

A Project On

**Stock Market Analysis Using Time Series**

**On ICICI Bank Nifty**

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**Statistics**

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## CONTENTS

| SL No | Topic                                   | Page No |
|-------|---|---------|
| 1     | Abstract                                | 1       |
| 2     | Introduction to ICICI Bank Ltd Industry | 1       |
| 3     | Project Summary                         | 2       |
| 4     | Objectives of the project               | 2       |
| 5     | Data Set                                | 3       |
| 6     | Data Visualisation                      | 4-6     |
| 7     | Bi-Variate analysis                     | 7-9     |
| 8     | Time Series Analysis                    | 9       |
| 9     | Moving Average Intuitions               | 9-14    |
| 10    | Trend Analysis                          | 15      |
| 11    | Effect of Covid 19                      | 16      |
| 12    | Stock in Present time                   | 17-18   |
| 13    | Conclusion                              | 19      |
| 14    | Acknowledgement                         | 19      |
| 15    | References                              | 20      |

# **Stock Market Analysis Using Time Series**

## **ICICI Bank NIFTY**

### **Abstract**

Time plays a very important role when it comes to business. Every national and global economies depends on time. Time series analysis have become a widely used tool in the field of analytics in order to understand a variable which depends on time. Time series analysis is a statistical technique that deals with time.

Time series analysis is a statistical technique that deals with time series data, or trend analysis. Time series data means that data is in a series of particular time periods or intervals. Time series data means that data is in a series of particular time periods or intervals. The Data is considered in three types:

- Time Series Data : A set of observations on the values that a variable takes at different time
- Cross-Sectional Data : Data of one or more variables, collected at the same point in time.
- Pooled Data : A combination of time series data and cross sectional data.

### **ICICI Bank Limited Industry:**

ICICI Bank Limited is an Indian multinational bank and financial services company headquartered in Vadodara. It offers a wide range of banking products and financial services for corporate and retail customers through a variety of delivery channels and specialized subsidiaries in the areas of investment banking, life, non-life insurance, venture capital and asset management.

The bank has a network of 5,275 branches and 15,589 ATMs across India and has a presence in 17 countries. The bank has subsidiaries in the United Kingdom and Canada; branches in United States, Singapore, Bahrain, Hong Kong, Qatar, Oman, Dubai International Finance Centre, China and South Africa;<sup>1</sup> as well as representative offices in United Arab Emirates, Bangladesh, Malaysia and Indonesia. The company's UK subsidiary has also established branches in Belgium and Germany.

## **Project Summary:**

The stock market is a marketplace that allows for the seamless exchange of corporate stock purchases and sales. Every Stock Exchange has its own value for the Stock Index. The index is the average value derived by adding up the prices of various equities. This aids in the representation of the entire stock market as well as the forecasting of market movement over time. The stock market can have a significant impact on individuals and the economy as a whole. As a result, effectively predicting stock trends can reduce the risk of loss while increasing profit.

I want to do stock market analysis of ICICI Bank Stock Market data from April 2011 to April 2020. Firstly I calculate the monthly average of the Stock Price. Then I do the bivariate analysis of several variables like close & open, High & low. Then with the help of Moving Average I will analyse this stock market data with the help of time series.

## **Objectives:-**

It is assumed that the market price doesn't reflect the true value of the company due to some uncontrollable external factors like investor sentiments. As the market will attain equilibrium, the real value will be equal to its market price in the long run. It believes that paying a higher price for a stock will affect return on investment adversely. Thus, by means of financial ratios, investors try to arrive at the true value at which a stock should ideally trade in the market. We interested to find dependency between open and close value of the stock market value. By moving average I will analyse this data and we build a time series model. Stock analysis is a method of investors and traders to make buying and selling decisions. By studying and evaluating past and current data, investors and traders attempt to gain an edge in the markets by making informed decisions. Stock market analysis enables investors to identify the intrinsic worth of a security even before investing in it. All stock market tips are formulated after thorough research by experts. Stock analysts try to find out activity of an instrument/sector/market in future. Performing a research before making an investment is a must. It is only after a thorough research that you can make some assumptions into the value and future performance of an investment. Even if you are following stock trading tips, it ideal to do some research, just to ensure that you are making an investment that's expected to get you maximum returns.

- DATA PREPARATION
- DATA VISUALISATION
- BUILDING A TIME SERIES MODEL

## **Dataset:-**

This data is about stock market price history and trading volumes of ICICI Bank Ltd. All datasets are at a day level with pricing and trading values split across .csv files for each stock along with a metadata file with some macro-information about the stocks itself. The data spans from 1<sup>st</sup> April 2011 to 30<sup>th</sup> April 2021.

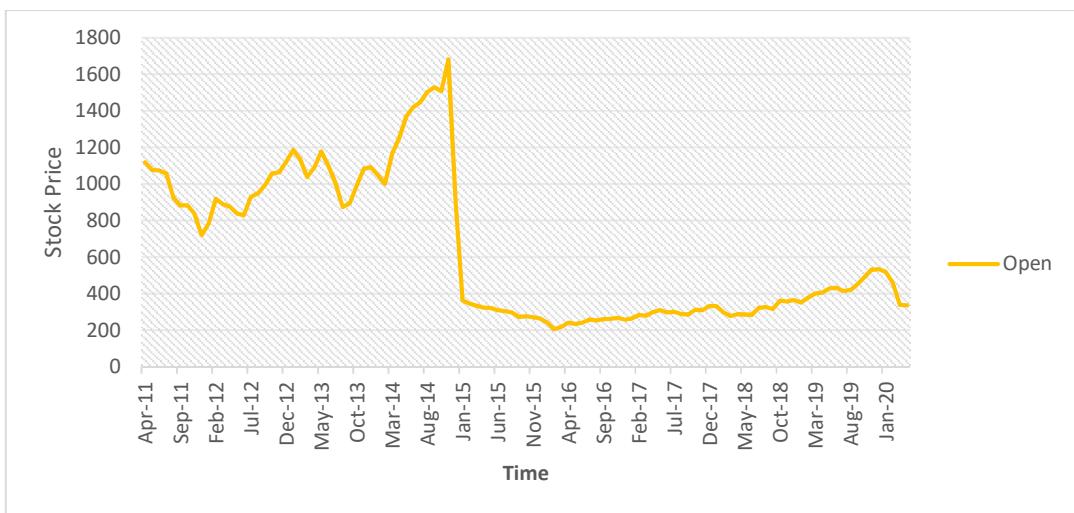
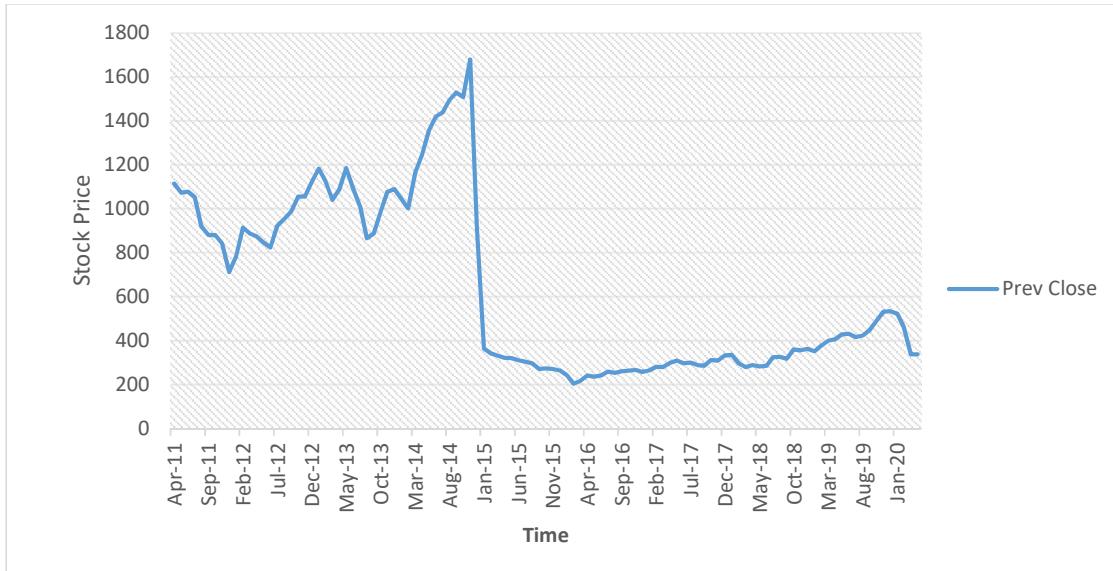
## **Dataset Details:-**

### **Description of columns in the file:**

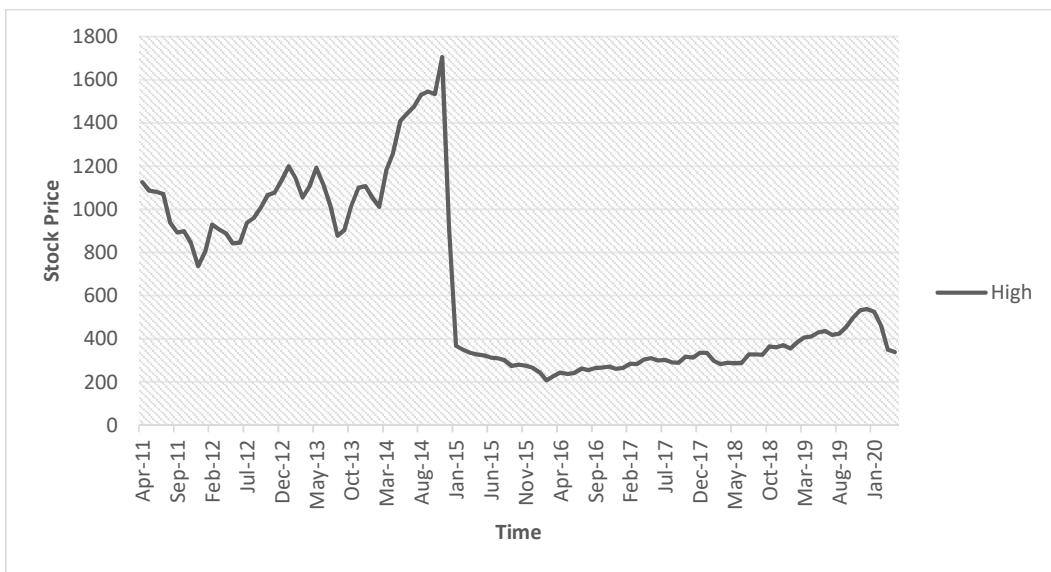
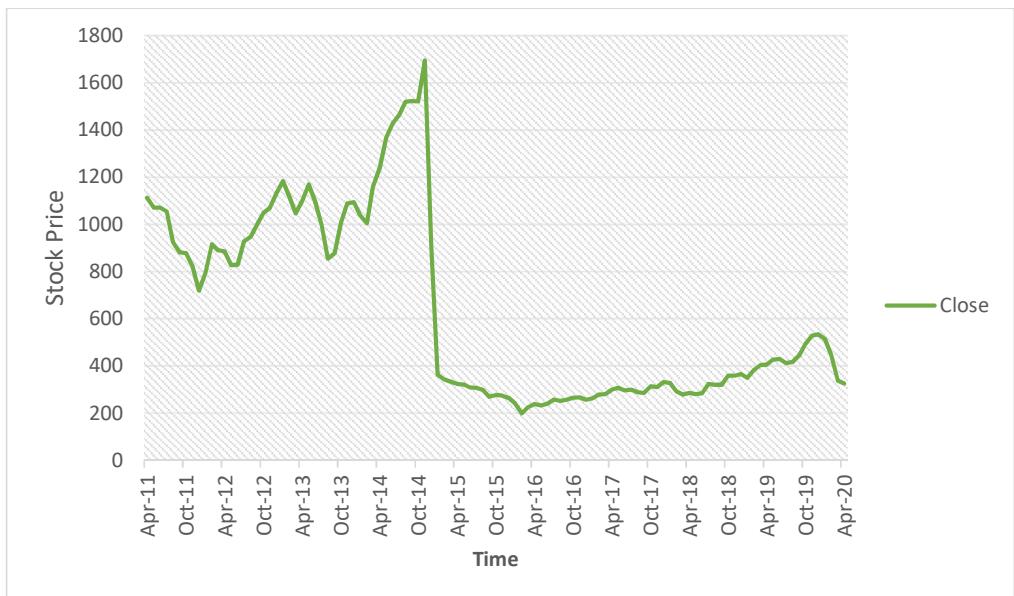
1. Date - Date of trade.
2. Symbol - Name of the company (ICICI BANK).
3. Series - We have only one series(EQ): It stands for Equity. In this series intraday trading is possible in addition to delivery.
4. Prev. Close – Refers to the prior days's final price of a security when the market officially closes for the day.
5. Open – The open starting period of trading on a securities exchange or organised over-the counter market.
6. High – Highest Price at which a stock traded during the course the course of the trading day.
7. Low – Lowest Price at which a stock traded during the course the course of the trading day.
8. Last - Low -Lowest price at which a stock traded during the course of the trading day.
9. Close - The close is a reference to the end of a trading session in the financial markets when the markets close for the day.
10. VWAP - (Volume-weighted average price)- It is the ratio of the value traded to total volume traded over a particular time horizon. It is a measure of the average price at which a stock is traded over the trading horizon.

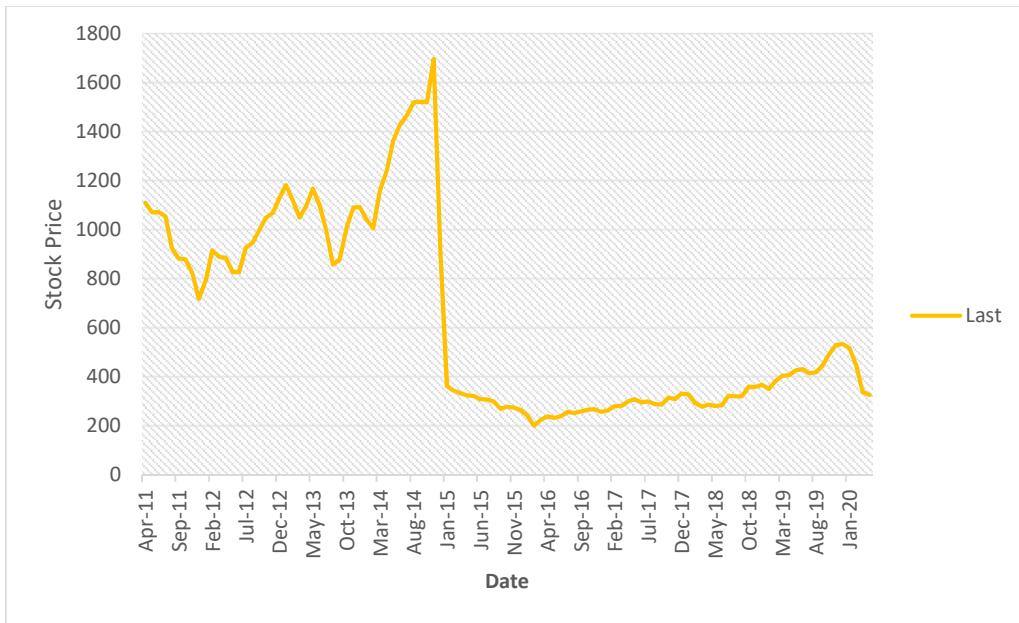
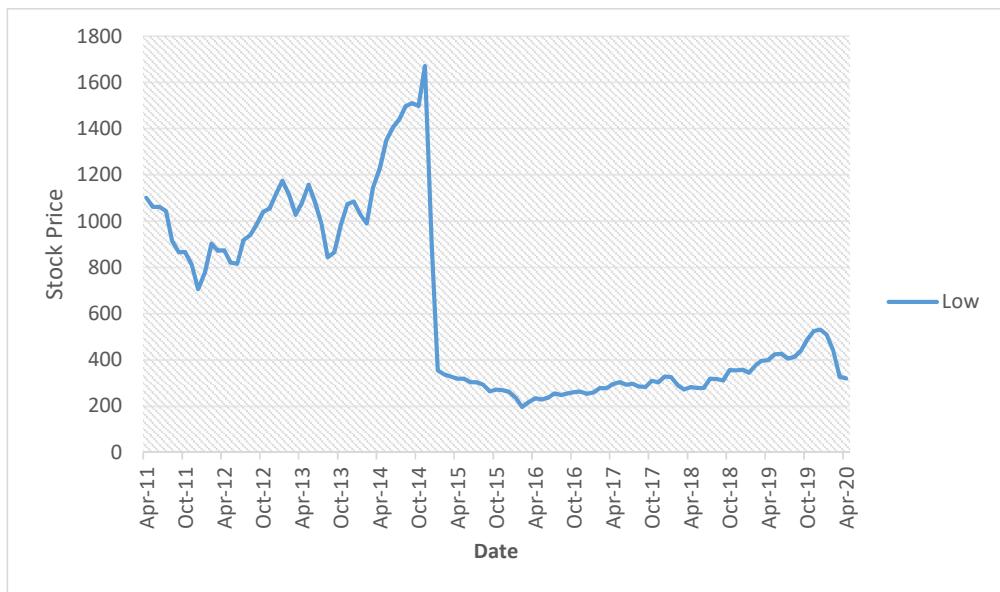
## Data Visualisation:-

Data Visualisation plays an important role in Time series Analysis. It gives a preliminary idea about the dataset i.e. how the parameter is changing with time. The best graph to represent a time series data is line diagram. Data visualisation of the several variables like prev.close, Open, Close etc are given below



## DSE-B2 PROJECT WORK





- We compute those graphs using Excel.

## Bivariate Analysis :-

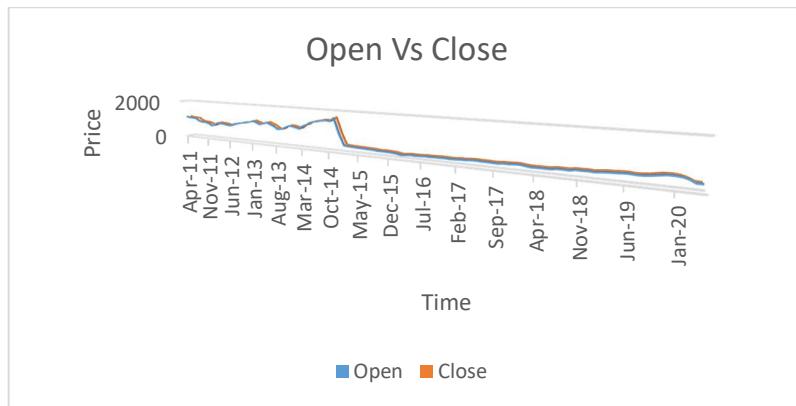
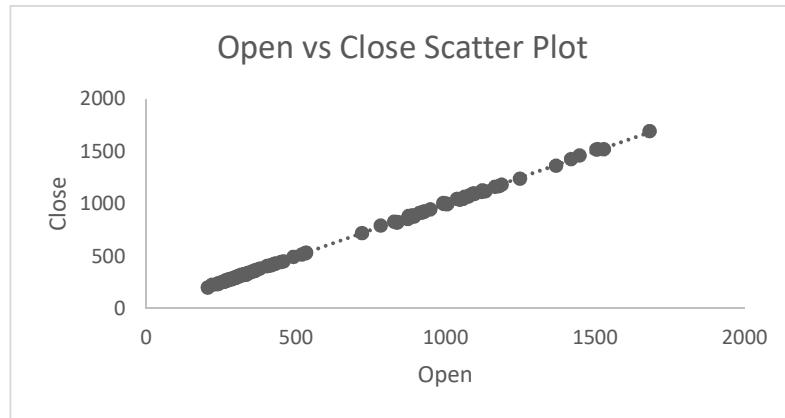
**Bivariate analysis** is one of the simplest forms of quantitative (statistical) analysis. It involves the analysis of two variables (often denoted as  $X, Y$ , for the purpose of determining the empirical relationship between them.

### Open Vs Close:-

Our First Bivariate analysis involves open and close parameters.

Correlation Coefficient between Open and Close-

|              | <b>Open</b> | <b>Close</b> |
|--------------|-------------|--------------|
| <b>Open</b>  | 1           | 0.999891     |
| <b>Close</b> | 0.999891    | 1            |



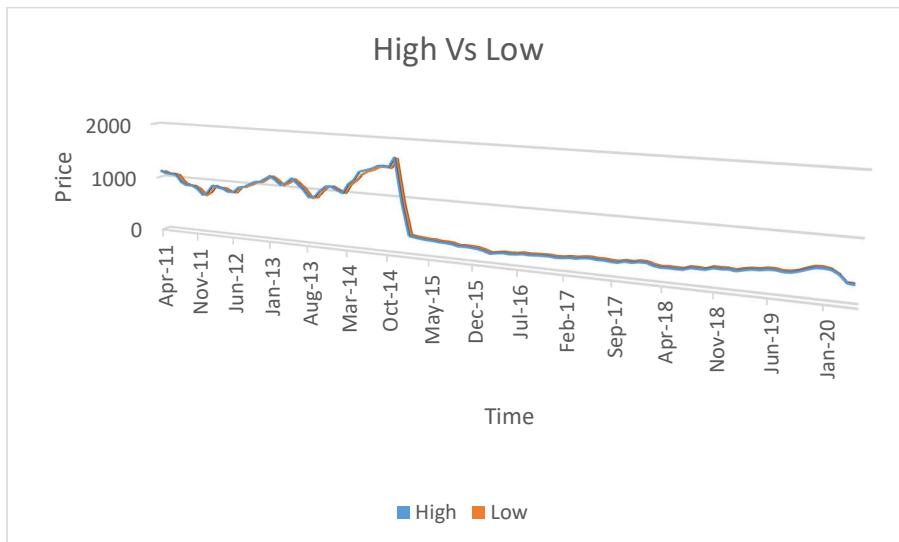
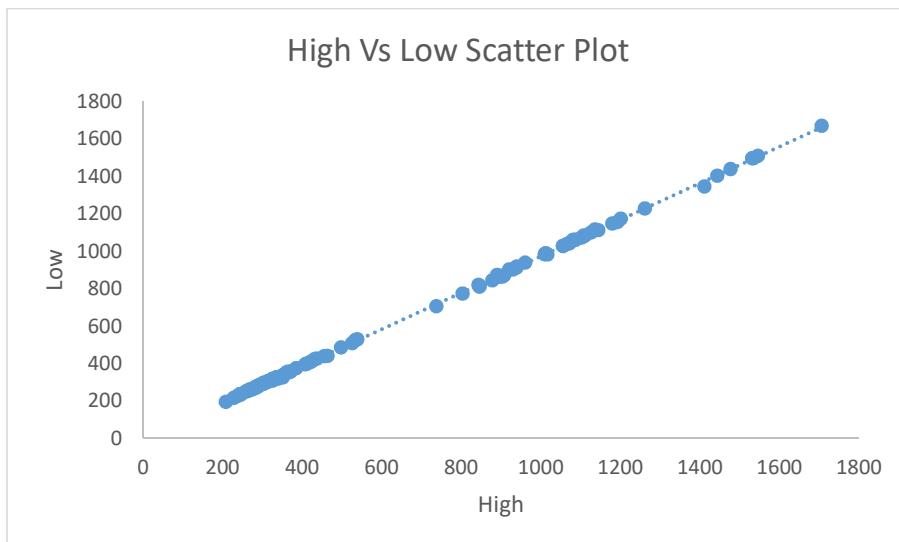
- We calculated correlation coefficient and plot those graph using Excel.

### High Vs Low:-

Now, lets look at the high and low parameters over the years.

Correlation Coefficient between High and Low -

|             | <b>High</b> | <b>Low</b> |
|-------------|-------------|------------|
| <b>High</b> | 1           | 0.999904   |
| <b>Low</b>  | 0.999904    | 1          |



- We calculated correlation coefficient and plot those graph using Excel.

Insights:-

If you can notice we can clearly see most of the time the open is higher than close. But the difference is very subtle. If we take moving average, we might not even notice the difference. High vs Low follows the same path as Open vs Low, where High is a little higher than Low price of the month. Open and Close are highly correlated as well as High and Low also.

## Time Series Analysis:-

Time series analysis is a specific way of analyzing a sequence of data points collected over an interval of time. In time series analysis, analysts record data points at consistent intervals over a set period of time rather than just recording the data points intermittently or randomly. Time series analysis is a statistical technique that deals with time series data, or trend analysis. Time series data means that data is in a series of particular time periods or intervals.

Advantages:

- Helps the users in detecting the market trend patterns and other conditions.
- The project report contains a number of filter elements ranging as per the market trends that helps the users to analyze the registered stocks
- The project report contains a number of shares, their prices and Volume Breakouts
- It contains stocks that have an unanticipated rise in the business volume and a rapid rate escalation in terms of cost.

## Moving Average Intuitions :-

Moving average is a smoothing technique applied to time series to remove the fine-grained variation between time steps. The hope of smoothing is to remove noise and better expose the signal of the underlying causal processes. Moving averages are a simple and common type of smoothing used in time series analysis and time series forecasting. Calculating a moving average involves creating a new series where the values are comprised of the average of raw observations in the original time series. A moving average requires that you specify a window size called the window width. This defines the number of raw observations used to calculate the moving average value. The "moving" part in the moving average refers to the fact that the window defined by the window width is slid along the time series to calculate the average values in the new series.

**Calculation Table of Moving Average**

| Date   | Open    | Close   | Moving Average<br>of Open Value | Moving Average<br>of Close Value |
|--------|---------|---------|---------------------------------|----------------------------------|
| Apr-11 | 1119.05 | 1112.92 | --                              | --                               |
| May-11 | 1076.24 | 1071.23 | --                              | --                               |
| Jun-11 | 1074.08 | 1070.31 | 1089.79                         | 1084.82                          |
| Jul-11 | 1057.18 | 1054.74 | 1069.166667                     | 1065.426667                      |
| Aug-11 | 926.05  | 923.72  | 1019.103333                     | 1016.256667                      |
| Sep-11 | 882.07  | 881.04  | 955.1                           | 953.166667                       |
| Oct-11 | 883.53  | 878.99  | 897.2166667                     | 894.5833333                      |
| Nov-11 | 836.91  | 820.66  | 867.5033333                     | 860.23                           |
| Dec-11 | 720.05  | 719.29  | 813.4966667                     | 806.3133333                      |
| Jan-12 | 782.78  | 793.66  | 779.9133333                     | 777.87                           |
| Feb-12 | 919.8   | 915.63  | 807.5433333                     | 809.5266667                      |
| Mar-12 | 888.9   | 889.97  | 863.8266667                     | 866.42                           |
| Apr-12 | 876.47  | 884.67  | 895.0566667                     | 896.7566667                      |
| May-12 | 838.51  | 826.9   | 867.96                          | 867.18                           |
| Jun-12 | 828.41  | 828.71  | 847.7966667                     | 846.76                           |
| Jul-12 | 929.08  | 928.4   | 865.3333333                     | 861.3366667                      |
| Aug-12 | 948.8   | 946.96  | 902.0966667                     | 901.3566667                      |
| Sep-12 | 994     | 998.05  | 957.2933333                     | 957.8033333                      |
| Oct-12 | 1058.24 | 1048.45 | 1000.346667                     | 997.82                           |
| Nov-12 | 1064.32 | 1069.18 | 1038.853333                     | 1038.56                          |
| Dec-12 | 1122.27 | 1129.11 | 1081.61                         | 1082.246667                      |
| Jan-13 | 1186.55 | 1183.23 | 1124.38                         | 1127.173333                      |
| Feb-13 | 1132.79 | 1119.69 | 1147.203333                     | 1144.01                          |
| Mar-13 | 1037.88 | 1046.5  | 1119.073333                     | 1116.473333                      |
| Apr-13 | 1092.46 | 1098.84 | 1087.71                         | 1088.343333                      |
| May-13 | 1177.77 | 1169.28 | 1102.703333                     | 1104.873333                      |
| Jun-13 | 1097.8  | 1097.22 | 1122.676667                     | 1121.78                          |
| Jul-13 | 1004.9  | 997.11  | 1093.49                         | 1087.87                          |
| Aug-13 | 872.85  | 854.17  | 991.85                          | 982.8333333                      |
| Sep-13 | 894.66  | 877.41  | 924.1366667                     | 909.5633333                      |
| Oct-13 | 991.96  | 1006.69 | 919.8233333                     | 912.7566667                      |
| Nov-13 | 1084.4  | 1089.05 | 990.34                          | 991.05                           |
| Dec-13 | 1092.27 | 1093.34 | 1056.21                         | 1063.026667                      |
| Jan-14 | 1046.98 | 1038.89 | 1074.55                         | 1073.76                          |
| Feb-14 | 999.59  | 1004.32 | 1046.28                         | 1045.516667                      |
| Mar-14 | 1165.24 | 1161.53 | 1070.603333                     | 1068.246667                      |
| Apr-14 | 1247.91 | 1239.15 | 1137.58                         | 1135                             |
| May-14 | 1368.95 | 1365.03 | 1260.7                          | 1255.236667                      |
| Jun-14 | 1418.81 | 1427.86 | 1345.223333                     | 1344.013333                      |
| Jul-14 | 1447.57 | 1462.12 | 1411.776667                     | 1418.336667                      |

**DSE-B2 PROJECT WORK**

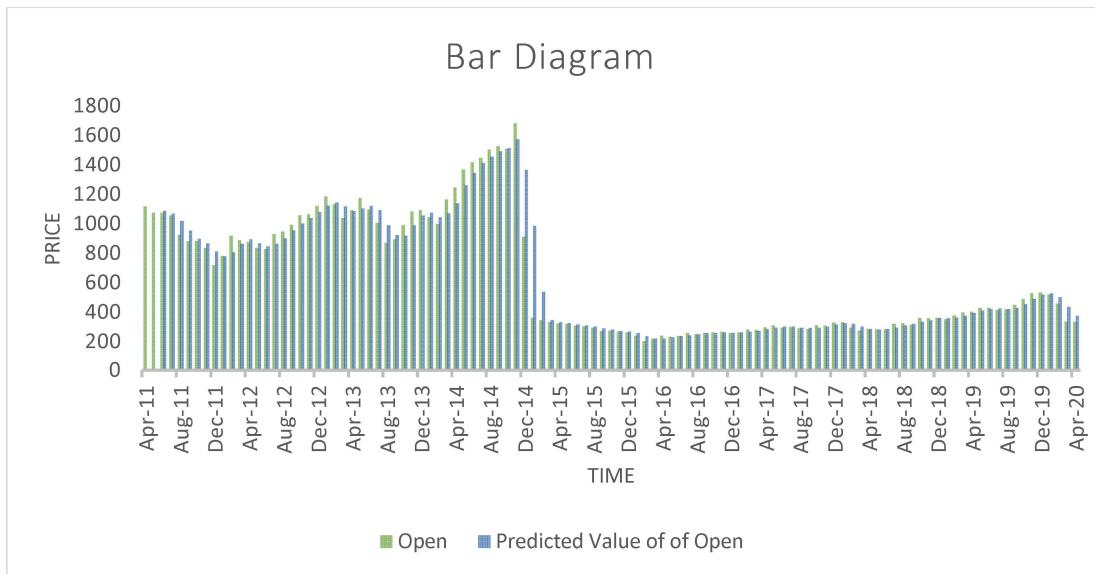
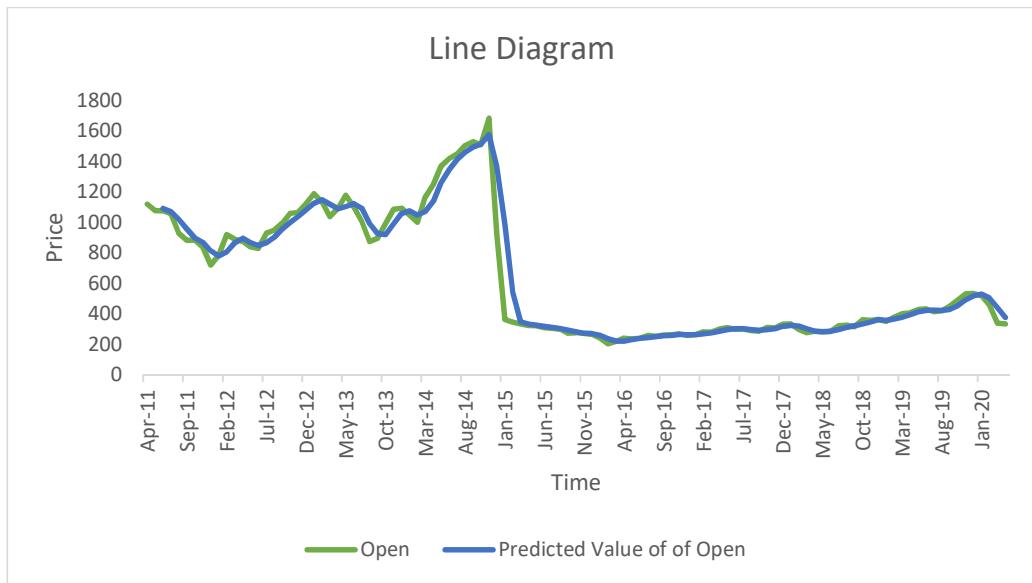
|        |         |         |             |             |
|--------|---------|---------|-------------|-------------|
| Aug-14 | 1503.38 | 1518.97 | 1456.586667 | 1469.65     |
| Sep-14 | 1528.64 | 1521.44 | 1493.196667 | 1500.843333 |
| Oct-14 | 1508.23 | 1520.88 | 1513.416667 | 1520.43     |
| Nov-14 | 1681.58 | 1693.7  | 1572.816667 | 1578.673333 |
| Dec-14 | 912.71  | 911.75  | 1367.506667 | 1375.443333 |
| Jan-15 | 363.82  | 361.89  | 986.0366667 | 989.1133333 |
| Feb-15 | 344.79  | 343.58  | 540.44      | 539.0733333 |
| Mar-15 | 332.71  | 332.67  | 347.1066667 | 346.0466667 |
| Apr-15 | 323.03  | 323.64  | 333.51      | 333.2966667 |
| May-15 | 321.68  | 321.15  | 325.8066667 | 325.82      |
| Jun-15 | 308.62  | 308.44  | 317.7766667 | 317.7433333 |
| Jul-15 | 304.44  | 307.14  | 311.58      | 312.2433333 |
| Aug-15 | 297.57  | 298.29  | 303.5433333 | 304.6233333 |
| Sep-15 | 271.7   | 269.6   | 291.2366667 | 291.6766667 |
| Oct-15 | 275.38  | 277.31  | 281.55      | 281.7333333 |
| Nov-15 | 270.47  | 274.21  | 272.5166667 | 273.7066667 |
| Dec-15 | 264.44  | 264.01  | 270.0966667 | 271.8433333 |
| Jan-16 | 240.81  | 241     | 258.5733333 | 259.74      |
| Feb-16 | 204.22  | 199.81  | 236.49      | 234.94      |
| Mar-16 | 218.71  | 225.1   | 221.2466667 | 221.97      |
| Apr-16 | 241.18  | 238.25  | 221.37      | 221.0533333 |
| May-16 | 234.49  | 232.15  | 231.46      | 231.8333333 |
| Jun-16 | 240.42  | 239.53  | 238.6966667 | 236.6433333 |
| Jul-16 | 258.31  | 257.36  | 244.4066667 | 243.0133333 |
| Aug-16 | 252.09  | 251.52  | 250.2733333 | 249.47      |
| Sep-16 | 260.81  | 258.42  | 257.07      | 255.7666667 |
| Oct-16 | 262.93  | 265.4   | 258.61      | 258.4466667 |
| Nov-16 | 267.8   | 266.89  | 263.8466667 | 263.57      |
| Dec-16 | 257.67  | 256.13  | 262.8       | 262.8066667 |
| Jan-17 | 263.52  | 263.08  | 262.9966667 | 262.0333333 |
| Feb-17 | 281.56  | 280.09  | 267.5833333 | 266.4333333 |
| Mar-17 | 279.75  | 281.32  | 274.9433333 | 274.83      |
| Apr-17 | 299.36  | 299.77  | 286.89      | 287.06      |
| May-17 | 309.89  | 307.63  | 296.3333333 | 296.24      |
| Jun-17 | 297.33  | 296.36  | 302.1933333 | 301.2533333 |
| Jul-17 | 300.1   | 299.55  | 302.44      | 301.18      |
| Aug-17 | 289.49  | 287.91  | 295.64      | 294.6066667 |
| Sep-17 | 286.44  | 285.88  | 292.01      | 291.1133333 |
| Oct-17 | 312.03  | 314.28  | 295.9866667 | 296.0233333 |
| Nov-17 | 308.33  | 309.54  | 302.2666667 | 303.2333333 |
| Dec-17 | 332.07  | 332.06  | 317.4766667 | 318.6266667 |
| Jan-18 | 332.52  | 327.55  | 324.3066667 | 323.05      |
| Feb-18 | 297.17  | 293.73  | 320.5866667 | 317.78      |
| Mar-18 | 277.15  | 278.32  | 302.28      | 299.8666667 |
| Apr-18 | 287.15  | 285.35  | 287.1566667 | 285.8       |
| May-18 | 285.1   | 281.07  | 283.1333333 | 281.58      |
| Jun-18 | 283.9   | 284.23  | 285.3833333 | 283.55      |
| Jul-18 | 321.87  | 323.82  | 296.9566667 | 296.3733333 |

### DSE-B2 PROJECT WORK

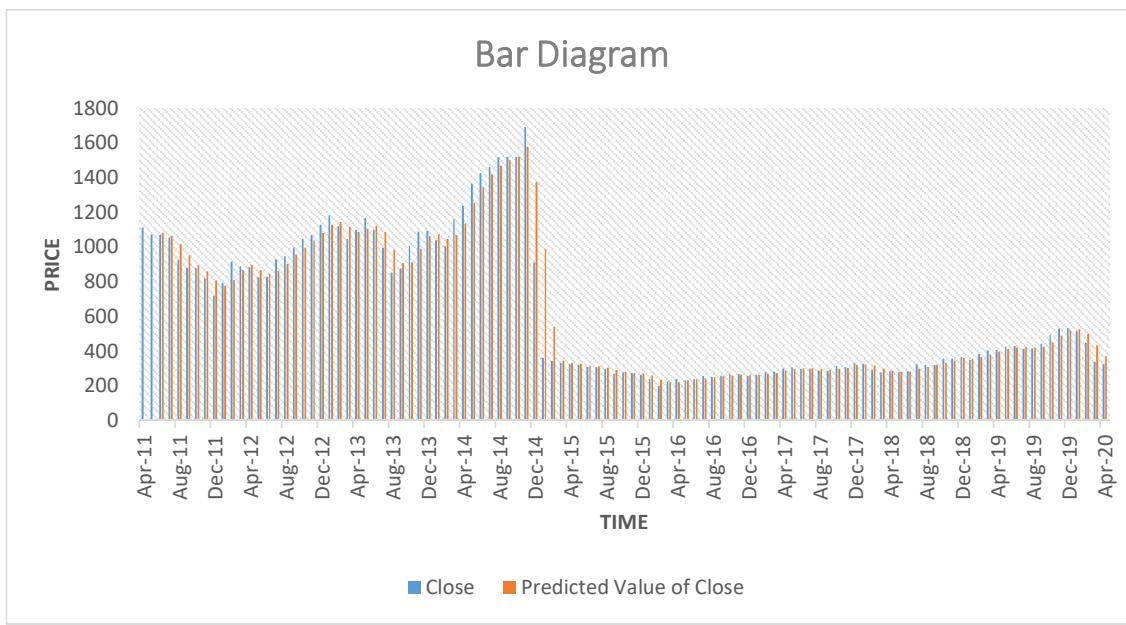
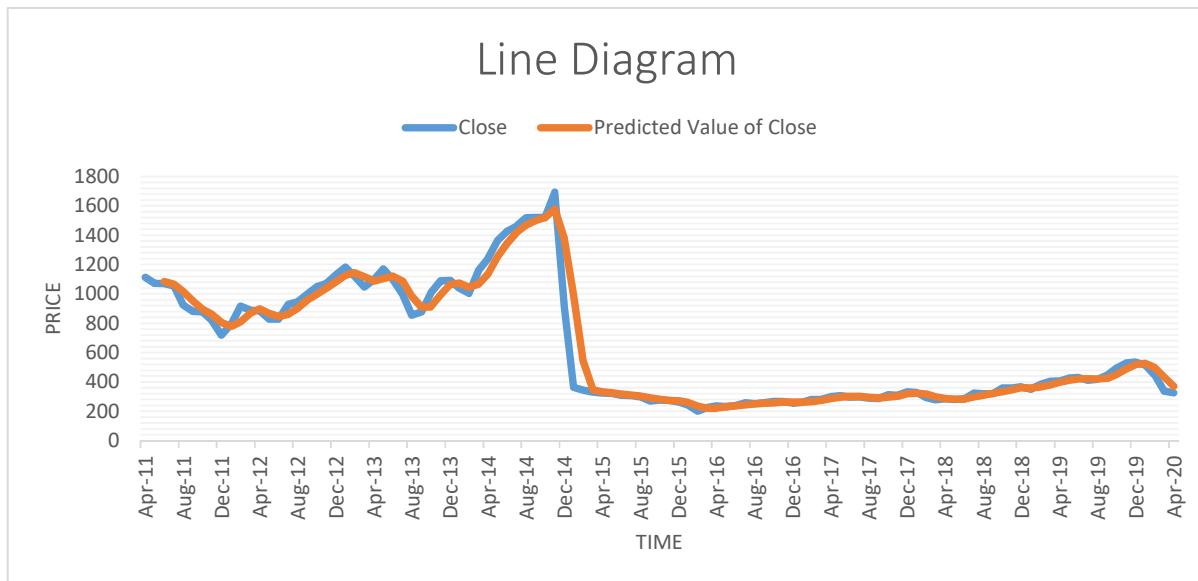
|        |        |        |             |             |
|--------|--------|--------|-------------|-------------|
| Aug-18 | 326.09 | 320.11 | 310.62      | 309.3866667 |
| Sep-18 | 315.52 | 320.11 | 321.16      | 321.3466667 |
| Oct-18 | 361.82 | 358.61 | 334.4766667 | 332.9433333 |
| Nov-18 | 357.12 | 358.56 | 344.82      | 345.76      |
| Dec-18 | 364.05 | 366.29 | 360.9966667 | 361.1533333 |
| Jan-19 | 351.8  | 349.41 | 357.6566667 | 358.0866667 |
| Feb-19 | 378.16 | 382.77 | 364.67      | 366.1566667 |
| Mar-19 | 401.34 | 403.42 | 377.1       | 378.5333333 |
| Apr-19 | 405.54 | 405.95 | 395.0133333 | 397.38      |
| May-19 | 428.03 | 426.85 | 411.6366667 | 412.0733333 |
| Jun-19 | 431.39 | 430.06 | 421.6533333 | 420.9533333 |
| Jul-19 | 414.27 | 412.13 | 424.5633333 | 423.0133333 |
| Aug-19 | 419.47 | 416.94 | 421.71      | 419.71      |
| Sep-19 | 449.89 | 444.28 | 427.8766667 | 424.45      |
| Oct-19 | 490.61 | 492.87 | 453.3233333 | 451.3633333 |
| Nov-19 | 531.22 | 528.47 | 490.5733333 | 488.54      |
| Dec-19 | 533.49 | 534.47 | 518.44      | 518.6033333 |
| Jan-20 | 518.73 | 515.71 | 527.8133333 | 526.2166667 |
| Feb-20 | 457.98 | 449.1  | 503.4       | 499.76      |
| Mar-20 | 337.76 | 338.08 | 438.1566667 | 434.2966667 |
| Apr-20 | 334.43 | 325.24 | 376.7233333 | 370.8066667 |

- We calculated this table using Excel.

### Open Vs Predicted Open:-



Close Vs Predicted Close :-



- We Compute those graphs using Excel.

## Trend Analysis :-

It has been already stated that the most important purpose Time series Analysis is Forecasting, the usual method of forecasting is to separate out Trend. So here we are conducting the trend analysis of the given data.

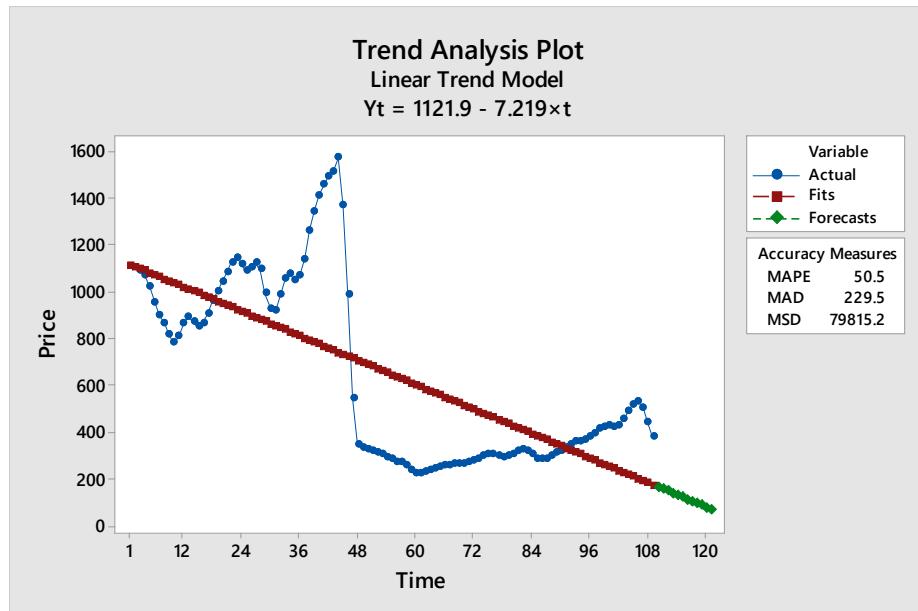
We are using minitab to complete the action.

### Fitted Trend Equation

$$Y_t = 1121.9 - 7.219xt$$

### Forecasts

| Period | Forecast |
|--------|----------|
| 110    | 327.81   |
| 111    | 320.591  |
| 112    | 313.372  |
| 113    | 306.153  |
| 114    | 298.934  |
| 115    | 291.715  |
| 116    | 284.496  |
| 117    | 277.277  |
| 118    | 270.058  |
| 119    | 262.839  |
| 120    | 255.62   |



## **Effect on COVID-19**

The havoc created by the world-wide pandemic COVID-19 toppled the complete economic status of the world. Perhaps the most tragic period of history human has ever seen. Whether it's developing country, under-developed or world's most powerful economy for that matter, no country escaped safe from its brunt. The economy has been extremely affected due to COVID-19 Pandemic. Reserve Bank of India; the Apex bank of India made necessary changes with the help of expert in their policy for facing COVID19 pandemic. Entire Indian Banking sector faced and continue to face many challenges such as liquidity issue, Reserve Bank Of Indian reduced REPO rate to name a few. Since people are struggling to receive income, Reserve Bank of India decided to provide concession for paying EMI from customer by increasing the period for re-payment. The objective of the research paper is to study the changes RBI bought in its policy due to COVID-19 and also in general how COVID-19 has impacted the Indian Banking Sector. Further the solution is proposed for Indian Banking system to tackle the losses due to COVID19 Pandemic. The research found that Indian Banking system has added various measures due to COVID-19 Pandemic to make Banking system smooth and effective. Most of the Indian Banks were facing the problem of NPA, Non recovery of loan, customer frauds, Bad Loans etc. and to add on to it COVID-19 has expedited the collapse of Indian Banking business. No doubt banks are established in India with a fundamental purpose to make profit by giving expected comfort to customers. But Covid19 has changed the scenario of Indian customers. Due to shut down of businesses income source of the people came to halt. Then where lie the scope of availing loan and repaying with interest. These challenges our Indian banks were facing inthe pandemic situation.

Lockdown has become a big blow for the Indian economy. From MNCs to street vendors were affected due to this lockdown phase. As many companies operate with the work from home,many managed to survive the race. In the Data we can see that Lockdown and Covid didn't hit massively ICICI Bank Ltd. The trend is increasing in the lockdown period Phase 1 (25<sup>th</sup> March – 14<sup>th</sup> April) and Phase 2 Lockdown (15<sup>th</sup> April – 3<sup>rd</sup> May).

### **Stock in Present time :-**

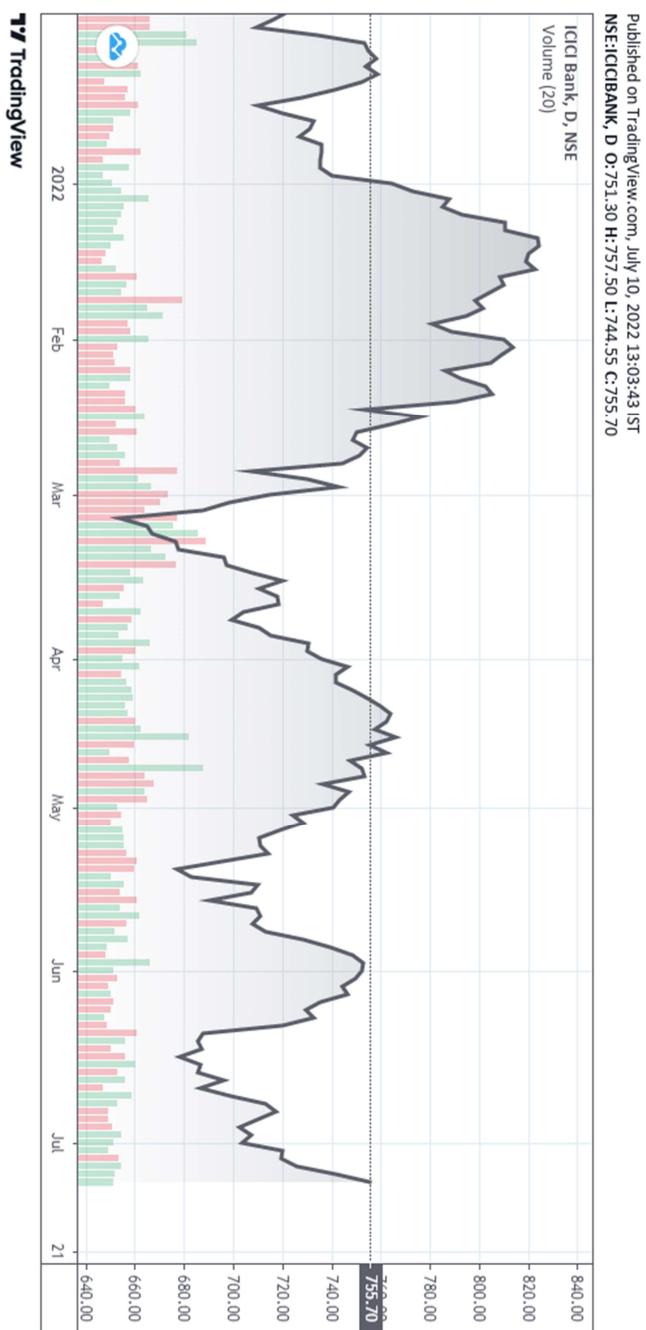
In economics and financial theory, analysts use random walk techniques to model behavior of asset prices, in particular share prices on stock markets. This practice has its basis in the presumption that investors act rationally and without biases, and that at any moment they estimate the value of an asset based on future expectations. Under these conditions, all existing information affects the price, which changes only when new information comes out. By definition, new information appears randomly and influences the asset price randomly.

Empirical studies have demonstrated that prices do not completely follow random walks. Low serial correlations (around 0.05) exist in the short term, and slightly stronger correlations over the longer term. Their sign and the strength depend on a variety of factors. Researchers have found that some of the biggest price deviations from random walks result from seasonal and temporal patterns. In particular, returns in January significantly exceed those in other months (January effect) and on Mondays stock prices go down more than on any other day. Observers have noted these effects in many different markets for more than half a century, but without succeeding in giving a completely satisfactory explanation for their persistence.

Technical analysis uses most of the anomalies to extract information on future price movements from historical data. But some economists, for example Eugene Fama, argue that most of these patterns occur accidentally, rather than as a result of irrational or inefficient behavior of investors: the huge amount of data available to researchers for analysis allegedly causes the fluctuations. Another school of thought, behavioral finance, attributes non-randomness to investors' cognitive and emotional biases. This can be contrasted with fundamental analysis. When viewed over long periods, the share price is related to expectations of future earnings and dividends of the firm. Over short periods, especially for younger or smaller firms, the relationship between share price and dividends can be quite unmatched.

Now in this project we can see that in the present time the stock market price of ICICI Bank Ltd is increasing in some previous months and the trend is upwards.

## DSE-B2 PROJECT WORK



- The given Graphical representation is obtained from NSE (National Stock Exchange)

## **Conclusions :-**

From the analysis, we can understand what are all the factors which is being undergone while working on a time-series project. Time series result's aren't the supreme way to tell accurate results as anything can happen to worsen or brighten up the stock market and the predictions aren't 100% reliable. But we can easily understand and derive from the past data and associate it with time and figure out why the event happened. We predict the 12 months data and we can see that there is a difference in predicted valued and Actual values.

Coming to context with our project, we can see that major down in stock price of ICICI Bank at the month of December 2014 and then the stock price is very downing but in recent couple of years we can see that the trend is upwards, so we can assumed that ICICI bank's stock price will reach a good price like 2011-2013 stock price.

## **Acknowledgement:-**

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## References :-

The followings books, websites and softwares have been used for this project work.

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### Websites:

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2. National Stock Exchange : <https://www.nseindia.com>
3. Wikipedia : <https://www.wikipedia.org/>

### Softwares:

1. Microsoft Office 2016
2. Minitab 18