Exercise Set 2 - Mean-Variance Analysis*

Corporate Finance and Incentives - Fall 2010

Problem 1

A portfolio consists of the following three stocks, whose performance depends on the economic environment.

Table 1: The Subsidiaries of ABCO

	Investments in $	Good	Bad
Stock 1	500	13%	-20%
Stock 2	1250	6%	3%
Stock 3	250	-7%	2%

a) Assuming that the good economic environment is twice as likely to take place as the bad environment, compute the expected return and variance of each asset.

b) Calculate the variance-covariance of each combination asset, and list the matrix.

c) Now compute the expected return and variance of the portfolio.

d) Now 1000$ worth of a stock 4 with an expected return of 4%, a variance of 0.0002 and no correlation with the original portfolio is included. What will happen to the expected return and variance with this new stock in the portfolio?

Problem 2

In July 1995, First Quadrant, a fund management firm in Pasadena, California, estimated the variance-covariance matrix of the returns between four different portfolios: U.S. stocks (asset 1), Japanese stocks (asset 2), U.K. stocks (asset 3) and Canadian stocks (asset 4).

a) Calculate the correlation matrix using table 2.

b) Calculate the variance of a portfolio with weights: $w_1 = \frac{1}{6}, w_2 = \frac{1}{3}, w_3 = \frac{1}{4}$ and $w_4 = \frac{1}{4}$

*Compiled by Jacob Lundbeck Serup and Ian Rusu; September 2006. Last edited by Benjamin Falkeborg and Carsten S. Nielsen; September 2010.

Table 2: The Variance-covariance Matrix

	Asset 1	Asset 2	Asset 3	Asset 4
Asset 1	0.0220	0.0093	0.0191	0.0181
Asset 2	0.0093	0.0517	0.0120	0.0096
Asset 3	0.0191	0.0120	0.0342	0.0204
Asset 4	0.0181	0.0096	0.0204	0.0290

Problem 3

Consider a portfolio of N assets where each of these assets have a standard deviation of σ and a correlation coefficient of ρ with all other assets. Assume that the portfolio is equally weighted and solve the following problems.

a) Find the variance of the portfolio.

b) Show what happens, when $N \to \infty$.