Binomial Pricing Model

montgoing17

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1 Introduction

Pricing any trad-able asset is difficult since stock prices experience change nearly every second. There is therefore a need for a mathematically proven (reliable) model to evaluate stock prices, a model which reduces possibilities of price changes and removes the possibility for arbitrage- to create a nearly perfect if not perfect market efficiency. The increase and decrease in stock prices are due to many economic factors of which some affect the stock price model resulting in a non-deterministic system. What happens when stock prices are affected by uncertainties? Which is the best tool to use in addressing the inefficiencies of the resulting model?

We study the Binomial Pricing Model to tackle this problem. The model was first proposed by Cox, Ross and Rubinstein in 1979. Essentially, the model uses a "discrete-time" (lattice based) model of the varying price over time of the underlying financial instrument. The model has a comparative usefulness over other models, first it can handle a variety of conditions for which other models cannot be easily applied. For example as compared to Black-Scholes formula it is a relatively slower model in calculating the stock prices however at an advantage since the mathematical formula is easy to use. Furthermore the calculations are more accurate because market developments can be inserted in the ongoing binomial model and thus the calculation will be more in sync with the actual market developments.

In this project our aim is to investigate the Binomial pricing model, its usefulness and applications on stock price dynamics, how it relates to different financial models of stock price (differences and similarities). The limitations thereof if any. We first define some miscellaneous lemmas(theorems) for some useful models and ideas, such as the Mathematical model for the Brownian motion. Modelling of stock price dynamics (rates of change of stock price) using stochastic process. We note that these axioms, lemmas theorems and concepts are not our main topic of interest, however they are to help facilitate our presentation of the Binomial Pricing model. The results obtained shall help us establish a simplified version of the model, easily understood by the reader together with its applications.

In the first chapter we shall define stock price dynamics, derivative as a rate

of change, differential equations and their solutions, deterministic and non-deterministic models and many other lemmas and comments which will be found useful in developing our model. We then move to the second chapter where we shall discuss in full the Binomial Pricing model. Finally will present conclusions from our presentation together with the applications of the model.