Options strategies and market analysis

Assignment 2

May 18,2024

Submission Deadline: May 22,23:59.

1.If we find that your code is entirely written using ChatGPT or another AI source, we will not consider your submission. However, you are allowed to take help from the internet to code. The code should be your own work.

2.Refrain from any means of plagiarism.

3.The deadline will not be extended, so please ensure that you adhere to it and submit your work before the deadline.

Task 1. Option Chain Data Collection and BSM Model Application

1. Download the option chain data or manually obtain it from reliable financial websites.
2. Select at least 10 In-The-Money (ITM), 10 Out-Of-The-Money (OTM), and the most appropriate At-The-Money (ATM) options data for at least two months. This should not be done manually by looking over data.
3. Use the Black-Scholes-Merton (BSM) model to calculate the fair values of these options and determine whether they are overpriced or underpriced.
4. Additionally, determine which CE should be purchased and which should not.

Deliverables

Python code for downloading and preprocessing (if required) of option chain data and the following things in the code itself:

1. Selected ITM, OTM, and ATM options data.
2. Calculated fair values using the BSM model.
3. Assessment of whether each option is overpriced or underpriced.

Task 2. Stock Option Data and Monte Carlo Simulation

1. Download stock option data for your chosen stock.
2. Use Monte Carlo simulation to generate various possible future price curves.
3. Generate both actual (historical stock price graph) as well as what you get from the simulation.

Deliverables:
Python code (Excel Sheet) showing plots generation and simulation. Prefer using python for this task but you are allowed to use Excel as well for this task only.

Note: We are not asking to prepare a report for the task but it is strongly recommended to comment your code and sheet very neatly and up to the requirement. (Extra points for well commented code)

Task 3: Binomial Pricing and Tree Model (Theoretical)
1. The stock of a company is currently quoted in the market at ₹150. The price of the stock is expected to go up or down by 10% in next one year and by 15% in the second year. The risk-free interest rate in the economy is 6%.

Required: Using two-step Binomial Model, find out the price of a 2-year American put option on the company's stock with strike price of ₹ 170. (Hint: Option Premium cannot be greater than Intrinsic value)

2. Consider a two-year call option with strike price Rs. 50 on a stock the current of which is also Rs. 50. Assume that there are 2 time periods of 1 year and in each year the stock price can move up or down by an equal percentage of 20%. The risk-free interest rate is 6%. Using binomial option model, calculate the probability of price moving up and down. Also draw a two-step binomial tree showing prices and payoffs at each node.