UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Postponed exam: **ECON4510 – Finance Theory**

Date of exam: Monday, June 8, 2015

Time for exam: 09:00 a.m. – 12:00 noon

The problem set covers 4 pages

Resources allowed:

- No resources allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences)

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

The exam consists of three problems. They count equally. Start by reading through the whole exam, and make sure that you allocate time to answering questions you find easy. You can get a good grade even if there are parts of problems that you do not have time to solve.

Problem 1

Consider an economy where the Capital Asset Pricing Model holds. In presentations of the model there are two lines (or rays or line segments) known as the Capital Market Line (CML) and the Security Market Line (SML).

(a)

Draw the Capital Market Line in a suitable diagram. Explain which variable is on the horizontal axis and which variable is on the vertical axis. Explain how far the CML extends in both directions. Explain what kind of objects are found on the CML, and in particular, what kind of objects are found far to the right and what kind are found far to the left along the line. Explain what kind of objects are located above the line, if any, and what are located below the line, if any.

(b)

Draw the Security Market Line in a suitable diagram. Explain which variable is on the horizontal axis and which variable is on the vertical axis. Explain how far the SML extends in both directions. Explain what kind of objects are found on the SML, and in particular, what kind of objects are found far to the right and what kind are found far to the left along the line. Explain what kind of objects are located above the line, if any, and what are located below the line, if any.

(c)

What kind of objects belong both on the CML and the SML?

Problem 2

Consider a call option on a stock, with expiration date at time T and exercise price K, when today is time zero, and today's stock price is S_0. Assume that there is a constant nominal risk free interest rate, which is strictly positive.

Consider two suggestions for a lower bound on the call option value, either $S_0 - K$ or $S_0 - Ke^{-rT}$. Use absence-of-arbitrage arguments to answer (a) and (b):

(a)

For an American call option on a stock which does not pay dividends, what is the relevant lower bound on the option value today, C_0?

(b)

For an American call option on a stock which may or may not pay dividends, what is the relevant lower bound on the option value today, C_0? If there is a difference from (a), explain why the same arguments cannot be used in both cases.

(c)

Discuss the following statement: "In case (a), a European call option will have the same value as a similar American call option, $c_0 = C_0$." If the statement is true, explain why. If the statement is not true, explain why.

(d)

Discuss the following statement: "In case (b), a European call option will have the same value as a similar American call option, $c_0 = C_0$." If the statement is true, explain why. If the statement is not true, explain why.

Problem 3

Consider an economy which exists for two periods, $t = 0$ and $t = 1$. At $t = 1$, there are two possible states of the world, $s = 1$ and $s = 2$, with probabilities π and $1 - \pi$, respectively, with $\pi \in (0, 1)$. At $t = 0$ there are markets for two types of securities: Risk free bonds with a rate of return of 20 percent, and one type of shares. The shares will be worthless in state 2, but will have a rate of return of 60 percent if state 1 is realized at $t = 1$.

Consider a person with wealth W at $t = 0$, who wants to maximize expected utility of consumption at $t = 1$. You can assume that consumption at $t = 0$ is already taken care of, so that the whole of W will be spent to prepare for consumption at $t = 1$. The person can buy or sell (or sell short) the two types of securities, but may in addition invest in a risky real investment opportunity. An amount I of real investment at $t = 0$ will result in production $f(I)$ at $t = 1$ if state 2 is realized, but nothing in state 1. The function f is increasing and strictly concave.

(a)

Specify how consumption in each of the two future states will depend on the amounts invested in the three possible investment opportunities. Formulate the person's maximization problem, and derive first-order conditions.

(b)

Discuss the following statement: "The optimal real investment for this person is independent of the person's preferences and the size of W. When the investment function is defined as $f(I) = 48\sqrt{I}$, the optimal real investment is $I = 25$." Explain what additional assumptions you rely on in your discussion.