

EE431/438 Economics of Financial Markets and Institutions

Semester 1/2013 Mean Variance Analysis

Problem Set 4 and Solution Guidance (Self Study)

There is no need to submit. No mark will be given for this problem set.

1. Let the expected rate of return on the market portfolio M be equal to 0.10. The standard deviation of the market portfolio M is equal to 0.20. The risk-free interest rate is equal to 0.02. Find the equation for the CML.

$$\left[E(R_p) = R_f + \left(\frac{E(R_m) - R_f}{\sigma_m} \right) \sigma_p = 0.02 + \left(\frac{0.10 - 0.02}{0.20} \right) \sigma_p = 0.02 + 0.4\sigma_p. \right]$$

2. Assume there are just two risky securities in the market portfolio. Security A, which constitutes 40% of this portfolio, has an expected return of 10% and a standard deviation of 20%. Security B has an expected return of 15% and a standard deviation of 28%. If the correlation between the assets is 0.3 and the risk free rate 5%, calculate the capital market line.

$$\left[E(R_m) = 13\%, \sigma_m = 20.661\%, E(R_p) = 0.05 + \frac{0.08}{0.20661} \sigma_p \right]$$

3. Consider the following stocks.

Stock	Expected Return	Standard Deviation
A	5%	10%
B	7%	11%
C	6%	12%
D	6%	10%

Which stock would you prefer between the following pairs.

- (a) A and D? [D]
- (b) B and C? [B]
- (c) C and D? [D]

4. The covariance of the returns on the two securities, A and B, is - 0.0005. The standard deviation of A's returns is 4% and the standard deviation of B's returns is 6%. What is the correlation coefficient between the returns of A and B?

[-0.2083]

5. Consider securities D and E with the following estimates:

$$E(R_D) = 8\%, \quad \sigma_D = 12\%, \quad E(R_E) = 13\%, \quad \sigma_E = 20\%.$$

Now consider the portfolios that can be formed with D and E, assuming that the investment is equal between D and E (that is, each has a weight of 50%). What is the portfolio's standard deviation if the correlation between D and E for each of the following?

- (a) $r_{DE} = 1.0$. [$\sigma_p = 0.16$]
- (b) $r_{DE} = 0.3$. [$\sigma_p = 0.131149$]
- (c) $r_{DE} = 0.0$. [$\sigma_p = 0.116619$]

(d) $r_{DE} = -1.0$. $[\sigma_p = 0.04]$

6. Consider securities X and Y with the following estimates:

$$E(R_X) = 5\%, \quad \sigma_X = 10\%, \quad E(R_Y) = 15\%, \quad \sigma_Y = 25\%.$$

If the portfolio is comprised of 40% X and 60% Y and if the correlation coefficient between the returns on X and Y is -0.25, what is the portfolio's expected return and risk?

$$[ER_p = 11\%, \sigma_p = 14.5268\%]$$

7. For each of the following probability distribution, calculate the expected value and standard deviation:

(a)

Outcome	Probability	Outcome Value
Good	30%	\$40
Normal	50%	\$20
Bad	20%	\$10

$$[E(X) = \$24, \sigma_X^2 = 124, \sigma_X = \$11]$$

(b)

Outcome	Probability	Outcome Value
Pessimistic	10%	\$1,000,000
Moderate	40%	\$4,000,000
Optimistic	50%	\$6,000,000

$$[E(X) = \$4,700,000, \sigma_X^2 = 2,410,000,000, \sigma_X = \$1,552,417]$$

(c)

Outcome	Probability	Outcome Value
One	10%	60%
Two	50%	40%
Three	30%	20%
Four	10%	-40%

$$[E(X) = 28\%, \sigma_X^2 = 656, \sigma_X = 25.61\%]$$