hw8-2-7

Cohort 2 - Group 7 (Huanyu Liu, Hyeuk Jung, Jiaqi Li, Xichen Luo)

Problem 1

1.

a. According to the CAPM:

$$E(R_i) = R_f + \beta(E(R_m) - R_f)$$

Since $R_f = 5\%$, $E(R_m) - R_f = 6\%$, and $\beta = 1.4$, the return that investors expect on the security is:

$$E(R_i) = 13.4\%(= 5\% + 1.4 \times 6\%)$$

b. The price of the security to trade next year is:

$$E(R_i) = \frac{P_1 - P_0}{P_0} \times 100\%$$

Since $E(R_i) = 13.4\%$, $P_0 = \$35$,

$$P_1 = P_0(1 + E(R_i)) = 35 \times (1 + 13.4\%) = 39.69$$

The price of the security to trade next year is \$39.69.

c. If there exists dividend, the price of the security to trade next year is:

$$E(R_i) = \frac{P_1 - P_0 + \text{Dividend}}{P_0} \times 100\%$$

Since $E(R_i) = 13.4\%$, $P_0 = \$35$, and Dividend $= \$2$

$$P_1 = P_0(1 + E(R_i)) - \text{Dividend} = 35 \times (1 + 13.4\%) - 2 = 37.69$$

The price of the security to trade next year is \$37.69.

Problem 2

a. According to the CAPM:

$$E(R_i) = R_f + \beta(E(R_m) - R_f)$$

For the aggressive stock:

$$2\% = R_f + \beta_a(5\% - R_f)$$

$$32\% = R_f + \beta_a(20\% - R_f)$$

Solve these two equations, the beta of the aggressive stock is:

$$\beta_a = 2$$

and the risk-free rate is:

$$R_f = 8\%$$

For the defensive stock:

$$3.5\% = R_f + \beta_d(5\% - R_f)$$

$$14\% = R_f + \beta_d(20\% - R_f)$$

Solve these two equations, the beta of the defensive stock is:

$$\beta_d = 0.7$$

and the risk-free rate is:

$$R_f = 0$$

b. If the market return is equally likely to be 5% or 20%, the market return is:

$$E(R_m) = 0.5 \times 5\% + 0.5 \times 20\% = 12.5\%$$

For the aggressive stock, the expexted rate of return is:

$$E(R_a) = R_f + \beta_a[E(R_m) - R_f] = 8\% + 2 \times [(0.5 \times 5\% + 0.5 \times 20\%) - 8\%] = 17\%$$

For the defensive stock, the expexted rate of return is:

$$E(R_a) = R_f + \beta_d[E(R_m) - R_f] = 0 + 0.7 \times [(0.5 \times 5\% + 0.5 \times 20\%) - 0] = 8.75\%$$

c.

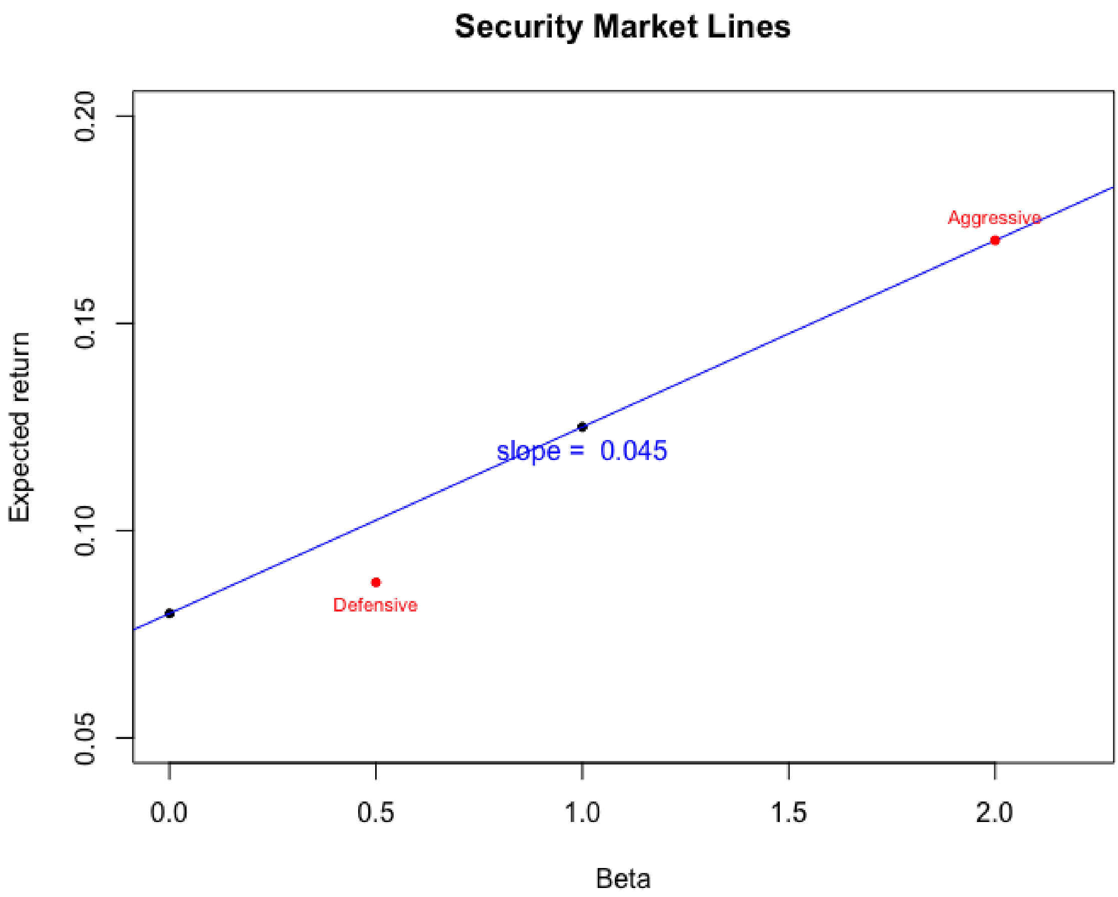
d. If the T-bill rate is 8%, then we have: $R_f = 8\%$.
The alpha of the aggressive stock is:

$$\alpha_a = E(R_a) - (R_f + (E(R_M) - r_f) \times \beta_a) = 0$$

The alpha of the defensive stock is:

$$\alpha_d = E(R_d) - (R_f + (E(R_M) - r_f) \times \beta_d) = -2.4\%$$

The SML for the economy and the two securities is shown below:



Problem 3

a. The estmates of the betas and standard deviation of these estimates:

$$\sigma_{MSFT} = 0.017$$

$$\beta_{MSFT} = 1.142$$

$$\sigma_{INTC} = 0.020$$

$$\beta_{INTC} = 1.332$$

$$\sigma_{LUV} = 0.021$$

$$\beta_{LUV} = 1.007$$

$$\sigma_{MCD} = 0.014$$

$$\beta_{MCD} = 0.624$$

$$\sigma_{JNJ} = 0.013$$

$$\beta_{JNJ} = 0.598$$

b. The estmates of alphas and standard deviation of these estimates:

$$\sigma_{MSFT} = 0.0002$$

$$\alpha_{MSFT} = 0.0005$$

$$\sigma_{INTC} = 0.0002$$

$$\alpha_{INTC} = 0.0003$$

$$\sigma_{LUV} = 0.0002$$

$$\alpha_{LUV} = 0.0004$$

$$\sigma_{MCD} = 0.0002$$

$$\alpha_{MCD} = 0.0003$$

$$\sigma_{JNJ} = 0.0001$$

$$\alpha_{JNJ} = 0.0004$$

The estimates of the standard deviation of idiosyncratic risk:

$$\text{idio}_{MSFT} = 0.016$$

$$\text{idio}_{INTC} = 0.019$$

$$\text{idio}_{LUV} = 0.020$$

$$\text{idio}_{MCD} = 0.013$$

$$\text{idio}_{JNJ} = 0.011$$

c. The highest expected return under CAPM:

$$E(R_{INTC}) = 0.00056$$

The lowest expected return under CAPM:

$$E(R_{JNJ}) = 0.00031$$

The highest expected return under sample:

$$E(R_{MSFT}) = 0.00097$$

The lowest expected return under sample:

$$E(R_{MCD}) = 0.00062$$

Since the highest and lowest expected return calculated from sample and from CAPM are different, the CAPM predictions are not supported by the data.