Chapter 14

14-3 a. Original value of the firm \( (D = 0) \):

\[
V = D + S = 0 + ($15)(200,000) = $3,000,000.
\]

Original cost of capital:

\[
WACC = w_d r_d (1-T) + w_e r_e = 0 + (1.0)(10\%) = 10\%.
\]

With financial leverage \( (w_d=30\%) \):

\[
WACC = w_d r_d (1-T) + w_e r_e = (0.3)(7\%)(1-0.40) + (0.7)(11\%) = 8.96\%.
\]

Because growth is zero, the value of the company is:

\[
V = \frac{\text{FCF}}{WACC} = \frac{(\text{EBIT})(1-T)}{WACC} = \frac{($500,000)(1-0.40)}{0.0896} = $3,348,214.286.
\]

Increasing the financial leverage by adding $900,000 of debt results in an increase in the firm’s value from $3,000,000 to $3,348,214.286.

b. Using its target capital structure of 30% debt, the company must have debt of:

\[
D = w_d V = 0.30($3,348,214.286) = $1,004,464.286.
\]

Therefore, its debt value of equity is:

\[
S = V - D = $2,343,750.
\]

Alternatively, \( S = (1-w_d)V = 0.7($3,348,214.286) = $2,343,750. \)

The new price per share, \( P \), is:

\[
P = \frac{[S + (D - D_0)]/n_0 = [$2,343,750 + ($1,004,464.286 - 0)]/200,000}{\text{EPS}} = \frac{16.741}{\text{EPS}}.
\]

The number of shares repurchased, \( X \), is:

\[
X = (D - D_0)/P = $1,004,464.286 / $16.741 = 60,000.256 \approx 60,000.
\]

The number of remaining shares, \( n \), is:

\[
n = 200,000 - 60,000 = 140,000.
\]

Initial position:

\[
\text{EPS} = \frac{[(500,000 - 0)(1-0.40)]}{200,000} = $1.50.
\]
With financial leverage:
$$EPS = \frac{[($500,000 - 0.07($1,004,464.286))(1-0.40)]}{140,000}$$
$$= \frac{[($500,000 - $70,312.5)(1-0.40)]}{140,000}$$
$$= $257,812.5 / 140,000 = $1.842.$$ 

Thus, by adding debt, the firm increased its EPS by $0.342.

d. 30% debt: \[ TIE = \frac{EBIT}{T} = \frac{EBIT}{$70,312.5}. \]

<table>
<thead>
<tr>
<th>Probability</th>
<th>TIE</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>1.42</td>
</tr>
<tr>
<td>0.20</td>
<td>2.84</td>
</tr>
<tr>
<td>0.40</td>
<td>7.11</td>
</tr>
<tr>
<td>0.20</td>
<td>11.38</td>
</tr>
<tr>
<td>0.10</td>
<td>15.64</td>
</tr>
</tbody>
</table>

The interest payment is not covered when TIE < 1.0. The probability of this occurring is 0.10, or 10 percent.

14-4 a. Present situation (50% debt):

$$\text{WACC} = w_d r_d (1-T) + w_e r_e$$
$$= (0.5)(10\%)(1-0.15) + (0.5)(14\%) = 11.25\%.$$ 

$$V = \frac{\text{FCF}}{\text{WACC}} = \frac{(\text{EBIT})(1-T)}{\text{WACC}} = \frac{($13.24)(1-0.15)}{0.1125} =$100 million.$$ 

70 percent debt:

$$\text{WACC} = w_d r_d (1-T) + w_e r_e$$
$$= (0.7)(12\%)(1-0.15) + (0.3)(16\%) = 11.94\%.$$ 

$$V = \frac{\text{FCF}}{\text{WACC}} = \frac{(\text{EBIT})(1-T)}{\text{WACC}} = \frac{($13.24)(1-0.15)}{0.1194} =$94.255 million.$$ 

30 percent debt:

$$\text{WACC} = w_d r_d (1-T) + w_e r_e$$
$$= (0.3)(8\%)(1-0.15) + (0.7)(13\%) = 11.14\%.$$ 

$$V = \frac{\text{FCF}}{\text{WACC}} = \frac{(\text{EBIT})(1-T)}{\text{WACC}} = \frac{($13.24)(1-0.15)}{0.1114} = $101.023 million.$$ 

**Mini Case:** 14 - 2
14-5  a. BEA’s unlevered beta is $b_u = b_L/(1 + (1-T)(D/S)) = 1.0/(1+(1-0.40)(20/80)) = 0.870.$

b. $b_L = b_U (1 + (1-T)(D/S)).$

At 40 percent debt: $b_L = 0.87 (1 + 0.6(40%/60%)) = 1.218.$

$c_s = 6 + 1.218(4) = 10.872\%$

c. WACC = $w_d r_d (1-T) + w_e r_s$

$= (0.4)(9\%)(1-0.4) + (0.6)(10.872\%) = 8.683\%.$

$V = \frac{FCF}{WACC} = \frac{(EBIT)(1-T)}{WACC} = \frac{($14.933)(1-0.4)}{0.08683} = $103.188 million.