TTA-45036 Introduction to Financial Engineering and Derivatives Markets

Exam
10.10.2017

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This is a closed-book exam, a non-programmable calculator allowed. Please answer in English. Good luck!

Question 1. Explain the following concepts and terms:

a) Bid and offer prices (1 p)

b) Arbitrage (1 p)

c) OTC markets (1 p)

d) Implied volatility (1 p)

e) Credit derivatives (1 p)

f) Incomplete markets (1 p)

Question 2.

a) What is hedging about?

b) What is wrong with the following expressions for price a call option in arbitrage free markets (two things)

$$C_t = \max[E_{(}S_T) - K, 0]\frac{1}{(1+k)^T},$$

where S_T is the price of the underlying stock at maturity T, K is the strike price and k is the required rate of return of the underlying stock. $E_t[.]$ is conditional expectation. (3 p)

Question 3.

a) Suppose that IBM is trading at \$75 per share. Consider a derivative security that pays exactly one dollar when IBM hits \$100 for the first time. Show that by no-arbitrage, the derivative security cannot sell for more than \$0.75. Ignore IBM's dividends, assume a riskless interest rate of zero, assume all assets are infinitely divisible, and ignore any taxes or transactions costs. (4 p) [Hint: How can you replicate this derivative?]

b) Draw a payoff diagram of the portfolio of following options:

- A long call option with strike 10 EUR
- Two short put options with strike 12 EUR

Draw payoff curves for call, for two puts, and for the portfolio. The underlying price can vary between 5 and 17 EUR.