International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2013): 4.438

Forecasting of Stock Market through Trends and Patterns using Time Series Analysis

Parmeet Arora[1], D. Hemavathi[2]

[1]Department of Information Technology, Database systems, SRM University, Katankulathur, Chennai, India

[2]Assistant Professor, Department of Information Technology, Database systems, SRM University, Katankulathur, Chennai, India

Abstract: ***The Indian stock market, which mainly consists of the BSE (Bombay stock exchange) and the NSE (National stock exchange), is one of the fastest growing emerging markets in the world. Technical analysis is a method of predicting changing movements of price and future stock trends by studying historical data. The initial data for a technical analysis are prices: the highest and the lowest prices, the price of opening and closing within a certain period of time, and adjacent volume of transactions. Technical analyses necessitate that all the information related to the market and its further variation in stock is contained in the price chain. Any tangible or intangible factor, that has some influence on the price, whether economic, political or psychological, has previously been considered by the market and included in the price, technical analysis is more concerned with what has actually happened in the market, rather than what should happen and takes into account the price of instruments and the volume of trading, and creates patterns and trends from that data to use as the primary tool. The prime objective is to understand the trends in the stock prices using technical analysis and to use this information to determine the future direction where the price of a stock is headed in the short run, to learn the basic concepts which an individual should be aware of when he or she enters the stock market; as when to enter the market and when to exit and to understand the day to day fluctuations of stock market***

Keywords: Stock Market Prediction, Time Series Approaches, Prediction Line,Seasonal and Trend Line, Linear Model

1. Introduction

The Indian stock market, which mainly consists of the Bombay stock exchange and the national stock exchange, is one of the fastest growing emerging markets in the world. One of the mainly thinks people want to know about the stock market is, "what to buy and when to buy?" There are many different approaches for analyst the market. Two basic methods are classified as fundamental analysis and technical analysis:

(i) Fundamental Analysis

The massive amount of numbers in a company's financial statement can be wildering and intimidating to many investors. Financial statement analysis is the biggest part of fundamental analysis. Also known as quantitative analysis, it involves looking at historical performance data to estimate the future performance of stocks. Followers of quantitative analysis want as much data as they can find on revenue, expenses, assets, liabilities and all the other financial aspects of a company. Fundamental analysts look at this information to gain insight on a company's future performance, this doesn't mean that they ignore the company's stock price; they avoid focusing on it exclusively.

Financial markets, by their very nature, reveal itself in the form of rhythmic, patterned, price movement that bear not only a natural relationship to one another but also are essentially predictable once they are understood. Thus the discipline of technical analysis-hearing the message of the market via price movement –becomes an accurate tool for making profitable trading decisions. Furthermore, since markets essentially attempt to anticipate movements in economic and social fundamentals, the accurate use of technical analysis actually implies an ability to predict those fundamentals. This is why technical analysis is such an important tool for making investment decisions.

(ii) Technical Analysis

Technical analysis is a method of predicting price movements and future market trends by studying charts of historical data. The initial data for a technical analysis are prices: the highest and the lowest prices, the price of opening and closing within a certain period of time, and the volume of transactions. Technical analysis presupposes that all the information about the market and its further fluctuations is contained in the price chain. Any factor, that has some influence on the price, be it economic, political or psychological, has already been considered by the market and included in the price, technical analysis is concerned with what has actually happened in the market, rather than what should happen and takes into account the price of instruments and the volume of trading, and creates charts from that data to use as the primary tool.

In a shopping mall, a fundamental analyst would go to each store, study the product that was being sold, and then decide whether to buy it or not. By contrast, a technical analyst would sit on a bench in the mall and watch people go into the stores.

2. Overview

Why someone should dependent on reading on graphs and plots, present price and adjacent volume, instead technical formulas evaluate the same. The reason for dependency on graphs and plots is for determining efficient market, trends of stock market and reoccurrence in patterns that are largely predictable. The idea of trends reoccurring is that history repeats itself. If there was abundant stock for sale (supply)previously at 50 and that selling caused a retreat in prices, it may as well be the case again when the stock ap-

proaches this level again. If it doesn't, that tells you something that demand was not this strong enough to overcome selling.

Here we have imported a large amount of data in map-reduce of different enterprise. Our approach is to predict future trends based on the past data of an particular enterprise and then comparing different companies based on the prediction performed through different time series methods, in the order of ranking. The enterprise data on which analytics is to be performed is imported to database Mongo DB, in connection to Hadoop.

For performing analytics, statistical tool R has been used. R is the statistical software to analyse the data in the form of visualization, which is connected to Mongo Db with the required packages installed in R: rmongo, rmongodb, rplyr ,rjava etc. Based on the average of the close values, time series has been obtained and analytics has been applied.

3. Proposed Solution

Our Proposed solution comprises study of distinct patterns and trends which help out to conclude short-term profits based on the changes in trends, caused by the demand rating and shifts in the position of shares. Movement in the demand as per supply can be decided later in the graph of market action. Some graph trends tend to repeat themselves.

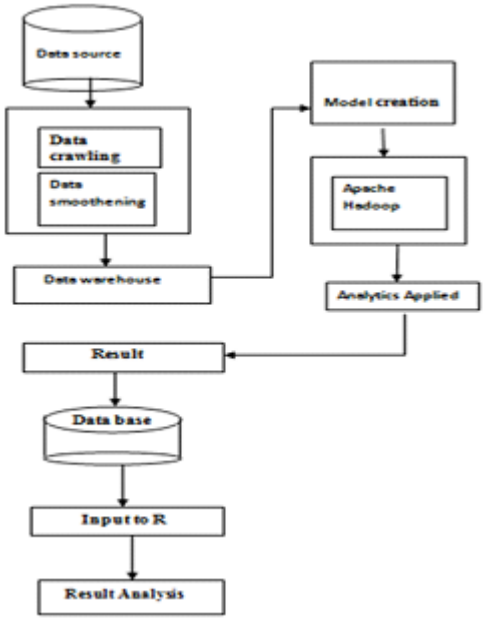
Fundamental analysis does not involve in determination of short-time variations. There are many factors which are responsible for fluctuations in the stock market but all the tangible with intangible factors cannot be accurately specified.

On the other hand, technical analysis is responsible for determining short-time fluctuations in the market through which one can deal with the share prices without knowing reasons behind. If the market share are rising, then purchase the share at market value. If the market share value is decreasing, then sell the share at market value. If market is steady, then wait for the market value to change.

Technical analysis presupposes that all the information about the market and its further fluctuations is contained in the price chain.

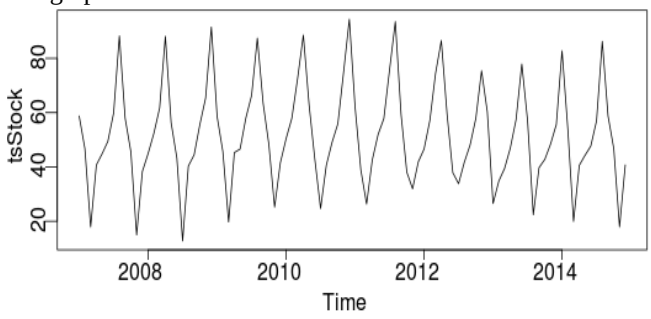
Any factor, that has some influence on the price, be it economic, political or psychological, has already been considered by the market and included in the price, technical analysis is concerned with what has actually happened in the market, rather than what should happen and takes into account the price of instruments and the volume of trading, and creates charts from that data to use as the primary tool.

4. Solution Architecture



5. Implementation

A script is used to download all available stocks. The implementation is performed on data of "American Express" from year 2007 to 2014.The data was in form of CSV (comma separated value) files which includes the following values: Open, Close, High, Low, Volume, Adj. Close. Based on average of the close values of every month, time series has been evaluated. The forecasting involves variety of time series approaches for predicting stock trend in further years. The graph of the actual function mentioned below:

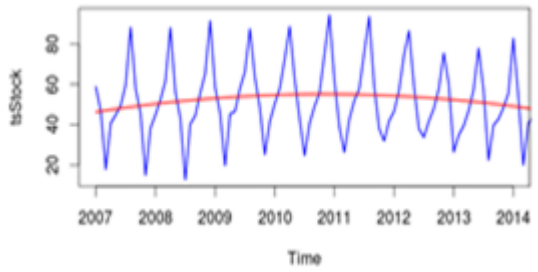


The variety of time series approaches for predicting stock trends:

- Polynomial trend
- STL Decomposition
- Holt Winters Filtering
- ARIMA model (fixed and auto)
- Neural Networks

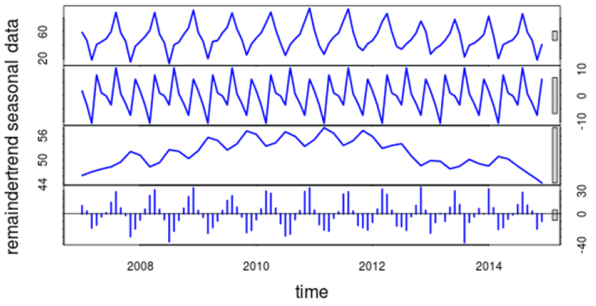
5.1 Polynomial Trend

```
tl = seq(2007,2014,length=length(tsStock))
tl2 = tl^3polyStock = lm(tsStock ~ tl + tl2)
tsStocktrend1=ts(polyStock$fit,start=c(2007,
1),frequency=12)
```

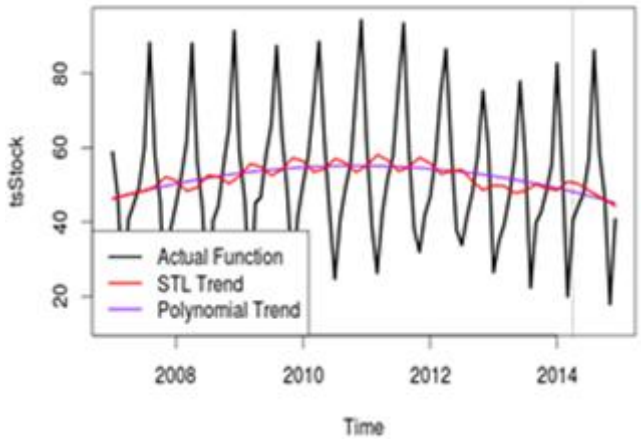


5.2 STL Trend

```
stlStock = stl(tsStock,s.window="periodic")
plot(stlStock,col="blue",lw=2)
```



5.3 Overview of Three Basic Functions



5.4 Prediction of the Three Basic Plots

The following predictions for the three base plots (Polynomial, STL, actual graph) are based on the following underlying Code:

Holt Winter Filtering:

```
HWStock1_ng =
HoltWinters(tsStocktrend1,gamma=FALSE)
HWStock1 = HoltWinters(tsStocktrend1)
```

Neural Networks:

```
NETfit1 <- nnetar(tsStocktrend1)
```

ARIMA model:

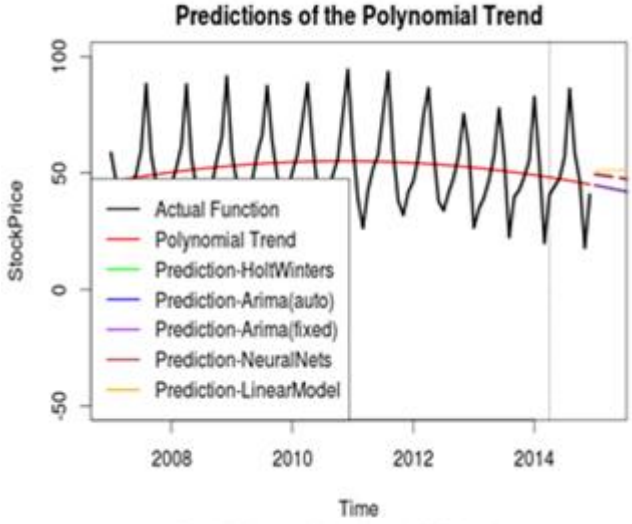
```
autofit1 = auto.arima(tsStocktrend1)fit12 <-
arima(tsStocktrend1, order=c(1,0,0),list(order=c(2,1,0),
period=12))
```

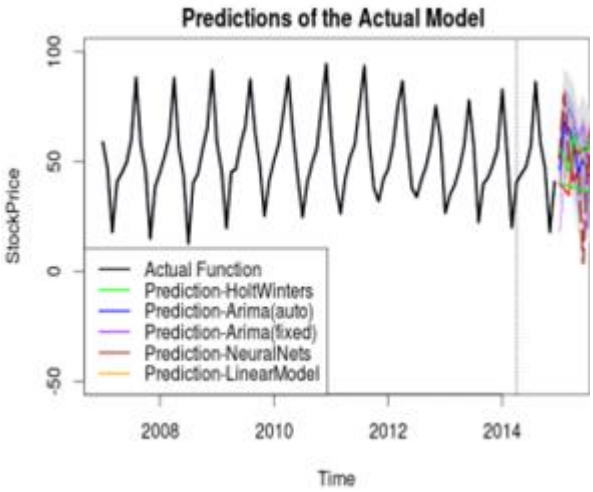
Linear Model:

```
fitl1 <- tslm(tsStocktrend1 ~ trend + season, lambda=0)
```

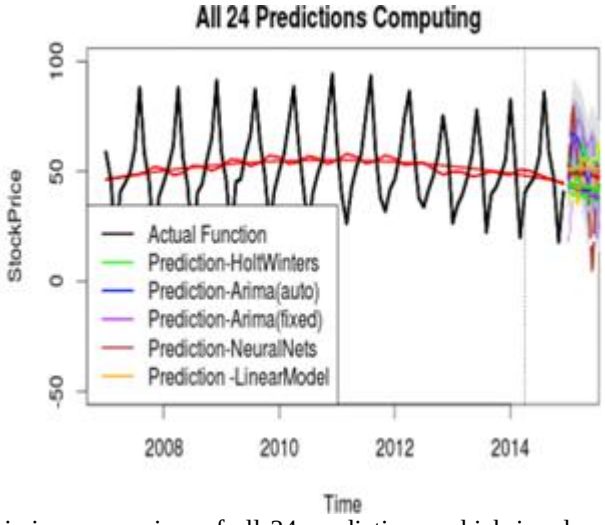
STL Model:

```
stlStock1 = stl(tsStocktrend1,s.window="periodic")
```





5.5 Evaluating the Techniques



This is an overview of all 24 predictions, which involve in the evaluation of predicting stock market of an enterprise. The 24 predictions computing together will reflect a new pattern, through which prediction of actual function could be determine, can help us in forecasting the next value of stock market.

6. Conclusion

This paper involves a forecasting of stock market based on different approaches of time series. It also involves training method that contributed to improving prediction accuracy of the stock market. The prediction performed on American Express leads to predict the past actual function to be continued which reflects improvement and increasing of the market share of value of an enterprise. The future implementation will be continued in determining the charts of other companies, in order to rank the companies, based on their predicted stock value.

References

[1] AN. Refenes, N. Burgess, and Y. Bentz, "Neural Networks in Financial Engineering: A study in methodology," in IEEE Trans on Neural Networks, pp. 1222-1267, 8(6), 1997.
[2] K.Sahu, R.Panwar, "Exchange Forecasting Using Hadoop Map-Reduce Technique", S.Tilekar, R.Satpute. April 2013.
[3] Jeffrey Dean and Sanjay Ghemawat. MapReduce:Simplified Data Processing on Large Clusters. Google Research Publication (2004).
[4] Yong Liao. Based on Gene Expression Programming and the timeseries analysis of the price of stock. Chinese dissertation database, 2005.
[5] Lucas, K. C. Lai, James, N. K. Liu, "Stock Forecasting Using Support Vector Machine," In: Proceedings of the Ninth International Conference on Machine Learning and Cybernetics, pp. 1607-1614, 2010.
[6] ApacheeHadoop,http://Hadoop.apache.org.archive/macros/latex/contrib/supported/IEEEtran/
[7] William Leigh, Ross Hightower, Naval Modani. Forecasting the New York Stock exchange composite index with past price and invest rate on condition of volume spike. Expert System with Applications, 2005.
[8] Lean Yu, Shouyang Wang, and Kin Keung Lai, A Novel Adaptive Learning Algorithm for Stock Market Prediction, LECTURE NOTES IN COMPUTER SCIENCE , 3827, pp. 443 – 452, 2005..
[9] M.K.Md. Rafiul Hassan., Baikunth Nath. A fusion model of hmm, ann and ga for stock market forecasting. Expert Systems with Applications,2006.
[10] Edwards F.R,Neftci S.N.EXtremendous Price Movements and Margin Levels in Future Markets .. J .. .Journal of Futures Markets,1988, (3):371-384.
[11] Brorsen BW. Future trading transaction cost and stock market volatility..J...The Journal of Future Markets..1991,11(2):152-163.