Exercise 1:
Access the data in R as follows:

```r
> a <- read.table("http://www.stat.ucla.edu/~nchristo/datac183c283/statc183c283_10stocks.txt", header=TRUE)
```

These are closing monthly prices for 10 stocks (the first 5 are the same as in homework 2) from January 1986 to December 2003. The last column represents the returns on S&P500 for the same period (31-Jan-1986 to 31-Dec-2003). After you convert all the prices into returns (but not the last column - these are already returns), use the single index model to:

a. Estimate $\beta$, $\alpha$, and residual risk ($\sigma_e$) for each stock.

b. Estimate the mean, and variance for each stock. Do the same for the returns of the market (find the mean and variance of S&P500).

c. Use the Vasicek’s technique to adjust the betas. In other words, what betas would you use for the period 2004-09?

Exercise 2:
Single index model: Use these data (10 stocks) and $R_f = 0.001$:

a. Find the cut-off point $C^*$ when short sales are allowed and when short sales are not allowed.

b. Assume short sales are not allowed: Find the composition of the optimum portfolio.

c. Assume short sales are allowed: Find the composition of the optimum portfolio.

Note: You should submit the table that shows all the necessary steps.

Exercise 3:
Constant correlation model: Use these data (10 stocks) and $R_f = 0.001$:

a. Find the cut-off point $C^*$ when short sales are allowed and when short sales are not allowed. You will have to compute the average correlation coefficient first by using all the $\binom{10}{2} = 45$ pairs. So find the correlation matrix first.

b. Assume no short sales are allowed: Find the composition of the optimum portfolio.

c. Assume short sales are allowed: Find the composition of the optimum portfolio.

Note: You should submit the table that shows all the necessary steps.