BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF BANKING AND FINANCE

FINANCIAL ENGINEERING (BS452)

DURATION: THREE HOURS

NOV 2023

INSTRUCTIONS TO CANDIDATES:

1) Answer any **four** questions.

2) Candidates will need non-programmable calculators.

3) Each question carries equal marks as indicated in square brackets.

4) Electronic data saving devices are not allowed into the examination halls.

ADDITIONAL MATERIAL

Standard Normal Distribution Tables

QUESTION ONE

Evaluate the contribution of financial engineering to the Global Financial Crisis and suggest strategies that can be put in place to avoid reemergence of a similar crisis.

[25 MARKS]

QUESTION TWO

a) A bank is holding on to the following assets: TBs = $230m, cash = $160m, Mortgages =$ 270m, Loans to Pvt Companies = $ 300m and Loans to Government departments = $ 98m. The equity capital of the bank is $50m and regulation stipulates that Risk Weighted capital should be at least 12%.

(i) Comment on the position of the bank with regards to regulation requirements. (3)

(ii) Suggest how the position in (i) can be corrected if not correct or can be improved by the bank management. (6)

b) Explain two (2) uses of financial engineering by banks. (6)

c) Share price = $40, Strike price=40, risk free rate is 8%, volatility =30% and t= 0.25. If a trader shorts calls on 100 shares on day 0 and day 1 share price is 40.5 while day 2 share price is 39.25. Show how this short position on calls should be delta- hedged between day 0 and day 2. (10)

[25 MARKS]

QUESTION THREE

a) Explain three (3) factors that have led to the growth of financial engineering. (6)

b) Consider a one-period binomial model in which the underlying price is at 65 and can go up 30 percent or down 22 percent. The risk-free rate is 8 percent.

(i) Determine the price of a European call option with an exercise price of 70. (6)

(ii) Assume that the call is selling for $9 in the market. Demonstrate how to execute an arbitrage transaction and calculate the rate of return. Use 10,000 call options. (8)

c) Explain the concept behind delta-hedging options. (5)

[25 MARKS]

QUESTION FOUR

a) Explain the impact of Bad Lemons Theory in design and trading of financial assets. (8)

b) Calculate the value of delta of a 6-months European call option on a stock with a strike price equal to the current stock price (t=0). The interest rate is 6 percent and volatility is equal to 16%. (5)

c) ABC limited buys, from ZDB Bank, a 3 -against-9 month Forward Rate Agreement (FRA) at a contract rate of 6.25% . The benchmark rate / settlement reference rate is Treasury bill rate. At settlement date, the benchmark rate is 9%. Assuming a notional amount of $100, 000, show the cashflows at maturity. (7)

d) Explain the basic mechanics in a Credit Default SWAP. How do these instruments differ from Collateralized Debt Obligations? (5)

[25 MARKS]

QUESTION FIVE

a) Highlight the necessary condition for a fixed-for-floating interest rate swap to be possible? (5)

b) Discuss the risks confronting an interest rate and currency swap dealer. (10)

c) Suppose XYZ Ltd. is quoting swap rates as follows: 7.75 - 8.10 percent annually against six-month dollar LIBOR for dollars and 11.25 - 11.65 percent annually against six-month dollar LIBOR for British pound sterling. At what rates will XYZ enter into a $/£ currency swap? (10)

[25 MARKS]

QUESTION SIX

a) Given a market without arbitrage opportunities between Put options and Call options, using the forward contract argument, show that for European options; $C + Ke^{-rt} = P + S_o$

Where;

C =Call price

P=Put price

K=Exercise price

S_o= Spot price

r= risk free rate of return

t= time to maturity for both put and call options (10)

b) Given that Call option and Put option premiums are at $4 and $3 respectively. The spot price of an underlying asset is $50 while the exercise price on both put options and call options contracts of 0.25 years to maturity is $60 and Treasury bill rate =8%.

(i) Evaluate the relationship between two possible portfolios that can be derived from information given. (6)

c) Air Zimbabwe expects a boom in the number of flights in two months and its projections are that it will need to buy two million gallons of Jet A1 fuel in a month's time. To hedge this exposure, it decides to use Heating oil futures. The following data pertains to Jet A fuel prices and the prices of futures on Jet A1 fuel.

- Correlation coefficient between spot price and futures price = 0.928
- Standard Deviation of spot prices = 0.0263
- Standard deviation of futures prices = 0.0313

(i) Calculate the Minimum variance hedge ratio. (6)

(ii) If the size of each futures contract is 42000, find the optimal number of contracts to be used to hedge the exposure (3)

[25 MARKS]

END OF EXAMINATION