**JAIPURIA INSTITUTE OF MANAGEMENT, INDORE**

**PGDM**

**FOURTH TRIMESTER (Batch 2021-23)**

**END TERM IMPROVEMENT EXAMINATION, DEC-2022**

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| --- | --- | --- | --- |
| Course Name | **Financial Derivatives and Risk Management** | Course Code | **40223** |
| Max. Time | **2 hours** | Max. Marks | **40** |

**INSTRUCTIONS:**

***Answer all questions.***

**Questions.1 (8 Marks)**

Anmol currently holds 10,000 shares of Reliance stock. The Reliance stock currently sells for Rs. 2290 per share. Anmol will need to sell all his holdings after three months to provide for the admission fee of his son, who was selected at Harvard Business School in the USA. Anmol is worried about the price risk involved in keeping his shares. If the value of his holdings falls below Rs. 22,800,000, his ability to come up with the necessary admission fee would be jeopardized. On the other hand, if the stock value rises to Rs. 23,000,000, he could maintain a small cash reserve even after paying the admission fee. Anmol considers the following three investment strategies:

* Strategy A is to buy three-month European put options on Reliance shares with a strike price Rs. 2280. These puts are currently selling for Rs. 50 each.
* Strategy B is to write three-month European call options on Reliance shares with strike price Rs. 2300. These call options also sell for Rs. 50 each.
* Strategy C is to establish a zero-cost collar by writing the three-month European call options on Infosys shares with a strike price Rs. 2300 and buying three-month European put options on Infosys shares with a strike price Rs. 2280.
1. Explain whether the above three strategies are hedging strategies or speculative strategies.
2. Evaluate each of these investment strategies with respect to Anmol’s investment goals. What are the advantages and disadvantages of each? Which would you recommend?

**Questions.2 (5 Marks)**

A company has a Rs. 50 crores portfolio with a beta of 1.20. The three-month NSE Nifty index futures price is currently 18,000, and one futures contract is on Rs. 50 times the NSE Nifty index. How can the company use futures contracts on the NSE Nifty index to completely hedge its risk over the next three months? What position should it take to reduce the portfolio's beta to 0.60?

**Questions.3 (8 Marks)**

Three put options on NSE Nifty have the same expiration date and strike prices of 18,000, 18,100; and 18,300. These options currently sell for Rs. 100, Rs. 120, and Rs. 150, respectively.

1. Explain how a butterfly spread can be created. Construct a table showing the profit from the strategy.
2. For what range of stock prices on the maturity of the options would the butterfly spread strategy give profits?
3. At what price, on the maturity of the options, would the butterfly strategy give maximum profit? What is the value of that maximum profit? Explain your answer.

**Questions.4 (8 Marks)**

Omega Hedge Fund has the following portfolio on exchange-traded-options on Eta Stock:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Type of Option | Position | Delta of Option | Gamma of Option | Vega of Option |
| Call | -5000 | 0.65 | 1.75 | 1.55 |
| Call | -4000 | 0.75 | 0.55 | 0.30 |
| Put | 4000 | -0.45 | 1.30 | 0.80 |
| Put | 2000 | -0.55 | 1.45 | 0.85 |

The options shown in the table below can be traded.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Delta | Gamma | Vega |
| Option 1 | 0.75 | 1.00 | 1.00 |
| Option 2 | 0.65 | 1.65 | 0.65 |

What position in the traded options and in Eta stock would make the portfolio delta, gamma, and vega neutral? Explain your answer.

**Questions.5 (6 Marks)**

Consider an option on a non-dividend paying stock when the stock price is Rs. 2000, the exercise price is Rs. 1950, the risk-free rate of interest is 6% (with continuous compounding), the volatility is 20% per annum, and the time to maturity is three months.

1. What is the price of the option if it is a European call?
2. What is the price of the option if it is a European put?
3. Verify that put-call parity holds.
4. What is the probability that the call option will be exercised in a risk-neutral world?
5. What is the probability that the put option will be exercised in a risk-neutral world?

[N(0.4532) = 0.6748; N(0.3532) = 0.6380; N(0.4955) = 0.6899; N(0.3955) = 0.6538]

**Questions.6 (5 Marks)**

The price of a European call that expires in three months and has a strike price of Rs. 1000 is Rs. 50. The underlying stock price is Rs. 1020, and the risk-free interest is 6% per annum with continuous compounding. What is the theoretical price of a European put option that expires in three months and has a strike price of Rs. 1000? Explain the arbitrage opportunities carefully if the actual market price of a three-month European put option with an exercise price of Rs. 1000 is Rs. 10.