

## **EFFECT OF STOCK INDEX PARAMETERS ON FORECASTING THE HIGH STOCK VALUE OF VISA STEEL USING DEEP LEARNING NEURAL NETWORK MODEL**

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### **Abstract**

The stock markets contribute a largescope in economic development of India. The banking industrygrip 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 Visa Steelconsidering 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”are noted. High stock price is considered as output while other parameters are used as input. Pipeline Pilot module of Biovia software (DassaultSystems of France) is used for analysis. The software provides different built-in components to develop a machine learning model and use the model for prediction.

**Key words:** Bombay Stock Market, Visa Steel, High Stock Prices, WAP, Spread, Deliverable Quantity

### **Introduction**

#### **1.1 Background of the Study**

In this Liberalization, Privatization and Globalization (LPG) regime, capital markets play a significant role in reflecting the monetary and economic condition of developing nations. 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). The two major stock exchanges of India are Bombay Stock Exchange (BSE) and National Stock Exchange (NSE). BSE, established as 'The Native Share & Stock Brokers' Association' in 1875, is one the oldest stock exchanges in the world. Since the past 143 years, BSE has aided the development of the Indian company by contributing towards well-organized fund raising platform. Currently BSE delivers an effective and apparent market for buying and selling in equity, currencies, debt instruments, derivatives, mutual funds (bseindia.com). The National Stock Exchange (NSE) is the leading stock exchange in India began its operations in 1994 and is ranked as the largest stock exchange in India (nseindia.com).

### ***1.2 Literature Review:***

DeBondt and Thaler (1985) examined the share prices by means of low long-term returns inclined to achieve higher expected returns. While Pesaran and Timmermann (1995), observed the strength of the indication on certainty of U.S. share prices returns and studied prediction of stock prices depends upon past trend oppressed by investors to earn profits in excess of a buy and hold strategy. On the other hand Nelson et al. exploited Long Short-Term Memories (LSTMs) to forecast forthcoming trends in stock prices considering stock price as well as technical analysis parameters. Investigational consequences presented that their projected LSTM was more precise than other machine learning models, such as random forest, multilayer perceptron, and pseudo-random models. 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 autoencoder. 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.

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.

### ***1.3 Indian Steel Industry:***

In 2019, India remained as the 2<sup>nd</sup> largest producer of crude steel in the world after China. Rapid rise in production of steel in the recent past made India as the second producer of crude steel in the world in the year 2018. "The domestic consumption of finished steel made India as the 3<sup>rd</sup> most consumers in the world. In FY19, production of gross finished steel and crude steel in India were 131.57 million tonnes (MT) and 106.56 MT respectively (Ministry of Steel, GoI). India's finished steel consumption grew at a CAGR of 7.5 per cent during FY08-FY19 to reach 97.54 MT. In FY20 (till February 2020), crude steel and finished steel production stood at 100.78 MT and 94.01 MT respectively" (<https://www.ibef.org/>). According to Department for Promotion of Industry and Internal Trade (DPIIT), the Indian metallurgical industries attracted Foreign Direct Investments (FDI) to the tune of US\$ 11.45 billion in the period April 2000 – December 2019. The steel industry directly contributes slightly more than 2% to the GDP of the country. The indirect contribution of steel

is much larger as other sectors depend on it. The steel industry employs nearly half a million people directly and two million people indirectly. The National Steel Policy 2017 has provided the broad roadmap for promoting long term growth of steel industry in India. It has aimed at 300 million tonnes of production capacity by 2030-31. The main objective of the study is to analyze the effect of different variables on the high stock price of Visa Steel.

## 2. Materials & methods:

### 2.1 Software used:

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.

### 2.2 Methodology:

#### 2.2.1 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 Visa Steel 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.

#### 2.2.2 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° 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

### 2.2.3 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.

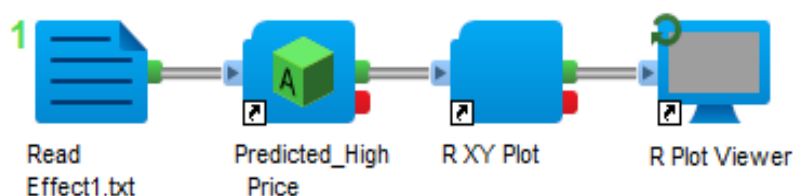


Figure 2. Use of trained model for prediction

## 3. 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.

### 3.1 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.

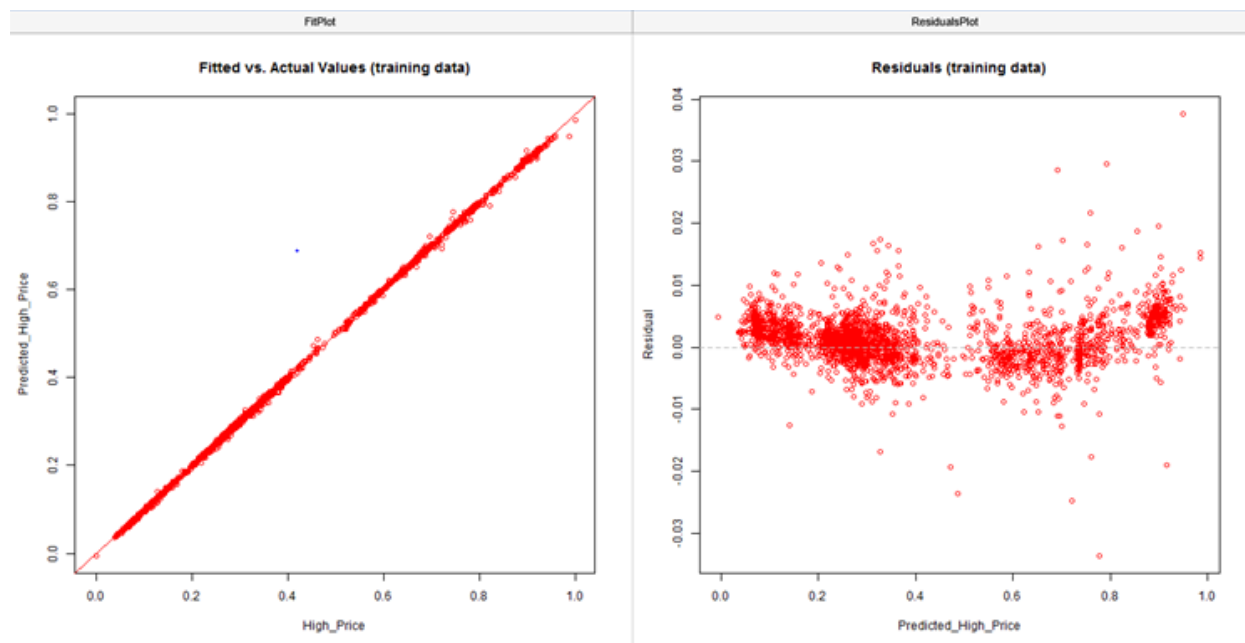


Figure 3. Prediction capability of the model

### 3.2 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.

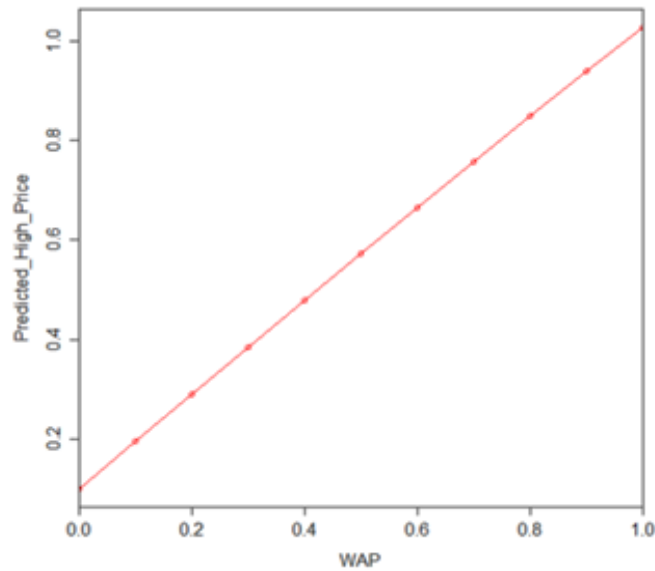


Figure 4. Effect of WAP on high stock price

### 3.3 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).

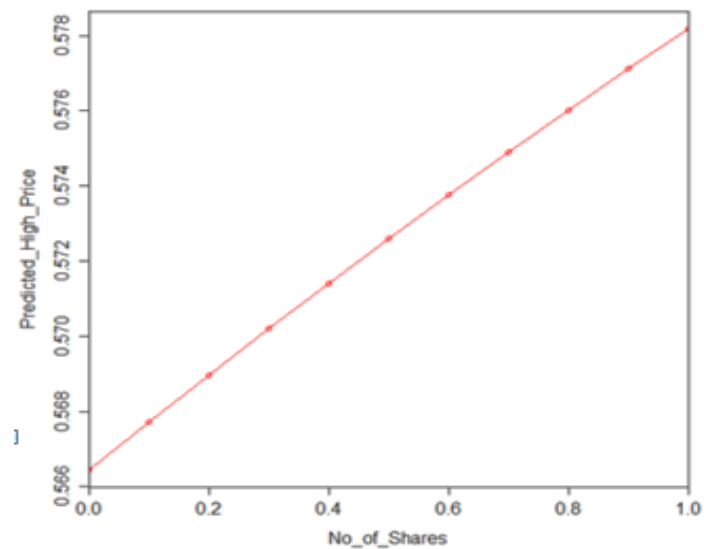


Figure 5. Effect of number of shares on high stock price

### 3.4 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. But Figure 6 shows that an increase in number of trades decreases the stock price, which is reasonably unexpected.

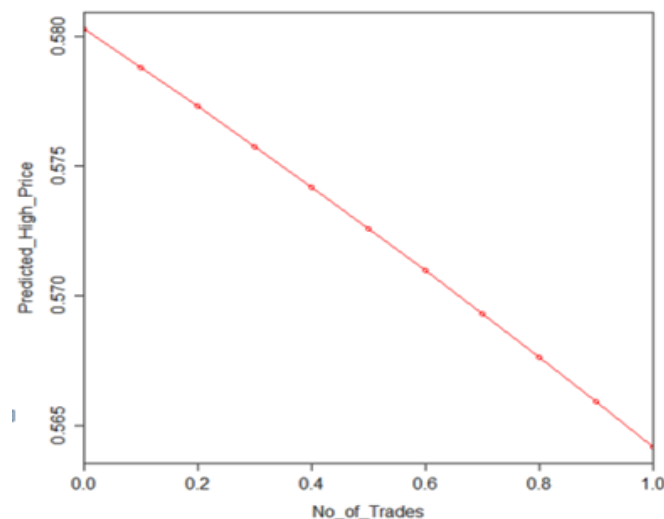


Figure 6. Effect of number of trades on high stock price

### 3.5 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 for 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.

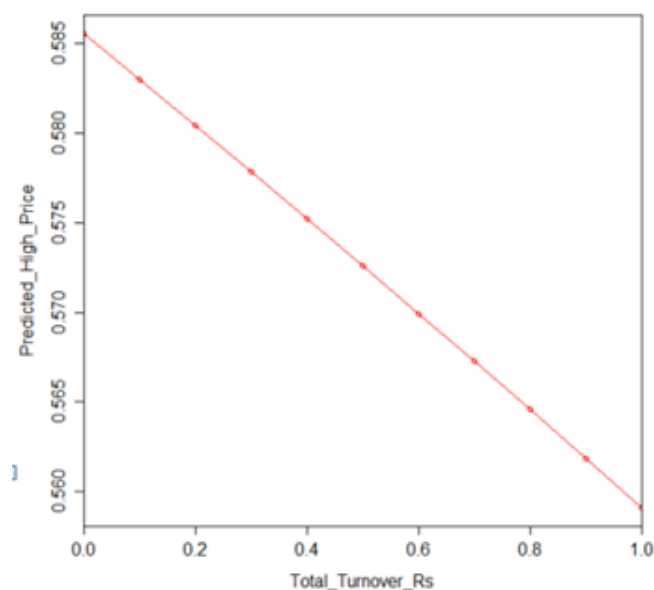


Figure 7. Effect of total turnover on high stock price

### 3.6 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 show that the stock price demonstrates an increasing trend with the increase in the deliverable quantity.

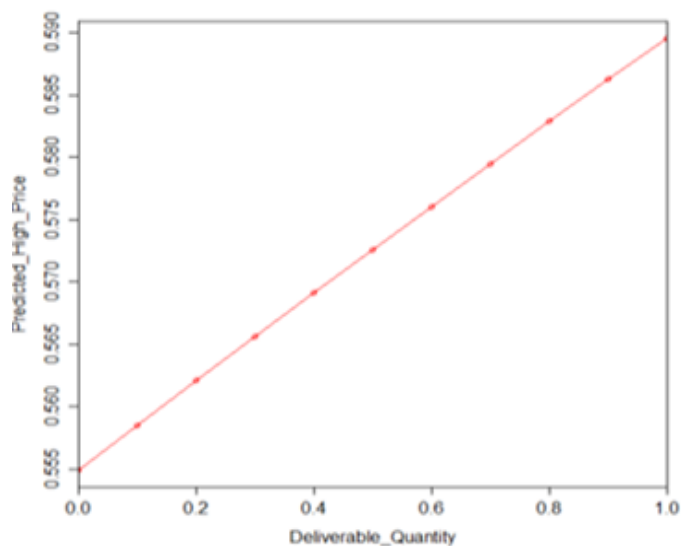


Figure 8. Effect of deliverable quantity on high stock price

### 3.7 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 stock prices increases with the increases in percent deliverable quantity to traded quantity.

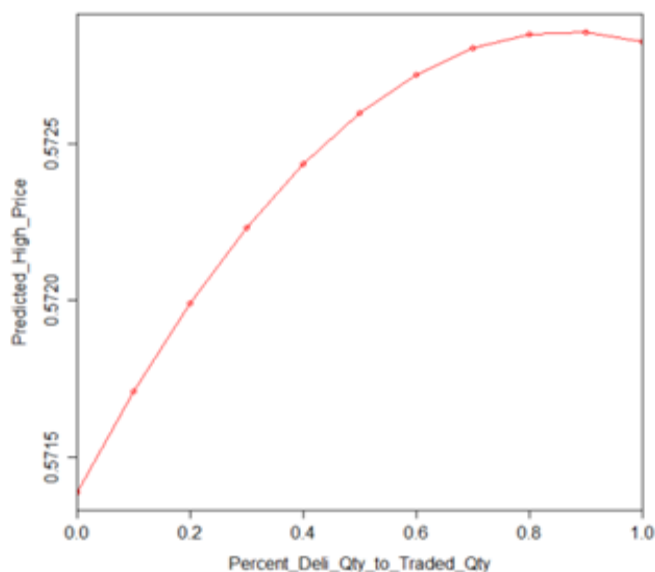


Figure 9. Effect of Percent deliverable quantity to traded quantity on high stock price

### 3.8 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 hike in stock price with an increase in the spread high and low indicates good sign in the market for the investor (Figure 10).

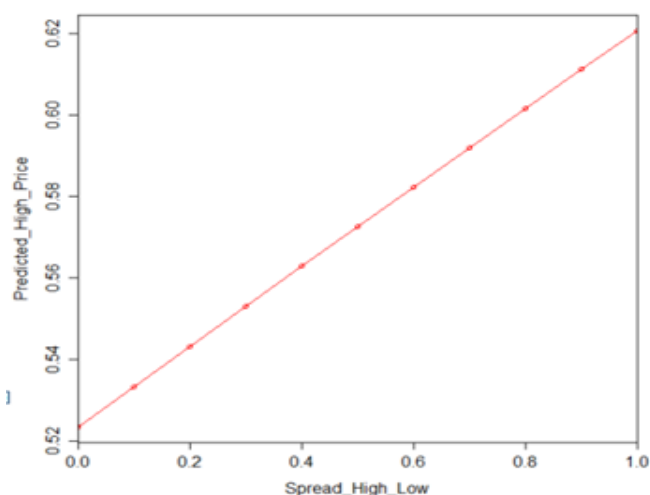


Figure 10. Effect of spread high and low on high stock price

### 3.9 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.

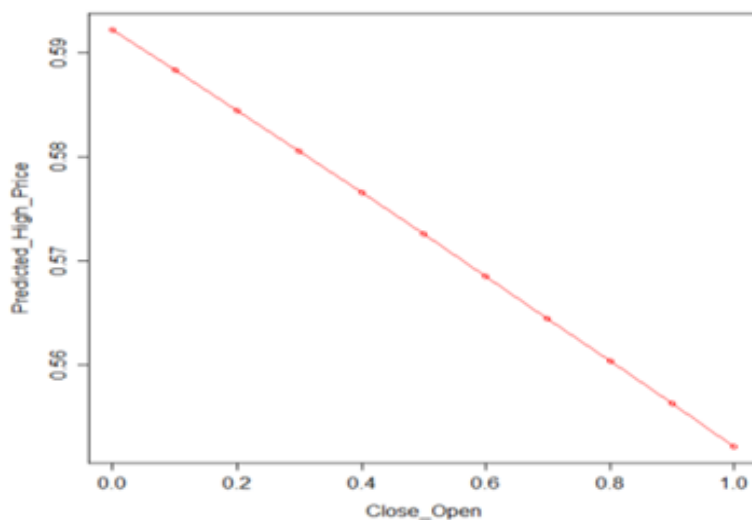


Figure 11. Effect of close and open price on high stock price

## Conclusions

The fluctuation in the stock prices depends on 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 Visa Steel 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, deliverable quantity, percent deliverable quantity to traded quantity and spread high and low have similar effect on high price of Visa Steel during the study period. The increases in WAP, number of shares, deliverable quantity, percent deliverable quantity to traded quantity and spread high and low increases the stock prices. On the contrary numbers of trades, total turnover, and spread open and close have a reverse effect on high price of Visa Steel. It has been found out that increase in number of trades, total turnover, and spread open and close decreases in stock prices indicating a possibility of a falling market. Therefore, one can conclude that relationship between WAP, number of shares, deliverable quantity, percent deliverable quantity to traded quantity and spread high and low have significant effect on high price on stock of Visa Steel.

## References

- [1] Aduda, J., Masila, J. M., & Onsongo, E. N. (2012). The determinants of stock market development: The case for the Nairobi Stock Exchange. *International Journal of Humanities and Social Science*, 2(9), 214-230.
- [2] Ashraf, S., & Baig, M. A. (2015). Investment and Trading Strategies in Indian Stock Market. *International Journal of Arts and Commerce*, 4(3), 1-15.
- [3] Bagchi, D. (2006). Noise Trading in an Emerging Market: Evidence and Analysis. [https://www.researchgate.net/publication/251204057\\_Noise\\_Trading\\_in\\_an\\_Emerging\\_Market\\_Evidence\\_and\\_Analysis](https://www.researchgate.net/publication/251204057_Noise_Trading_in_an_Emerging_Market_Evidence_and_Analysis)

- [4] Brown, D. P. and Jennings, R. H. (1889). On Technical Analysis. *Rev Financ Stud* [Internet]. 1989, 2(4), 527–51. Available from: <https://academic.oup.com/rfs/article-lookup/doi/10.1093/rfs/2.4.527>
- [5] DeBondt, W. F. M. & Thaler, R. (1985). Does the Stock Market Overreact? *The Journal of Finance*, 40{3}, 793-805.
- [6] Graham, R. E., & Dodd, P. (1951). *Security Analysis*. USA: McGraw-Hill.
- [7] Hosseini, S. M., Ahmad, Z., & Lai, Y. W. (2011). The role of macroeconomic variables on stockmarket index in China and India. *International Journal of Economics and Finance*, 3(6),233.
- [8] Joshi, M. (2013). Factors Affecting Indian Stock Market. *International Journal of Contemporary Research in Management, Engineering and Health Science* (002), 2320-1185.
- [9] Nelson, D. M. Q., Pereira, A. C. M. and De Oliveira, R.A. (2017). Stock market's price movement prediction with LSTM neural networks. *Proceedings of the International Joint Conference on Neural Networks*, 1419–26.
- [10] Pesaran, M.H. and Timmermann, A. (1995) “The Robustness and Economic Significance of Predictability of Stock Returns”. *Journal of Finance*, 50, 1201-1228.
- [11] Savsani, M. & Rathod, U. (2018). Comparative Risk Return Analysis of Bombay Stock Market With Selected Banking Stocks in India. *International Journal of Scientific Research in Science and Technology*, 4 (5), 908=916.
- [12] Singh, J. & Yadav, P. (2016). A Study on the Factors Influencing Investors Decision in Investing in Equity Shares in Jaipur and Moradabad with Special Reference to Gender. *Amity Journal of Finance*, 1(1), 117-130.
- [13] Yartey, C. A. (2008). The determinants of stock market development in emerging economies: Is South Africa different? *IMF Working Papers*, 1-31.
- [14] Siddique, M. and Panda, D. (2019) Prediction of Stock Index of Tata Steel using Hybrid Machine Learning Based Optimization Techniques, *International Journal of Recent Technology and Engineering*, Vol. 8 (2): 3186-3193.
- [15] Siddique, M. and Panda, (2019) D. A hybrid forecasting model for prediction of stock index of Tata Motors using principal component analysis, support vector regression and particle swarm optimization, *International Journal of Engineering and Advanced Technology*, Vol. 1 (9): 3032-3037.