Written Exam for the B.Sc. or M.Sc. in Economics – Summer School 2013

Corporate Finance and Incentives

Final Exam/ Elective Course/ Master's Course

31st July 2013

(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.

The exam consists of 5 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. Please give intuitive explanations and comment on your results. Good luck ☺

Problem 1 (Various themes, 15%)

1) How is the tangent portfolio found and why must this be the market portfolio?
2) "Because all stocks are located on the Capital Market Line (CML) in CAPM they all have the same Sharpe ratio". Is this true or false? Explain.
3) What is the value of the real option to wait one round to make the decision whether to invest or not, if the world can take two states one time period later?
   - Initial investment €100 million
   - Perpetual cash flow in good state: €40 million
   - Perpetual cash flow in bad state: €0
   - Probability of good state: 90%
   - Discount rate: 20%
   - Risk neutral investor

Problem 2 (Multi factor models and APT, 20%)

Assume that the following two-factor model can describe the return of the three stocks a, b and c:

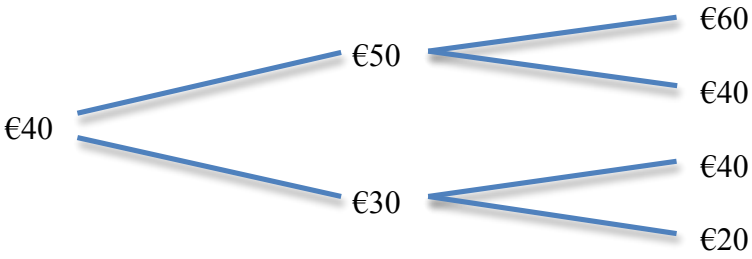
$$r_a = .10 + F_1 + F_2 + \varepsilon_a$$
$$r_b = .11 + 2F_1 + F_2 + \varepsilon_b$$
$$r_c = .12 + F_1 + 2F_2 + \varepsilon_c$$

With all the usual assumptions.

1) Find the pure factor portfolios.
2) If the risk free rate is 7%, what are then the pure factor equations and what are the risk premiums λ_1 and λ_2?
3) A new stock also follows the two-factor model: $r_x = \alpha_x + 2F_1 + 2F_2 + \varepsilon_x$. What is the value of α_x if there is no arbitrage?
4) What are usually the expected values of F_1 and F_2? Explain why.

Problem 3 (Options, 20%)

A non-dividend paying stock currently cost €40. In the next two periods it can either increase in price by €10 or decrease in price by €10 each period as shown in the binary tree below. The risk free rate is 10% per period. An American call option on this stock has an exercise price of €35.



1) Assign risk free probabilities to the binary tree.
2) Use the risk free probabilities to price the call option.
3) Use replication portfolios to price the call option.
4) Explain why an American put option normally can be hard to price using the put-call parity and then explain whether you think it can be used here in this particular setup. Explain your assumptions.

Problem 4 (Fixed Income, 20%)

Explain what Fixed Income theory is. In your explanation you should include:

1. Bonds and valuation
2. Complete markets
3. Zero coupon bonds
4. Synthetically creating bonds and bootstrapping
5. Yield to maturity
6. Term structure
7. Spot rates, forward rates, discount factors
8. Types of bonds
9. Duration
10. Convexity

Problem 5 (Capital structure, 25%) – See also appendix 1

A firm has the following perpetual cash flow:

Turnover	1000
Operating costs	300
EBITDA	700
Depreciation & Amortization	300
EBIT	400
Interest payments	100
Earnings before taxes (EBT)	300
Tax (25%)	75
Profit after tax	225

The debt rate is 5% and return on equity at the current debt level is 15%

1) Find the unlevered asset return and the value of the unlevered firm.
2) What is WACC at the current debt level? Explain why WACC changes when leverage is added and relate it to Modigliani-Miller.

Now assume that the cash flow is a growing perpetuity with a constant growth rate of 2.5% and debt-to-equity is kept constant over time

3) What is the new value of the tax shield, equity, debt and the firm?

Appendix 1: Un-levering and de-levering (refer to problem 5)

The (Asset) return of the unlevered firm (de-levering / un-levering):

$$r_A = \left(\frac{E}{E + D(1-T_C)}\right) r_E + \left(\frac{D(1-T_C)}{E + D(1-T_C)}\right) r_D$$

The (Asset) beta of the unlevered firm (de-levering / un-levering):

$$\beta_A = \left(\frac{E}{E + D(1-T_C)}\right) \beta_E + \left(\frac{D(1-T_C)}{E + D(1-T_C)}\right) \beta_D$$

Re-levering:

$$\beta_E = \left(\frac{E + D(1-T_C)}{E}\right) \beta_A - \left(\frac{D(1-T_C)}{E}\right) \beta_D = \beta_A + \left(\frac{D(1-T_C)}{E}\right) (\beta_A - \beta_D)$$

$$r_E = \left(\frac{E + D(1-T_C)}{E}\right) r_A - \left(\frac{D(1-T_C)}{E}\right) r_D = r_A + \left(\frac{D(1-T_C)}{E}\right) (r_A - r_D)$$

Where subscript "A" refer to (unlevered) Assets, "E" Equity, "D" Debt, and "T_C" is the corporate tax rate