In-Class Exercise Solution

We compute the beta of the portfolio as the weighted average of the betas of its constituent assets (note that the risk-free asset has a beta of zero):

$$\begin{aligned}\beta_P &= 0.25 \times \beta_F + 0.25 \times \beta_{GM} + 0.20 \times \beta_{CH} + 0.15 \times \beta_M \\ &= 0.25 \times 1.2 + 0.25 \times 1.4 + 0.20 \times 1.7 + 0.15 \times 1 \\ &= 1.14\end{aligned}$$

According to the CAPM, the expected return on the portfolio should hence be:

$$E(R_i) = R_f + \beta_i \times \left(E(R_M) - R_f\right) = 5\% + 1.14 \times (12\% - 5\%) = 12.98\%$$

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Method1:

We can use the CAPM. Substituting in the value we are given for each stock, we find:

$$E(R_Y) = R_f + \beta_Y \times \left(E(R_M) - R_f\right) = 8\% + 1.3 \times 7.5\% = 17.75\%$$

It is given in the problem that the expected return of Stock Y is 18.5 percent, but according to the CAPM, the return of the stock based on its level of risk, the expected return should be 17.75 percent. This means the stock return is too high, given its level of risk. Stock Y plots above the SML and is undervalued. In other words, its price must increase to reduce the expected return to 17.75%.

For Stock Z, we find:

$$E(R_Z) = R_f + \beta_Z \times \left(E(R_M) - R_f\right) = 8\% + 0.7 \times 7.5\% = 13.25\%$$

The return given for Stock Z is 12.1 percent, but according to the CAPM the expected return of the stock should be 13.25 percent based on its level of risk. Stock Z plots below the SML and is overvalued. In other words, its price must decrease to increase the expected return to 13.25 percent.

Method 2:

We can also answer this question using the reward-to-risk ratio. All assets must have the same reward-to-risk ratio. The reward-to-risk ratio is the risk premium of the asset divided by its β. We are given the market risk premium, and we know the β of the market is one, so the reward-to-risk ratio for the market is 7.5%.

Calculating the reward-to-risk ratio for Stock Y, we find:

$$\frac{\mathrm{E}(R_Y) - R_f}{\beta_Y} = \frac{18.5\% - 8\%}{1.30} = 8.08\%$$

The reward-to-risk ratio for Stock Y is too high, which means the stock plots above the SML, and the stock is undervalued. Its price must increase until its reward-to-risk ratio is equal to the market reward-to- risk ratio.

For Stock Z, we find:

$$\frac{\mathrm{E}(R_Z) - R_f}{\beta_Z} = \frac{12.1\% - 8\%}{0.70} = 5.86\%$$

The reward-to-risk ratio for Stock Z is too low, which means the stock plots below the SML, and the stock is overvalued. Its price must decrease until its reward-to-risk ratio is equal to the market reward-to- risk ratio.