Quantitative Finance Club - Numerical Methods for Solving SDEs/PDEs - Research Project

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1 Overview

Rather than solving SDEs/PDEs analytically, which is often impossible for complex models, numerical methods can approximate solutions.
Methods like

- Finite Difference Methods (FDM)
- Monte Carlo Simulations
- Euler-Maruyama Method
- Runge-Kutta Methods
- Milston Method
- Feynman-Kac Formula

These methods discretize time and/or space to approximate the evolution of stochastic processes or the solutions to differential equations.

2 Goals

The primary goal of this research project is to explore and implement various numerical methods for solving stochastic differential equations (SDEs) and partial differential equations (PDEs) in the context of quantitative finance.
We want to understand the strengths and limitations of each method, compare their accuracy and efficiency across different financial models, and identify best practices for their application in real-world scenarios.

3 Structure

The project is structured into several key sections:

- Literature Review (1 week)
- Skill Development (1 week)
- Method Implementation (2 weeks)
- Model Testing (2 weeks)
- Analysis and Comparison (1 week)
- Documentation and Reporting (1 week)

We hope to take 2 months to complete this project, with each phase building upon the previous one to ensure a comprehensive understanding and application of numerical methods in quantitative finance.
We don't expect to be able to cover everything in this time to the fullest extent, but we hope to gain a solid foundation and practical experience that can be built upon in future work.

4 Meeting Notes