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Short Note: ELECTRIAL, ELECTRONICS & COMPUTER SCIENCE

Predictive Analysis of Indian Stock Market on Time Series Data using ARIMA model

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Abstract - Accuracy in forecasting is the important factor for selecting any forecasting methods. The accuracy of forecasting methods is getting increased as more and more people are researching in this area. Selecting the right stock at the right time is critical for the investor to get the maximum profit with no loss or minimal loss. Selecting the right stocks plays key role in maximizing the profits. Various methods and techniques are used to predict the price of the stock which includes the technical and fundamental analysis. Fundamental analysis involves analyzing the characteristics of a company in order to predict the future estimated value. Technical Analysis is the forecasting of future financial price movements based on an examination of previous historical market prices. Similar to weather forecasting, technical analysis does not result in absolute predictions about the future. In other way, it can help investors anticipate what ―likely to happen to prices over time is. In this paper proposes a method for forecasting of stock price with time series data analysis. The outcome of this study tries to make the investors to think about the stock market to decide the better timing for buy or to sell stocks based on the knowledge extracted from the historical prices of such stocks along with other impacting factors.

Keywords: Time series, BSE, ARIMA, forecasting, stock market.

1. INTRODUCTION

Stock market prediction is an interesting problem domain where many researchers have attempted to predict the future stock prices using various models such as ARIMA, mathematical and statistical models, machine learning techniques like support vector machine and neural network techniques like recurrent neural network. In this paper we use different time series forecast models to predict future momentum of stock and select the best prediction from the different models and correlate with the dependent trend of the index to improve the accuracy.

1.1 Stock Market and Stock Prediction

Stock market prediction is a process of forecasting the future value of the stock of a company. A stock is some amount of share owned by ownership of a company. More number of stocks will lead to greater ownership stake in the company. Consumers and Vendors use stock market as a common platform to trade their products through stock exchange. A common stock exchange in India is National Stock Exchange (NSE) and Bombay Stock Exchange (BSE). Needs of consumer decides the rise and fall in stocks and based on their preference the ratings are made. If a consumer wants to purchase a stock, it is obvious the vendor has to sell it. To be precise, if large number of people shows their interest towards a particular stock, the stock price goes up. When the price gets so high that people are not willing to buy any more, the price starts to drop. Similarly if we have more vendors and less consumers, then the value of the stock decreases. In this platform a vendor makes money only if his stock worth more, calculated from the time of purchasing. There is always a perception of stocks prevails i.e Low purchase high cost. Suppose if the value of his stock gets reduced, then it is advisable to sell the stock at current price and acquire the same stock at low cost than selling.

Stock market is not consistently a profitable one. It always has fluctuations. So it is not possible to appropriately calculate the returns in future. We need to propose a model that predicts the future stock price to a satisfactory accuracy and predict when and which stock to buy or sell.

This problem can be transformed into an engineering problem and solved by application of technological applications like data mining or machine learning. Many investors made stock prediction using gut feeling or they evaluate the performance

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of the company performance to make investment decision. Nowadays mostly stock prediction is made by statistical methods or machine learning techniques. Many researchers have proposed various prediction algorithms which use historical data for stock forecasting. Our prediction model attempts to predict the movement of stock price in the next day by using historical data of the stock. With this knowledge, an investor can make profitable decisions and reduce the risk

1.2. What is Time Series?

A time series is a sequence of observations on a variable measured at successive at particular time or over a period of time [1]. It can be measured every hour, day, week, month or year. The major role is in comprehending the factor related to the series of past. If such behavior is to be occurred in future, the past pattern can be utilized to guide in choosing an apt method.

1.3. Trend Pattern

Time series is not constant and has shifts and fluctuations over a period of time with higher and lower values. In such situation Trend pattern exists. A trend pattern is nothing but the effect of a continual process such as increase in demographic statistics, drastic change in technology and shift over in consumer ideology [2]. It can be noted as the change in traditional pattern and forming a new pattern with the current expectations.

1.4. Seasonal Pattern

This pattern is different from time series and trend series. Time series focuses on continual measurements and trend pattern focuses on the pattern formed based on the requirements, but seasonal pattern is something which comes in effect only in seasons. For example, the sale of air conditioners will be more in summer and less in winter. So repeating same pattern for every season is seasonal pattern which is the effect of seasonal demands. Time series when calculated reveals many seasonal patterns. Time series is also a mixture of trend and seasonal pattern.

1.5. Time Series Forecasting

Time series is designed for future based on the execution of past pattern. Various parameters are taken into account, Such as statistics, consumer satisfaction, vendors marketing techniques. Based on this, the model is generated and tested. Time series forecasting has natural temporal ordering and it differs from typical data mining where each order must be learnt. In time series the ordering of data does not matter. Capacity planning, inventory replenishment, sales forecasting and future staffing can be considered as examples of time series

1.6. Holt-Winters

Holt (1957) and winters (1960) extended Holt's method to capture seasonality. The Holt-Winters seasonal method consists of the forecast equation and three smoothing equations — one for level ℓ_t, one for trend b_t, and one for the seasonal component denoted by s_t, with smoothing parameters α, β* and γ. m denotes the period of the seasonality, i.e., the number of seasons in a year. For example, for quarterly data m=4, and for monthly data m=12. There are two variations to this method that differ in the nature of the seasonal component. The additive method is preferred when the seasonal variations are roughly constant through the series, while the multiplicative method is preferred when the seasonal variations are changing proportional to the level of the series [3].

$$\hat{y}t+h|t=\ell t+hbt+st-m+h+m$$

$$\ell t=\alpha\,(yt-st-m) + (1-\alpha)(\ell t-1+bt-1)$$
$$bt=\beta*\,(\ell t-\ell t-1)+(1-\beta*)bt-1$$
$$st=\gamma(yt-\ell t-1-bt-1)+(1-\gamma)st-m$$

Where $h^{+}m=\lfloor(h-1)\bmod m\rfloor+1$, which ensures that the estimates of the seasonal indices used for forecasting come from the final year of the sample[3]. The level equation shows a weighted average between the seasonally adjusted observation (y_t-s_{t-m}) and the non-seasonal forecast $(\ell_{t-1}+b_{t-1})$ for time t. The trend equation is identical to Holt's linear method. The seasonal equation shows a weighted average between the current seasonal index, $(y_t-\ell_{t-1}-b_{t-1})$, and the seasonal index of the same season last year

2. ARIMA MODEL

The defects of time series is rectified through the ARIMA procedure which analyses and forecasts equally spaced time series data, transfer function data, and intervention data using the Auto Regressive Integrated Moving-Average (ARIMA) or autoregressive moving-average (ARMA) model [4]. An ARIMA model regulates the time series. This model predicts a value in a response time series as a linear combination of its own past values, past errors (also called shocks or innovations), and current and past values of other time series. The ARIMA approach was first popularized by Box and Jenkins, and ARIMA models are often referred to as Box-Jenkins models [5]. The general transfer function model employed by the ARIMA procedure was discussed by Box and Tiao (1975). When an ARIMA model includes other time series as input variables, the model is sometimes referred to as an ARIMAX model. Pankratz (1991) refers to the ARIMAX model as **dynamic regression.**

The order of an ARIMA model is usually denotedby the notation ARIMA(p, d,q), where

p is the order of the autoregressive part
d is the order of the differencing
q is the order of the moving-average process

If no differencing is done (d = 0), the models are usually referred to as ARMA(p,q)models.

Mathematically the pure ARIMA model is written as

$$W_t = \mu + \frac{\theta(B)}{\Phi(B)} \alpha_t$$

Where
t indexes time
W_t is the response series $Y_t$or a difference of the response series.
μ is the mean term
B is the backshift operator; that is $BX_t = X_{t-1}$
$\Phi(B)$ is the autoregressive operator, represented as a polynomial in the back shift operator: $\Phi(B)=1-\Phi_1(B)-\cdots-\Phi_p(B^p)$.
$\theta(B)$ is the moving-average operator, represented as a polynomial in the back shift Operator: $\theta(B)=1-\theta_1(B)-\cdots-\theta_p(B^p)$
α_t is the independent disturbance, also called the random error.

3. LINEAR MODEL

Linear Trend estimation is a statistical technique to aid interpretation of data. When a series of measurements of a process are treated as a time series, trend estimation can be used to make and justify statements about tendencies in the data, by relating the measurements to the times at which they occurred [5]. This model can then be used to describe the behaviour of the observed data.In particular, it may be useful to determine if measurements exhibit an increasing or decreasing trend which is statistically distinguished from random behaviour. Some examples are determining the trend of the daily average temperatures at a given location from winter to summer, and determining the trend in a global temperature series over the last 100 years

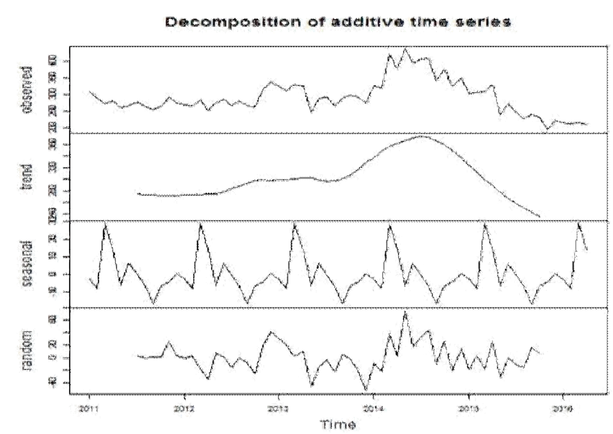
$$T_t = b_0 + b_1 t$$

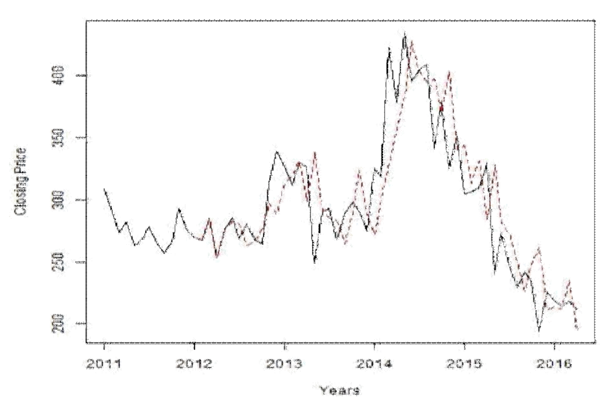
T_t linear trend forecast in
Period t b_0 intercept of the
Linear trend line $b_1$slop of the linear trend line t time period.

4. PROPOSED SYSTEM

Sample Code:

```
#ARIMA

ArimaStock2=arima(train,order=c(1,0,0),
list(order=c(2,1,0),period=12)) },error=function(a){

ArimaStock2=0})

tryCatch({

predArimaStock2=     window(forecast(ArimaStock2,h=39)$mean,
start=2016) },error=function(a){

predArimaStock2=0})

tryCatch({

mae[2,i] =
abs(predArimaStock2[i]-
test[i]) preds[2,i] =
predArimaStock2[i]
},error=function(a){})
```





5. OUTPUT

Stock Name	Originalprice	Predicted Price	MAE	Percentage	Model
ONGC	306.8	303.1323009	3.667699062	1.195469055	Holt Winter (No Gamma)
ONGC	304.6	301.8823009	2.717699062	0.892218996	Holt Winter (No Gamma)
ONGC	329.95	319.7994131	10.15058689	3.076401542	Holt Winter
ONGC	309.65	299.3823009	10.26769906	3.315904751	Holt Winter (No Gamma)
ONGC	273.05	298.1323009	25.08230094	9.185973609	Holt Winter (No Gamma)

6. CONCLUSION

All the prediction methods have predicted the future values and the best prediction is selected based on the lowest MAE, this method has shown better accuracy than individual methods. When the market is more volatile the actual and the predicted value may vary significantly. If the % variance of the prediction is over 5, it's better to ignore the prediction and check the market carefully. With this prediction accuracy, we can certainly make profitable trading decisions and earn money.

REFERENCES

[1] Shashikumar G.TOTAD, G. Suresh, A Novel Fuzzy Time-Series Based Forecasting Of Stock Price, International Journal of Soft Computing and Artificial Intelligence, ISSN: 2321-404X, Volume-1, Issue-2, Nov-2013

[2] Raj Kumar , Anil Balara, Time Series Forecasting Of Nifty Stock Market Using Weka, JRPS International Journal for Research Publication & Seminar Vol 05 Issue 02 March -July 2014

[3] A. Upadhyay, G. Bandhopadhyay and A. Dutta, "Forecasting Stock Performance in Indian Market using Multinomial," ***Journal of Buisness Studies,*** vol. 3, no. 3, pp. 16-39, 2012.

[4] Hung Pham, Andrew Chien and Youngwhan Lim, "A Framework for Stock Prediction," Stanford, 2011.

[5] Kim, K.J. (2003). Financial time series forecasting using support vector machines, Neuralcomputing, 55, 307-319.

[6] Lean Yu, Shouyang Wang, and Kin Keung Lai, A Novel Adaptive Learning Algorithm for Stock Market Predic-tion, LECTURE NOTES IN COMPUTER SCIENCE , 3827, pp. 443 – 452, 2005..

[7] J. G. Agrawal, Dr. V. S. Chourasia (2013), ―State-of-the-Art in Stock Prediction Techniques‖, IJAREEIE

[8] https://www.r-project.org/

[9] https://www.otexts.org/fpp/7/5