COMPUTATION FINANCE MIDTERM EXAM

Data

1. Download daily stock prices from yahoo financed for the company you had chosen before. You can choose for any company from the available index.

2. The data that you will use in this midterm exam is the data for the last 12 months. (01 May 2020-01 May 2022)

3. Find the interest rate of the country based on where the company you are using is located.

4. Use close price to calculate mean, variance, standard deviation of daily stock price/first difference/return of stock (according to what you need).

5. Since you will use annual mean instead of daily mean, you need to annualize the result you get from point 4. In Brownian Motion, if X is random variable that means the price of stock, it is assumed that $X \sim N(\mu, \sigma^2)$.

Assume for 1 year, there are 252 working days, so for 1 year, we have

$$S = X_1 + X_2 + \cdots + X_{252}$$

With X_i is daily stock price. You have to use the properties of expectation to calculate the mean and the variance of yearly stock price.

6. As in the point 5, for Geometry Brownian Motion, you know that log return is normally distributed, so, know, find the log return of your stock and repeat point 4 and 5 for log return data.

Once your data is ready, you can start to do simulation for your midterm exam.

Note : You have to understand what is the difference of Brownian Motion and GBM, In Brownian motion, if you want to simulate close price, the close price its self has normal distributed (as you can see $X \sim N(\mu, \sigma^2)$). But, in GBM, the stock price has log normal distribution, or in other word, the log return that has normal distribution. So, don't misinterpretation what mean you need to use.

Simulation

1. Use your data from point 6 to run the simulation for Geometry Brownian Motion for time 1 day until 6 months. Remember your data is annually, since you run the simulation in daily time t, $t = \frac{1}{252}, \frac{2}{252}, \dots, \frac{n}{252}$ (we assume 252 working days for 1 year).

For this simulation X_0: The last data in your stock price data.

You need to run the simulation 10 times and plot the result in same axes. Hence, you will have 10 simulations with the same starting point X_0.

2. Use your data from point 6 to run the simulation for Geometry Brownian Motion for time 1 week until 104 week. Remember your data is annually, since you run the simulation in weekly time t, $t = \frac{1}{52}, \frac{2}{52}, \dots, \frac{n}{252}$ (we assume 52 weeks for 1 year).

For this simulation X_0: The last data in your stock price data.

You need to run the simulation 10 times and plot the result in same axes. Hence, you will have 10 simulations with the same starting point X_0.

Black Scholes

Find the available option in the market for your stock, both call and put option. Get the information about the strike price, the premium, and the expired date.

1. Now, using the data from point 2 and 5, calculate the premium should be using Black Scholes formula and analyze you result comparing with the available option in the market. Use the latest closed price as S_0.

2. Plot the payoff plot and profit plot for the available option and from the Black Scholes result.

Option

1. Choose one strategy to buy options, (combine short call/put and long call/put). Simulate the payoff and profit based on your option data.

Submission

You must submit a report in pdf format with content:

1. The profile of the company

2. The stock price

3. Simulation and description

4. Black Scholes and analysis.

5. Conclusion