Exercise 1:
Suppose 2 securities have the following mean and variances of their returns: \( \bar{R}_1 = 12\% \), \( \sigma_1^2 = 8\% \), \( \bar{R}_2 = 6\% \), \( \sigma_2^2 = 2\% \). Assume that short sales are not allowed:

a. For these 2 securities find the composition, standard deviation, and expected return of that portfolio that has minimum risk.

b. Plot the expected return and standard deviation for all possible combinations of securities 1 and 2. You can use a spreadsheet software to do this (e.g. Microsoft Excel). Change \( X_1 \) from 0 to 1 by 0.05, (and therefore \( X_2 \) from 1 to 0 by 0.05).

c. Assuming that investors prefer more to less and that they are risk averse. Indicate in the previous plot the efficient frontier.

Exercise 2:
Consider the following with short sales not allowed:

<table>
<thead>
<tr>
<th>Security</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Security 1</td>
<td>10%</td>
<td>5%</td>
</tr>
<tr>
<td>Security 2</td>
<td>4%</td>
<td>2%</td>
</tr>
</tbody>
</table>

a. For these 2 securities find the portfolio possibilities curve, and identify the efficient frontier. Use different values of \( X_1 \) and \( X_2 \), with \( X_1 + X_2 = 1 \). You can use a spreadsheet software as in Exercise 1b.

b. Assume \( \rho = 1, -1, 0 \). For each correlation coefficient what is the combination that yields the minimum \( \sigma_p \) and what is that \( \sigma_p \).

Exercise 3:
For the previous problem assume a riskless rate of 10%. What is the optimal investment. Show this in the plot \( \bar{R}_p \) against \( \sigma_p \).

Exercise 4:
Retrieve the following data using Stata or Microsoft Excel as follows:
With Stata, at the command window type: use http://www.stat.ucla.edu/~nchristo/statc183c283_5stocks.dta.
To use Excel you can download the data using: http://www.stat.ucla.edu/~nchristo/statc183c283_5stocks.xls.
These are closing monthly prices from January 1986 to December 2003. The first column is the date and the last column is the S&P500 monthly return for the same period. Also, \( P_1, P_2, P_3, P_4, P_5 \) represent the closing monthly prices for the stocks Exxon-Mobil, General Motors, Hewlett Packard, McDonalds, and Boeing respectively. Assume short sales are not allowed to answer the following questions:

a. Convert the prices into returns for all the 5 stocks. Please do not print these numbers!

b. Compute the mean return for each stock and the variance-covariance matrix.

c. Use only Exxon-Mobil and Boeing stocks: For these 2 stocks find the composition, expected return, and standard deviation of that portfolio that minimizes the risk.

d. Plot the portfolio possibilities curve and identify the efficient frontier.

e. Use only Exxon-Mobil, McDonalds and Boeing stocks: For these 3 stocks try to find the portfolio possibilities curve. For different combinations of \( X_1, X_2, X_3 \), with \( X_1 + X_2 + X_3 = 1 \) compute several pairs of \( \bar{R}_p, \sigma_p \). Approximately what is the expected return (\( \bar{R}_p \)) and standard deviation (\( \sigma_p \)) of the minimum risk portfolio?