CONSEQUENCE OF DIFFERENT PARAMETERS ON THE HIGH STOCK INDEX OF ALLAHABAD BANK USING DEEP LEARNING TECHNIQUES

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Abstract

Stock market is one of exciting and demanding monetary activities for individual investors, and financial analysts. The stock market is an inter-connected important economic international business. Prediction of stock price has become a crucial issue for stock investors and brokers. The stock market is able to influence the day to day life of the common people. The stock markets contribute a large scope in economic development of India. The banking industry grip majority share between other industries in Indian stock trading consequence. The investors in the stock market use to bear certain risk for their predictable returns in the future. Investment decisions are usually taken by considering different fundamental factors both internal and external. Apart from fundamental factors which replicated in the security prices, there are numerous additional factors that can influence investment are stock prices, volume of trading, spread, turnover etc. The paper explores the effect of different variables on the high stock price of Allahabad Bank considering daily data over the period 4 Jan 2010 to 23 Apr 2020. For the study the "weighted average price (WAP), number of shares, number of trades, total turnover (in INR), deliverable quantity, percent deliverable quantity to traded quantity, spread high and low, spread open and close and the high stock price of the organization" were noted. High stock price was considered as output while other parameters were used as input. Pipeline Pilot module of Biovia software (Dassault Systems of France) was used for analysis. The software provides different built-in components to develop a machine learning model and use the model for prediction.

Keywords: Allahabad Bank, Bombay Stock Market, Deep Learning, High Stock Prices, WAP, Spread, Deliverable Quantity

Introduction

Trading in the financial instruments like share, debenture and bonds of different companies used to be carried out in the capital market. The investors buy and sell on various financial instruments of different companies in the stocks market. As the demand and supply of different stocks in a specific time determines the stock prices, it varies in every minute. Thus, investments in the capital market involve risks as well as uncertainties associated with high level of instability or volatility. The investors in the stock market use to bear certain risk for their predictable returns in the future. As a result investments in stock market involve risk and returns (Savsani and Rathod, 2018). While investing in the stock market, investors respond to the accessible data with them and take the decisions consequently based on their analysis. Investment decisions are usually taken by considering different variables like types of investors, family back ground, age, occupation, sex, income, marital status, risk tolerance capacity, education, demographic environment and advice of financial expert and advisor (Singh and Yadav, 2016). On the other hand, an investor considers internal factors (firm particulars) like company news and performance, industry performance, board structure, asset situation, dividends and earnings and external factors comprising of governmental policies, interest rates, economic outlook, inflation, business cycle, approach of investor, market environments and contingencies like strikes, lock outs etc. before making an investment decision (Graham and Dodd, 1934). Different theories indicate that apart from fundamental factors which replicated in the security prices, there are numerous additional factors that can influence investment are stock prices, volume of trading, spread, turnover etc. (Debasis, 2006). Indian stock market has seen remarkable progress in last three decades in relations of contribution, volume of trade, financial instruments, procedures, dynamics and strategies of investment. The stock market is creating new record by achieving high market

capitalisation in addition to incorporated with the international stock markets. Simultaneously, the various stock markets of different countries inside the economy are getting better (Ashraf and Baig, 2015).

Literature Review:

The literature survey speaks about both approaches of machine learning i.e traditional approaches and hybridization approach in the field of financial stock market prediction. In the traditional approaches mostly one technique were used to address the forecasting the stock market for example only ANN and only BP were used by many authors. But with the hybridization of machine learning techniques leads the scope in improvement in accuracy. Traditional regression methods gives optimal result to some extent but a new hybridization method may give more accurate towards optimal solution but it does not mean that always that 1st method has drawback. As second method gives more accurate towards result, so that method should be adopted in a particular category of problems. In the forthcoming chapters, hybridizations of different methods were adopted to solve optimal forecasting problems of stock market. Since we are adopting different non traditional methods meant for handling large data set, the method consists of two parts. In first part, the re-organization of huge data set is required where as in second part; a suitable optimization technique is used. Bao et al. considered a three-stage process to forecast 6 market index futures. First, they considered a wavelet transformation to decrease high dimensionality stock data to low dimensionality signal data. Second, these data were replicated using a stacked auto encoder. Finally, they used an LSTM to predict stock prices. They confirmed that the performance of the proposed model was better than those of other models, such as RNN, LSTM, and wavelet-LSTM omitted second-stage models. From the literature survey we analyzed that the impact of hybrid concepts has improved the prediction accuracy of financial market. Not a particular combination of methods gives good result always.

Das and Padhy (2015) projected he experimental results using the dataset of everyday's last prices of the COMDEX commodity futures index and it observed that their planned model was very good as well good as camper to SVM and hybrid model of SVM and particle swarm optimization (PSO). Wei-Chiang Hong (2011) presented a forecasting model which combines the seasonal recurrent SVR with chaotic ABC algorithm and investigated electric load forecasting of Northeast China. The study employed here for SVR model to solve the non-linear forecasting problem and the messy behaviour of honey bees, to determine suitable values of the three free parameters of SVR, i.e., C, ϵ, and γ. The performance results of the investigation indicated that the proposed model (namely SRSVRCABC) gives better prediction results than ARIMA and TF-ϵ-SVR-SA models.

Hong et al. (2011) proposed a hybrid model of support vector regression and CGA to forecast the tourism demands. In the proposed model named as SVR-CGA, CGA was employed in overcoming premature local optimum in determining three free parameters of SVR (i.e. σ, ϵ, and C). The empirical results which were evaluated using on MAPE, MAE, and RMSE, demonstrated that the proposed SVRCGA model outperformed other competing approaches on the data of tourist arrivals in Barbados. Kazem et al. (2013) proposed a forecasting model using SVR with chaos-based firefly algorithm for prediction of stock index.Yartey (2008) investigated that the in developing countries the macro-economic issues like income level, gross domestic investment, banking sector development, private capital flows, and stock market liquidity are vital elements for the growth in stock market. The research also indicates that political risk, law and order, and bureaucratic quality are important elements of growth in stock market. Similarly, Hosseini, Ahmad and Lai (2011) observed the associations among stock market indices and four macro-economic elements, specifically crude oil price, money supply, industrial production as well as inflation rate in China and India. Aduda, Masila, and Onsongo (2012) examined the factors influencing the Nairobi Stock Exchange and brought out that, macro-economic features like stock market liquidity, institutional excellence, income per capita, domestic savings and bank growth are vital factors of growth in stock market. While Joshi (2013) in his research suggested that the foremost issues of accountable fluctuation in Indian stock market are investment of FIIs, political condition, growth of GDP, price level changes, liquidity and altered in interest rate. As indicated in the literature that performance of banking sector has an impact on stock market, an attempt is made to study the same. Indian banking industry has recently witnessed the roll out of innovative banking models like payments and small finance banks. The digital payments system in India has evolved in the last decade and with India's Immediate

Payment Service (IMPS), being the only system at level 5, is the Faster Payments Innovation Index (FPII). Allahabad Bank is one of the pioneer public sector banks which are introducing innovative digital platforms for smooth running of the bank. The objective of this paper to analyze the effects of different variables on the high stock price of Allahabad Bank.

Methodology:

3.1   Collection of data:

Data was collected from Bombay Stock Exchange on 23 Apr 2020 at around 9 PM for the period 4 Jan 2010 to 23 Apr 2020 for Allahabad Bank. Data for certain dates were not available. For each of the available dates "weighted average price (WAP), number of shares, number of trades, total turnover (in INR), deliverable quantity, percent deliverable quantity to traded quantity, spread high and low, spread open and close and the high stock price of the organization" were noted. High stock price was considered as output while other parameters were used as input.The data were normalized within the range of minimum and maximum for each parameter such that all the values lie between 0 and 1. The data were randomized and fed into a neural network model.

3.2   Development of Deep Learning Neural Network Model:

The normalized dataset was read using "Delimited Text Reader" component of pipeline pilot. The component was connected to the "Learn R Deep Neural Net Model" component. The output of the model was displayed using "HTML Table Viewer" component. The parameters for the "Learn R Deep Neural Net Model" component were set as shown in Figure 1. The setting for which the experimental output parameter and the predicted parameter were close to a 45^0 line were considered for the final model.

Parameters		
LearnedPropertyName	Predicted_High_Price	
Name	High_Price	
TypeOfPropertyToLearn	Continuous	∨
⊞ UseProperties	AllPropertiesOnFirstData	∨
ROutput	FitSummary ¦ FitPlot	...
⊟ NN Options		
⊞ Method	nn	∨
ActivationFunction	tanh	∨
HiddenLayers	50|50	
⊞ LearningRate	0.05	
Momentum	0.6	
NumEpochs	4000	
MinibatchSize	150	
HiddenDropoutFraction	0	
VisibleDropoutFraction	0	
Seed	123	
⊟ Learn Options		...
⊞ Numeric Distance Function	Euclidean	
Fingerprint Distance Function	Tanimoto	
Model Domain Fingerprint	FCFP_2	
Additional Properties		
⊞ Additional Options		

Figure 1. Parameters for the "Learn R Deep Neural Net Model" component

3.3   Study of Effect of Different Input Parameters on High Stock Price:

Text files were prepared where one parameter was varied within the range of 0 to 1. All other parameters were kept constant at 0.5. The 0.5 value was chosen arbitrarily for the normalized parameter value. Figure 2 shows a sample application developed for the purpose of studying the effect of parameter 1 (WAP) on high stock price.
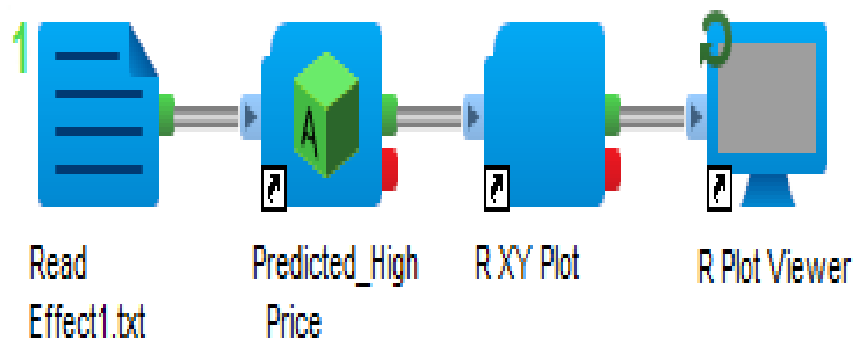

Figure 2. Use of trained model for prediction

Results and Discussion:

Stock prices vary every day due to different market forces. Share prices, on principle, change because of supply and demand. If more people want to buy a stock (demand) than sell it (supply), then the price moves up. On the other hand, if more people want to sell a stock than buy it, the price would fall. However, it is difficult to predict the factors what make people prefer a particular stock and dislike another stock. If an organization's earnings surprise (are better than expected), the stock price jumps up. If a company's results disappoint (are worse than expected), then the price falls. Apart from earnings, the sentiment towards a stock can control its price. The stock prices are volatile and can change due to number of parameters. However, the relationships are difficult to predict. Thus, this study focuses on the effect of various input parameters on the high stock price.

4.1 Prediction Ability of the Model

Figure 3 shows that the prediction ability of the model was good and the predictions were close to the experimental values.
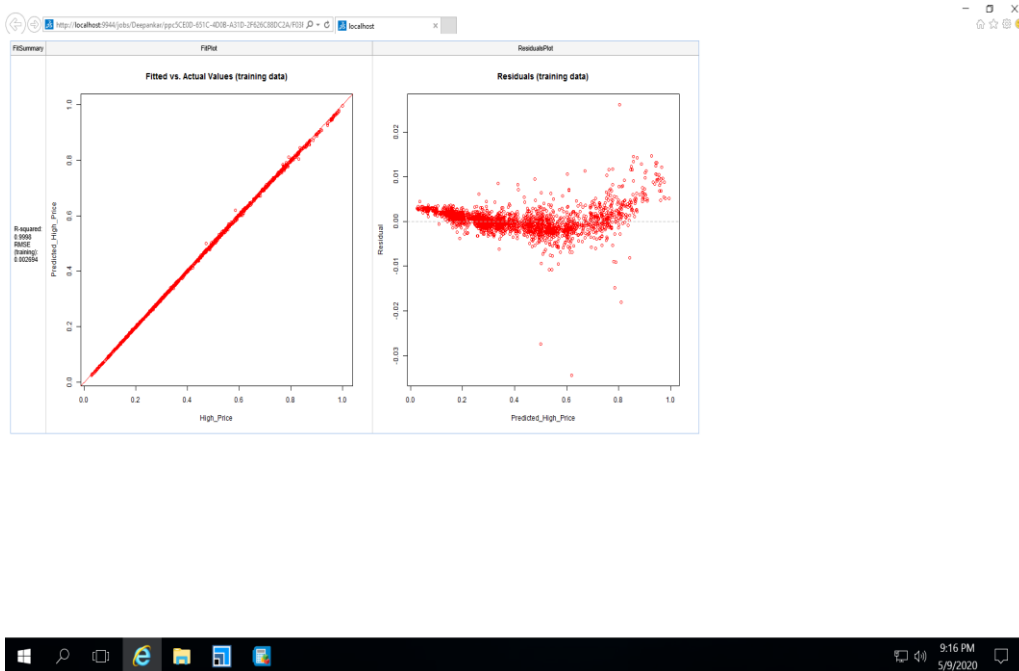
Figure 3. Prediction capability of the model

4.2 WAP

A weighted average takes into account the number of shares purchased with each trade. It is important because it provides traders with insight into both the trend and value of a security. Institutions usually try to buy below the WAP, and sell above it. Thus, WAP controls the stock prices. As expected, Figure 4 shows that an increase in WAP increases the stock prices.
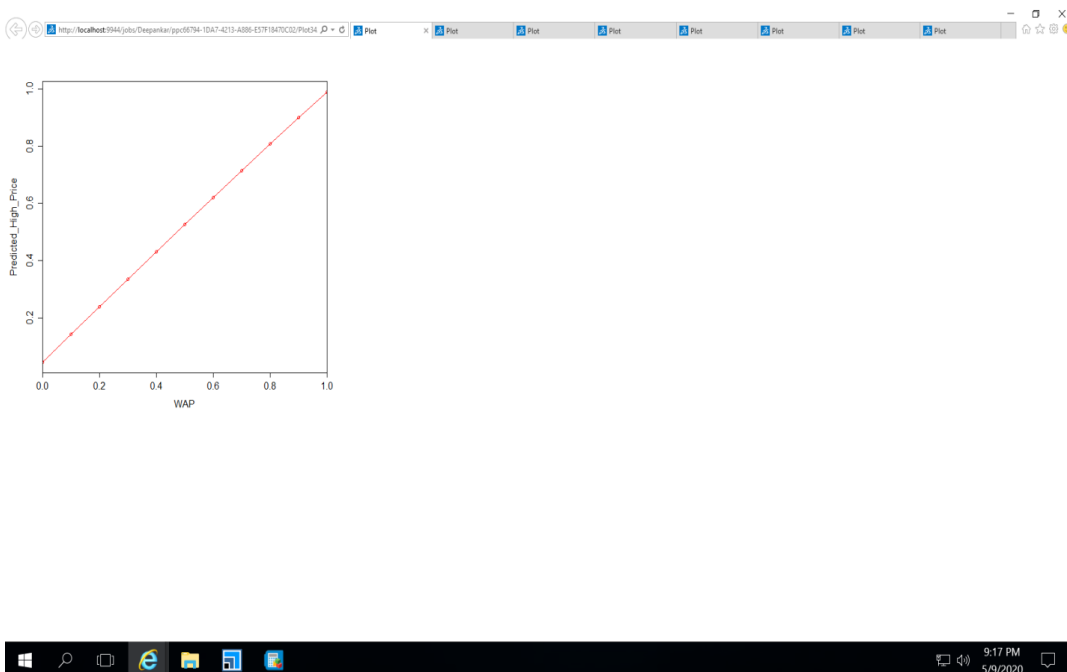

Figure 4. Effect of WAP on high stock price

4.3 Number of Shares:

The principal theory is that the price movement of a stock indicates what investors feel about the worth of a company is worth. The number of shares a company holds controls the impression about the company. Thus, increase in number of shares increase the stock price (Figure 5).
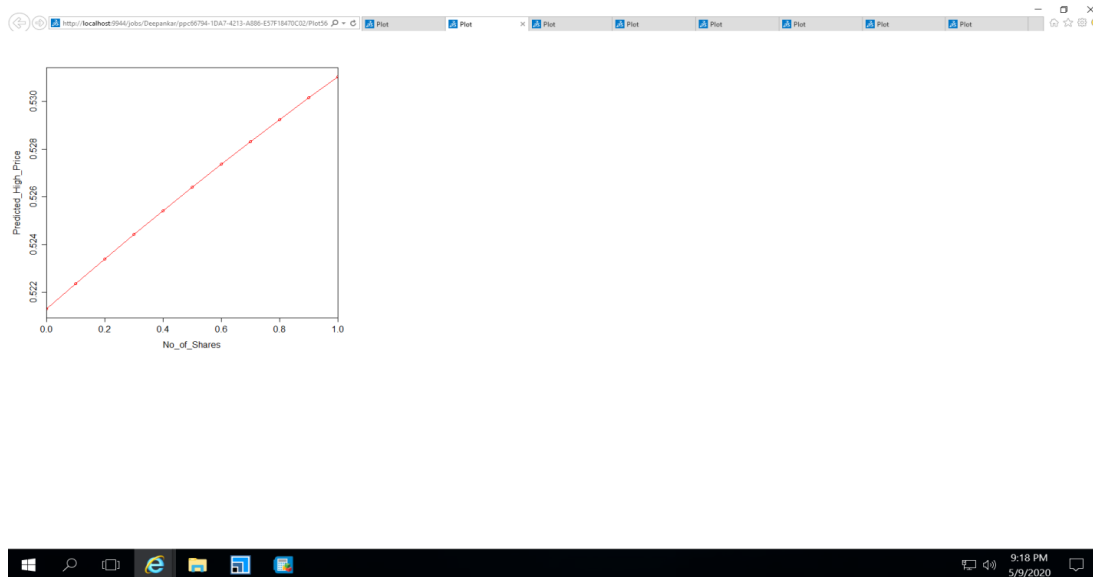

Figure 5. Effect of number of shares on high stock price

4.4 Number of Trades

Every stock has a component of number of trades. Higher numbers of trades create a positive impression in the mind of the investors. Figure 6 shows that an increase in number of trades increases the stock price, as expected.
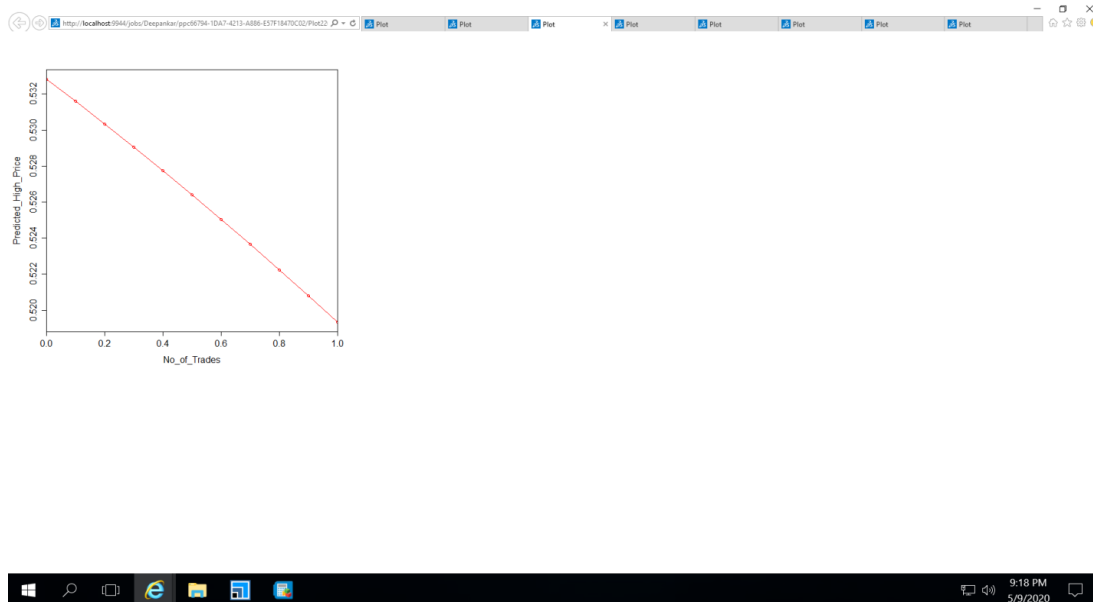

Figure 6. Effect of number of trades on high stock price

4.5 Total turnover (in INR)

In an emerging market, one of the noise indicators is turnover. Usually the investors use these noises to predict future prices of the stocks on a short-term time horizon. Turnover parameter is dynamic in nature and usually depends on the choice f the investors. For a rising market, a high turnover reflects the investors' affinity and is likely to increase the stock price. On the other hand, in falling market, usually high turnover accelerates fall in

stock prices. Figure 7 shows that an increase in turnover decreases fall in stock prices indicating a possibility of a falling market.
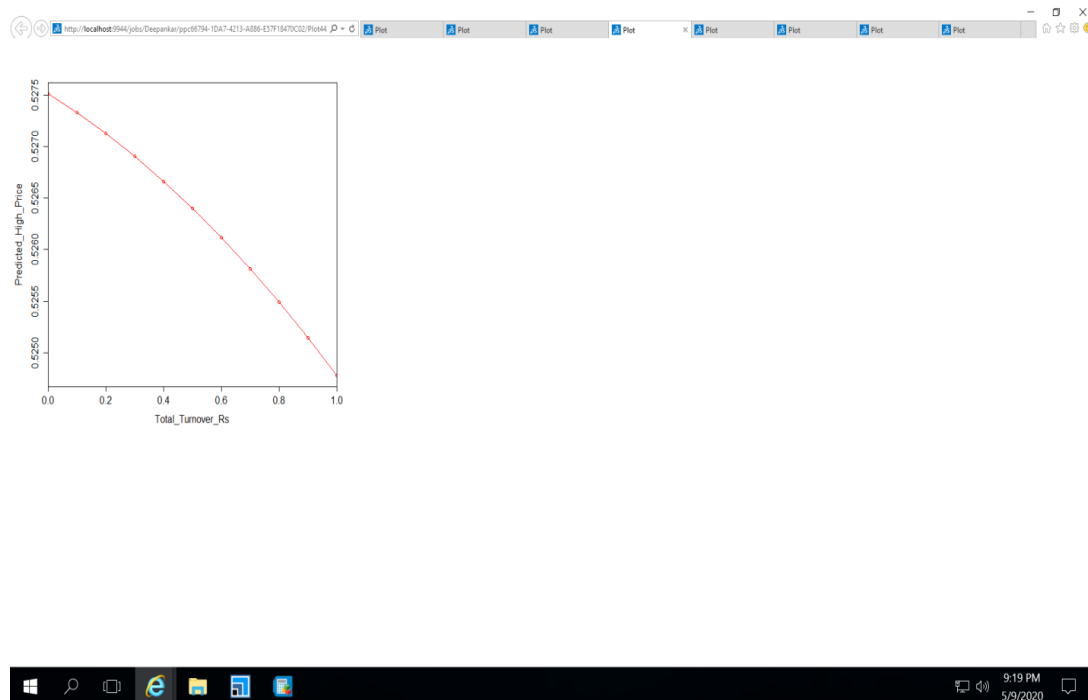

Figure 7. Effect of total turnover on high stock price

4.6 Deliverable Quantity

Deliverable quantity is that portion of total traded quantity which actually drives a person taking delivery into Demat or selling from Demat. When the deliverable quantity increases and the stock price do not increase, then people are waiting for something nice to happen in the near future. This is a good indicator to hold the stock for a long term. Usually an increase in deliverable quantity should increase the stock price. Figure 8 shows that the stock price increased to a threshold value of deliverable quantity followed by a decrease. Above the threshold value there might be some uncertainty in the minds of the investors.
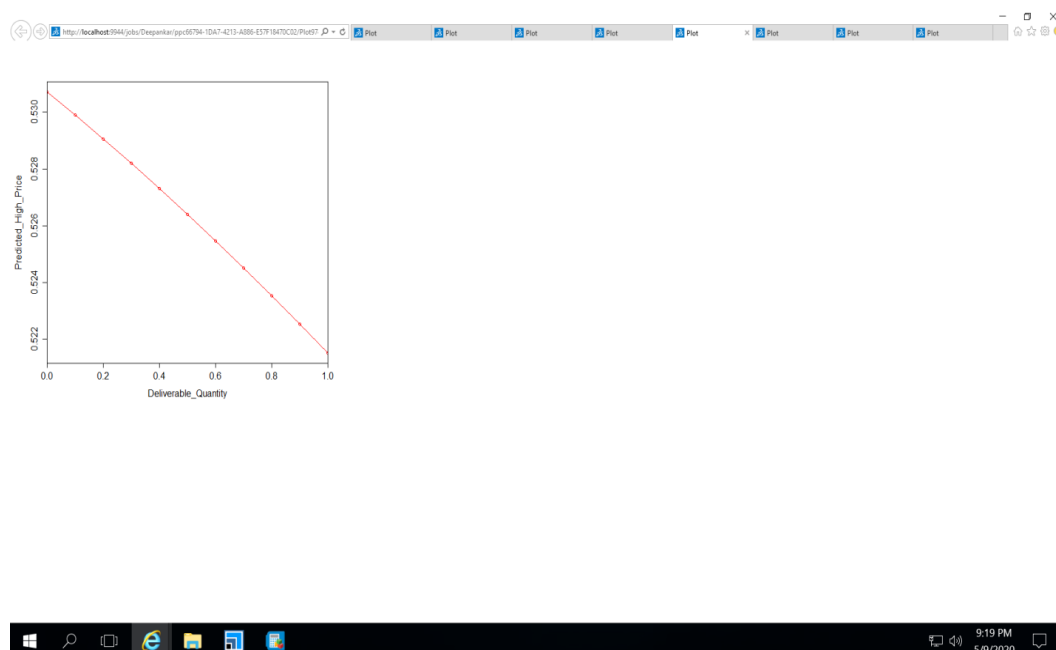
Figure 8. Effect of deliverable quantity on high stock price

4.7 Percent Deliverable Quantity to Traded Quantity

When the deliverable quantity percentage (with respect to total traded quantity) increases with increase in the stock price, then there is a bullish move on the stock. When the stock price decreases with increase in deliverable quantity percentage(with respect to total traded quantity), then there is a bearish move on the stock. Figure 9 shows that there is a threshold below which there is interest in the stock and above which the investors lose interest in the stock.
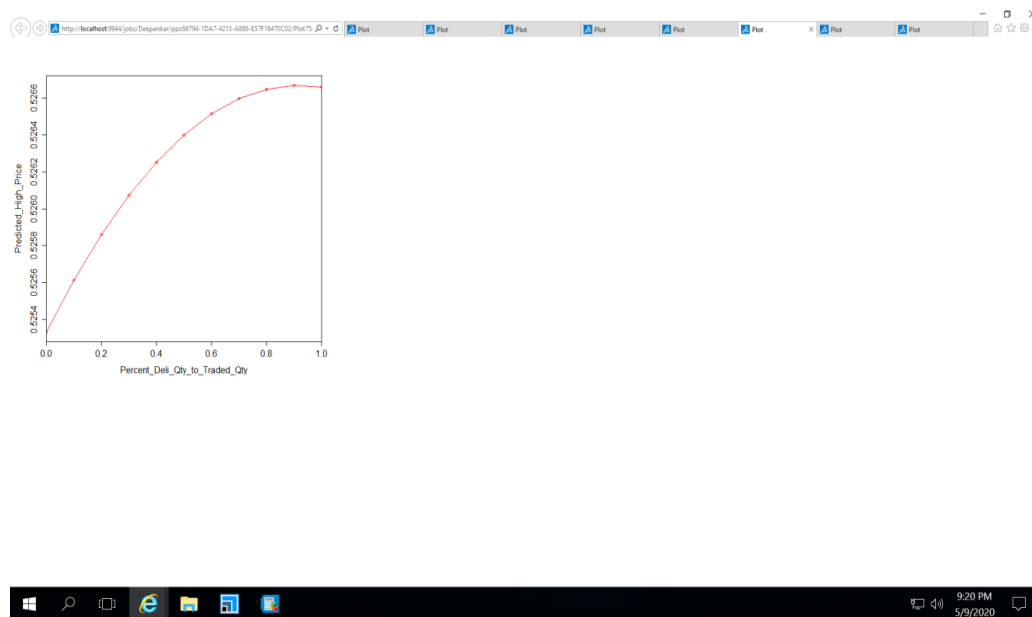

Figure 9. Effect of Percent deliverable quantity to traded quantity on high stock price

4.8 Spread High and Low

One of the noise indicators is spread high and low. Usually the investors use these noises to predict future prices of the stocks on a short-term time horizon. The spread between high and low prices reflects the extremities of intra-day movement and it indicates boundaries of intra-day volatility. If the difference is high, the prices are susceptible to react more on instant market information. As this indicator is usually used under falling market condition, a drop in stock price with an increase in the parameter indicates some issues in the market. In certain cases, spread of high and low may trigger selling (Figure 10).
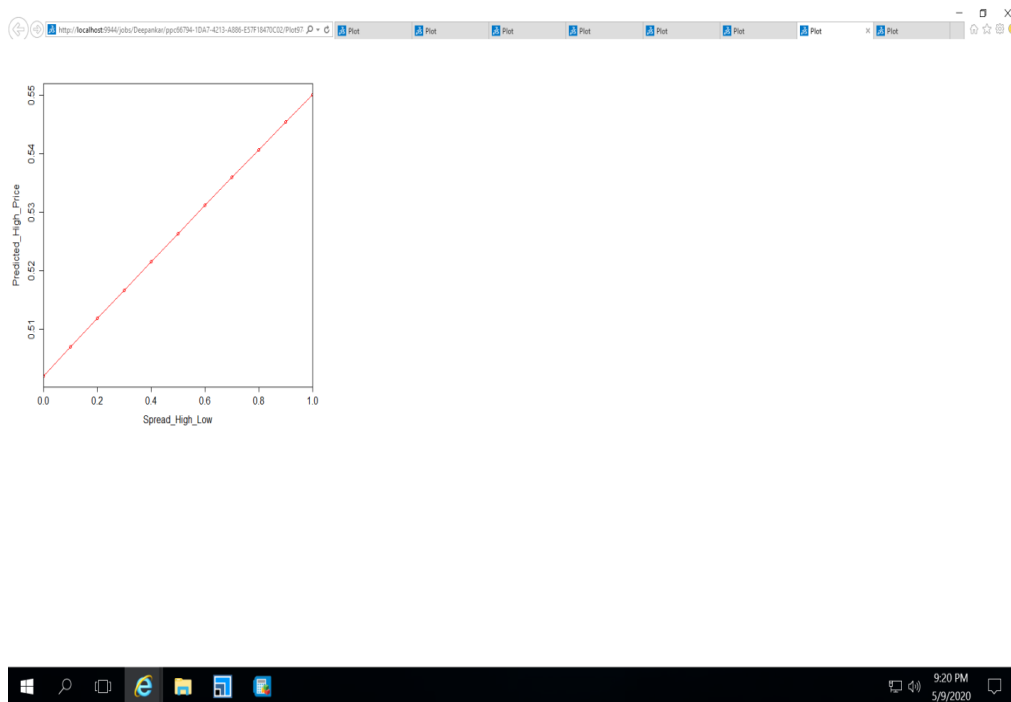
Figure 10. Effect of spread high and low on high stock price

4.9 Spread Open and Close

One of the noise indicators is spread open and close. Usually the investors use these noises to predict future prices of the stocks on a short-term basis. The spread between opening and previous closing prices is a differentially static price phenomenon. It shows the impulse of price movement during the period of no trading. Even if the nature of this noise is comparatively static, it can have a positive relationship with the stock price movements (Figure 11). Figure 11 also shows that above a threshold value it negatively affects the stock price.
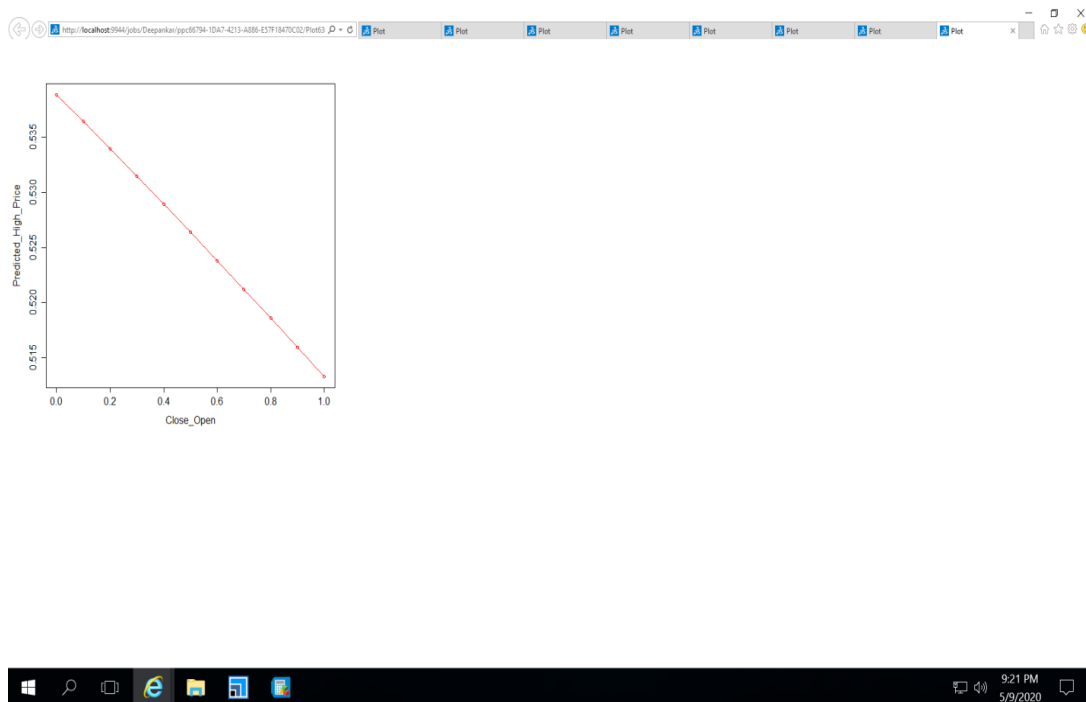

Figure 11. Effect of spread high and low on high stock price

Conclusions:

The fluctuation in the stock prices effect by different fundamental factors both internal and external. Apart from fundamental factors which replicated in the security prices, there are numerous additional factors that can influence investment are stock prices, volume of trading, spread, turnover etc. This paper explores the effect of different variables on the high stock price of Allahabad Bank considering daily data over the period 4 Jan 2010 to 23 Apr 2020. Pipeline Pilot module of Biovia software (Dassault Systems of France) was used for analysis. The software provides different built-in components to develop a machine learning model and use the model for prediction. The results show that WAP, number of shares and number of trades have similar effect on high price of Allahabad Bank during the study period. The increases in WAP, number of shares and number of trades increases the stock prices. On the contrary turnover have a reverse effect on high price of Allahabad Bank and found increase in turnover decreases in stock prices indicating a possibility of a falling market. On the other hand the percent deliverable quantities to traded quantity, deliverable quantity in addition to spread open and close have identical effect on Allahabad Bank stock prices during the study period. It found from the analysis that the percent deliverable quantities to traded quantity, deliverable quantity as well as spread open and close positive relationship with the stock price movements for a certain period and then shows above a threshold value it negatively affects the stock price. Therefore it can conclude that relationship between WAP, number of shares, number of trades, percent deliverable quantities to traded quantity, deliverable quantity in addition to spread open and close have significant effect on high price on stock of Allahabad Bank.

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