UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

THE APPROXIMATION SOLUTION OF LINEAR BLACK-SCHOLES EQUATION BY NUMERICAL METHOD

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IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

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ABSTRACT

Linear Black Scholes model is a partial differential equation in financial mathematics. This report is discussed about a solution method for the Black Scholes model with the European options call as boundary problem numerically. For numerical approximation, a weighted average method was used to solve the model by using different weights. Firstly, the approximation solution was obtained by using a Finite Different Method then followed by a weighted average technique. After that, the numerical results for the European Call options was presented. The results for the Finite Different method showing that if there is increasing in time, the value of the options, V(S, t) also increases but value of the options have the different results when using a weighted average method. Finally, the research continue by doing some changes in parameter of Black Scholes to determine the value of the options

1 INTRODUCTION

1.1 Research Backgroud

Black Scholes model is a powerful tool for valuation of equity options and being represented as linear partial differential equation. Besides that, Black-Scholes equation is known as one of the model that gives significant contribution in the financial field. The Black-Scholes model firstly was developed by Fisher Black and Myron Scholes in the early 1970's and Robert C. Merton was the first person who published a paper on develop the mathematical understanding of the options pricing model where his paper known as "Theory of rational option pricing". This equation is used to estimates the price of the options over time. Besides that, the Black Scholes equation allowed the financial professionals to estimate the value of the financial products, based on the properties of the derivatives.

The derivative is a security with a price that is depending on one or more underlying asset. The underlying asset is the one of financial instrument such as stock or commodity which is the price based on derivative's price. The major idea of this model is to reduce any big losses or get suffered by an individual or organization for the option by buying or selling the underlying asset to eliminate risk. The objective is to determine the price of stock that fair for the both of buyer and seller. Stock price is the cost that buyer need to pay for a security on an exchange. There are a few factors that will influence the stock price including volatility in the market, current economic conditions and popularity of the organization.

There are two types of boundary problem which are called as European call option and American call option can be consider on solving the Black Scholes model. An European option is an option that only can be exercised when it at matured time while an American option can be exercised anytime between the purchasing and expiring date. This paper are focusing on solving the model with the European option as the boundary problem. This paper is very motivated to solve Black Scholes model numerically. In the previous study, most of the researchers solving