BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI - K. K. BIRLA GOA CAMPUS
First Semester 2020-21, Comprehensive Examination December 2022
(DERIVATIVE AND RISK MANAGEMENT (FIN F311, ECON F354)
(Answer all questions)

Date: 29th December, 2022. Max Marks: 40

SECTION A

Q.1) Today You import 10Tonnes of special steel at CIF price of $ 600 per ton (FOB plus 20%) on a LC payable 90 days from today .LC is for the FOB value of the goods. Spot price of dollar today is Rs 79.30. Market estimates of dollar prices in 90 days from today is in the range of Rs 79.55 and Rs 79.85 Futures in this range are available. Options both call and put are also available in the lot size of $100 You are desirous of the full coverage of the risk? How would you hedge your exposure? **(Marks 2)**

Q.2)) The share price of Asian Paints on July 1 is Rs 1400 and a September futures contract on Asian Paints has price of Rs 1420.633. The contract size is 200 shares per futures contract, and the maturity is on September 28. The risk-free rate is 6% p.a. Show how you can replicate a long futures position using stocks and risk-free assets. **(Marks 2)**

Q.3) Five years ago a SWAP was entered by an Indian Bank with a foreign financial institution converting its rupee liability into pound sterling where in the bank received 10% on rupee and paid 6% on pound. The amount involved was Rs 120 million and £1.5 million at an exchange rate of Rs 80/£. Swap has four semi annual payments to follow. Now, the Indian bank with mutual consent wants to cancel the swap arrangement. Assuming the next payment is due after 6 months from now and the term structure in India rupee and pound sterling are flat at 9.00% and 5.50%(both Rc) respectively. Present exchange rate is Rs 82/£. What is the amount to be exchanged in rupees? (Calculate using both bond and FRA methods

(Marks 3)

Q.4) In July, a small chocolate factory receives a large order for chocolate bars to be delivered in November. The spot price for Cocoa is $2,400 per metric ton. It will need 10 metric tons of Cocoa in September to fill this order. Because of limited storage capacity and volatility in the world cocoa prices, the company decides the best strategy is to buy 10 call options for $53 each with strike price of $2,400 (equal to the current price) with a maturity date of September 2012. When the options expire in September, how much will the company pay (including the cost of the options) for cocoa if the spot price in September proves to be: a) $2,300, and b) $2,600? **(Mark 1)**

Q.5)A European call option and put option on a stock both have a strike price of $20 and an expiration date in three months. Both sell for $3. The risk-free interest rate is 10% per annum, the current stock price is $19, and a $1 dividend is expected in one month. Identify the arbitrage opportunity open to a trader. **(Marks 2)**

SECTION B

1. A financial institution has the following portfolio of over-the-counter options on sterling: **(Marks 4)**

Type	Position	Delta of Option	Gamma of Option	Vega of Option
Call	−1,000	0.50	2.2	1.8
Call	−500	0.80	0.6	0.2
Put	−2,000	−0.40	1.3	0.7
Call	−500	0.70	1.8	1.4

A traded option is available with a delta of 0.6, a gamma of 1.5, and a vega of 0.8.

(a) What position in the traded option and in sterling would make the portfolio both gamma neutral and delta neutral?

(b) What position in the traded option and in sterling would make the portfolio both vega neutral and delta neutral?

2. Jon has a delta neutral portfolio with a gamma of -3000. A traded call option has a delta of 0.62 and a gamma of 1.5 and a traded put option has a delta of -0.5 and gamma of 1. How can Jon make his portfolio gamma neutral as well as delta neutral only using these two options? **(Marks 2)**

3. What is the delta of a short position in 1,000 European call options on silver futures? The option matures in eight months, and the futures contract underlying the option matures in nine months. The current nine-month futures price is $8 per ounce, the exercise price of the options is $8, the risk-free interest rate is 12% per annum, and the volatility of silver is 18% per annum. **(Marks 3)**

4. A call with a strike price of $60 costs $6. A put with the same strike price and expiration date costs $ 4 Construct a table that shows the profit from a straddle. For what range of stock prices would the straddle lead to a loss? **(Marks 2)**

5. Suppose that put options on a stock with strike prices of $30 and $35 costs $4 and $7, respectively. How can the options be used to create a) a bull spread and b) s bear spread? Construct a table that shows the profit and payoff for both spreads. **(Marks 3)**

6. A stock price is currently $ 40. It is known that at the end of three months it will be either $ 45 or $ 35. The RFR with quarterly compounding is 8% p.a. Calculate the value of three- month European put option on the stock with an exercise price of $ 40. Verify that no--arbitrage arguments and risk-neutral valuation arguments give the same answers. **(Marks 5)**

7. Consider an American call option on a stock. The stock price is $50, the time to maturity is 15 months, the risk-free rate of interest is 8% per annum, the exercise price is $55 and the volatility is 25% dividend of $1.50 are expected in 4 months and 10 months. Calculate the price of the option. **(Marks 6)**

8. A company has issued 3 and 5 year bonds with a coupon of 5% per annum payable annually. The yields on the bonds (expressed with continuously compounding) are 4.5% and 4.75%, respectively. Risk-free rates are 3.5% with continuous compounding for all maturities. The recovery rate is 50%. Defaults can take place halfway through each year. The risk-neutral default rates per year are Q1 for years 1 to 3 and Q2 for years 4 to 5. Estimate Q1 and Q2. **(Marks 5)**