

Asset Pricing

Homework 3

Due at 24:00 pm (KST) on Thursday

Submit one file: written solutions with executable Python code in Jupyter Notebook(.ipynb)

**Subject**

**[Session3. Optimal Portfolio with Risk-free and Risky Assets]**

**1. Investment Science**

**Chapter 6. Mean-variance Portfolio Theory**

**2. Introduction to Portfolio Construction and Analysis with Python**

**Week 2. An Introduction to Portfolio Optimization**

**Week 3. Beyond Diversification**

**Assignment 1.**

Summarize this week's study

**Assignment 2.**

Make a problem about the above subjects

**Assignment 3.**

Solve the following problems

**Problem 1.**

With the Coursera lecture: Introduction to Portfolio Construction and Analysis with Python, please replicate the code in the lab session of Week 2, An Introduction to Portfolio Optimization, and Week3, Beyond the Diversification

**Problem 2.**

There are two risky assets, such that

expected returns of A and B:

standard deviations of A and B:

Thus, we can construct the portfolio ( are the weights of risky assets) with these two risky assets.

Using the Lagrange Multiplier Method, find the analytical solution of the efficient frontier

**Hint:**

When the target expected return is given as

Constraints: 1. , 2.

Step1. Lagrange Function under the given rate

Step2. Find the Optimal weights written by lambda after Partial Differentiation

Step3. Apply Optimal weight obtained in the Step2 to constraint formula, and then find the analytical solution of

Step4. Derive minimum standard deviation of portfolio in given expected return by using the optimal weight

**Problem3.**

Jin’s friend is planning to invest $1 million in a rock concert to be held 1 year from now. The friend figures that he will obtain $3 million revenue from his $1 million investment-unless, my goodness, it rains. If it rains, he will lose his entire investment. There is a 50% chance that it will rain the day of the concert. Gain suggests that he buy rain insurance. He can buy one unit of insurance for $0.5. and this unit pays $1 if it rains and nothing if it does not. He may purchase as many as he wishes, up to $3 million.

a) What is the expected rate of return on his investment if he buys units of insurance? (The cost of insurance is in addition ot his million investment.)

b) What number of units will minimize the variance of his return? What is this minimum value? And what is the corresponding expected rate of return?

Hint: Before calculating a general expression for variance, think about a simple answer.