In Class Final Math 5010. Each Problem 10 points

Please write a pledge that this exam represent your own work and that you did not use any forbidden means during the exam.

1. Assume that the 1 year forward exchange rate is 110 yen for 1 US dollar. Interest rate in dollars is 2 percent with annual compounding. Interest rate in yen is 0.2 percent with annual compounding. What is the spot exchange rate. Calculate with 2 decimal points.

2. Suppose you are offered two combinations of European one year options. Combination A is long one put with strike 50 and long one call with strike 60. Combination B is long one call with strike 55 and one put with strike 53. What combination do you think should be more valuable and how does it depend on current stock price and volatility.

a) Combination A has always bigger or equal price than Combination B
b) Combination B has always bigger or equal price than Combination A
c) The answer what is more expensive A or B depend on the level of implied volatility and not on stock price.
d) The answer what is more expensive A or B depend on both the level of implied volatility and stock price.

3. Consider the following binomial option model. Stock price is 100 dollars now. In 1 year it can go to 120 dollars or 80 dollars. Interest rate with annual compounding is 10 percent. What is the price of a 1 year call with strike 110.

4. What are the risk neutral probabilities in the model of problem 3 that give the same price.

5. What are the parameters affecting European PUT price on a non dividend paying stock? What happens to the put price when one of these parameters changes with all the others remaining the same? Make the table.

6. Write the Black-Scholes partial differential equation for non dividend paying stocks.

7. Write the Black-Scholes option price formula for non dividend paying stocks.

8. Give the definition of VAR and CVAR. Can CVAR have smaller absolute value than VAR.

9. Suppose that the stock price follows geometric Brownian motion $dXt = 0.05\ Xt\ dt + 0.4\ Xtd\ Wt$. Write two probability density functions for the distribution of the stock prices in 1 year and in 3 years if the current stock price is 100.

10. Write the probability density function for a normal distribution with mean -2 and the standard deviation 2. What is approximate probability that the variable is positive.

11. Does put-call parity holds for European options and why?

12. What is delta of a long position in deep out of-the-money call?

13. 1 year spot rate is 2%, 4 year spot rate is 3%. Calculate the annualized forward rate between 1st and 4nd year. Please use continuous compounding.

14. If the overall interest rates rise, a coupon paying bond will

a) increase in market price
b) experience a decrease in modified duration
c) experience an increase in modified duration
d) none of the above
e) both a and b above

Explain your answer.

15.Bonds with higher coupons everything else being equal

a) Have higher modified duration than smaller coupon bonds
b) Have lower modified duration than smaller coupon bonds
c) Can have higher or lower modified duration.

Explain your answer