MA 323 : MONTE CARLO SIMULATION

SIMULATION

LAB 7

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Simulating Stock Prices using GBM

The values of μ and σ found are as follows :

μ = 0.00029810607002000273

σ = 0.02228172705870555

The Stock Prices are estimated using the recursive relation given in lectures with $t_{i+1} - t_i = 1$ working day.

Here t_0 = 30 Sep. So we have :

1. For 7th october, we have the value of t_k = k = 4 i.e. 4 working days away from 30 Sep.
2. For 14th october, we have the value of t_k = k = 9 i.e. 9 working days away from 30 Sep.
3. For 21st october, we have the value of t_k = k = 14 i.e. 14 working days away from 30 Sep.

If we recursively apply the the given formula, we get :

$$S_k = S_0 * \prod_{i=1}^{k} e^{\left(\mu - \frac{1}{2}\sigma^2 + \sigma z_i\right)} \qquad k = 1, .. , N$$

$$S_k = S_0 * e^{\left(\left(\mu - \frac{1}{2}\sigma^2\right)t_k + \sigma W_k\right)}$$

$$W_k = \sum_{i=1}^{k} b_i \qquad k = 1, .. , N$$

where   **b_i ~ N(0,1) i.i.d. Random variables**

ANSWER 1

Note : The estimated values are random i.e. every time the program is executed we will get different values.

The estimated values for stock prices on given dates are as follows:

DATE	ESTIMATED STOCK PRICE
7th October 2020	185.92623
14th October 2020	186.50086
21th October 2020	186.77785

ANSWER 2

%Error = (Estimated Stock Price - Actual Stock Price)/Actual Stock Price x 100%

DATE	ACTUAL STOCK PRICE	ESTIMATED STOCK PRICE	% ERROR
7th October 2020	190.70	185.92623	-2.50329%
14th October 2020	200.05	186.50086	-6.77287%
21th October 2020	203.75	186.77785	-8.32988%

Here negative value of %error depicts that the estimated value of stock prices are less than actual stock price on that day.