

UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Term paper in: **ECON4515 – Finance theory 1: Portfolio choice and equilibrium models**

Handed out: Friday, October 8, 2004

To be delivered by: Wednesday, October 20, 2004, at 15:00 hrs.

Place of delivery: Department office, 12th floor.

Further instructions:

- This term paper is **compulsory**.
- You must use a printed front page, which will be found at http://www.oekonomi.uio.no/info/EMNER/Forside_obl_eng.doc
- It is of importance that the term paper is delivered by the deadline (see above). Term papers delivered after the deadline, **will not be corrected**.*)
- All term papers must be delivered to the place given above. You must not deliver your term paper to the course teacher or send it by e-mail. If you want to hand in your term paper **before** the deadline, please contact the department office on 12th floor.
- If the term paper is not accepted, you will be given a new attempt. If you still not succeed, you will not be permitted to take the exam in this course. You will then be withdrawn from the exam, so that this will not be an attempt.

*) If a student believes that she or he has a good cause not to meet the deadline (e.g. illness) she or he should discuss the matter with the course teacher and seek a formal extension. Normally extension will only be granted when there is a good reason backed by supporting evidence (e.g. medical certificate).

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Problem (1)

(a) Consider the following situation. The assumptions underlying the standard one-period CAPM are satisfied, with one exception: One agent has been denied the possibility to borrow at the risk-free interest rate (also known as short-selling the risk-free asset).

Discuss what the opportunity set of the agent looks like in this case. Show this in a suitable diagram. Then discuss whether it is possible, based on the given assumptions, to narrow down in what part of the opportunity set the agent will choose his/her investment.

(b) Consider the following situation. The assumptions underlying the standard one-period CAPM are satisfied, with one exception: One agent has been required (by someone) to invest at least some minimum fraction of his/her wealth in the risk free alternative. The rest may be invested in risky shares. The minimum fraction is a number $a \in (0, 1)$, so that at least a fraction a of this agent's wealth must be invested in the risk free alternative.

Discuss what the opportunity set of the agent looks like in this case. Show this in a suitable diagram. Then discuss whether it is possible, based on the given assumptions, to narrow down in what part of the opportunity set the agent will choose his/her investment. Discuss in particular whether the agent may benefit from composing risky assets differently from the market portfolio.

(c) Discuss what the role of mutual funds (*aksjefond* in Norwegian) is in the standard CAPM: What kind of portfolio(s) should they offer? Then discuss what the role of mutual funds will be in relation to groups of investors who are required to obey to the kind of restrictions described in parts (a) and (b).

Problem (2)

Consider a corporation (joint-stock, limited company) which is going to invest in a production process which only needs input in the form of investment now, and which produces only one period from now. The produced quantity Q can be sold at a unit price \tilde{P} . The company does not borrow. You may assume $\theta = 1$, cf. Lund (2002).

You are asked to characterize the marginal investment under three different tax systems. More specifically, you are asked to find formulae for two numbers which characterize the marginal investment for each tax system, $i = a, b, c$. The first number is γ_i , the before-tax ratio of the valuation of the revenue to the investment. The other number is β_i , the beta value (according to the CAPM).

(a) Consider first a cash flow tax at a rate t . The corporation will be refunded a fraction t of the invested amount in the same period as the investment. It must pay the same fraction of the gross revenue as a tax in the next period. What will γ_i and β_i be? Interpret the result.

(b) Consider next a tax on gross revenue, with a rate t . Whatever the investment is, none of it may be deducted, neither in the investment period nor in the production period. What will γ_i and β_i be? Interpret the result, and try to explain the difference from cases (a).

(c) Consider finally a particular kind of corporate income tax, with a rate t . This particular kind of tax will have an "allowance for corporate equity," which means that the investment of I will allow a deduction of $I(1 + r_f)$ in the next period. If the tax base becomes negative, the negative tax is refunded by the tax authorities. What will γ_i and β_i be? Interpret the result, and try to explain the differences from cases (a) and (b).