TJHSST Senior Research Project
Investigating Black-Scholes with regards to Basic Financial Instruments
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Abstract

This project investigates creating an application that downloads stock information from the Internet and applies to it the famous Black Scholes algorithm, outputting the result. The Black Scholes algorithm is used in modeling price variaton over time of securities that are heavily traded. This application prompts the user for one of several available heavily traded stocks, pulls that stock's information from the Internet, and applies the Black Scholes algorithm to it. The goal of this project is to create an easy to use application that gives the user not just stock information but to an extent objective stock advice.

Keywords: genetic algorithms, algorithmic composition, data importing

1 Introduction

1.1 Rationale

There are many applications avaialble to download stock information, but how many are available that also include mathematical models of price valuation? This projects attempts to revolutionize mobile stock information by providing with easy access financial behavior predictors.

1.2 Purpose

With the contemporary movement of smart phones marching through telecom, the Internet is racing to go mobile. More and more mobile applications are being developed that provide handy services while keeping the memory stamp and total size to a minimum. One basic mobile app is downloading stock data in the hope of providing investors with updated information on their portfolio on the go. This project attempts to improve upon that application by providing not only stock information but also the results of a financial algorithm.

1.3 Importance of Topic

The proliferation of mobile computing is leading us into a world where people try to stay productive 24/7. Giving these peopole more comprehensive information will lead to increased productivity and hopefully increased economic growth.

2 Background

To appreciate this project, one must first have an understanding of the Black Scholes option pricing algortihm. The model operates on the premise that the price variation of stocks and other financial instruments that are heavily traded follow simple Brownian motion, with constant velocity and drift. Treating the price of stocks as simple mathematical functions allows one to attempt predicting the behavior of such stocks.

1. Brownian Motion is defined as the random movement of microscopic particles suspended in a liquid or gas, which is caused by collisions between the suspended particles and the surrounding medium. In other words, Brownian Motion is a way of looking at random flucutations, which is one reason the stock market is often cited as a real world application of this concept.

2. Black Scholes in this case involves four variables– the constant price variation of the stock, the time value of money, the option's striking price and the time to the option's expiry.

3. Black Scholes was discovered in 1973 by the men after whom the model is named: Fischer Black and Myron Scholes. Scholes and Robert Merton, the man who further developed the model, won the Nobel Economics Prize in 1997 for their work. The model was developed shortly after the introduction of options trading, which led many to be skeptical to the effectiveness of the algorithm. The use of stochastic differential equations, however, proved to be exceedingly effective.

4. Much of the contemporary research surrounding Black Scholes has to do with attempting to improve the algorithm. Black Scholes operates on several restricting assumptions. One is that the volatility of the stock will remain constant. Another factor that the Black Scholes model does not take into account is risk aversion: the idea that the seller will want to avoid risk and adapt his/her behavior accordingly.

3 Procedure/Methodlogy

First the user is prompted for a stock symbol through a JDialog box. Once entered, the program imports the source data for the page of that specific stock from Yahoo! Finance. The source code is parsed into a String, and the program then seaches the string for relevant information (such as the last trade price) due to previous identification. Once the relevant variables have been identified, the Driver calls on the Black Scholes class to run the algorithm. The result is then outputted to the user along with the last traded price.

4 Expected Results

The expected result of this program is returning the output of running stock prices through the Black Scholes algortihm along with the stock's price and other key information, in an attempt to give the user objective stock advice. Future experimentation may involve adapting this program to be made into a mobile applications so operating systems such as Blackberry and iPhone can run the program and give their users the chance to use the program.

5 Current Results

At this point I am able to read in stock information from Yahoo! Finance, with the specific stock inputted by the user. So far I have only been able to read in the stock price and other information for the most recent update to the Yahoo! Finance page. The program then stores the last trade as a double, and it prints out the information as well. The program also only works if the user inputted stock symbol is entirely lower case. This is because I use the user input to find the information from the source code of the Yahoo! Finance webpage that I import. In the source code, the symbol is lower case. For development purposes, the program currently prints out the entire source code of the Yahoo! Finance page as a string. The program also loads a GUI that allows the user to promp the program to run the Black Scholes algorithm.

6 Moving Forward

I have a clear plan moving forward. The first step is figuring out a way to access historical data for the stock the user chooses. As Black Scholes measures price variaton, it is important to have historical data to get better results from the algorithm. Additionally, I want to download some graphs or figure out a way to display a graph so that I can provide the user with more easy-to-read information.

6.1 Software

I will be using Java for this program, because it is supported by almost every operating system and therefore can expose the program to more people.

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