

HOMEWORK 6. Due Monday March 29.

1. (20% of last year's midterm 2) Consider the CAPM-model.

a) Let X be an asset whose payout PO_X is 200 with probability 0.6 and 0 with probability 0.4. Assume that PO_X has a covariance with the market return (measured in percent) of 10 and that the variance of the market return is 20 (measured in percent). The expected rate of return of the market is 4 percent. Assume that the safe rate of interest is 2 percent.

a) What is the expected return (ER_X) to an investment in X ?

b) What is the price of asset X in the initial period?

Now assume that Y is an asset whose payout PO_Y is 400 with probability 0.6 and 0 with probability 0.4. Assume that PO_X has a covariance with the market return (measured in percent) of 20.

c) What is the expected return (ER_Y). (Hint: you can provide the answer easily, if you consider the relation between the payout to X and the payout to Y .)

2. (7% of second core exam 2003.) Asset A and asset B exist for one period and their returns have identical covariances with the market return. The rate return of asset B has a variance that is twice as large as the variance of the rate of return of asset A. Which asset will—if the CAPM holds—have the highest expected rate of return?

3. Assume that the mean return on the market portfolio (ER_M) is 10% and that a safe asset exists with a return of 6%. Assume that the standard CAPM is true.

a) Let X is an asset whose payout is determined by you flipping a coin and paying 1\$ if head and nothing if tail. What is the return (R_X) to an investment in X ?

b) Now let the return (R_i) to an asset be $R_i = .5 R_M + .5 R_X$. What is the expected value $E(R_i)$.

c) If the asset X now paid out 100\$, rather than just 1\$, in the case of heads, and still nothing in the case of tails. What would now be the answer to a)?

4. Assume that IBM stock has a mean return of 3% and a variance of 4, and that GM stock has a mean return of 8% and a variance of 9. Also assume that the covariance between IBM and GM stock is 1. Calculate the mean and standard deviation for portfolios that consist of IBM and GM stocks: do this for 0, 25%, 50%, 75%, and 100% invested in IBM. Sketch (by hand) the efficient frontier when these are the only assets available.

5. (25% of midterm 2, 2008) Consider the CAPM. Assume that there are two states of the economy next year, "A" and "B"; state A happens with probability 0.2 and state B with probability 0.8. Assume the return to the market portfolio is 10% in both states. Now consider assets 1 and 2.

For these we know the pay-outs. For asset 1 the payout is 20 in state A and 120 in state B, while for asset 2 the payout is 200 in state A and 5 in state B. Use the CAPM as it was derived in the handout. The safe rate of return is 1%. (Note: it is not really feasible for the market return to have zero variance and a higher rate of return than the safe asset—we make this assumption for simplicity.)

a) What would be the rate of returns of assets 1 and 2?

Now assume that in state A the return to the market portfolio is 10% and in state B the return to the market portfolio is 0%.

b) Find the rate of returns to asset 1 and asset 2 under this assumption.

c) Explain in words why one of the assets (which one) is worth relatively more in this situation compared to the situation where the market return has zero variance.