

## Points breakdown

Question 1:  $10+(5)$

Question 2:  $5+5+5+5+(5)$

Question 3:  $10+10+5$

Question 4:  $10+5+5+5$

Question 5:  $10+10$

Question 1

a) The first blank is solved from

$$950 = \frac{1000}{1+x} \Leftrightarrow x = 0.0526 = 5.26\%$$

The second blank is solved from

$$981.79 = \frac{x}{1.065} + \frac{x}{(1.065)^2} + \frac{1,000}{(1.065)^2} \Leftrightarrow x = 55 = 5.5\%$$

The third blank is solved from

$$x = \frac{80}{1.075} + \frac{80}{(1.075)^2} + \frac{1,080}{(1.075)^3} = 1,1013.01$$

b) The solution to this problem comes from the equation

$$x = \frac{80}{(1.075)^{\frac{1}{4}}} + \frac{80}{(1.075)^{\frac{5}{4}}} + \frac{80}{(1.075)^{\frac{9}{4}}} = 1,069.47$$

## Question 2

- a) Expected return is 11% and standard deviation 6%
- b) Return of T bills is 5% (1/20), return on stocks is -3.3% (-1/30) and overall return is 0% (0/50)
- c) The expected return in December 31 is

$$\frac{20}{44} * 5\% + \frac{24}{44} * 15\% = 10.45\%$$

The standard deviation is 5.45%

- d) You need to have again 60% of the value in stocks and 40% in Tbills. This means to have 17.6 million in Tbills and 26.4 in stocks. So, he needs to buy 2.4million in stocks and sell the same amount in Tbills
- e) In this question the first step is to know the value in dollars of the expected return in January 1. For the Tbills 5% of 20million is 1 million and for the stocks 15% of 30million is 4.5million. The total dollar return is 5.5million. So, you just need to solve this equation

$$5.5 = w * 44 * 5\% + (1 - w) * 44 * 15\% \Leftrightarrow w = 0.25$$

So, 25% of the wealth must be in Tbills and 75% in stocks. This means 11million in Tbills and 33million in stocks. So, he needs to buy 9million in stocks and sell 9 million in tbills.

### Question 3

- a) To calculate the Wacc you start with  $R_s$

$$R_s = 5\% + 1.3(20\% - 5\%) = 24.5\%$$

Then the WACC is

$$WACC = 24.5\% * 0.8 + 5\%(1 - 0.3) * 0.2 = 20.3\%$$

- b) For this you need to unlever the beta of the sweet potato firm and then relever it with the information of Idaho potato

$$1.5 = \beta_{sweet} \left( 1 + \frac{1}{3}(1 - 0.25) \right) \Leftrightarrow \beta_{sweet} = 1.2$$

$$\beta_s = 1.2 \left( 1 + \frac{1}{4}(1 - 0.3) \right) = 1.41$$

So, the cost of equity for the sweet potato line is

$$5\% + 1.41 * (20\% - 5\%) = 26.15\%$$

And the cost of capital is

$$WACC = 0.8 * 26.15\% + 0.2 * (1 - 0.3) * 5\% = 21.62\%$$

- c) It is wrong. You should use a cost of capital that is adjusted to risk of the project. In this case, using the original wacc, that is lower than the correct one for the sweet potato business would mean taking the risk of accepting projects with negative NPV

#### Question 4

- a) To calculate the value of the equity, you use the FTE. So, we start by calculating the levered cash flow

$$(1,000 - 450 - 325 - 29.5)(1 - 0.4) = 117.3$$

$$\text{So, } Equity = \frac{117.3}{0.19} = 617.368$$

- b) To know the value of the Debt you just use the debt equity ratio of 0.4. So,

$$\frac{B}{617.368} = 0.4 \Leftrightarrow B = 246.947$$

The rate of return of Debt is simply

$$\frac{29.5}{246.947} = 11.95\%$$

- c) The company is worth the sum of equity and debt, 864.315  
d) No, maximizing the value of the equity or maximizing the value of the whole firm is the same.

### Question 5

- a) The first thing to do is to find  $R_0$  in order to use the APV method

$$16\% = R_0 + \frac{1}{2}(1 - 0.4)(R_0 - 9\%) \Leftrightarrow R_0 = 14.38\%$$

Next is to calculate the interest payments. In the first year is 9% of 12 million, in the second year is 9% of 8million and in the third year is 9% of 4million. The tax shield will be 40% of that. This means they will be 432,000 in the first year, 288,000 in the second and 144,000 in the third.

The NPV of the expansion is

$$-24m + \frac{8m}{1.1438} + \frac{13m}{(1.1438)^2} + \frac{10m}{(1.1438)^3} + \frac{0.432m}{1.09} + \frac{0.288m}{(1.09)^2} + \frac{0.144m}{(1.09)^3} = 0.364m$$

- b) For the move to Estonia, the tax shield disappears but the cash flows of the project increase. They will be the before tax cash flows. So, they will be 13.333million, 21.667million and 16.667million. Again we use  $R_0$  which is 14.38%. So the NPV now is 15.356million.