Stochastic Modelling of Financial Derivatives

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Total Marks: 100 **Deadline:** 3rd July 2025

Assignment 5

Q1. Simulation of Call Option Prices via Stochastic Differential Equations

Develop a Jupyter Notebook to simulate and estimate the prices of the following types of Options using the Euler–Maruyama method in conjunction with a Monte Carlo framework. The simulations should be based on geometric Brownian motion (GBM) for the underlying asset dynamics.

a) European Call Option

b) Arithmetic Asian Option

c) Geometric Asian Option

d) Lookback Call Option (with floating strike)

Your implementation should include:

- Numerical simulation of asset paths using the Euler–Maruyama discretization scheme.
- Application of the appropriate payoff function at maturity for each option type.
- Estimation of expected option payoff using Monte Carlo averaging and appropriate discounting to present value.

Submission Instructions:

- Submit a well-commented Jupyter Notebook (*.ipynb).
- Clearly state all assumptions made.
- Ensure plots, explanations, and code structure are clear and presentable.