MA 473: Computational Finance

Lab – 10

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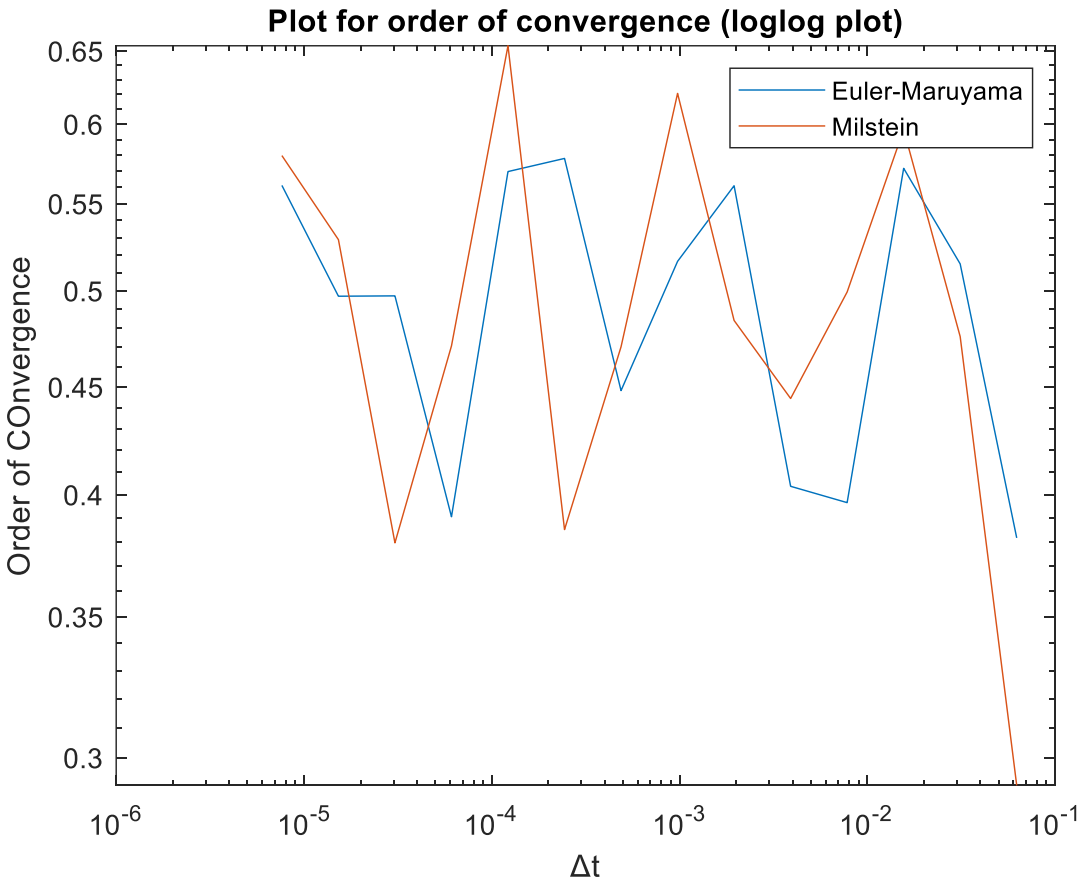
1 QUESTION - 1:

The exact solution of the Black-Scholes diffusion equation is:

$$X(t) = X(0)\exp((\mu - 0.5\sigma^2)t + \sigma W(t))$$

After solving the SDE using **Euler-Maruyama method** and **First-order Milstein Scheme**, following **order of convergence plot** was constructed (loglog plot):

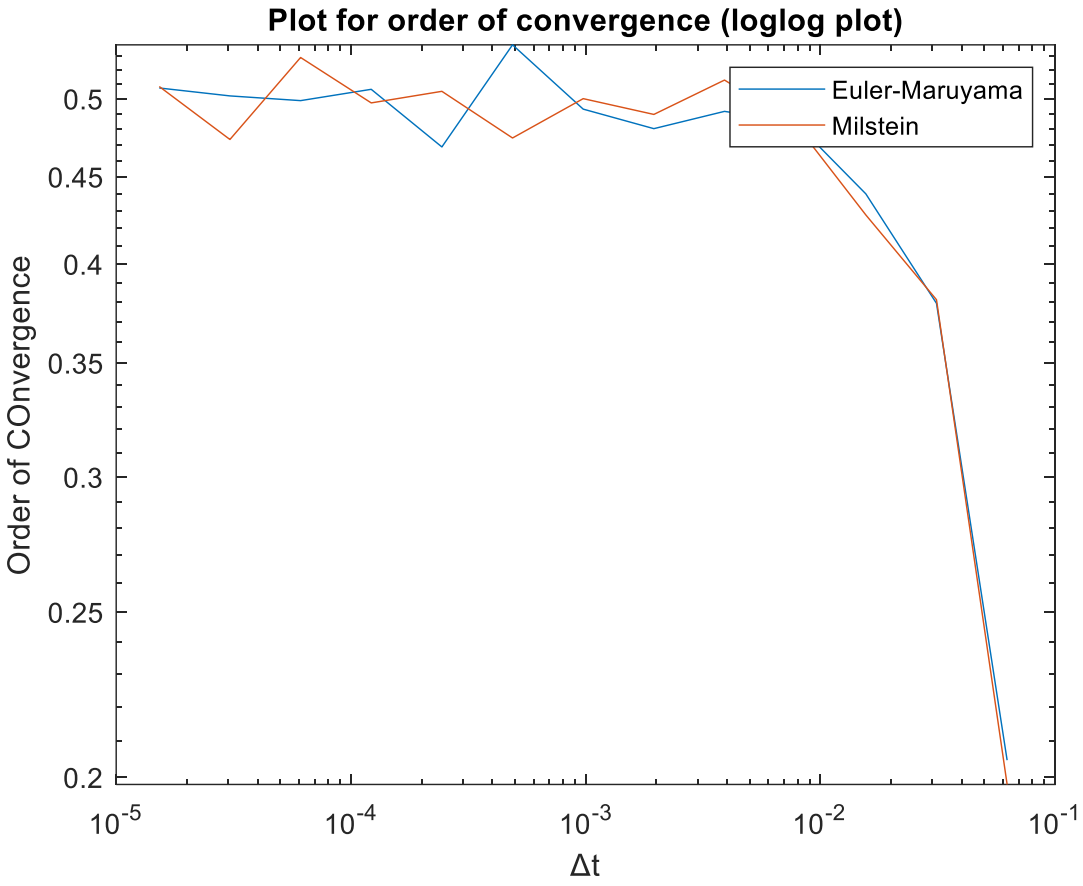


Observations:

We can observe that the Euler-Maruyama method has order of convergence fluctuating around 0.5 while the Milstein scheme shows somewhat higher convergence rate than the Maruyama method.

2 QUESTION - 2:

After solving the SDE using **Euler-Maruyama method** and **First-order Milstein Scheme**, following **order of convergence plot** was constructed (loglog plot):



Observations:

We can observe that both the schemes show similar order of convergence in **Langevin SDE** because the b'(X) term is 0 in Milstein scheme. Hence both the schemes become equivalent and has order of convergence 0.5, which is also demonstrated by the plot.