Class 4
Mean-variance analysis and CAPM

Reading: GT: Chapter 5.

Question 1

Percival Hygiene has $10 million invested in long-term corporate bonds. This bond portfolio's expected annual rate of return is 9 percent, and the annual standard deviation is 10 percent. Amanda Reckonwith, Percival's financial adviser recommends that Persival consider investing in an index fund which closely tracks the Standard and Poor's 500 index. The index has an expected return of 14 percent, and its standard deviation is 16 percent.

a. Suppose Percival puts all his money in a combination of the index fund and Treasury bills. Can he thereby improve his expected rate of return without changing the risk of his portfolio? The Treasury bill yield is 6 percent.
b. Could Percival do even better by investing equal amounts in the corporate bond portfolio and the index fund? The correlation between the bond portfolio and the index fund is +.1.

Question 2

Two stocks are traded in the market: AT&T and Microsoft. The expected returns are 10 percent and 21 percent, respectively. The standard deviations of returns are 15 percent and 25 percent, respectively.

a. Find the minimum-variance portfolio, assuming, in turn, the correlation coefficient of 1, 0.5, 0, -1. What are its expected return and the return standard deviation? What happens to the weights of the stocks if the correlation falls? Why?
b. Assume that the risk-free rate is 4 percent. Find the tangency portfolio for the cases when the correlation between the stock returns is 1 and 0. What are its expected return and return standard deviation?
c. Write down the equation of the Capital Market Line (CML) (for the case of zero correlation of stock returns).
d. Draw the Security Market Line (SML). What is its equation?
e. What is the expected return of a stock with a beta of -0.2?

Question 3

The Treasury bill rate is 4 percent, and the expected return on the market portfolio is 12 percent. Using the capital asset pricing model:

a. Draw a security market line.
b. What is the risk premium on the market?
c. What is the required return on an investment with a beta of 1.5?
d. If an investment with a beta of .8 offers an expected return of 9.8 percent, does it have a positive NPV?
e. If the market expects a return of 11.2 percent from stock X, what is its beta?
f. Find the fair value of a stock with a beta of 1.2. The stock owners have just received a dividend of $5, and the dividend is expected to grow at the rate of 3 percent per annum in the future. Shall you buy this stock if its current market price is $52? What will be your expected return if you buy the stock at this price? Plot the stock on the SML graph.