Chapter 13, Questions and Problems 15

Here we need to find the expected return of the market using the CAPM.

$$E(R_i) = R_f + \beta_i \times (E(R_M) - R_f)$$

Substituting the values given, and solving for the expected return of the market, we find:

$$E(R_i) = 0.1045 = 0.036 + 0.93 \times [\mathrm{E}(R_M) - 0.036]$$

So

$$\mathrm{E}(R_M) = 0.1097, \text{or } 10.97\%$$

Chapter 13, Questions and Problems 20

a. Again we have a special case where the portfolio is equally weighted, so we can sum the returns of each asset and divide by the number of assets. The expected return of the portfolio is:

$$\mathrm{E}(\mathrm{R}_P) = (0.108 + 0.027)/2 = 0.0675, \text{or } 6.75\%$$

b. We need to find the portfolio weights that result in a portfolio with a beta of 0.92. We know the beta of the risk-free asset is zero. We also know the weight of the risk-free asset is one minus the weight of the stock since the portfolio weights must sum to one, or 100 percent. So:

$$\beta_{\mathrm{P}} = 0.92 = \mathrm{w_S}(1.12) + (1 - \mathrm{w_S})(0)$$

$$0.92 = 1.12\mathrm{w_S} + 0 - 0\mathrm{w_S}$$

$$\mathrm{w_S} = 0.92/1.12 = 0.8214$$

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

$$\mathrm{w_{Rf}} = 1 - 0.8214 = 0.1786$$

c. We need to find the portfolio weights that result in a portfolio with an expected return of 9 percent. We also know the weight of the risk-free asset is one minus the weight of the stock since the portfolio weights must sum to one, or 100 percent. So:

$$\mathrm{E(R}_P) = 0.09 = 0.108\mathrm{w_S} + 0.027(1 - \mathrm{w_S})$$

$$0.09 = 0.108\mathrm{w_S} + 0.027 - 0.027\mathrm{w_S}$$

$$0.063 = 0.081\mathrm{w_S}$$

$$\mathrm{w_S} = 0.7778$$

So, the beta of the portfolio will be:

$$\beta_\mathrm{P} = 0.7778(1.12) + (1 - 0.7778)(0) = 0.871$$

d. Solving for the beta of the portfolio as we did in part *a*, we find:

$$\beta_\mathrm{P} = 2.24 = \mathrm{w_S}(1.12) + (1 - \mathrm{w_S})(0)$$

$$\mathrm{w_S} = 2.24/1.12 = 2$$

$$\mathrm{w_{Rf}} = 1 - 2 = -1$$

The portfolio is invested 200% in the stock and –100% in the risk-free asset. This represents borrowing at the risk-free rate to buy more of the stock.

Chapter 13, Questions and Problems 24

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

$$\mathrm{w_A} = \$165{,}000/\$1{,}000{,}000 = 0.165$$

$$\mathrm{w_B} = \$350{,}000/\$1{,}000{,}000 = 0.350$$

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

$$\beta_P = 1 = w_A(0.80) + w_B(1.09) + w_C(1.27) + w_{Rf}(0)$$

$$1 = 0.165(0.80) + 0.35(1.09) + w_C(1.27)$$

Solving for the weight of Stock C, we find:

$$w_C = 0.38307087$$

So, the dollar investment in Stock C must be:

Investment in Stock C $= 0.38307087 \times \$1{,}000{,}000 = \$383{,}070.87$

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, or:

$$1 = w_A + w_B + w_C + w_{Rf} = 1 - 0.165 - 0.350 - 0.38307087 - w_{Rf}$$

$$w_{Rf} = 0.10192913$$

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

Investment in risk-free asset $= 0.10192913 \times \$1{,}000{,}000 = \$101{,}929.13$