Examination: **Derivatives (1928)** **Summer Term 2005**

Examiner: **Prof. Dr. Peter Reichling**

The following aids can be used: non-programmable pocket calculator

This examination comprises **10 problems**. All of them are to be solved.

EXAMINATION QUESTIONS:

Problem 1. (3 points)

Explain in brief the role of speculators, hedgers and arbitrageurs on the derivatives market.

Problem 2. (3 points)

Is the following statement true? "When the stock volatility *increases*, the put option price *decreases*." Explain briefly.

Problem 3. (8 points)

Let P_1, P_2, and P_3 be the prices of put options with strike prices K_1, K_2, and K_3, respectively, where $K_1 < K_2 < K_3$ and $2K_2 = K_1 + K_3$. All options are of the European type. The maturities of all the options are the same. Verify that $P_2 \leq 0.5(P_1 + P_3)$.

Problem 4. (3 points)

Explain in brief why it is not optimal to exercise an American call option before maturity. (Assume an option on a non-dividend paying stock.)

Problem 5. (4 points)

Consider a bullish spread option strategy using a call option with a €25 exercise price priced at €4 and a call option with a €40 exercise price priced at €2.50. If the price of the stock increases to €50 at expiration and the option is exercised, what is the net profit per share (ignoring transaction cost)? Sketch the profit profile of this strategy.

Problem 6. (3 points)

What kind of relationship arises from delta, theta, and gamma of a portfolio which consists of different derivatives, is self-financing, and yields the risk-free rate of return?

Problem 7. (3 points)

Consider you have shorted 200 call options. What is the price of a delta hedging against your position? Assume that the call price is €4.16, the delta is 0.7644, and stock price is €73.00.

Problem 8. (5 points)

A call option of European type on a non-dividend paying stock has a price of €3.50. The option matures in 6 months. The current stock price is €51, the exercise price is €50, and the risk-free interest rate is 12% p.a. Is arbitrage possible in this situation? If yes, how much would an arbitrageur earn?

Problem 9. (9 points)

The current stock price is €100, which is expected either to increase by 5% or decrease by 5% in the next two periods. (Assume a period is one month.) Consider an American put option with the exercise price of €100. The option matures in two months. The risk free rate is 12% p.a. What is the current value of the option?

Problem 10. (9 points)

(i) Sketch the payoff profiles of cash-or-nothing and asset-or-nothing options of both types.

(ii) How can one value a cash-or-nothing call option? How are the cash-or-nothing call and put options related to each other? Derive from this relationship the price of a cash-or-nothing put option.

(iii) Do the same for asset-or-nothing options as it was required for cash-or-nothing options in (ii).

GOOD SPEED!