

Written Exam for the B.Sc. or M.Sc. in Economics winter 2015-16

Corporate Finance and Incentives

Final Exam/ Elective Course/ Master's Course

December 14, 2015

(3-hour closed book exam – access to Excel)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

This exam question consists of 3 pages in total

The exam consists of 4 problems. All problems must be solved. The approximate weight in the final grade of each problem is stated. A problem can consist of different sub-questions that do not necessarily have equal weight. Please provide intermediate calculations.

Problem 1 (CAPM 25%)

Assume that the stocks of four firms have the variance-covariance matrix A and expected return vector b shown below. Furthermore assume that the risk free interest rate is $r_f = 2\%$.

Stock	Firm 1	Firm 2	Firm 3	Firm 4	Expected return
Firm 1	0.007	0.009	0.011	0.006	11.6%
Firm 2	0.009	0.016	0.015	0.007	15.275%
Firm 3	0.011	0.015	0.022	0.006	13.775%
Firm 4	0.006	0.007	0.006	0.011	15.125%

- 1) Find the efficient (tangency) portfolio. [Solve $Az = b - r_f \mathbf{1}$ and normalize.]
- 2) Find the expected return and variance of the efficient (tangency) portfolio.
- 3) Find the Betas of the four firms' stocks with respect to the efficient portfolio. [The CAPM model says $r_i - r_f = \beta_i^{eff} (r_{eff} - r_f)$.]

Problem 2 (Tax Shield 25%)

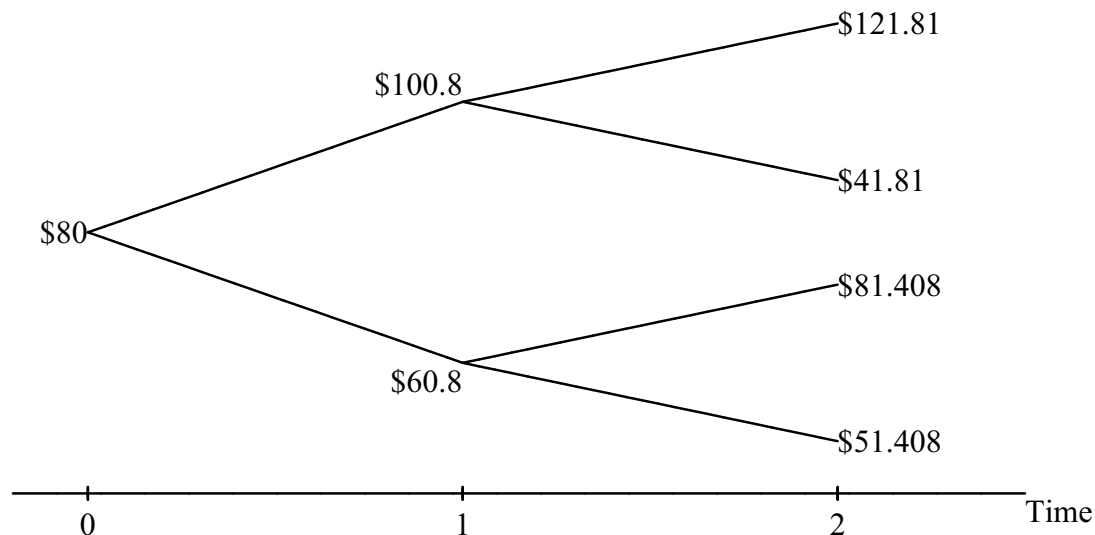
A firm's unlevered pre-tax value is 200 million Kroner, based on permanent income from its assets. The firm has safe, permanent debt, paying interest of 2 million Kroner every year.

Suppose the corporate tax rate is $\tau_C = 35\%$. The risk-free interest rate is $r_f = 2\%$.

- 1) Assume that investors pay no taxes on private income from equity and interest income. Calculate the value of the firm's debt D and equity E . Calculate also the present value of the interest tax shield, and the firm's levered value V^L .
- 2) Under the assumption from 1), who would benefit if the firm changes capital structure, issuing more permanent debt to buy back shares?
- 3) Assume instead that investors do pay taxes on this income: The tax rate on equity income is $\tau_e = 20\%$ and the tax rate on interest income is $\tau_d = 50\%$. Recompute your answers to 1 and 2 under this new assumption.

Problem 3 (Binomial Model 25%)

A non-dividend paying stock currently costs $S_0 = \$80$. In the next two periods it can either increase in price or decrease in price as shown below in the binary tree. The risk free rate is $r_f = 1\%$ per time period.



- 1) Compute the risk-neutral probabilities at each node.
- 2) Consider a European put option with strike price $K = \$70$, expiring at time 2. Compute the market value of the put option at all nodes in the tree.
- 3) Consider an American put option with the same strike price $K = \$70$, also expiring at time 2. Compute the market value of this put option at all nodes in the tree.

Problem 4 (Various Themes 25%)

- 1) Give a reason why there should be no risk premium on diversifiable risk.
- 2) What does a bond's duration tell us? How can it be computed?
- 3) Which are the assumptions of the Modigliani-Miller theorems, and what does the first Modigliani-Miller theorem claim?
- 4) Define the concept of financial distress costs, and suggest some actions a firm can take to reduce these costs.