Course : **Re-examination Introduction to Investment Theory**

Date : **January 25, 2012**

All answers must be motivated
You may use an electronic calculator
Answers may be written in English or Dutch
Lots of success !

Problem 1. **(3 points)** The par yield for a certain bond is the coupon rate (paid semi-annually) that causes the current bond price to equal its par value (face value). The table below gives the spot rates:

Year	0.5	1.0	1.5	2.0
Spot rate	5.0	5.8	6.4	6.8

Let C denotes the two-year par yield at the yearly rate with face value of 100. Determine C by equating the NPV of the bond cash flow with the current bond price.

Problem 2. **(5 points)** Suppose that you can trade in two bonds, A and B, paying coupons at a yearly rate of 6% of face value. The coupons are paid out semi-annually (so each coupon payment is \$3 per \$100 of face value). Assume that the first coupon payment of each bond is due in 6 months. Bond A matures in one year and bond B matures in a year and a half. You assume that bonds A and B are trading for the same price. Which positions should you take in bonds A and B to match the forward rate of borrowing some amount after one year and paying it back 6 months thereafter? What is the continuously compounded forward rate?

Problem 3. An investor intends to construct a portfolio consisting entirely of two assets A and B. Short selling is not allowed. The prospects of the assets are as follows:

	Share A	Share B
Expected return ($\bar{r}$)	10%	20%
Standard deviation of return (σ)	20%	30%

Our objective is the minimization of σ of the portfolio. What proportion of the available funds should be invested in A and what proportion in B if the returns of assets A and B are:

(a) **(2 points)** perfectly positively correlated ($\rho_{12} = +1$).

(b) **(1 point)** uncorrelated ($\rho_{12} = 0$).

(c) **(2 points)** perfectly negatively correlated ($\rho_{12} = -1$).

Explain all the steps in your answer.

Problem 4. The current spot price of copper is \$390 per kilo, and the yearly compounded risk-free rate is 6% per year (for all relevant maturities). The storage cost of copper is \$1 per year per kilo, and is paid in the beginning of the year the copper is stored.

(a) **(3 points)** Compute the one-year and two-year forward price of copper.

(b) **(2 points)** You expect to mine copper and sell 100,000 kilos of copper in two years, and you want to hedge your revenue uncertainty. What forward position you will take as a hedge, and what is your overall cash flow going to be?

Problem 5. Consider a single period binomial tree of a non-dividend paying stock with current price $S = 100$. The risk-free return over the period is 8%.

(a) **(1 point)** What are the restrictions on u and d that rules out the possibility of arbitrage opportunities?

(b) **(2 points)** Suppose that $u = 1.20$ and $d = 1.05$. What is the price of a call option with strike 50 expiring at the end of the period?

(c) **(2 points)** What is the replicating portfolio?

Total Points: 23 + (2 bonus points) = 25 points.