MATH 497 - Additional Questions for Homework on Section 3.3.

Suppose that S_1, S_2, and S_3 are risky securities with the following information

Security	Expected Return (μ_j)	Risk (σ_j)
S_1	0.05	0.03
S_2	0.10	0.12
S_3	0.08	0.06

Security Pair	Correlation Coeff.(ρ_{ij})
$S_1 - S_2$	-0.2
$S_1 - S_3$	0.5
$S_2 - S_3$	0.2

A. Calculate the expected return and risk for the following portfolios

(i) the portfolio consisting of of 70% of S_1 and 30% of S_2 by weight

(ii) the portfolio evenly divided between S_1, S_2, and S_3 by weight

(iii) the portfolio with weightings 150% security S_1, 50% security S_2 and -100% security S_3

B. Calculate the weights of the minimum variance portfolio for this set of securities. Calculate the expected return and risk of the minimum variance portfolio. [Note: You may wish to use Mathematica to calculate the various matrix inverses.]

C. Calculate the weights and risk of the portfolio on the minimum variance line that have expected return

(i) $\mu = 0.02$

(ii) $\mu = 0.04$

(iii) $\mu = 0.06$

(iv) $\mu = 0.08$

(v) $\mu = 0.10$

D. Suppose that one has access to a risk-free return of 2%.

(i) Calculate the Sharpe ratio of each security S_1, S_2, and S_3.

(ii) Calculate the Sharpe ratio of each portfolio in problem A.

(iii) Calculate the weights of the market portfolio for this set of securities. Calculate the expected return and risk of the market portfolio. [Note: You may wish to use Mathematica to calculate the various matrix inverses.]

E. Plot the risk-return profile (on a $\sigma\mu$ plane) of each of the securities S_1, S_2, and S_3, the portfolios in problem B and C, and the market portfolio. Sketch the graph of the minimum variance line.