
<th>10.40%</th>
</tr>
</thead>
<tbody>
<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>.30</td>
<td>7.20%</td>
<td>2.160%</td>
</tr>
<tr>
<td>Preferred Stock</td>
<td>.15</td>
<td>13.50%</td>
<td>2.025%</td>
</tr>
<tr>
<td>Common Stock</td>
<td>.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>

11-14 LG 2, 3, 4, 5: Cost of Capital and Break Point

a. Cost of Retained Earnings
\[ k_r = \frac{1.26(1+.06)}{40.00} + .06 = \frac{1.34}{40.00} = 3.35\% + 6\% = 9.35\% \]

b. Cost of New Common Stock
\[ k_s = \frac{1.26(1+.06)}{40.00 - 1.00} + .06 = \frac{1.34}{39.00} = 3.44\% + 6\% = 9.44\% \]

c. Cost of Preferred Stock
\[ k_p = \frac{2.00}{25.00 - 3.00} = \frac{2.00}{22.00} = 9.09\% \]

d. 
\[ k_a = \frac{100 + \frac{1,000 - 1,175}{5}}{\frac{1,175 + 1,000}{2}} = \frac{65.00}{1,087.50} = 5.98\% \]
\[ k_i = 5.98\% \times (1 - .40) = 3.59\% \]

e. 
\[ BP_{\text{common equity}} = \frac{4,200,000 - (1.26 \times 1,000,000)}{.50} = \frac{2,940,000}{.50} = 5,880,000 \]

f. 
\[ WACC = (.40)(3.59\%) + (.10)(9.09\%) + (.50)(9.35\%) \]
\[ WACC = 1.436 + .909 + 4.675 \]
\[ WACC = 7.02\% \]

This WACC applies to projects with a cumulative cost between 0 and $5,880,000.
g. WACC = (.40)(3.59%) + (.10)(9.09%) + (.50)(9.44%)
WACC = 1.436 + .909 + 4.72
WACC = 7.07%

This WACC applies to projects with a cumulative cost over $5,880,000.

11-15 LG 2, 3, 4, 5: Calculation of Specific Costs, WACC, and WMCC

a. Cost of Debt: (approximate)

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

\[ k_d = \frac{10}{($950 + $1,000)} = \frac{10}{$1950} = 0.0517 = 5.17\% \]

\[ k_i = 10.77 \times (1 - .40) \]
\[ k_i = 6.46\% \]

Cost of Preferred Stock: \[ k_p = \frac{D_p}{N_p} \]
\[ k_p = \frac{$8}{$63} = 12.70\% \]

Cost of Common Stock Equity: \[ k_s = \left( \frac{D_1}{P_0} \right) + g \]

Growth rate:
\[ \frac{$4.00}{2.85} = 1.403 \]

Look for FVIF factor nearest 1.403.

From FVIF table:
\[ g = 7\% \]

Calculator solution: 7.1%

\[ k_r = \left( \frac{$4.00}{$50.00} \right) + 7\% = 15.00\% \]

Cost of New Common Stock Equity:

\[ k_n = \left( \frac{$4.00}{$42.00} \right) + 7\% = 16.52\% \]

b. Breaking point = \[ AF_j \div W_j \]

BP common equity = \[ [$7,000,000 \times (1 - .6)^*] \div 0.50 \]
\[ = $5,600,000 \]
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. \[\text{WACC - $0 to $5,600,000:} \quad \begin{align*} 
\text{L-T Debt} & \times 6.46\% = 2.58\% \\
\text{Preferred stock} & \times 12.70\% = 1.27\% \\
\text{Common stock} & \times 15.00\% = 7.50\% \\
\text{WACC} & = 11.35\% 
\end{align*} \]

d. \[\text{WACC - above $5,600,000:} \quad \begin{align*} 
\text{L-T Debt} & \times 6.46\% = 2.58\% \\
\text{Preferred stock} & \times 12.70\% = 1.27\% \\
\text{Common stock} & \times 16.52\% = 8.26\% \\
\text{WACC} & = 12.11\% 
\end{align*} \]

11-16 LG 2, 3, 4, 5: Calculation of Specific Costs, WACC, and WMCC

a. Debt: (approximate)

\[k_d = \frac{I + ($1,000 - N_d)}{n} \times \frac{n}{(N_d +$1,000)} \times \frac{n}{2} \]

\[k_d = \frac{\$80 + ($1,000 - $940)}{($940 +$1,000)} = \frac{8.56\% \times \$970}{2} = 8.56\% \]

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

\[k_i = 8.56\% \times (1 - .40) \]

\[k_i = 5.1\% \]

Preferred Stock:

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

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

Common Stock:
\[ k_n = \frac{D_n}{N_n} + g \]
\[ k_p = \frac{7.00}{78} = .06 = .1497 = 14.97\% \]

**Retained Earnings:**
\[ k_r = \frac{D_1}{P_0} + g \]
\[ k_p = \frac{7.00}{90} = .06 = .1378 = 13.78\% \]

b. Breaking point \[ = \frac{AF_i}{W_i} \]

1. **BP** \[ = \frac{\$100,000}{.50} = \$200,000 \]

<table>
<thead>
<tr>
<th>Target Capital Structure</th>
<th>Cost of Capital Source</th>
<th>Weighted Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Capital</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>(2) WACC equal to or below $200,000 BP:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long-term debt</td>
<td>.30</td>
<td>5.1%</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>.20</td>
<td>8.4%</td>
</tr>
<tr>
<td>Common stock equity</td>
<td>.50</td>
<td>13.8%</td>
</tr>
<tr>
<td>WACC =</td>
<td></td>
<td>10.11%</td>
</tr>
</tbody>
</table>

(3) WACC above $200,000 BP:
| Type of Capital          | Cost of Capital Source | Weighted Cost |
| Long-term debt           | .30                    | 5.1%          | 1.53%          |
| Preferred stock          | .20                    | 8.4%          | 1.68%          |
| Common stock equity      | .50                    | 15.0%         | 7.50%          |
| WACC =                   |                        | 10.71%        |

11-17 LG 4, 5, 6: Integrative–WACC, WMCC, and IOS

a. **Breaking Points and Ranges:**

<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 ÷ .40 = $800,000</td>
<td>$0 - $800,000</td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>$320,001</td>
<td>Greater than $800,000</td>
<td>Greater than $0</td>
</tr>
<tr>
<td>Preferred stock</td>
<td>17</td>
<td>$0 and above</td>
<td>Greater than $0</td>
<td></td>
</tr>
<tr>
<td>Common stock equity</td>
<td>20</td>
<td>$0 - $200,000</td>
<td>$200,000 ÷ .40 = $500,000</td>
<td>$0 - $500,000</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>$200,001</td>
<td>Greater than</td>
<td></td>
</tr>
</tbody>
</table>


Part 4 Long-Term Financial Decisions

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) x (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></td>
<td></td>
<td></td>
<td></td>
<td>WACC = 13.80%</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></td>
<td></td>
<td></td>
<td></td>
<td>WACC = 15.40%</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></td>
<td></td>
<td></td>
<td></td>
<td>WACC = 16.20%</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>

IOS and WMCC
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%.

11-18 LG 4, 5, 6: Integrative—WACC, WMCC, and IOC

a. WACC: 0 to $600,000
   \[ \text{WACC} = (.5)(6.3\%) + (.1)(12.5\%) + (.4)(15.3\%) \]
   \[ = 3.15\% + 1.25\% + 6.12\% \]
   \[ = 10.52\% \]

WACC: $600,001 - $1,000,000
   \[ \text{WACC} = (.5)(6.3\%) + (.1)(12.5\%) + (.4)(16.4\%) \]
   \[ = 3.15\% + 1.25\% + 6.56\% \]
   \[ = 10.96\% \]

WACC: $1,000,001 and above
   \[ \text{WACC} = (.5)(7.8\%) + (.1)(12.5\%) + (.4)(16.4\%) \]
   \[ = 3.9\% + 1.25\% + 6.56\% \]
   \[ = 11.71\% \]

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. 

IOS and WMCC
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.