BUSN3049 Corporate Finance
Tutorial 6

1. Using the CAPM, show that the ratio of the risk premiums on two assets is equal to the ratio of their betas.

   Answer

   We know that the reward-to-risk ratios for all assets must be equal. This can be expressed as:

   $$\frac{E(R_A) - R_f}{\beta_A} = \frac{E(R_B) - R_f}{\beta_B}$$

   The numerator of each equation is the risk premium of the asset, so:

   $$\frac{\rho_A}{\beta_A} = \frac{\rho_B}{\beta_B}$$

   We can rearrange this equation to get:

   $$\frac{\beta_B}{\beta_A} = \frac{\rho_B}{\rho_A}$$

   If the reward-to-risk ratios are the same, the ratio of the betas of the assets is equal to the ratio of the risk premiums of the assets.

2. You want to create a portfolio equally as risky as the market, and you have $500,000 to invest. Given this information, fill in the rest of the following table.

Asset	Investment	Beta
Stock A	85,000	0.80
Stock B	165,000	1.15
Stock C		1.40
Risk-Free Asset		

   Answer

   We know the total portfolio value and the investment of two stocks in the portfolio, so we can find the weight of these two stocks. The weights of Stock A and Stock B are:

   $$x_A = 85,000/500,000 = 0.17$$
   $$x_B = 165,000/500,000 = 0.33$$

   Since the portfolio is as risky as the market, the β of the portfolio must be equal to one. We also know the β of the risk-free asset is zero. We can use the equation for the β of a portfolio to find the weight of the third stock. Doing so, we find:

   $$\begin{aligned}\beta_p = 1 =& x_A(0.80) + x_B(1.15) + x_C(1.40) + x_{R_f}(0)\\ =& 0.17(0.80) + 0.33(1.15) + x_C(1.40)\end{aligned}$$

Solving for the weight of Stock C, we find:

$$x_C = 0.346071$$

So, the dollar investment in Stock C must be:

$$0.346071(500,000) = 173,035.71$$

We also know the total portfolio weight must be one, so the weight of the risk-free asset must be one minus the asset weights we know:

$$\begin{aligned} x_{R_f} =& 1 - x_A - x_B - x_C \\ =& 1 - 0.17 - 0.33 - 0.346071 \\ =& 0.153929 \end{aligned}$$

So, the dollar investment in the risk-free asset must be:

$$0.153929(500,000) = 76,964.29$$

3. You have $100,000 to invest in either Stock D, Stock F, or a risk-free asset. You must invest all your money. Your goal is to create a portfolio that has an expected return of 11.4%. If D has an expected return of 13.6%, F has an expected return of 9.7%, the risk-free rate is 3.8%, and you invest $50,000 in Stock D, how much will you invest in Stock F?

Answer

We know the expected return of the portfolio and of each asset, but only one portfolio weight. We need to recognize that the weight of the risk-free asset is one minus the weight of the other two assets. Mathematically, the expected return of the portfolio is:

$$\begin{aligned} E(R_p) = 0.114 =& 0.50(0.136) + x_F(0.097) + (1 - 0.50 - x_F)(0.038) \\ =& 0.50(0.136) + x_F(0.097) + 0.038 - 0.019 - 0.038x_F \\ x_F =& 0.4576 \end{aligned}$$

So, the weight of the risk-free asset is:

$$x_{R_f} = 1 - 0.50 - 0.4576 = 0.0424$$

And the amount of Stock F to buy is:

$$0.4576(100,000) = 45,760$$