Written Exam for the B.Sc. or M.Sc. in Economics, Winter 2010/2011

Corporate Finance and Incentives

Final Exam/ Elective Course/ Master's Course

17. December 2010

(3-hour closed book exam)

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.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students' self-service system.

Problem 1.

1. Consider an exactly 3-year bullet bond with an annual 4% coupon with a yield-to-maturity of 4.37%. Find the price of the bond.

2. In the market, the current 1-year rate is $r_1 = 0.04$ and 2-year rate is $r_2 = 0.06$. Find the 1-year forward rate in 1 year and explain the method used.

3. Consider a financial market with three assets, that have the co-variance matrix below. Find the minimum variance portfolio weights and explain the method used to derive it.

$$\Omega = \begin{pmatrix} 0.01 & 0.003 & 0.002 \\ -0.001 & 0.005 & 0.003 \\ 0.002 & -0.001 & 0.008 \end{pmatrix}$$

4. Assume the return on respectively the minimum-variance and tangency portfolio is given by $r_{min} = 0.04$ and $r_T = 0.08$. The respective variance of the two portfolios is given by $\sigma_{min} = 0.05$ and $\sigma_T = 0.2$. Explain how you can use this to draw the mean-variance frontier and draw it.

5. The CAPM model is given by $r_i = r_f + \beta(r_M - r_f)$, where $\beta = \frac{CoVar(r_i, r_M)}{\sigma_i}$. Explain why it intuitively makes sense, that a high-beta portfolio will have a higher return than the market portfolio.

6. Define the five Greeks (delta, gamma, vega, rho and theta) in option pricing.

7. Define the pay-off functions for respectively a call and put option with strike K and stock price S. Furthermore argue that a 1-unit short position in a put option and and a 1-unit long position in a call option replicates the stock price.

8. Explain the Modigliani-Miller theorem about capital structure.

Problem 2. Each of the 4 questions has a weight of 6.25%.

Imagine that we have a company, where all future revenues are independent of the chosen capital structure, assume that corporate debt is risk free and finally assume, that we initially have no taxes. The company considers making an investment in a project with the following expected costs and income:

Year	1	2	3	4	5
Costs	200	100	100	50	50
Income	0	100	150	150	175

1. The company uses a 2-factor APT model, $r_e = r_f + \beta_1(r_M - r_f) + V$, to estimate the riskiness of projects. β_1 is the standard CAPM β, whereas the second term, V, is an qualitative adjustment made by the company's management. The risk-free rate is 5% and the market return is 15 %. The β_1 is estimated to be 0.5 for this project. Find the Net Present Value of the project using their cost of capital model for $V = 0$ and $V = 2\%$.

2. The company management agrees that for this project $V = 2\%$. It also believes that it should leverage this project and finance half of it by issuing debt at an interest rate of 7%. It will raise debt according in proportion to the costs, i.e. in period 1 it will issue debt for 100, in respectively period 2 and 3 it will raise 50 and finally it will raise 25 in each period 4 and 5.

Find the expected profit of the project.

3. Assume taxes are introduced and debt payments could be deducted in tax payments. Can the Weighted Average Cost of Capital method be used. Justify our answer.

4. Suddenly a second investor steps in. The new investor promises to pay 50% of the expected income if the company will pay 52.5% of the expected costs. Any surplus or losses will be absorbed by the second investor. Does this proposition add value for the company.

Problem 3.

Consider a stock that evolves according to the diagram shown below, i.e over two years. The risk free asset pays an interest of 4%.
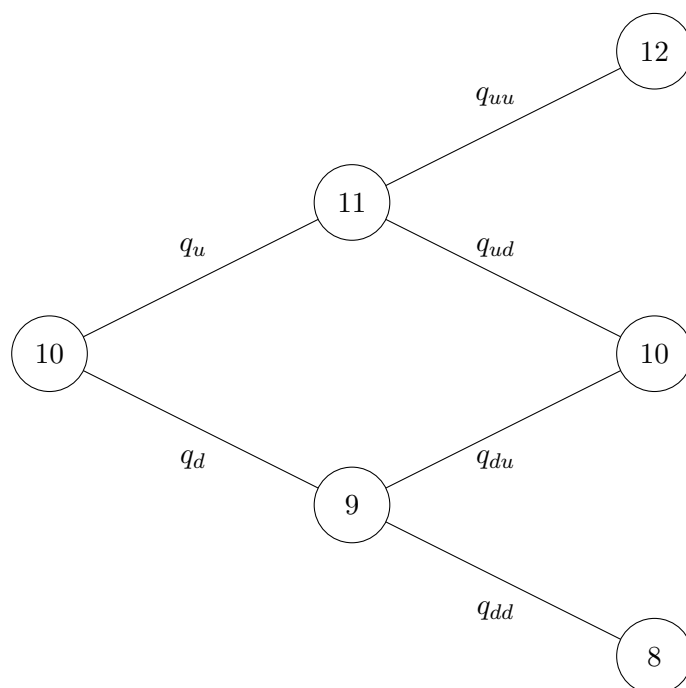
1. Construct a portfolio of call and put options, that returns exactly one dollar in the first and the second year. Construct the portfolio such that you use 1-year options, i.e. a portfolio of options that run from year 0 to 1 and another portfolio that runs from year 1 to 2.

2. The option strategy employed in the first question is a so-called straddle. What is the price of such a portfolio in the first and second year.

3. Price a call and put option with strike 10.

4. Explain the intuition behind the put-call parity.[1] Does it apply in this situation - justify why or why not.

---

[1]The put-call parity is given by $c_o + PV(K) = p_0 + S_0$, where c_0 and p_0 is respectively the price of a call and a put option and S_0 is the share price.