

# Finite Differences

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September 2024

## 1 Task 1

The code is designed to compare the accuracy of three finite difference methods—Explicit, Implicit, and Crank-Nicolson—in pricing a European put option against the Black-Scholes formula. It starts by setting up the parameters for the option, including the strike price, risk-free rate, time to maturity, and stock price range. It defines a function to calculate the Black-Scholes price of the option. The code then uses another function to compute option prices using the three finite difference methods, with the Explicit method updating prices at each time step, the Implicit method solving a system of linear equations, and the Crank-Nicolson method combining both approaches for better stability. To evaluate accuracy, it includes an interpolation function that aligns the calculated prices with stock prices used for error calculations. The code calculates errors between the Black-Scholes price and the finite difference method prices for both 30 and 500 time steps, and plots these errors to compare method performance. However, despite these efforts, the code ultimately fails to reproduce the expected results, likely due to issues in the implementation or parameter settings.