# BUSI 2505F - MIDTERM SUGGESTED EXERCISES
# CHAPTERS 15 AND 16 (7TH EDITION)

## 15.1bcd 15.2bc 15.5 15.12 15.14
## 16.4 16.5 16.10 16.11 16.12 16.14 16.15 16.16 16.17

## NOTE: FOR CHAPTERS 2,10,11,13,14...
## SEE `http://lemma.ca/2505f/quizzes.html`

## SOLUTIONS

**Q15-1b**

The number of rights associated with the old shares is the number of shares outstanding divided by the rights offered, so:

$$\text{Number of rights needed} = \frac{500,000 \text{ old shares}}{60,000 \text{ new shares}} = \textbf{8.33 rights per new share}$$

**Q15-1c**

The new price of the stock will be the new market value of the company divided by the total number of shares outstanding after the rights offer, which will be:

$$P_X = \frac{\$44,700,000}{(500,000 + 60,000)} = \textbf{\$79.82}$$

**Q15-1d**

$$\text{Value of a right} = \$81.00 - \$79.82 = \textbf{\$1.18}$$

**Q15-2b**

The number of new shares will be the amount raised divided by the subscription price, so:

$$\text{Number of new shares} = \frac{\$40,000,000}{\$48} = \textbf{833,333 shares}$$

And the number of rights needed to buy one share will be the current shares outstanding divided by the number of new share offered, so:

$$\text{Number of rights needed} = \frac{4,100,000 \text{ shares outstanding}}{833,333 \text{ new shares}} = \textbf{4.92}$$

**Q15-2c**

A shareholder can buy 4.92 rights on shares for:

$$4.92(\$53) = \$260.76$$

The shareholder can exercise these rights for \$35, at a total cost of:

$$\$260.76 + 48 = \$308.76$$

The investor will then have:

$$\text{Ex-rights shares} = 1 + 4.92 = 5.92$$

The ex-rights price per share is:

$$P_X = \frac{(4.92)(\$53) + \$48}{5.92} = \$52.16$$

So, the value of a right is:

$$\text{Value of a right} = \$53 - 52.16 = \mathbf{\$0.84}$$

**Q15-5**

Using X to stand for the required sale proceeds, the equation to calculate the total sale proceeds, including flotation costs is:

$$X(1 - .09) = \$60,000,000$$

$$X = \$65,934,066 \text{ required total proceeds from sale.}$$

So the number of shares offered is the total amount raised divided by the offer price, which is:

$$\text{Number of shares offered} = \frac{\$65,934,066/}{\$21} = \mathbf{3{,}139{,}717}$$

**Q15-12**

The number of new shares is the amount raised divided by the subscription price, so:

$$\text{Number of new shares} = \frac{\$60,000,000}{\$P_S}$$

And the ex-rights number of shares (N) is equal to:

$$N = \frac{\text{Old shares outstanding}}{\text{New shares outstanding}}$$
$$N = \frac{19,000,000}{\left(\frac{\$60,000,000}{\$P_S}\right)}$$
$$N = 0.03167P_S$$

We know the equation for the ex-rights stock price is:

$$P_X = \frac{(N \cdot P_{RO} + P_S)}{(N+1)}$$

We can substitute in the numbers we are given, and then substitute the two previous results. Doing so, and solving for the subscription price, we get:

$$P_X = \$71 = \frac{N(\$76)) + \$P_S}{(N+1)}$$
$$\Rightarrow \$71 = \frac{76(0.03167P_S) + P_S}{(0.03167P_S + 1)}$$
$$\Rightarrow \$71 = \frac{24.0667P_S}{(1 + 0.03167P_S)}$$
$$\Rightarrow P_S = \$27.48$$

**Q15-14**

The net proceeds to the company on a per share basis is the subscription price times one minus the underwriter spread, so:

$$\text{Net proceeds to the company} = \$23(1 - .06) = \$21.62 \text{ per share}$$

So, to raise the required funds, the company must sell:

$$\text{New shares offered} = \frac{\$5,600,000}{\$21.62} = 259,019$$

The number of rights needed per share is the current number of shares outstanding divided by the new shares offered, or:

$$\text{Number of rights needed} = \frac{650,000 \text{ old shares}}{259,019 \text{ new shares}} = 2.51 \text{ rights per share}$$

The ex-rights stock price will be:

$$P_X = \frac{(N \cdot P_{RO} + P_S)}{(N+1)} = \frac{(2.51(\$50) + 23)}{2.51 + 1} = \$42.31$$

So, the value of a right is:

$$\text{Value of a right} = \$50 - 42.31 = \$7.69$$

And your proceeds from selling your rights will be:

$$\text{Proceeds from selling rights} = 5,000(\$7.69) = \mathbf{\$38{,}467.41}$$

**Q16-4a**

Under Plan I, the unlevered company, net income is the same as EBIT with no corporate tax. The EPS under this capitalization will be:

$$\text{EPS} = \frac{\$350,000}{160,000 \text{ shares}} = \$2.19$$

Under Plan II, the levered company, EBIT will be reduced by the interest payment. The interest payment is the amount of debt times the interest rate, so:

$$\text{NI} = \$350,000 - (.08)(\$2,800,000) = \$126,000$$

And the EPS will be:

$$\text{EPS} = \frac{\$126,000}{80,000 \text{ shares}} = \$1.58$$

Plan I has the higher EPS when EBIT is $350,000.

**Q16-4b**

Under Plan I, the net income is $500,000 and the EPS is:

$$\text{EPS} = \frac{\$500,000}{160,000 \text{ shares}} = \$3.13$$

Under Plan II, the net income is:

$$\text{NI} = \$500,000 - (.08)(\$2,800,000) = \$276,000$$

And the EPS is:

$$\text{EPS} = \frac{\$276,000}{80,000 \text{ shares}} = \$3.45$$

Plan II has the higher EPS when EBIT is $500,000.

**Q16-4c**

To find the breakeven EBIT for two different capital structures, we simply set the equations for EPS equal to each other and solve for EBIT. The breakeven EBIT is:

$$\frac{\text{EBIT}}{160,000} = \frac{\text{EBIT} - (.08)(\$2,800,000)])}{80,000}$$

$$\Rightarrow \quad \text{EBIT} = \$448,000$$

**Q16-5**

We can find the price per share by dividing the amount of debt used to repurchase shares by the number of shares repurchased. Doing so, we find the share price is:

$$\text{Share price} = \frac{\$2,800,000/}{(160,000 - 80,000))} = \$35.00 \text{ per share}$$

The value of the company under the all-equity plan is:

$$\text{V} = \$35.00(160,000 \text{ shares}) = \$5,600,000$$

And the value of the company under the levered plan is:

$$\text{V} = \$35.00(80,000 \text{ shares}) + \$2,800,000 \text{ debt} = \$5,600,000$$

**Q16-10**

With no taxes, the value of an unlevered firm is the interest rate divided by the unlevered cost of equity, so:

$$\text{V} = \frac{\text{EBIT}}{\text{WACC}} \qquad \Rightarrow \qquad \$23,000,000 = \frac{\text{EBIT}}{.09}$$

$$\Rightarrow \qquad \text{EBIT} = (.09)(\$23,000,000) = \$2,070,000$$

**Q16-11**

If there are corporate taxes, the value of an unlevered firm is:

$$V_U = \frac{\text{EBIT}(1 - T_C)}{R_U}$$

Using this relationship, we can find EBIT as:

$$\$23,000,000 = \frac{\text{EBIT}(1 - .35)}{.09} \quad \Rightarrow \quad \text{EBIT} = \$3,184,615.38$$

The WACC remains at 9 percent. Due to taxes, EBIT for an all-equity firm would have to be higher for the firm to still be worth $23 million.

**Q16-12a**

With the information provided, we can use the equation for calculating WACC to find the cost of equity. The equation for WACC is:

$$\text{WACC} = \left(\frac{E}{V}\right) R_E + \left(\frac{D}{V}\right) R_D(1 - T_C)$$

The company has a debt-equity ratio of 1.5, which implies the weight of debt is 1.5/2.5, and the weight of equity is 1/2.5, so

$$\text{WACC} = .10 = \left(\frac{1}{2.5}\right) R_E + \left(\frac{1.5}{2.5}\right) (.12)(1 - .35)$$

$$R_E = .1818 = 18.18\%$$

**Q16-12b**

To find the unlevered cost of equity we need to use M&M Proposition II with taxes, so:

$$R_E = R_U + (R_U - R_D)\left(\frac{D}{E}\right)(1 - T_C)$$

$$\Rightarrow \quad .1818 = R_U + (R_U - .07)(1.5)(1 - .35)$$

$$\Rightarrow \quad R_U = .1266 = 12.66\%$$

**Q16-12c**

To find the cost of equity under different capital structures, we can again use the WACC equation. With a debt-equity ratio of 2, the cost of equity is:

$$R_E = (.1266) + (.1266 - .07)(2)(1.35)$$

$$\Rightarrow \quad R_E = .2001 = 20.01\%$$

With a debt-equity ratio of 1.0, the cost of equity is:

$$R_E = (.1266) + (.1266 - .07)(1)(1.35)$$

$$\Rightarrow \quad R_E = .1634 = 16.34\%$$

And with a debt-equity ratio of 0, the cost of equity is:

$$R_E = (.1266) + (.1266 - .07)(0)(1.35)$$
$$\Rightarrow \quad R_E = \text{WACC} = .1266 = 12.66\%$$

**Q16-14a**

The value of the unlevered firm is:

$$V_U = \frac{\text{EBIT}(1 - T_C)}{R_U} = \frac{\$92,000(1 - .35)}{.15} = \mathbf{\$398{,}666.67}$$

**Q16-14b**

The value of the levered firm is:

$$V_L = V_U + T_C D = \$398,666.67 + .35(\$60,000) = \mathbf{\$419{,}666.67}$$

**Q16-15**

We can find the cost of equity using M&M Proposition II with taxes. Doing so, we find:

For the levered firm, $V_L = D + E$, so the value of equity can be calculated as:

$$E = V_L - D = \$419,666.67 - 60,000 = \$359,667.67$$

$$R_E = R_U + (R_U - R_D)\left(\frac{D}{E}\right)(1 - T_C)$$

$$= .15 + (.15 - .09)\left(\frac{\$60,000}{\$359,667}\right)(1 - .35)$$

$$= .1565 = 15.65\%$$

Using this cost of equity, the WACC for the firm after recapitalization is:

$$\text{WACC} = \left(\frac{E}{V}\right)R_E + \left(\frac{D}{V}\right)R_D(1 - T_C)$$

$$= (.1565)\left(\frac{\$359,667.67}{\$419,667}\right) + (.09)(1 - .35)\left(\frac{\$60,000}{\$419,667}\right)$$

$$= .1425 = 14.25\%$$

When there are corporate taxes, the overall cost of capital for the firm declines the more highly leveraged is the firms capital structure. This is M&M Proposition I with taxes.

**Q16-16**

To find the value of the levered firm we first need to find the value of an unlevered firm. So, the value of the unlevered firm is:

$$V_U = \frac{\text{EBIT}(1 - T_C)}{R_U} = \frac{(\$64,000))(1 - .35)}{.15} = \$277,333.33$$

Now we can find the value of the levered firm as:

$$V_L = V_U + T_C D = \$277,333.33 + .35(\$95,000) = \$310,583.33$$

Applying M&M Proposition I with taxes, the firm has increased its value by issuing debt. As long as M&M Proposition I holds, that is, there are no bankruptcy costs and so forth, then the company should continue to increase its debt/equity ratio to maximize the value of the firm up to the point where debt is 100% of the capital value of assets (D = $277,333.33).

**Q16-17**

With no debt, we are finding the value of an unlevered firm, so:

$$V_U = \frac{\text{EBIT}(1 - T_C)}{R_U} = \frac{\$14,000(1 - .35)}{.16} = \$56,875$$

With debt, we simply need to use the equation for the value of a levered firm. With 50 percent debt, one-half of the firm value is debt, so the value of the levered firm is:

$$V_L = V_U + T_C D = \$56,875 + .35\left(\frac{\$56,875}{2}\right) = \$66,828.13$$

And with 100% debt, the value of the firm is:

$$V_L = V_U + T_C\left(\frac{D}{V}\right)V_U = \$56,875 + .35(1.0)(\$56,875) = \$76,781.25$$