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## SOLUTIONS TO PRACTICE EXERCISES LECTURE 5

**Solution Q1:** Project beta = 0.88 (using all equity comp). Thus,  $r_p = 3.9\% + 0.88(4.9\%) = 8.21\%$

### **Solution Q2:**

a.  $E = \$16/\text{share} \times 16 \text{ million shares} = \$256 \text{ million}$

$$E + D = \$256\text{M} + \$110\text{M} = \$366 \text{ million}$$

Unlevered beta:  $B_u = 256/366 \times 1.00 + 110/366 \times 0 = 0.69945$  (Note here we assume that beta debt is zero due to its high ranking, i.e. AA-rated, the yield 4.1% is close to the risk-free rate of 3.9%).

$$\text{Unlevered cost of capital: } R_u = 3.9\% + 0.69945(4.9\%) = 7.33\%$$

b.  $R_e = 3.9\% + 1.0 \times 4.9\% = 8.80\%$

$$R_u = 256/366 \times 8.80\% + 110/366 \times 4.1\% = 7.39\%$$

### **Solution Q3:**

a.  $EV = E + D - C = 99 + 18 - 52 = \$65 \text{ billion}$

b. Net Debt =  $18 - 52 = -34$

$$B_u = (99/65) \times 1.16 + (-34/65) \times 0 = 1.77$$

### **Solution Q4:**

$$R_u = 10\% = 78\% R_e + 22\% R_d = 78\% R_e + 22\%(6\%) \rightarrow R_e = (10\% - 22\%(6\%))/78\% = 11.13\%$$

$$R_{wacc} = 78\%(11.13\%) + 22\%(6\%)(1 - 33\%) = 9.57\%$$

### **Solution Q5:**

Debt-to-value ratio =  $D/(D+E) = D/A = 13\%$ ; Hence the equity-to-value ratio =  $E/(D+E) = E/A = 87\%$

At a cost of debt of 6%:

$$r_E = r_U + \frac{D}{E}(r_U - r_D)$$

$$r_E = 0.092 + \frac{0.13}{0.87}(0.092 - 0.06)$$

$$= 0.0968$$

$$= 9.68\%.$$

### **Solution Q6:**

First calculate the initial  $r_u$  or unlevered wacc:

$$wacc = \frac{470}{(470 + 299)} \times 13\% + \frac{299}{(470 + 299)} \times 5\% = 9.89\% = r_u$$

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With the issuance of 71 million new debt, the total debt becomes  $299\text{m} + 71\text{m} = \$370\text{m}$ . The share repurchase will reduce the equity on the balance sheet by the same amount so the equity becomes  $470 - 71 = \$399\text{ million}$ .

$$R_e = r_u + d/e (r_u - r_d) = 9.89\% + 370/399 * (9.89\% - 5\%) = 14.42\%$$

**Solution Q7:**

- MM proposition I  $\Rightarrow$  no change in the share price, i.e. \$73
- Initial enterprise value ( $V$ ) =  $E + D = (\$73 \times 10\text{m}) + \$84\text{m} = \$814\text{ million}$   
 New debt =  $D = \$354\text{ million}$   
 $E = 814 - 354 = \$460\text{ million}$   
 Share price =  $\$460\text{m}/10\text{m} = \$46$
- Initially:  $R_u = (730/814) \times 8.5\% + (84/814) \times 4.39\% = 8.08\%$   
 After the transaction:  $R_e = 8.08\% + 354/460(8.08\% - 4.93\%) = 10.50\%$

**Solution Q8:**

- Issue  $\frac{160}{67} = 2.388$  million new shares  $\Rightarrow$  The total number of shares outstanding becomes = 9 million + 2.388 million = 11.388 million shares outstanding.  
 Next year's EPS =  $\frac{31}{11.388} = \$2.72$  per share.
- Interest expense on new debt =  $160 \times 8\% = 12.8$  million. The interest expense will reduce earnings to  $31 - 12.8 = \$18.2$  million. With 9 million shares outstanding,  $EPS = \frac{18.2}{9} = \$2.02$  per share.
- By MM, share price is \$67 in either case. PE ratio with equity issue is  $\frac{67}{2.72} = 24.63$ .  
 PE ratio with debt is  $\frac{\$67}{2.02} = 33.17$ .

The higher PE ratio with debt is justified because with leverage, EPS will grow at a faster rate (see lecture 5: leverage and EPS).

**Solution Q9:**

- Annual interest tax shield =  $\$15 \times 7\% \times 35\% = \$0.3675\text{ million}$
- $PV(\text{Interest tax shield}) = \frac{\$0.3675}{7\%} = \$5.25\text{ million}$

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### Solution Q10:

- a. As an all-equity firm: Assets = Equity =  $\$15 \times 27 = \$405$  million
- b.  $VU = E + D = \$405M + \$65M = 470$  million.  $VL = VU + PV(\text{interest tax shield}) = 470 + (38\% \times 65) = \$494.7$  million
- c. Before the share repurchase:  $E = \text{Assets} - \text{Debt} = 494.7 - 65 = \$429.7$  million. Share price =  $\$429.7 \text{ million} / 27 \text{ million} = \$15.91$ .
- d. With \$65 million borrowed funds, Kurz will repurchase  $\frac{65}{15.91} = 4.085$  million shares.
- e. After the share repurchase (\$65 million debt is totally used to repurchase shares): Assets = 405 (initial as in answer a) +  $38\% \times 65$  (tax shield) =  $\$429.7$  million

Debt = \$65 million

$E = A - D = 429.7 - 65 = \$364.7$  million

Recall that Kurz repurchased 4.085 million shares in d, so then the number of shares outstanding will decrease to: 27 million – 4.085 million = 22.915 million shares outstanding.

Share price =  $\frac{\$364.7}{27 - 4.085} = \$15.91$  per share .

The market value balance sheet for the entire leveraged recapitalization will look like this (this is similar to Table 15.2 on page 563).

MV Balance Sheet (\$ million)	Initial	Step 1: Recapitalization announced	Step 2: Debt issuance	Step 3: Share repurchase
<b>Assets</b>				
Cash	0	0	65	0
Original assets (VU)	405	405	405	405
Interest tax shield	0	24.7	24.7	24.7
<b>Total assets</b>	405	429.7	494.7	429.7
<b>Liabilities</b>				
Debt	0	0	65	65
<b>Equity = A – D</b>	405	429.7	429.7	364.7
<b>Shares outstanding (million)</b>	27	27	27	22.915
<b>Price per share</b>	\$15	\$15.91	\$15.91	\$15.91

### Solution Q11:

- a.  $PV = \tau_c D = 40\% \times 127 = \$50.8$  million.

- b.  $\tau^* = 1 - \frac{(1 - 0.40)(1 - 0.25)}{1 - 0.35} = 30.77\%$

$PV = \tau^* D = 30.77\% \times 127 = \$39.08$  million