Written Exam for the B.Sc. or M.Sc. in Economics autumn 2011-2012

Corporate Finance and Incentives

Final Exam/ Elective Course/ Master's Course

20th December 2011

(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 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 (Various themes, 20%)

1. Explain what a factor model is and what three of the most common macroeconomic factors are.
2. Briefly explain APT and what λ_i means in this regard.
3. Explain the covered interest rate parity relation.
4. Explain and preferable draw what the "Implied Volatility Approach" is.
5. Explain what a real option is and construct a simple example of such one.
6. State the expression of the NPV of a growing annuity.
7. Explain the traditional ratio comparison approach and one adjusted alternative to the traditional approach.
8. Are there situations where companies should only apply either APV or WACC? Why or why not?
9. Two companies in different industries have the following financial characteristics:

Company	r_E	r_D	$\frac{D}{E+D}$
A	12%	8%	50%
B	20%	8%	75%

   Which NPVs (disregard taxes) do the two companies assign a government guaranteed future perpetual net cash flow of $10 million per year due to a new contract on delivery of services? Explain.
10. Explain the Modigliani-Miller Theorem.

Problem 2 (Mean-Variance optimization and CAPM, 25%)

Consider the following covariance matrix, mean returns for the three stocks A, B and C and the risk free rate:

$$\Omega = \begin{pmatrix} 0.020 & 0.006 & 0.005 \\ 0.006 & 0.015 & 0.004 \\ 0.005 & 0.004 & 0.010 \end{pmatrix} \qquad E(R_i) = \begin{pmatrix} 14\% \\ 10\% \\ 8\% \end{pmatrix} \qquad r_f = 4\%$$

1. Find the minimum-variance portfolio and the tangency portfolio and draw the efficient frontier.
2. Find the Capital Market Line and express as an equation.
3. Find the three asset betas and the Securities Market Line and express as an equation.

Problem 3 (Fixed Income, 30%)

Consider a market with three bonds:

Type of bond	**Coupon**	**Price**
1-year bullet bond	4%	99.050
2-year serial bond	6%	100.955
3-year annuity bond	7%	102.525

The bonds pay exactly one, two and three years from today.

1. Find the yields to maturity (YTM) for the three bonds.
2. Find the arbitrage free forward rates in the market.
3. Find the price and YTM for a newly introduced 3-year serial bond with a coupon of 6%.
4. Explain why the YTM's for the two 3-year bonds are not the same.
5. Find the Macaulay duration and the modified duration for the 3-year annuity bond. Explain what the two durations mean and interpret the result.

Macaulay duration: $D(c,r) = \frac{1}{PV(c,r)} \sum_{t=1}^{T} t \frac{c_t}{(1+r)^t}$

Problem 4 (Options, 25%)

1. An American call option on a non-dividend paying stock expires three years from now. The current stock price is 100 and the strike price is 110. The continuous risk free rate is 5% and the volatility measured by standard deviation is 10% per year. What is the value of this option according to the Black-Scholes option pricing model?
2. Can you use the put-call parity to find the value of the equivalent American put option? Why or why not? Show by the use of an equation and explain intuitively when you would prematurely exercise the non-dividend paying American put option.

Black-Scholes: $c_0 = S_0 N(d_1) - PV(K) N\left(d_1 - \sigma\sqrt{T}\right)$, *where* $d_1 = \frac{\ln\left(S_0 / PV(K)\right)}{\sigma\sqrt{T}} + \frac{\sigma\sqrt{T}}{2}$