

BUSI 2505E - SOLUTIONS TO SUGGESTED EXERCISES

CHAPTERS 13 AND 14

Q13-2

The expected return of a portfolio is the sum of the weight of each asset times the expected return of each asset. The total value of the portfolio is

$$\text{Total value} = 1,200 + 1,900 = 3,100$$

So, the expected return of this portfolio is

$$E(R_p) = w_A E(R_A) + w_B E(R_B) = \frac{1,200}{3,100}(0.11) + \frac{1,900}{3,100}(0.16) = .1406 = \mathbf{14.06\%}$$

Q13-8

The expected return of a portfolio is the sum of the weight of each asset times the expected return of each asset. So, the expected return of the portfolio is

$$E(R_p) = (.20)(.08) + (.70)(.15) + (.1)(.24) = .1450 = \mathbf{14.50\%}$$

If we own this portfolio, we would expect to get a return of 14.50 percent.

Q13-14

The beta of a portfolio is the sum of the weight of each asset times the beta of each asset. If the portfolio is as risky as the market it must have the same beta as the market. Since the beta of the market is one, we know the beta of our portfolio is one. We also need to remember that the beta of the risk-free asset is zero. It has to be zero since the asset has no risk. Setting up the equation for the beta of our portfolio, we get

$$\beta_p = 1.0 = \frac{1}{3}(0) + \frac{1}{3}(1.9) + \frac{1}{3}(\beta_X)$$

Solving for the beta of Stock X, we get

$$\beta_X = \mathbf{1.10}$$

Q13-16

We are given the values for the CAPM except for the β of the stock. We need to substitute these values into the CAPM, and solve for the β of the stock. One important thing we need to realize is that we are given the market risk premium. The market risk premium is the expected return of the market minus the risk-free rate. We must be careful not to use this value as the expected return of the market. Using the CAPM, we find

$$E(R_i) = .14 = .04 + .06\beta_i \Rightarrow \beta_i = \mathbf{1.67}$$

Q13-18

Here we need to find the risk-free rate using the CAPM. Substituting the values given, and solving for the risk-free rate, we find

$$E(R_i) = .17 = R_f + (.11 - R_f)(1.9) = .209 - .9R_f \Rightarrow R_f = .0433 = \mathbf{4.33\%}$$

Q14-2

Here we have information to calculate the cost of equity using the CAPM. The cost of equity is

$$R_E = R_f + \beta(E(R_M) - R_f) = .045 + 1.30(.12 - .045) = .1425 = \mathbf{14.25\%}$$

Q14-6

The pretax cost of debt is the YTM of the company's bonds, so

$$-1,050 \text{ [PV]}; \quad 24 \text{ [N]}; \quad 40 \text{ [PMT]}; \quad 1,000 \text{ [FV]}; \quad \text{[CPT] [I/Y]} = 3.683\%$$

$$\Rightarrow YTM = 2 \times 3.683\% = 7.37\%$$

And the aftertax cost of debt is

$$R_D(1 - T_c) = (.0737)(1 - .35) = .0479 = \mathbf{4.79\%}$$

Q14-8

The book value of debt is the total par value of all outstanding debt, so

$$BVD = \$20M + 80M = \mathbf{\$100M}$$

To find the market value of debt, we find the price of the bonds and multiply by the number of bonds. Alternatively, we can multiply the price quote of the bond times the par value of the bonds. Doing so, we find

$$MVD = 1.08(\$20M) + .58(\$80M) = \mathbf{\$68M}$$

The YTM of the zero coupon bonds is

$$-580 \text{ [PV]}; \quad 7 \text{ [N]}; \quad 1,000 \text{ [FV]}; \quad \text{[CPT] [I/Y]} = 8.09\%$$

So the aftertax cost of the zero coupon bonds is

$$R_Z = .0809(1 - .35) = .0526 = 5.26\%$$

The aftertax cost of debt for the company is the weighted average of the aftertax cost of debt for all outstanding bond issues. We need to use the market value weights of the bonds. The total aftertax cost of debt for the company is

$$R_D = .0595 \frac{21.6}{68} + .0526 \frac{46.4}{68} = .0548 = \mathbf{5.48\%}$$

Q14-10

Here we need to use the debt-equity ratio to calculate the capital structure weights

$$\begin{aligned}\frac{D}{E} &= .6 \text{ and } D + E = 1 \\ \Rightarrow D &= .6E \\ \Rightarrow .6E + E &= 1 \\ \Rightarrow 1.6E &= 1 \\ \Rightarrow E &= \frac{1}{1.6} = .625 \\ \Rightarrow D &= 1 - E = 1 - .625 = .375\end{aligned}$$

and we then use the WACC formula

$$\begin{aligned}\text{WACC} &= w_E R_E + w_D R_D (1 - T_c) \\ &= (.18)(.625) + (.10)(.375)(1 - .35) \\ &= .1369 \\ &= \mathbf{13.69\%}\end{aligned}$$

Q14-12a

The book value of equity is the book value per share times the number of shares, and the book value of debt is the face value of the company's debt

$$\text{BookValue}_E = (9.5M)(\$5) = \$47.5M; \quad \text{BookValue}_D = 75M + 60M = 135M$$

and the total value of the company is

$$V = 47.5M + 135M = 182.5M$$

so the book value weights of equity and debt are

$$w_E = \frac{E}{V} = \frac{47.5}{182.5} = \mathbf{.2603}; \quad w_D = \frac{D}{V} = 1 - \frac{E}{V} = \mathbf{.7397}$$

Q14-12b

The market value of equity is the share price times the number of shares

$$\text{MarketValue}_E = (9.5M)(\$53) = \$503.5M$$

Using the relationship that the total market value of debt is the price quote times the par value of the bond, we find the market value of debt

$$\text{MarketValue}_D = (.93)(75M) + (.965)(60M) = \$127.65M$$

This makes the total market value of the company

$$V = 503.5M + 127.65M = 631.15M$$

And the market value weights of equity and debt are

$$w_E = \frac{E}{V} = \frac{503.5}{631.15} = \mathbf{.7978}; \quad w_D = \frac{D}{V} = 1 - \frac{E}{V} = \mathbf{.2022}$$

Q14-12c

The market value weights are more relevant.

Q14-14a

Again, we need to use the debt-equity ratio to calculate the capital structure weights

$$\begin{aligned}\frac{D}{E} &= .8 \text{ and } D + E = 1 \\ \Rightarrow D &= .8E \\ \Rightarrow .8E + E &= 1 \\ \Rightarrow 1.8E &= 1 \\ \Rightarrow E &= \frac{1}{1.8} = .5556 \\ \Rightarrow D &= 1 - E = 1 - .5556 = .4444\end{aligned}$$

Next using equation to calculate WACC, we solve for the cost of debt R_D

$$\begin{aligned}\text{WACC} &= w_E R_E + w_D R_D (1 - T_c) = (.5556)(.15) + (.4444)(1 - .35)R_D = .105 \\ \Rightarrow R_D &= \frac{.105 - (.5556)(.15)}{(.4444)(1 - .35)} = .0750 = \mathbf{7.50\%}\end{aligned}$$

Q14-14b

Using the equation to calculate WACC, instead we solve for R_E

$$\begin{aligned}\text{WACC} &= w_E R_E + w_D R_D (1 - T_c) = (.5556)R_E + (.4444)(.064) = .105 \\ \Rightarrow R_E &= \frac{.105 - (.4444)(.064)}{.5556} = .1378 = \mathbf{13.78\%}\end{aligned}$$

Q14-16a

First, we find the market value of each type of financing

$$\begin{aligned}\text{MarketValue}_D &= (120,000)(1,000)(0.93) = 111.6M \\ \text{MarketValue}_E &= (9M)(\$34) = 306M \\ \text{MarketValue}_P &= (500,000)(\$83) = 41.5M\end{aligned}$$

and the total market value of the firm is

$$V = 111.6M + 306M + 41.5M = 459.1M$$

Q14-16a (cont.)

so the market value weights of the company's financing are

$$w_D = \frac{D}{V} = \frac{111.6M}{459.1M} = \mathbf{.2431}$$

$$w_P = \frac{P}{V} = \frac{41.5M}{459.1M} = \mathbf{.0904}$$

$$w_E = \frac{E}{V} = \frac{306M}{459.1M} = \mathbf{.6665}$$

Q14-16b

For projects equally as risky as the firm itself, the WACC should be used as the discount rate. First we can find the cost of equity using the CAPM

$$R_E = R_f + \beta(E(R_M) - R_f) = .05 + (1.20)(.10) = .1700 = 17.00\%$$

The cost of debt is the YTM of the bonds

$$-930 \text{ [PV]}; \quad 30 \text{ [N]}; \quad 42.5 \text{ [PMT]}; \quad 1,000 \text{ [FV]}; \quad \text{[CPT] [I/Y]} = 4.69\%$$

$$\Rightarrow YTM = 2 \times 4.69\% = 9.38\%$$

and the aftertax cost of debt is

$$R_D(1 - T_c) = (.0938)(1 - .35) = .0610 = 6.10\%$$

The cost of preferred stock is

$$R_P = \frac{D}{P_0} = \frac{7}{83} = .0843 = 8.43\%$$

Finally, we can calculate the WACC as

$$\begin{aligned} \text{WACC} &= w_E R_E + w_P R_P + w_D R_D(1 - T_c) \\ &= (.6665)(.1700) + (.0904)(.0843) + (.2431)(.0610) \\ &= .1358 \\ &= \mathbf{13.58\%} \end{aligned}$$

Q14-18a

He should look at the weighted average flotation cost, not just the debt cost.

Q14-18b

We need to use the debt-equity ratio to calculate the capital structure weights

$$\begin{aligned}\frac{D}{E} &= .9 \text{ and } D + E = 1 \\ \Rightarrow D &= .9E \\ \Rightarrow .9E + E &= 1 \\ \Rightarrow 1.9E &= 1 \\ \Rightarrow E &= \frac{1}{1.9} = .5263 \\ \Rightarrow D &= 1 - E = 1 - .5263 = .4737\end{aligned}$$

The weighted average flotation cost is the weighted average of the flotation costs for equity and debt

$$f_A = w_E f_E + w_D f_D = (.5263)(.10) + (.4737)(.041.9) = .072 = \mathbf{7.20\%}$$

Q14-18c

The total cost of the equipment including flotation costs is

$$\text{Amount raised} = \frac{15M}{1 - .072} = \mathbf{\$16,156,463}$$

Even if the specific funds are actually being raised completely from debt, the flotation costs, and hence true investment cost, should be valued as if the firms target capital structure is used.

Q14-20

We need to use the debt-equity ratio to calculate the capital structure weights

$$\begin{aligned}\frac{D}{E} &= .65 \text{ and } D + E = 1 \\ \Rightarrow D &= .65E \\ \Rightarrow .65E + E &= 1 \\ \Rightarrow 1.65E &= 1 \\ \Rightarrow E &= \frac{1}{1.65} = .6061 \\ \Rightarrow D &= 1 - E = 1 - .6061 = .3939\end{aligned}$$

which are needed to calculate the WACC

$$WACC = w_E R_E + w_D R_D(1 - T_c) = (.6061)(.15) + (.3939)(.055) = .1126 = 11.26\%$$

Q14-20 (cont.)

Since the project is riskier than the company, we need to adjust the project discount rate for the additional risk. Using the subjective risk factor given

$$\text{Project discount rate} = 11.26\% + 2.00\% = 13.26\%$$

We would accept the project if the NPV is positive. The NPV is the PV of the cash outflows plus the PV of the cash inflows. Since we have the costs, we just need to find the PV of inflows. The cash inflows are a growing perpetuity, which is the same as the dividend growth equation

$$\text{PV of future CF} = \frac{3,500,000}{.1326 - .05} = \mathbf{42,385,321}$$

The project should only be undertaken if its cost is less than \$42,385,321 since costs less than this amount will result in a positive NPV.

Q14-22

We can use the debt-equity ratio to calculate the weights of equity and debt

$$\begin{aligned}\frac{D}{E} &= 1.3 \text{ and } D + E = 1 \\ \Rightarrow D &= 1.3E \\ \Rightarrow 1.3E + E &= 1 \\ \Rightarrow 2.3E &= 1 \\ \Rightarrow E &= \frac{1}{2.3} = .4348 \\ \Rightarrow D &= 1 - E = 1 - .4348 = .5652\end{aligned}$$

The debt of the company has a weight for long-term debt and a weight for accounts payable. We can use the weight given for accounts payable to calculate the weight of accounts payable and the weight of long-term debt. The weight of each will be

$$\text{Accounts payable weight} = \frac{.20}{1.20} = .17$$

$$\text{Long-term debt weight} = \frac{1}{1.20} = .83$$

Since the accounts payable has the same cost as the overall WACC, we can write the equation for the WACC as

$$\begin{aligned}\text{WACC} &= w_E R_E + w_D R_D (1 - T_c) \\ &= (.4348)(.17) + (.5652) \left(.17 \text{ WACC} + (.83)(.09)(1 - .35) \right)\end{aligned}$$

Q14-22 (cont.)

and solving for WACC

$$\text{WACC} = .0739 + .5652 (.17 \text{ WACC} + .0488) = .0739 + .0942 \text{ WACC} + .0276$$

$$\Rightarrow .9058 \text{ WACC} = .1015 \Rightarrow \text{WACC} = .1132 = 11.32\%$$

Next, we use a similar equation to calculate the weighted average flotation cost, except with flotation cost for each form of financing

$$f_A = (.4348)(.08) + (.5652)((.17)(0) + (.83)(.04)) = .0529 = 5.29\%$$

The total amount we need to raise to fund the new equipment will be

$$\text{Amount raised} = \frac{45,000,000}{1 - .0529} = \$47,511,935$$

Since the cash flows go to perpetuity, we can calculate the future cash inflows using the equation for the PV of a perpetuity

$$\frac{5,700,000}{.1132} = 50,372,552$$

and the NPV is

$$\text{NPV} = -47,511,935 + 50,372,552 = \mathbf{\$2,860,617}$$