

## Forecasting the prominent, fluctuating and declining stock prices using a numerical approach

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**Abstract:** Stocks and shares play a major role in the economic and financial scenario of a country. When there is a change in the usual economic situation due to any unplanned events or circumstances, the changes in stocks becomes the most prevailing topic. The financial crisis is a major issue that adversely affects most nations. The stock market is a major part of an economy, and when that faces a financial crisis it may lead to a rapid fall in business. Hence, the topic is always an interest of study for the businessmen and academicians across the globe.

At present, the stock markets are adversely affected due to the pandemic situation. In this scenario, any type of prediction is helpful. So, we have considered the method of forecasting, which is a powerful tool in estimating future values. This helps investors to overcome significant capital losses. In this paper, we discuss the extrapolation method using mathematical software. It is used to forecast high and low stock prices for upcoming months from the data collected from nseindia.com. Stock market analysis helps the investors to identify the worth of a stock before investing it

**Keywords:** stock prices, forecasting, prominent stocks, declining stocks, fluctuating stocks

### 1. Introduction

Numerical Analysis is used to solve mathematical problems through equations using numerical methods. This is a branch of mathematics that analyzes and implements solutions to the simulated problems. There are different kinds of mathematical problems requiring numerical results, some can be simple and some complicated. Numerical methods are widely used, as they give an approximate solution to a problem for which it is difficult to find an exact solution. These methods are highly capable of handling large systems of equations, non-linearities and complicated geometries. Due to this reason, numerical methods are one of the most powerful tools in the field of engineering. The first known use of numerical analysis was in the year 1853. Then the application extended to the field of Physical sciences, Life sciences, Medicine, Business etc., accompanying various disciplines in Mathematics like ODE, PDE, operation research etc... Numerical methods can truly bring magic, even though some of the methods are time-consuming and the errors of approximations are acceptable. In short, we can say that numerical methods are the best way to find solutions closer to answer without even knowing the exact solution.

In this study, we discuss the importance of prediction in the stock markets using data sources. Prediction in the stock market always provides financial benefits. Here, we are using numerical methods for the prediction which can provide future movement of the stock value of a financial exchange. Stock is a financial instrument that describes the ownership share of a company. When you are purchasing a stock, you are buying a piece of that company. All those who purchase a company's stock are looking for financial gain. They are trying to be a part of that company. The stock market is considered as one of the best ways to build wealth, if the person invests wisely. Otherwise, it will lead to significant capital losses. Since the stock market is all about having confidence in taking risks, it will be too safe if you are able to predict the rising and falling of stocks successfully. Prediction plays an important role in the stock market since it is a complicated and challenging process due to the dynamic nature of the stock market. If we can successfully predict the future value, it will lead to a significant profit.

### 2. Literature Review

In the paper entitled "Stock Market Prediction Using a Linear Regression", the methods like Linear Regression, Polynomial Regression and RBF Regression are used for forecasting TCS dataset behavior on databases, collected from TCS stock database. Comparison of the confidence values of various regression methods is carried out. They have also used Python for the time series plot of trading values. On the basis of the analysis, it is concluded that linear regression model provides the best result compared to polynomial Regression and RBF Regression, which can help the stockbrokers and investors for investing money in the stock market [1].

The Interval method is used to forecast the stock market, in the research work "An Application of Interval Method to Stock Market Forecasting". This helps in improving the market forecasting quality. For a given time period, interval and stock market value of macroeconomic variables changes with time. Therefore, the paper

discusses the interval forecasting with interval method instead of traditional point method. C++ is practiced to conduct empirical experiments [2].

The details collected from *Reddit* and the numeric data from *Yahoo! Finance India* are investigated in the article "Examining Effects of Pandemic on Stock Market Trends through Sentiment Analysis". The proposed model and the activities related to Sentimental Analysis are carried out using 'Python' and 'Textblob algorithm'. The result shows that the model can predict market trends since there is a strong relation between news on pandemic and share prices in the stock market. Also, the model may help in improving the accuracy of prediction in the trends of the stock market [3].

Investigators use online information to predict the stock market with the help of textual financial analysis and research information in the paper "Daily Stock Market Forecast from Textual Web Data". The quantitative forecasts are predicted using statistical techniques and regression analysis. Technical analysis helps to foresee the future of the stock market. Forecasting is carried out based on the real-time textual web data. Trading strategy is dependent on fluctuating market values and the performance of forecasting systems [4].

The research paper uses Artificial Neural Networks (ANN) to predict Istanbul Stock Exchange market index value. The performance of ANN models are carried out by coefficient of determination. The authors have also done a comparison of the ANN models with Moving Averages (MA) models. The conclusion states that ANN models are more accurate than MA models for prediction in the stock market after calculating mean relative percentage error [5].

In the paper entitled "Clustering and Regression techniques for Stock Prediction", the data collected from NSE and selected the best companies out of that. Certain partitioning techniques and model-based techniques are used and compared. Concluded that K-means algorithm is the best partitioning technique and EM (Expectation-maximization) algorithm is the best model-based technique. Stock prices are predicted using Multiple Regression [6].

A prediction model is implemented in this paper using historical data and stock related information from social media, news articles and financial reports. Variance of closing price is incorporated for better prediction. Supervised machine learning technique named K- nearest neighbors (KNN) achieves better prediction accuracy. Naive Bayes classifier is used to identify the sentiments of news dataset [7].

In this paper the author predicted the stock index movement using the data collected from several global financial markets using machine learning algorithms. The paper also suggests the high efficiency of numerical results. And also the model can generate higher profits [8].

### 3. Data

It is a very difficult task for traders, investors and firms to predict which stocks will give a higher payoff. We know that there is no simple way to predict the behavior of the stock market. There can be numerous factors for the rise and fall of stock prices in a stock market. So the best way to analyze the fluctuations in the stock market is to study the stock market trends. Depending on overall market trends and certain other factors, we can see various behaviors of stock markets.

Basically, the behaviors of the stock markets are divided into three. They are :

- Prominent markets
- Declining markets
- Fluctuating markets

The prominent markets are all those markets having an overall rise/ growth in the stock market. They are also referred to as 'The Bull market'. The reasons for this growth can be the economic and political stability and the industrial growth. This growth will increase the confidence of the investors and hence, they will be investing a huge amount. It will increase the demand of the market. When the market behaves in such a positive way, more and more traders and investors will come forward to invest in the market.

The Fluctuating markets are those markets having a rise and fall at the same time for a particular duration. This is the most critical time for a market. They can bring a further growth or further decline in the market on the basis of how they act. In general, these fluctuating markets are affordable to layman. The share prices fluctuate due to varying demand and supply. Also, the stock market trend fluctuates when it gets influenced by the news related to elections, fear of consumers, upcoming change in social situations like calamities, wars etc...

The Declining markets are those markets having a rapid fall in stocks. The reason for the decline can be the slow-moving economic growth, political confusions and some unfavorable news. The investors feel high risk in

investing in such a market which is moving in a negative way. Since the investors pull out from investing, there is a huge chance for the market to face the same decline further.

As these trends can happen anywhere, at any time, an investor should have an idea of the market trends and also should have clarity about the changes that can happen in future, which will help them for safe investing.

We have collected the data from NSEINDIA.COM, which is the official site of stock exchange of India. Six companies were selected on the basis of their stock price behavior. Considering the behavior, the stocks are divided into 3 categories i.e., Prominent, Declining and Fluctuating markets.

Prominent stocks are those, which the laymen prefer buying than selling. From the collected data, we have chosen two of the prominent stocks -Asian paints Limited and Infosys Limited. These companies show increased stock price.

Declining stocks are those, which stands a higher chance of selling rather than buying. Apparently, from the data, South Indian Bank and HMT Limited are the high risky stocks.

Fluctuating stocks are those stocks whose price keep on rising & falling irregularly for a given short time period. Two examples of the Fluctuating stocks from the data are Radha Madhav Corp. and Goldstone Techno. The website displays the data of around 1600 companies, of which almost 1300 are presently active. Due to the time constraints, we have selected two companies each, for the different stock types for our study.

Since the available dataset on the website is so large, there is scope for extending this study by considering various other firms/stocks etc.

#### 4. Methodology

Forecasting is the process of collecting past and present data to make a prediction for the future trends. Forecasting is a challenging process and is uncertain at times. For accurate forecasts, the data must be up-to-date and flawless.

The forecasting methods can be categorized into two - qualitative methods and quantitative methods. Qualitative forecasting method is a statistical method, where we use information provided by experts, rather than the numerical techniques.

For this method, senior industrialists and other experts provide their experiences, opinions and judgements regarding the business pattern and behavior of clients. Quantitative forecasting methods use numerical analysis for the predictions about the future. These methods depend upon mathematical calculations. The more accurate the data, the more easier the prediction will be.

There is always a positive relationship between financial markets and economic growth. Movements in the stock market depend upon many components such as Macro-economic factors, International events and Human behavior. Therefore forecasting stock returns is a challenging task. If an accurate prediction can be done by a forecasting model/technique, the chances of risks in investments, uncertainties in the markets etc., becomes lesser.

There are certain ways for predicting stock price movements, of which Fundamental analysis and Technical analysis are prominent. Fundamental analysis is a forecasting method based on the financial analysis of companies or industries. Next one is technical analysis that uses historical data and predicts the future prices based on assumptions. Nowadays, with the advent of digital computers, forecasting has transformed from technical to technology aspects.

Recently, people are widely using computer algorithms for prediction. Artificial Neural Networks (ANN) and Genetic Algorithms (GA) are the most prominent methods used in the technical area.

There are also methods in which people collect secondary data from the internet and later predict the price changes in stock and other financial markets. When the obtained data is higher dimensional, people use time series aspects by structuring. Hence forecasting the trends on various stock markets.

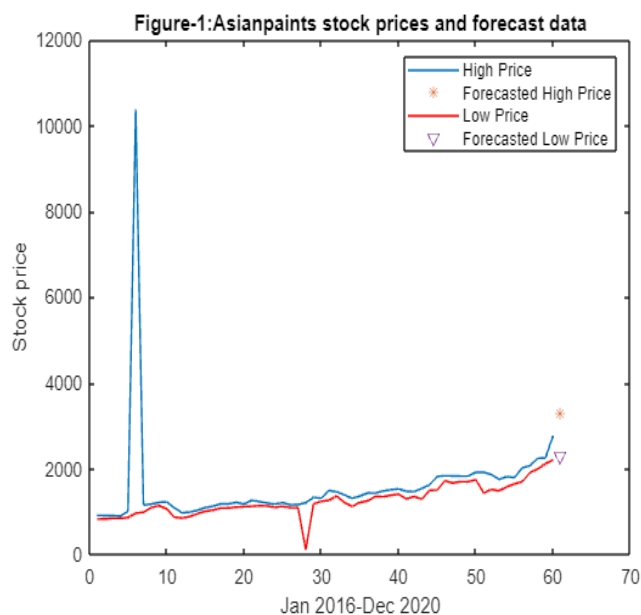
#### 5. Analysis

We are analyzing the data for the six major stocks and their according trends. Firstly, we discuss the behavior of the two *prominent* stocks -Asian paints and Infosys.

**a) Asian paints**

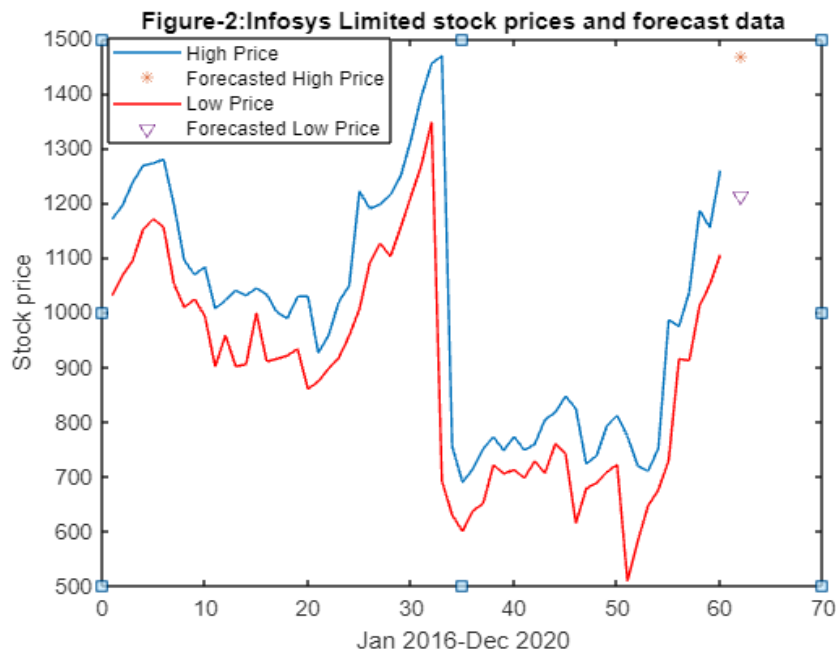
The prominent trend of stock market prices of Asian paints is considered from the period 2016 January to 2020 December, collected from *nseindia.com*. We have created the MATLAB code and obtained the corresponding graph which represents the high stock prices and low stock prices of Asian paints for the given period. The blue and red curve in the graph shows the high stock price and low stock price of the company respectively, for the given time duration. In the code, months from 2016 January to 2020 December is represented as the numbers from 1 to 60 successively. When we compile the code, the user is asked to enter the number corresponding to month as the input. Then, we obtain the corresponding high stock price and low stock price of that entered month. The plot is also constructed, which consists of stock prices for the given duration and the forecasted prices. The new forecasted value gets marked separately.

For example, when we consider the input value as 75, the number corresponding to the month of March 2022, the high stock price and low stock price of the respective month is obtained. For cross-checking whether the obtained solution is approximate, we consider the months inside the range of the data entered. We have verified the high and low stock prices for the months with the output values and found that they match the original data. This increases the chance of forecasted stock prices to be correct as per our code. The obtained plot is given below (Figure-1). The forecasted high price is displayed as an asterisk symbol \* and the low price as ▽.



**b) Infosys Limited**

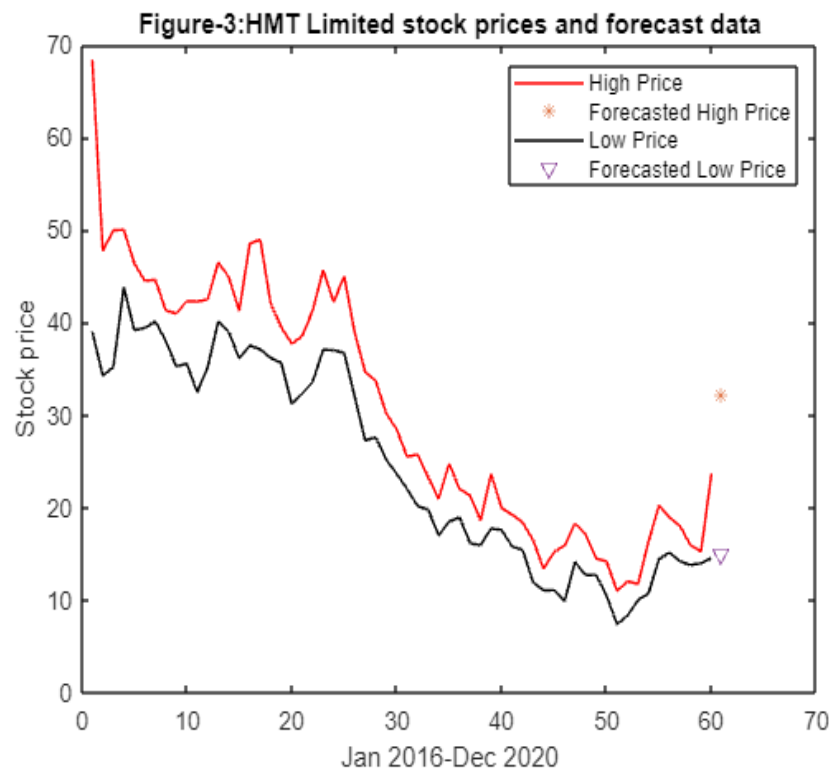
The graph of the data collected from the national stock exchange official website of India, showing the stock market trend of Infosys Limited during the period from 2016 January to 2020 December is displayed below (Figure-2). We used MATLAB for generating the graph, in which the blue curve is showing the high stock prices of the company for the given duration and red curve showing the low stock prices of the same company for the same duration. In the code, we have given the same successive numbering as in the case above. According to the code, users can get the high and low stock prices of the company for the month they are asking for and it will get marked separately in the plot. If 80 is the given input, the output stock prices-high and low, will be corresponding to the month of August, 2022. We can say that the forecasted values can be so close to the original upcoming data, since the output high stock prices and low stock prices for the input values of months between the given duration matches the original data.



Next, we discuss the behavior of two declining stock markets-HMT Limited and South Indian Bank

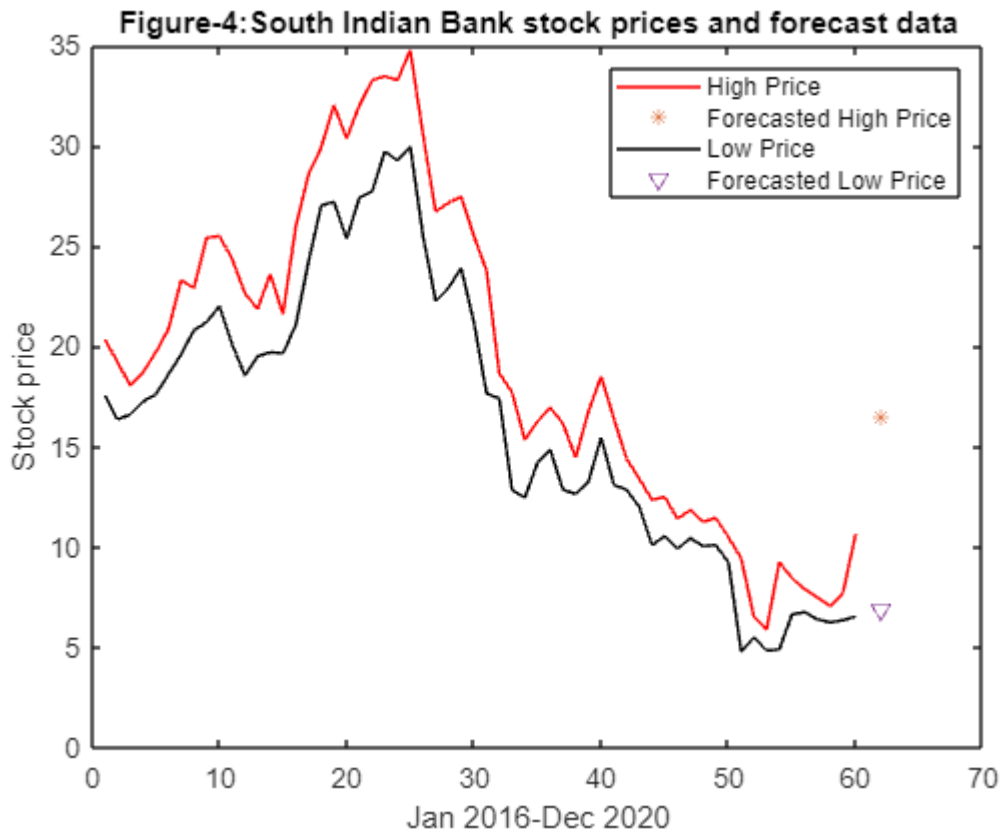
**a) Hindustan Machine Tools (HMT)**

This is the declining stock market trend showing the stock prices of HMT Limited during the period from 2016 January to 2020 December, which is collected from the same website. The red curve shows the high stock price of HMT during the given period and the black curve shows the low stock prices for the same period. We sketch the graph for a particular period using the same numbering format. As per the code, we can find the upcoming high and low stock prices for any number corresponding to the month after 2020 December and it will also get marked separately in the figure (Figure-3). If given an input value 62, the output will give the high stock price and low stock price of the month February for the year 2021. Here also, the chances for the correctness of forecasted value are high.



**b) South Indian Bank**

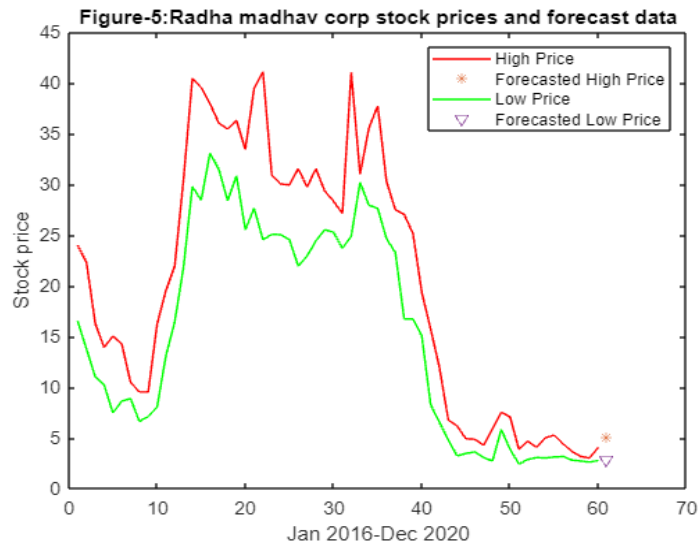
The graph shows the stock market trend of a private banking company- South Indian Bank Limited (SIB) from 2016 January onwards to 2020 December and the data was collected from nseindia.com. We developed a MATLAB code for representing the collected data of SIB. Hence we obtained a graph(Figure-4) where the red curve shows the high stock price of the company and the black curve shows the low stock price during the given time period. Here we give the same successive numbering as in the above case. While running this code, we get the exact value as the collected data if it is between the given 5 years. By using this code, we can forecast high-low stock prices for the upcoming months. For example, let 68 be our input which corresponds to August 2021, the output will be marked separately on the graph. This shows that the accuracy of forecasted values is higher.



Finally, we discuss the behavior of two *fluctuating* stocks- Radha Madhav Corp and Goldstone Techno.

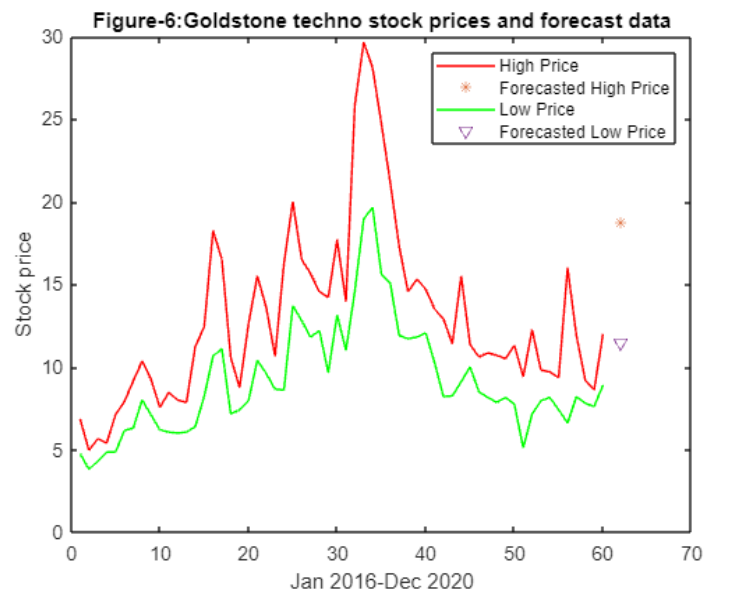
**a) Radha Madhav Corp**

The fluctuating stock market trend of a package manufacturing company, Radha Madhav Corporation Limited (RMCL) from 2016 January to 2020 December is displayed in the graph below and the data was collected from nseindia.com. We generated a code using MATLAB that represents the collected data of the company. Hence we obtained a plot (Figure-5), where the red curve shows the high stock price of the company and the green curve shows the low stock price for the period from 2016 January to 2020 December. The given period is represented as consecutive numbers from 1 to 60 in the code. While running this code, if we give input as the numbers corresponding to the months between these 5 years we will get an output value the same as that of the original data. Also, we can obtain the forecasted high-low stock prices for the upcoming months. For example, 79 be our input which corresponds to October 2021, then the output will be marked separately on the graph. This increases the chances of the forecasted values being more accurate.



**b) Goldstone techno**

The given trend gives the fluctuating stock market prices of an IT service management company, Goldstone Techno for the duration of 2016 January to 2020 December and the data was obtained from the same website as given above. The collected data is represented using a code .The red curve in the graph (Figure-6) shows the high stock price of the company and the green curve shows the low stock price for the period. The period is represented as successive numbers same as the above case in the MATLAB code. We get the exact value as the collected data if the input value is between the given 5 years, as per the code. Also, we can predict high-low stock prices for the upcoming months. For example, if 68 is our input which is corresponding to August 2021, the output will be marked separately on the graph.



**6. Conclusion**

The aim of our study is to forecast the stock prices of selected companies using the previously collected data set. The data set was extracted from the official website of stock exchange of India (nseindia.com). From the collected set, the data is divided into prominent, declining and fluctuating stocks. We generated a code to plot the stock prices and to forecast the data of the selected few companies using MATLAB and the graph is analyzed. According to the code, we can find the high price and low stock prices of a company for any previous and upcoming months. This forecasting might assist the stock traders to get to know about the desired companies’ financial state in advance. Hence, help them to make right decisions regarding the purchase of stocks for better profit.

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