



**FINITE DIFFERENCE METHOD FOR SOLVING BLACK-
SCHOLES EQUATION IN EUROPEAN OPTION**

UNDERGRADUATE THESIS

Submitted as one of the requirements to obtain

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FACULTY OF BUSINESS

ACTUARIAL SCIENCE STUDY PROGRAM

CIKARANG

JUNE 2024

PLAGIARISM REPORT

Finite Difference Method for Solving Black-Scholes Equation in European Option

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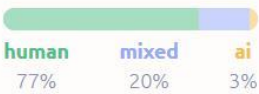
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ABSTRACT

Option pricing is one of the most important concerns in the world of finance. An option is an agreement between two parties to buy or sell an asset at a certain strike price in the future. Option can be classified into two types based on the sort of rights possessed by the holder, which are Call Option and Put Option. One method for calculating the option value is to use the Black Scholes model. Analytically resolving this equation can be difficult, particularly for more complicated option and market circumstances. One method that can be used in such situations is the finite difference method. This technique offers numerical solutions for option under actual market conditions and enables the computation of increasingly complex option values. This study aims to determine the option price using the explicit finite difference method applied to Tesla company stock price data. The results obtained from the explicit finite difference method will then be compared with the analytical method calculated using the Black-Scholes model. The analysis of the Black-Scholes equation using the explicit finite difference method highlights its performance and stability across different time steps. Using a grid partition of $\Delta t = 5$, the method closely approximates the analytical values at $\Delta t = 0.2$, resulting in minimal error with 0.0189 at $\Delta t = 300$ for both Call and Put Option with mean of the error analysis are 1.0014 for Call Option and 0.2080 for Put Option. But the result significantly deviates at $\Delta t = 1$ for both Call and Put Option. Leading to the largest error with 24.7095 at $\Delta t = 120$ and the mean of the error analysis is 13.0183 for the Call Option. And for the Put Option, the largest error is 16.2287 at $\Delta t = 60$ and the mean of the error analysis is 6.2927. This result consistent for both call and put options reinforce these findings, indicating that while the explicit finite difference method provides accurate approximations at earlier time steps.

Keywords : European Option, Black-Scholes Equation, Finite Difference Method, Option Pricing, Explicit Method.

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