International Journal of Recent Technology and Engineering (IJRTE)
ISSN: 2277-3878 (Online), Volume-8 Issue-6, March 2020

Stock Market Forecasting Technique using Arima Model

Bijesh Dhyani, Manish Kumar, Poonam Verma, Abhisheik Jain

Abstract*: *In Financial market, various shares, bonds, securities or currencies are traded on the daily basis , thus making most of the datasets as time series data where price is plotted against a time series[11] . There are many techniques and analysis technique that can be used with times series data like ARIMA model, exponential Smoothing, Neural Networks or Simple Moving average. However ARIMA Model is commonly used to understand time series analysis in order to extract meaningful characteristics of the data and help in the prediction of the stock prices.[12] since it helps to understand what happened in past and past behavior of data can help to predict future. Time series is a special property and different set of predictive algorithm. There are three variants of the ARIMA Model namely Basic, Trend Based and Wavelet Based. In this paper key components of time series data have been discussed and implemented using ARIMA model for we have collected NIFTY daily data of Nifty50 index and wants to predict future value of the Stock.

Keyword: ARIMA Model, Stock Market, Prices, Time Series data

I. INTRODUCTION

Different investment comes with different level of risk and profitability but one who invest in stock market should know the higher return he expects comes in price of higher uncertainty and risk. As investment is growing people companies economists analyse different prediction model for forecasting to minimize risk and to build the portfolio.
Market Index gives an idea how a given stock market is performing so for trading in India there are two exchanges Bombay Stock Exchange(sensex) and National Stock Exchange(NSE).Many people companies individual investor utilize the forecasting technique for investment and report preparations[3].In financial market specially in stock market people buy and sell shares but there are other securities which are also traded like ETF(Exchange Traded Funds) corporate bonds ,currency are also traded[4].

Manuscript received on February 10, 2020.
Revised Manuscript received on February 20, 2020.
Manuscript published on March 30, 2020.
* Correspondence Author
Bijesh Dhyani*, Management Studies, Graphic Era Deemed to be University, Dehradun, India. Email: bijesh.dhyanii@yahoo.com
Manish Kumar, Management Studies, Graphic Era Deemed to be University, Dehradun, India. Email: manishsingh12@rediffmail.com
Poonam Verma, SOC, Grpahic Era Hill University, Dehradun, India. Email: poonamddn18gmail.com
Abhishek Jain, SOC, Grpahic Era Hill University, Dehradun, India. Email:doon.abhishek@gmail.com

ARIMA model are generally applied where there is a evidence that data is non stationary .In this paper, we hereby have the potential to propose the utilization of ARIMA model for the prediction of stocks ' costs. An ARIMA , or autoregressive integrated moving average may be an applied mathematics analysis model that uses statistic information data to either perceive the data set or to predict future trends[4].

II. LITERATURE SURVEY

A lot of research utilizing the ARIMA model for the prediction purposes has been undergoing.
Some of the research carried out by different authors have been stated in this section. Authors conferred a hybrid intelligent system exploiting ARIMA and Neural networks, to forecasts the demand of the merchandise, with a dramatic reduction within the sales failure than the previous solutions in context to the Chilean market [1]. Variants of ARIMA Model ie. Basic, Trend Based and Wavelet Based have also been used to predict the average global temperature time series data where the Trend Based ARIMA Model is able to perform better than the other variants [2]. ARIMA model has been also compared with the conventional Grey Model GM(1,1) and modified GM(1,1) model using fourier series on the Noisy Gold Data [3]. ARIMA model has been popularly adopted for linear series , however it is observed that ARIMA Model cannot easily handle the nonlinear series , thus SVM can be implemented along with the ARIMA Model to forecast stock prices , which is non linear in nature [4]. Stock Market indices predictions have been further carried out using Bacterial foraging optimization and Adaptive Bacterial Foraging Optimization techniques and compared with the Genetic algorithm based techniques [5]. A hybrid intelligent data mining technique based on genetic algorithm and support vector machine is proposed to explore the forecast of the stock market [6]. Further some authors have also proposed a PHM(Proposed Hybrid Model) with weights determined by the Genetic Algorithm [7].Stock market price has been forecasted using the combination of the chaotic mapping, firefly algorithm and support vector regression, which outperformed variants of the genetic algorithm based support vector regression models[8]. Hybrid ARIMA and ANN have been used for the prediction of the stock data[9].one of the base paper for this paper utilized Time Series Analysis for Stock Trend Prediction using ARIMA Model for Nifty Midcap 50 that was carried out to help people for their investment decisions.[10]

III. OBJECTIVE AND STUDY

To predict the movement of Nifty 50 index of Indian stock market. The NIFTY 50 is the index on the NATIONAL STOCK EXCHANGE OF INDIA Ltd.

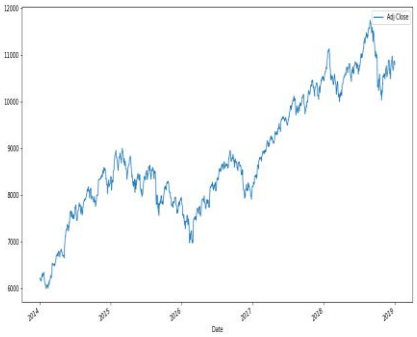
Which helps to follow the ongoing trend of the blue chip companies and reflects the true scenario of the Indian Stock Market on the daily basis. NIFTY 50 helps to offer exposure to the Investors and is self sufficient for the benchmarking and index based derivatives.

DATA AND METHODOLOGY

This analysis involves monthly information on the closing stock indices of NIFTY covering the period from 2014 to 2018 having a total number of 1222 observations. .On the idea of this information , we have tried to determine an acceptable likelihood model to enable the ARIMA model to predict the future longer term unobserved price of NIFTY.

3.1 Data Decomposition

Data Decomposition is the main factor considered for analysis .Time series data is cleave into different parts: seasonality, trends and random oscillate, that can be used to identify trend from past data [15].

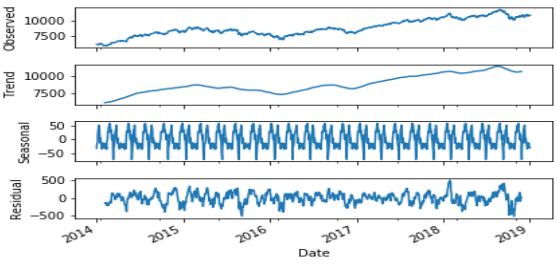


1. Seasonality

Dataset is a repeating set of trends, things which have to do with seasons of year.It allows to analyse repeating trends [15].

2. Trend

Time series data can have trend to them it can be upward trend, stationary or downward trend. This is basically describing on average what is the value doing for this time series on a larger time period what average is doing whether it is moving upward horizontal or stationary or whether it is moving downward [15].



3. 3.Cyclical

It means trend with no set repetition. It can be a non-repetitive trend [15].

From the above diagram we can conclude that there exists seasonality in time series data.

3.2 ADF

After decomposing the data the next step is to determine visually whether data is stationary or not. As to use ARIMA effectively stationary is an important concept. A stationary series has constant mean and variance over time, a stationary dataset will allow our model to predict that the mean and variance will be same in future trends. There are mathematical test which can be used to test stationarity in dataset one commonly used is ADF(Augmented Dicky Fuller Test). It's important to test the stationarity of data to apply fitting ARIMA model. In performing the test is assumed that data is non stationary and for performing

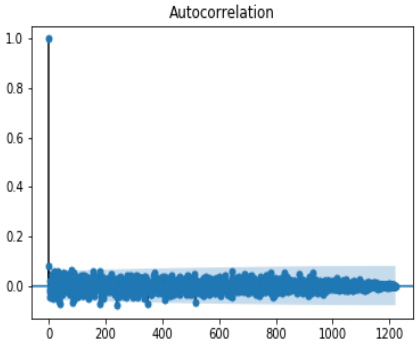
ADF test following are p values for different time period

For whole series the value of p=0.99, for 0-3 months p=0.1803, for 3 to 6 months p=0.6713, for 6 to 12 p=.7001 and for 12 + months p=.8331[15].Data need to be stationary either visually or mathematically. To make data suitable for analysis one simple way can be diffrencing also but we carry out Augmented Dickey Fuller Test which is considered unit root test for stationarity causes result which are not known earlier for time series.. This is why data needs to be stationary .Now after the data is stationary we can proceed further by plotting the autocorrelation and partial auto-correlation

3.2. A Autocorrelation

An Autocorrelation plot shows the correlation of time series with itself, lagged by x time units so the y axis so y axis is correlation value and x axis is number of units of lag. Our main priority here is to figure out whether we will use AR or MA components for ARIMA model or both and to also decide how many lags we should use. When we actually apply AR or MA the value of p and q need to be set. If the autocorrelation plot show positive autocorrelation at the first lag(lag-1) then it is recommended to use Autoregressive(AR) in relation to lag. If this plot shows negative correlation at the first lag then one can use Moving Average model. This will allow us to decide what actual value of p,d.q to provide to ARIMA model. The value of p is decided by number of lag observations included in the model, value of d is decided by number of times raw information is differenced and q which is the size of moving average also called order of moving average [14].

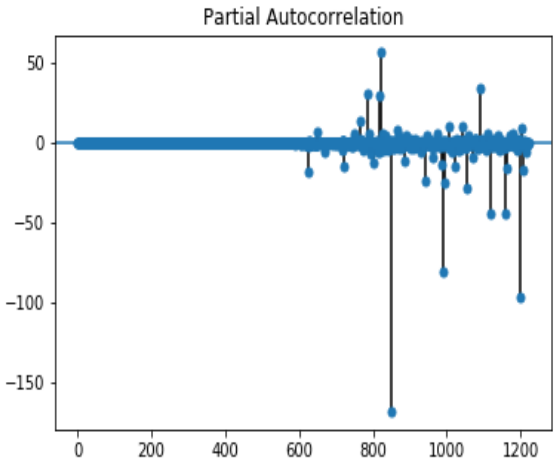
It is denoted by ACF and ranges from -1 to +1.



3.2.B Partial autocorrelation

A partial autocorrelation may be a conditional correlation it's a correlation between 2 variables beneath the

belief that we've taken price from another variable as an example think about a regression context during which y=response variable and x1,x2,x3 square measure predictor variables then the correlational statistics between the variables determined taking under consideration however each y and x3 square measure associated with x1 and x2 that's there conditional correlation[14]. It show the link outline between statistic knowledge with the values at previous time with intervening observations removed[17].It is denoted by PACF



ARIMA Model

The Autoregressive Integrated Moving Average model can be considered as generalization of an Autoregressive Moving Average(ARMA)model .Both of these model units are well fitted to time series information to predict future points asynchronous in static series is known as forecasting. The Auto Regressive (AR) and Moving Average (MA) work together to build ARIMA models (Rahimi and Khashei, 2018).There are two types of ARIMA model [15**]**. The Auto Regressive [AR] and Moving Average [MA] work along to develop ARIMA models [Rahimi and Khashei, 2018].There are two categories of ARIMA model :

1.Non-seasonal ARIMA

Non seasonal ARIMA models are typically denoted ARIMA(p,d,q) whereever parameters p,d,q are considered to be non negative integers.

AR(p). Its Autoregression that utilizes the dependant relationship between a current observation over previous time frame. Its a basic regression task.

I(d).Its the Integrated portion of ARIMA model which carries out the differencing of observation(subtracting an observation from from an observation at previous time step) in order to make series static.

MA(d). It's a Moving Average which uses dependency between an observation and a residual error from a moving average model applied to lagged observations [8].

2.Seasonal ARIMA

The seasonal ARIMA is for seasonal data model incorporates both non-seasonal and seasonal factors in a multiplicative model.

ARIMA [p,d,q] x [P,,D,Q]S with p = non-seasonal AR order, d = non-seasonal differencing, q = non-seasonal MA order, P = seasonal AR order, D = seasonal differencing, Q = seasonal MA order, and S = time span of repeating seasonal pattern[1**6].**

In this study we have applied non-seasonal ARIMA.

RESULT AND ANALYSIS

The prediction for the stock data is given in the table as described below

Date	Actual Price	Predicted Price
2018-11-26	10628.599609375	10519.1969056294
2018-11-27	10685.599609375	10635.1627452067
2018-11-28	10687.267454215	10688.4766817159
2018-11-29	10858.7001953125	10730.5744566998
2018-11-30	10876.75	10867.3363402093

IV. CONCLUSION AND FUTURE SCOPE:

As described above in the paper , we have analysed the data of the time series in the stock market using the ARIMA Model. As shown in the results , the predicted price using the ARIMA Model is very close to the Actual price on the given dates. This indicates the successful implementation of the ARIMA Model on the time series data. In the future, we hope to analyze the dynamic data of the stock market. We would like to propose an optimized ARIMA model for the dynamic data in the future.

REFERENCES

1. Aburto. L., & Weber. R. (2007)," Improved supply chain management on hybrid demand forecasts". Applied Soft Computing, 7(1), 136-144.
2. Babu. C. N., & Reddy. B. E. (2012, March). "Predictive data processing on average global temperature using variants of ARIMA models." In IEEE-International Conference On Advances In Engineering, Science And Management (ICAESM-2012) (pp. 256-260). IEEE.
3. Mehdi Askari and Hadi Askari,2011. "Time Series Grey System Predcition-based Models: Gold Price Forecasting". Trends in Applied Sciences Research,6:1287-1292.
4. Pai.P.F., & Lin.C.S.(2005). "A hybrid ARIMA and support vector machines model available in stock price forecasting". Omega,33(6), 497-505.
5. Majhi. R., Panda. G., Majhi, B., & Sahoo. G. (2009). "Efficient prediction of stock market indices using adaptive bacterial foraging optimization (ABFO) and BFO based techniques". Expert Systems with Applications, 36(6), 10097-10104.
6. Yu. L., Wang. S., & Lai. K. K. (2005, December). "Mining stock exchange tendency using GA-based support vector machines". In International Workshop on Internet and Network Economics (pp. 336-345). Springer, Berlin, Heidelberg.
7. Wang. J. J., Wang. J. Z., Zhang. Z. G., & Guo, S. P. (2012). "Stock index forecasting based on a hybrid model. Omega", 40(6), 758-766.
8. Kazem. A., Sharifi. E., Hussain F. K., Saberi M., & Hussain O. K. (2013). "Support vector regression with chaos-based firefly algorithm for stock market price forecasting". Applied soft computing, 13(2), 947-958.
9. Babu C. N., & Reddy B. E. (2014). "A moving-average filter based hybrid ARIMA–ANN model for forecasting time series data". Applied Soft Computing, 23, 27-38.
10. Devi. B. U., Sundar D., & Alli P. (2013). "An effective timeseries analysis for static trend prediction using ARIMA model for nifty midcap-50". International Journal of Data Mining & Knowledge Management Process, 3(1), 65.

11. Yanovitzky. I., & VanLear. A. (2008). “Time series analysis: Traditional and contemporary approaches”. In A. F. Hayes, M. D. Slater, & L. B. Snyder (Eds.), The SAGE Sourcebook of Advanced Data Analysis Methods for Communications Research (pp. 89-124). Thousand Oaks, CA: Sage Publications.
12. Chen.S. , “Stock Market”, Retrieved from https://www.investopedia.com
13. Tamatta, R. K. (2018). Time series forecasting of hospital Inpatients and Day case waiting list using ARIMA, TBATS and Neural Network Models (Doctoral dissertation, Dublin, National College of Ireland)
14. Hyndman.R.J. et.al., “Seasonal ARIMA models “ , Retrieved from https://online.stat.psu.edu/
15. Brownlee.J.,” A Gentle Introduction to Autocorrelation and Partial Autocorrelation “, Retrieved from https://machinelearningmastery.com
16. Hyndman.R.J. et.al., “Non-seasonal ARIMA models “,Retrieved from https://otexts.com
17. Stephanie , “Augmented Dickey Fuller Test”, Retrieved from https://www.statisticshowto.datasciencecentral.com

AUTHORS PROFILE

Bijesh Dhyani, Pursuing Ph.D, from Graphic Era Deemed to be University and has completed his MBA from WBUT technical University, Kolkata. His interest of research is Blockchain ,Machine and Data Science

Dr Manish Bisht, Assocaiate professor in Graphic era Universtity has completed MTech(CS) MBA and PhD(Management) and his area of research is Big data machine learning

Poonam Verma, Pursuing Ph.D, from Graphic Era Deemed to be University and has completed her M.tech(CS) from UP technical University, Lucknow. Her interest of research is Blockchain and Machine Learning.

Abhishek Jain, Pursuing Ph.D, from Graphic Era Hill University completed MTech(CS) from Graphic Era university.His intreset of research is Big data Machine Learning and Network Securuty.