Homework # 4

1. Assume asset j's $\beta_j = 0.75$ and that $\mu_f = 3\%$ and $\mu_M = 10\%$.

   (a) Assume that the CAPM theory holds, what is μ_j, the average return of asset j equal to?

   (b) If actually $\mu_j = 9\%$, is asset j overpriced, underpriced or correctly priced?

2. Do problems 3 and 6 on page 513 (Chapter 17)

3. Consider portfolios of three assets with means given by vector

$$\mu = \begin{pmatrix} 0.06 \\ 0.08 \\ 0.12 \end{pmatrix}$$

   and covariance given by

$$\Omega = \begin{pmatrix} 0.03 & -0.01 & 0.00 \\ -0.01 & 0.04 & 0.01 \\ 0.00 & 0.01 & 0.06 \end{pmatrix}$$

   (a) Find the mean and the variance of the minimum variance portfolio

   (b) Suppose we want to achieve an expected return of 10% by investing in these assets. How do we achieve this efficiently? find the risk of this portfolio.

   (c) Suppose $\mu_f = 4\%$, give the weights of the tangency portfolio.

   (d) Suppose we desire to achieve an expected return of 10%. by investing in the risk free and the risky assets, what is the risk of the efficient portfolio in this case?

4. The Security Market line (SML) of an asset relates the excess return of an asset to the excess return of the market portfolio. It says that the risk premium of a security j is proportional to the risk premium on the market portfolio, that is

$$\mu_j - \mu_f = \beta_j(\mu_M - \mu_f)$$

(We will derive this equation next week in class). Here μ_j and μ_f are the returns of securty j and risk-free asset, respectively, and μ_M is the return on the market portfolio. β_j is the jth security's "beta" value. Investors usually want an estimate of a stock's beta before purchasing it. The econometric model is obtained by including an intercept in the model (even though theory says it should be zero) and an error term and is given

$$R_{j,t} - R_{f,t} = \alpha + \beta_j(R_{m,t} - R_{f,t}) + \epsilon_{j,t}.$$

The data (CAPM, posted on courseworks under assignments) is the data on the monthly returns of four firms (Microsoft, GE, GM, IBM), the rate of return on the market portfolio (MKT) and the rate of return of risk free asset (RKFREE). The 120 observations cover January 1995 to December 2004. The columns in the data set are given in the following order Microsoft, GE, GM, IBM, MARKET PORTFOLIO, RISK FREE RATE (30 day T-Bill). Use this data to answer the following questions.

(a) Estimate the CAPM model for each firm and comment on their estimated beta values.

(b) Finance theory says that the intercept parameter α should be zero. Does this seem correct given your estimates (you need to test $H_0 : \alpha = 0$ against $H_a : \alpha \neq 0$ for each firm at 0.05 significance level.

(c) Construct a 95% for each β_j using the model and interpret your results

(d) Test at the 5% level of significance the hypothesis that each stock's β is 1 against the alternative that it is not equal to 1.

(e) Test at the 5% level of significance the hypothesis that the beta of Microsoft is 1 against the alternative that it is greater than 1.