

Stock Market Analysis using Data Visualization

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Abstract: Stock market is an important part of the economy of any country. People generally use stocks as an investment and try to get a profit out of them. Investing in the stock market is a huge risk-return. One bad decision can lead to huge losses while one good decision can result in good profit. To make sure that our investment decisions are not bad, one must choose the right stock. In this project we have tried to do the same. We have incorporated the functions to view data like closing prices, highs, lows etc. Using this data one can know the general trend of some stock but how to know whether the stock is risky or not. In this paper, we implemented two algorithms, namely Bootstrap method and Monte Carlo simulation for risk analysis.

Keywords: Correlation, Monte Carlo, Probability, GBM, Normal.

I. INTRODUCTION

Humans since a long time back have used pictures to represent information and today it has become a very big, hot topic in computer science in the form of data visualization. [1]. Visualization is the graphical representation of information while providing an analysis of the data in graphical form so that the user can draw a conclusion from it. Information visualization is something related to finding relationships between numbers, datasets and functions. Numerical data analysis needs specialized knowledge to draw out information out of them. On the other hand, it is easier to understand the visual representation of data. We can easily find out relations and trends in data in this manner as we use our visual senses which is more familiar to us. Pictures generally mean more to humans and is easier and faster for us to analyze and understand.

Stock analysis is the analysis of a particular stock, stock sector or the whole national market and one of its key parts is finding out risks associated with stocks and the future prices of stocks as well. If done and utilised in a proper manner, it can be used to gain profit and avoid loss. Monte Carlo simulations is a method used to find the probability (or set of probabilities) of different events which cannot be easily determined due to the interference of several random factors. It is used to find out risk and uncertainty of risk.

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II. LITERATURE REVIEW

Free Cash Flow Analysis: It is a way to look at the flow of cash to find which cash is available for use and the status of the other cash also. It can used to determine how much cash can be taken out from a company without disrupting its operations. It is a very useful method for risk analysis, however a major drawback of this is that it does not attempt to predict the future and so we do not consider possible situations and depend only on previous data. Value at Risk (VaR) [15] helps us find the risk in financial assets. It estimates how much a set of investments might lose, given normal market conditions, in a set time period such as a day. VaR is typically used by firms and regulators in the financial industry to gauge the amount of assets needed to cover possible losses. It is an improvement over FCFF as it is a quantitative measure compared to FCFF but it retains the same drawback i.e. it does not consider possible situations of the future.

Geometric Brownian motion (GBM) [2] is a process where the logarithm of a time changing value follows Brownian motion with drift. This is an innovation in stock market analysis as it is the first predictive model in stocks. However, it is not very reliable. Monte Carlo simulation [2] can be used to find probability and simulate uncertain situations. However, we can only analyze the maximum risk and confidence level from using plain Monte Carlo simulation.

Afterwards, an even better method was found which used Monte Carlo simulation as a basis called geometric Brownian motion. It beats all the previous methods in the aspect that it uses techniques of Monte Carlo simulation to predict risk, can be used to build a predict model, which though not always correct but is more reliable compared to the previously used method's.

III. PROPOSED METHOD

In this paper, we predict the risk by using the Bootstrap method and Monte Carlo Simulation. Firstly we Store stock prices in database and Retrieve data from database. Then Plot the closing prices of a stock. Calculate the moving averages for given days and daily returns. We Correlation between different stocks and predict Risk analysis by Bootstrap method and Monte Carlo simulation.

We have used Python as a base for our project with MySQL as the database. We have connected these two using a Python library called SQLAlchemy. We are getting the requested stock data from Yahoo Finance through Pandas and storing this data into our database. Then we use the data in the database to illustrate this data in different ways and finally we show risk analysis using two different algorithms, Bootstrap and Monte Carlo simulation.

Table1. Stock data

Enter Stock quote: aapl	Date	High	Low	Open	Close	Volume	Adj Close
0	2017-10-16	160	157.65	157.9	159.88	2.41215e+07	157.499
1	2017-10-17	160.87	159.23	159.78	160.47	1.89973e+07	158.08
2	2017-10-18	160.71	159.6	160.42	159.76	1.63742e+07	157.38
3	2017-10-19	157.08	155.02	156.75	155.98	4.25842e+07	153.657
4	2017-10-20	157.75	155.61	156.61	156.25	2.39741e+07	153.923
5	2017-10-23	157.69	155.5	156.89	156.17	2.19843e+07	153.844
6	2017-10-24	157.42	156.2	156.29	157.1	1.77572e+07	154.76
7	2017-10-25	157.55	155.27	156.91	156.41	2.12071e+07	154.08
8	2017-10-26	157.83	156.78	157.23	157.41	1.70005e+07	155.065
9	2017-10-27	163.6	158.7	159.29	163.05	4.44542e+07	160.621
10	2017-10-30	168.07	163.72	163.89	166.72	4.47008e+07	164.237
11	2017-10-31	169.65	166.94	167.9	169.04	3.60468e+07	166.522
12	2017-11-01	169.94	165.61	169.87	166.89	3.36378e+07	164.404
13	2017-11-02	168.5	165.28	166.6	168.11	4.13934e+07	165.606
14	2017-11-03	174.26	171.12	174	172.5	5.93986e+07	169.931
15	2017-11-06	174.99	171.72	172.37	174.25	3.50263e+07	171.655
16	2017-11-07	175.25	173.6	173.91	174.81	2.43615e+07	172.206
17	2017-11-08	176.24	174.33	174.66	176.24	2.44095e+07	173.615
18	2017-11-09	176.1	173.14	175.11	175.88	2.94826e+07	173.26
19	2017-11-10	175.38	174.27	175.11	174.67	2.51455e+07	172.687
20	2017-11-13	174.5	173.4	173.5	173.97	1.69821e+07	171.995
21	2017-11-14	173.48	171.18	173.04	171.34	2.47825e+07	169.395
22	2017-11-15	170.32	168.38	169.97	169.08	2.91581e+07	167.16

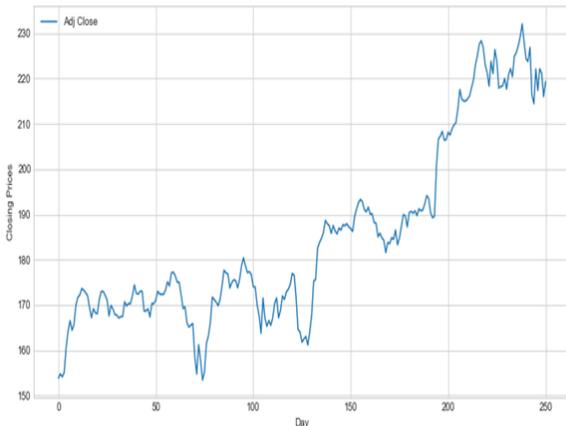


Fig4. Closing Price of Stock

The Figure4 shows the Adjusted Closing prices of the stock for last one year. An Adjusted Closing price [17] is a stock's end cost on some random day of exchange that has been corrected to incorporate any circulations and corporate activities that happened whenever before the following day's open. For instance, an organization choose to part the organization's stock two-for-one. Along these lines, the organization's shares outstanding increment by a various of two, while its offer cost is isolated by two. In the event that a stock shut at \$200 the day preceding its stock split, the end cost is changed in accordance with \$100, or \$200 isolated by 2, per offer to demonstrate the impact of the corporate activity.

For fourth option: Find moving averages for given days

Input: Stock Quote and No. of days



Fig5. Moving averages for given days.

A moving average (MA) is a broadly utilized marker in technical stock analysis that allows us to filter sudden random spikes in stock data which distort the trend in stocks. So, the Graph in blue is the graph for prices and the Graph in orange is the graph for moving average, which shows that the general trend is "Increase in prices".

For fifth option: Daily returns

Input: AAPL

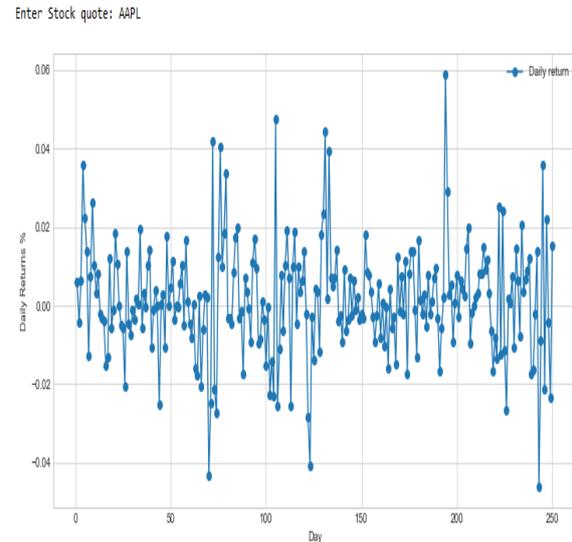


Fig6. Daily returns

A Return or a Financial Return is simply known as the money made or lost by investing in a stock over certain period of time. We can find return by simply finding the ratio of profit/loss and its last price. Y-axis here shows the return% of Apple stock for one year.

For Sixth Option: Correlation between different stocks

Input: AAPL FB TSLA

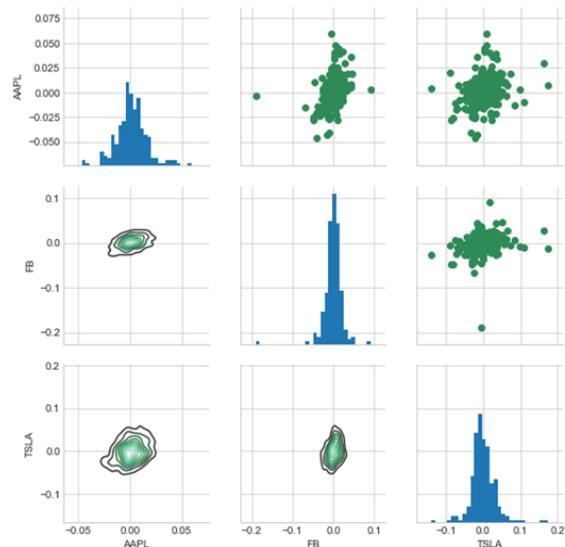


Fig7. Correlation between different stocks

As we know that denser and more linear the points are, more is the Pearson's correlation coefficient, we can tell that Apple and Facebook are most correlated. In contrast, Apple and Tesla are least correlated. Whereas, Tesla and Facebook are moderately correlated.

Stock Market Analysis using Data Visualization

For seventh option: Risk analysis by Bootstrap method
 Input: AAPL and Confidence percentage

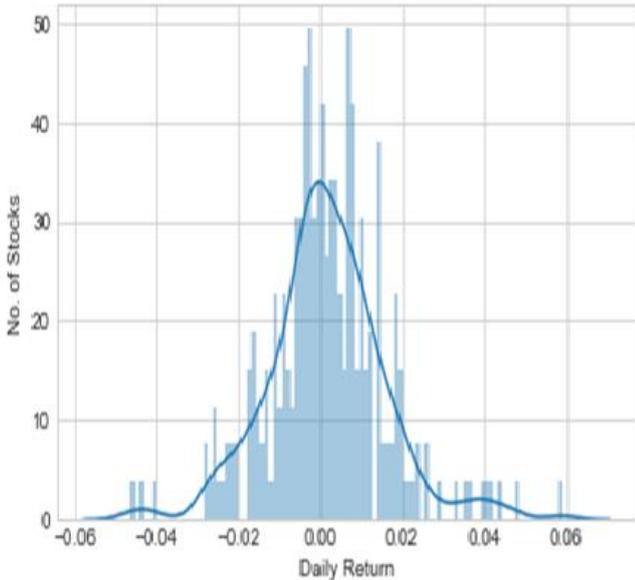


Fig8. Risk analysis by Bootstrap method

Or simply we can say that out of all the prices we have, what is the minimum return, above which 95%(say) of the prices reside.

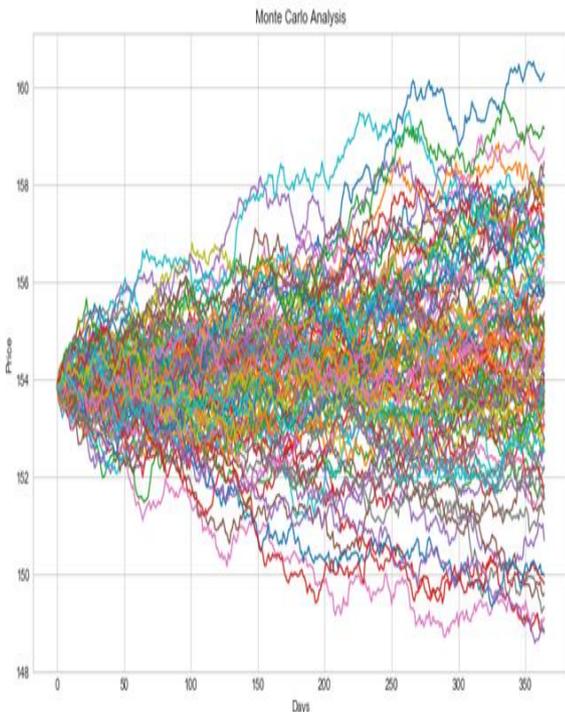


Fig9. Risk analysis by Monte Carlo simulation.

This was just a demonstration of how the graphs will look like for 100 runs. But for better results we have to calculate the average for at least a thousand possible values.

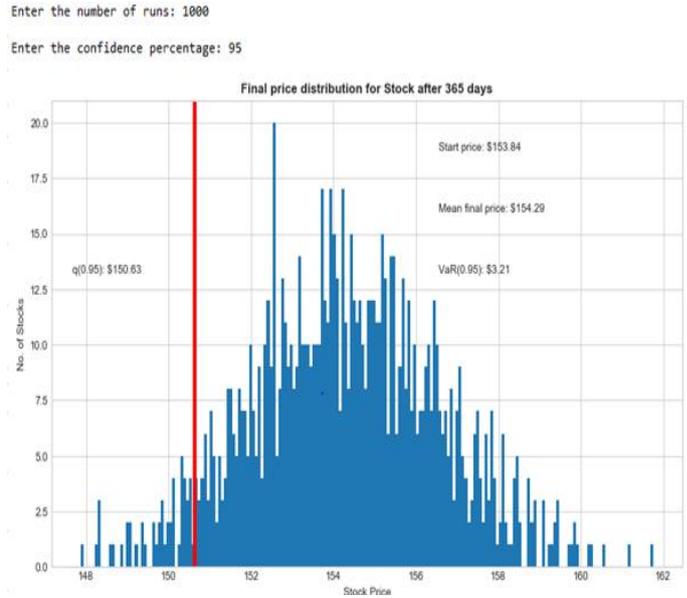


Fig10. Price distribution of the stock

From this graph we can say that for stock Apple, if the start price is \$153.84 then after one year the price should be \$154.29. And with 95% confidence we can say that the loss would not be more than \$3.21 i.e. your final price should not go below \$150.63.

If we compare Bootstrap algorithm and Monte Carlo Simulation, the Bootstrap algorithm is purely based on the past stock prices whereas Monte Carlo simulation works on both the average of the past prices and random value generation over huge number of runs and then taking the mean of those numbers.

Table2. Comparative Analysis

METHOD		CONFIDENCE	VALUE AT RISK
Stock Apple (AAPL)	Bootstrap Method	95%	\$3.47
	Monte Carlo Simulation	95%	\$3.36
Stock Microsoft (MSFT)	Bootstrap Method	95%	\$1.78
	Monte Carlo Simulation	95%	\$1.54
Stock Tesla (TSLA)	Bootstrap Method	95%	\$16.27
	Monte Carlo Simulation	95%	\$20.60

V. CONCLUSION

Stock analysis is one of the most important things in the finance sector. Different graphical representations and mathematical calculation can avoid bad investments and forecast future prices. We saw graphs for Moving Average and Daily Return.

We also saw correlation plots that show us how two different stocks are dependent on each other. For risk analysis we saw two different algorithms that are Bootstrap algorithm and Monte Carlo simulation. Bootstrap method predicts the risk using past data which is not a practical approach. Monte Carlo simulation creates its own possibilities for hundreds of times following a mathematical formula and then gives the final price after averaging the prices of each test case. Hence, we can conclude that Monte Carlo Simulation is better than Bootstrap method.

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AUTHORS PROFILE

Bharat Gupta, I am 20 years old. I've been born and brought up in New Delhi, India. I live in a joint family which includes 5 members – My father, mother, sister, grandmother and me. Currently, I am pursuing Computer Science Engineering from VIT Vellore. My hobbies include skating, swimming, chess, lawn tennis, badminton and table tennis. I have been an international level chess player..



Shefali, is a student of 3rd year BTech Biomedical at VIT Vellore. She is an 19 year old from Delhi. She is the recipient of Scholar's Gold Certificate for seven consecutive years during her school days and also won a Silver Medal in French Olympiad. Shefali has completed her schooling from DPS RK Puram and cleared her CBSE with a percentile of 93.2%. As a person she is always willing to learn new things in life.



Dr. K.Govinda. Associate Professor in VIT from 2005 to till date, received the degree in computer science and engineering from Nagarjuna University in 1998. M.Tech from JNTU, Hyderabad. Life member in CSI, IEEE and ACM. Published 100 + papers and participated in 50+ conferences. Interest area include Database, Data Mining, Cloud Computing, IOT and Big Data.



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