MA473 – Computational Finance Laboratory

Lab – 13

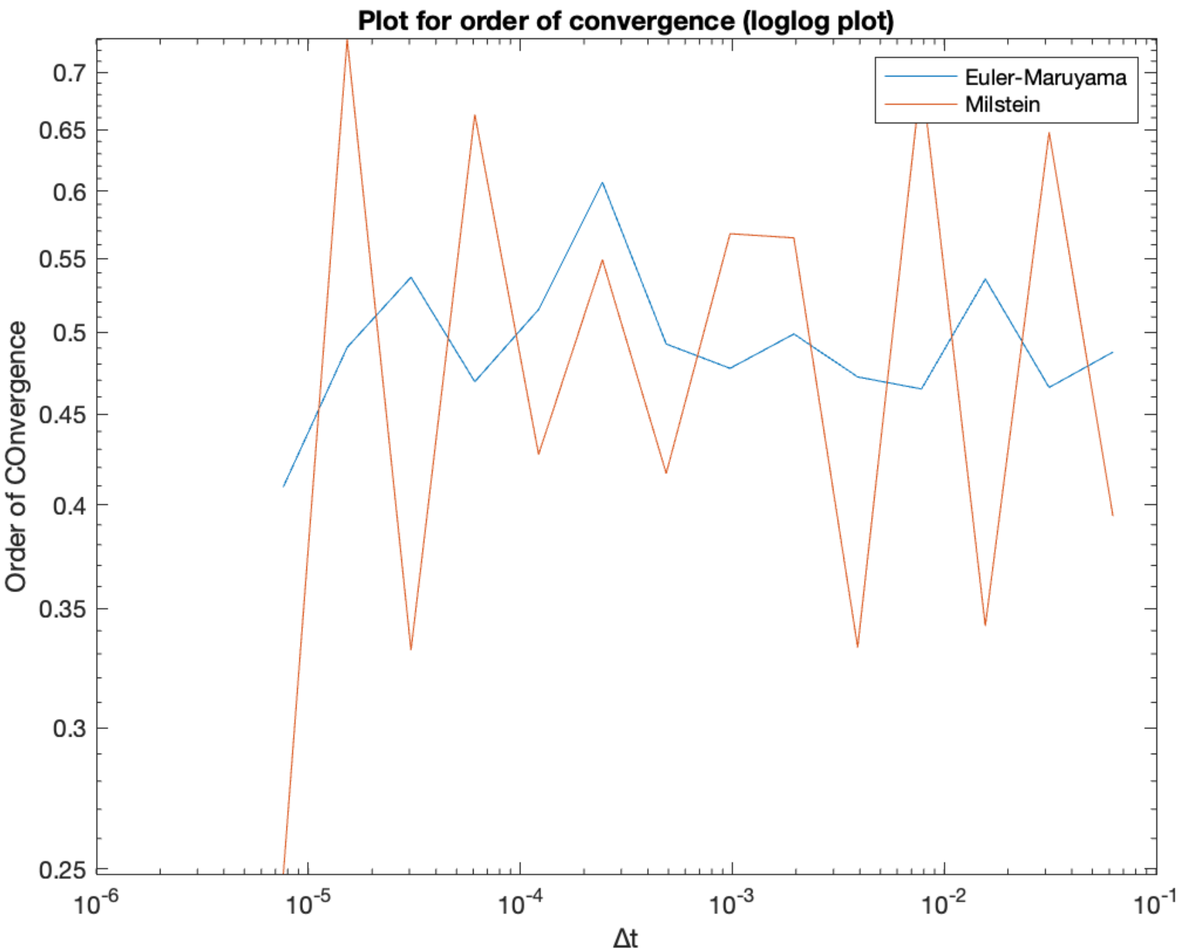
Dipanshu Goyal 210123083

Question – 1

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

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

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

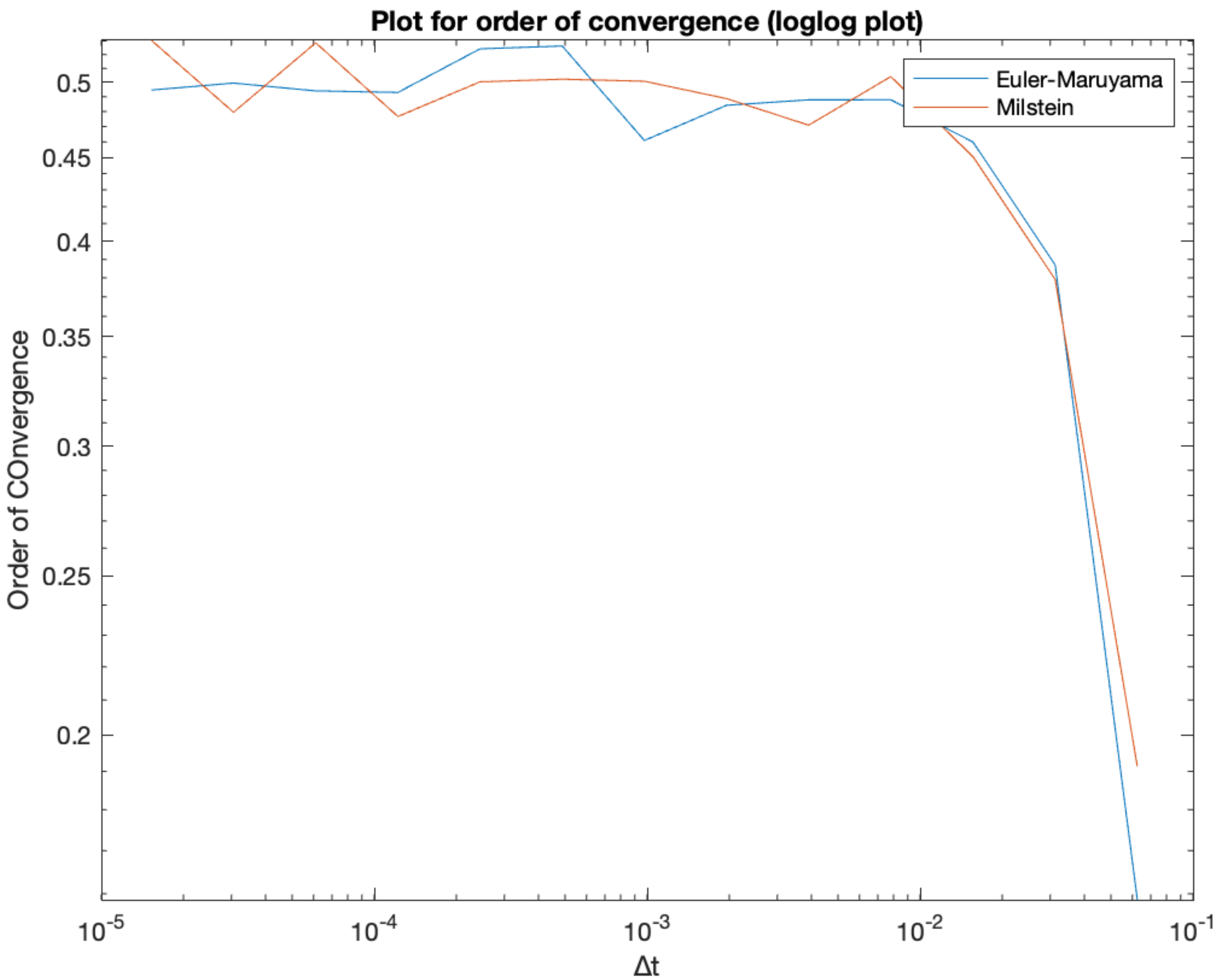


Observations:

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.

Question – 2

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



<u>Observations:</u>

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.