

Written Exam at the Department of Economics winter 2017-18

Corporate Finance and Incentives

Final Exam

December 21, 2017

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language for which you registered during exam registration.

This exam question consists of 4 pages in total

NB: If you fall ill during an examination at Peter Bangsvej, you must contact an invigilator in order to be registered as having fallen ill. In this connection, you must complete a form. Then you submit a blank exam paper and leave the examination. When you arrive home, you must contact your GP and submit a medical report to the Faculty of Social Sciences no later than seven (7) days from the date of the exam.

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 (APT 25%)

Consider a financial market with three assets whose returns are given by

$$\begin{bmatrix} R_1 \\ R_2 \\ R_3 \end{bmatrix} = \begin{bmatrix} 0.149 \\ 0.173 \\ 0.073 \end{bmatrix} + \begin{bmatrix} 7 & 3 \\ 15 & -2 \\ -5 & 8 \end{bmatrix} \begin{bmatrix} F_1 \\ F_2 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{bmatrix},$$

where $\varepsilon_1, \varepsilon_2, \varepsilon_3$ have mean zero and are uncorrelated with each other as well as uncorrelated with F_1 and F_2 . Also, $E[F_1] = E[F_2] = 0$.

- 1) Construct a risk-free portfolio of these three assets, i.e., with zero exposure to the two systematic risk factors F_1 and F_2 .
- 2) Which value of a risk-free interest rate r_f is consistent with no-arbitrage asset pricing?
- 3) Construct the two pure factor portfolios.
- 4) Compute the expected return and risk premiums of these two portfolios.

Problem 2 (Debt and Taxes 25%)

A firm lives today and in a future “tomorrow.” Today, the firm invests 100. Tomorrow, it receives 140 in a good state, and 40 in a bad state (think of million Kroner). Risk-neutral pricing assigns probability 65% to the good state. The safe interest rate is 3%.

The firm is financed by equity and debt. Debt promises the amount $P > 40$ next year. In the bad state, creditors will actually receive 40. The endogenous present value of debt is denoted by D .

Investors pay no personal taxes. The corporate tax rate is $\tau_c = 30\%$. The tax authorities allow the firm to deduct the initial investment as well as interest $P - D$. In the bad state the firm will thus pay zero taxes.

Equity holders with limited liability can keep whatever value is left tomorrow after creditors and tax authorities have received their payments.

- 1) Explain that, in the good state, the firm’s tax payment cannot exceed 12.
- 2) Assume that $P < 128$. Explain that

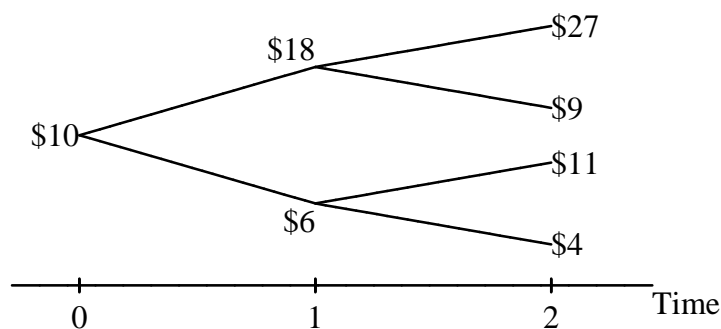
$$D = \frac{0.65P + 0.35(40)}{1.03}.$$

3) In the three cases $P = 50$, $P = 80$, and $P = 110$, compute D , the interest payment, the firm's tax bill in the good state, and the present value of equity.

4) In the three cases from before, compute the value of the firm. How does it change with the level of debt? Briefly explain this change.

Problem 3 (Option Pricing 25%)

A non-dividend paying stock currently costs $S_0 = \$10$. In the next two periods its market price S will evolve as shown in the tree below. The risk free rate is $r_f = 2.5\%$ per time period.



1) Compute the risk-neutral probabilities at each node.

2) Consider an American put option with strike price $K = \$10$, expiring at time 2. Compute the market value P of the put option at all nodes in the tree.

3) Consider an American put option with strike price $K = \$11$, expiring at time 2. Compute the market value P of this put option at all nodes in the tree.

4) Consider an American put option with strike price $K = \$12$, expiring at time 2. Compute the market value P of this put option at all nodes in the tree.

Problem 4 (Various Themes 25%)

1) Discuss the formula

$$E[R_i] = r_f + \beta_i (E[R_{mkt}] - r_f).$$

In particular, in this formula, what is the return premium for risk? What factors explain this return premium?

2) Discuss the following from the perspective of corporate governance and agency issues in corporate finance. In August 2017, Dara Khosrowshahi accepted a new position as CEO

at Uber. The Economist magazine has reported on one of his first achievements, in early October: “A crucial board meeting ended in a promising truce. It not only limits the power of Travis Kalanick, the firm’s co-founder and former chief executive, but creates the conditions for a \$10bn investment by a consortium led by SoftBank, a Japanese tech firm run by Masayoshi Son. One of Mr Son’s main conditions was that power be shifted to more recent investors. Early Uber backers, including Mr Kalanick, will have to give up their ‘super-voting’ rights. Mr Khosrowshahi’s concession was that Mr Kalanick now has at least a theoretical chance to become chief executive again (rules proposed earlier would have made that all but impossible). Benchmark, a venture-capital firm and an early investor in Uber, agreed to drop a lawsuit against Mr Kalanick.”

3) Consider a firm financed by debt and equity. Investors expect return r_D on debt and r_E on equity. Define the firm’s weighted average cost of capital, WACC, and discuss why this may be a good guide for the required return on investments undertaken by the firm.