ABSTRACT

Stock Market is the aggregation of buyers and sellers of stocks which represents shares in a company. A stock exchange is a place where individuals and organizations can trade stocks. This is a great area of interest of traders as one can generate profit by buying and selling stocks at right time. Determining right price and right time for trading stock is a challenging problem for traders. Techniques like fundamental analysis, technical analysis, predicting stock prices have been used and they are effective then randomly buying or selling. This project deals with providing a smart decision for buying and selling signals on the basis of technical indicators and oscillators. It also tries to predict the next day stock price.

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LIST OF ABBREVIATIONS

MA	**Moving Average**
LS-SVM	**Least Square Support Vector Machine**
RBF	**Radial Basis Function**
NSE	**National Stock Exchange**
SMA	**Simple Moving Average**
EMA	**Exponential Moving Average**
MACD	**Moving Average Convergence Divergence**
RSI	**Relative Strength Index**
VWMA	**Volume Weighted Moving Average**
MLP	**Multi-Layer Perceptron**

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CHAPTER-1

INTRODUCTION

1.1 About

Stock Market is the aggregation of buyers and sellers who buys and sell stock. A stock represent share in a company but that does not mean that you own the power to influence decision of the top management and leaders in a company. A Stock Exchange is a place where trading of stocks take place. Investors buy stocks for making profits and companies sell stocks to raise funds for finance of the company. Investors buy stock at a price and then sell it for a higher price and make profit.

Smart Investors look for trends, fundamental data, finance of company, history of the company, technical charts etc. and then decide whether to invest or not. Trading strategies are divided into two categories (i) fundamental analysis (ii) technical analysis.

Fundamental analysis is the study of financial statements and determining the true value of the stock and then taking decision.

Technical analysis is the study of charts and then determining the trend based on past stock data and then making a decision. It deals with looking for patterns. There are 3 principles in technical analysis:

- Technical analysis believes that it is important to understand what investors think of stock and what they know and what they perceive.
- Stock Prices follow trends.
- History repeats itself.

Various technical tools like SMA, EMA, RSI, MACD, Bollinger Bands etc. have been in use for a long time. They are used by technical analysts. This project has also made an attempt of making a smart decision based on indicators, oscillators. An attempt to predict stock price has also made. Statistical Regression is used for determining relationship between index and stock price.

CHAPTER-2

LITERATURE SURVEY

Technical analysis is a method of making buy and sell decision used extensively by the technical analyst. Assumptions on which technical analysis is based upon are against the widely accepted EMH (Eugene Fama, 1970).

The effectiveness of indicators and oscillators with volume is improved further. (Gang Li & Jin Zhu, 2014). They choose volume weighted moving average which consists of simple moving average (SMA) and volume based on 2139 stocks from January 1, 2003, to January 1, 2013, in China's A-share market. They used four criteria to evaluate volume weighted moving average: Sensitivity, Reliability, Risk and Benefits. Comparison of MA and VWMA was made based on these 4 criteria. VWMA was 6.9% more sensitive than MA. VWMA showed higher reliability than MA. VWMA could reduce risk. Based on this research they concluded that use of indicators becomes more effective when used with Volume.

It has been proved that in most cases technical analysis has certain predictive power that could gain an excess return. (Jelena Stankovic & Ivana Markovic & Milos Stojanovic, 2014). Selected Stock market of Serbia, Croatia, Romania and Bulgaria are taken into account. In the study, they used moving average (MA), Moving Average Convergence-Divergence (MACD) and Relative Strength Index (RSI) and generated trading signals. The indicator which performed well were taken as input for LS-SVM prediction model. Sample data was divided into 4 sub-periods. It was found that in the case of BELEX15, EMA and MACD performed really well. RSI did not perform well in any case. RSI trading strategy works only in the non-trending environment (Wong et al., 2010). LS-SVM trading strategy out-performed the results obtained by technical analysis in the case of BELEX15. In the case of CORBEX10, it was the only profitable alternative for investors in 2013. EMA and MACD were acceptable trend movement indicators. Trading strategies based on LS-SVM model outperformed all technical trading strategies.

Artificial Neural Network technique is useful in predicting stock prices (Mayankkumar B Patel & Sunil R Yallamalle, June 2014). They tried to predict the stock price of companies under LIX15 of NSE (National Stock Exchange). The data of LIX15's companies for past 36 months was taken as input (01-01-2011 – 01-01-2014). MLP was implemented and trained and tested over this data. It gave satisfactory results.

RBF neural network is preferred over MLP network for stock market prediction (Darmadi Komo et al., 1994).

CHAPTER-3

PROPOSED METHODOLOGY

3.1 Data Collection:

Quandl API is used to fetch the stock quote of any company under NSE. Stock Quote consist of Close Price, High, Low, Volume, Open etc. as a data-frame. A data-frame is a labelled two dimensional data structure that stores data of different types in different columns. A data-frame consists of columns and a single column represent a series.

Series of Close price is extracted and is used as data source for every indicator, oscillator and neural network. Date is the index of the series and is also used as data for indicators and oscillators. This series represents the past closing prices of a company under NSE.

3.2 Implementation of Indicators and Oscillators:

The following are implemented:

- SMA
- EMA
- MACD
- RSI
- Bollinger Band
- Statistical Regression(Not an indicator/Oscillator)

3.2.1 SMA (Simple Moving Average):

It is a type of moving average in which mean is calculated over the price of n-periods. Using it, we get a series of averages of different subsets of full dataset.

$$SMA = (p_m + p_{m-1} + p_{m-2} + \ldots\ldots\ldots\ldots + p_{m-(n-1)})/n \qquad 1.1$$

n = 20 but it can have any value.

Where numerator is the summation of previous n-periods prices and n is the length of period.

If the data used are not centered around the mean, a simple moving average lags behind the latest datum point by half the sample width. An SMA can also be disproportionately influenced by old

datum points dropping out or new data coming in. One characteristic of the SMA is that if the data have a periodic fluctuation, then applying an SMA of that period will eliminate that variation. But a perfectly regular cycle is rarely encountered.

3.2.2 EMA (Exponential Moving Average):

EMA or EWMA is a type of moving average that is similar to a simple moving average, except that more weight is given to the latest data. It's also known as the exponentially weighted moving average. This type of moving average reacts faster to recent price changes than a simple moving average.

Calculating EMA is a 3 step process:

- Calculate the SMA
- Calculate the multiplier
- Calculate the current EMA

$$\text{Multiplier} = 2 / (n+1), \quad (1.2)$$

$$\text{EMA} = (\text{Closing Price} - \text{EMA (previous day)}) * \text{multiplier} + \text{EMA (previous day)} \quad (1.3)$$

3.2.3 MACD (Moving Average Convergence Divergence)

Moving average convergence divergence (MACD) is a trend-following momentum indicator that shows the relationship between two moving averages of prices. The MACD is calculated by subtracting the 26-day EMA from the 12-day EMA. A nine-day EMA of the MACD, called the "signal line", is then plotted on top of the MACD, functioning as a trigger for buy and sell signals.

$$\text{MACD} = ((\text{12-day EMA}) - (\text{26-day EMA})) \quad (1.4)$$

3.2.4 RSI (Relative Strength Index)

The relative strength index (RSI) is a momentum indicator developed by noted technical analyst Welles Wilder , that compares the magnitude of recent gains and losses over a specified time period to measure speed and change of price movements of a security. It is primarily used to attempt to identify overbought or oversold conditions in the trading of an asset.

$$\text{RSI} = 100 - 100 / (1 + \text{RS}) \quad (1.5)$$

Where RS = Average gain of up periods during the specified time frame / Average loss of down periods during the specified time frame

RSI values range from 0 to 100. The default time frame for comparing up periods to down periods is 14, as in 14 trading days. Traditional interpretation and usage of the RSI is that RSI values of 70 or above indicate that a security is becoming overbought or overvalued, and therefore may be primed for a trend reversal or corrective pullback in price.

On the other side of RSI values, an RSI reading of 30 or below is commonly interpreted as indicating an oversold or undervalued condition that may signal a trend change or corrective price reversal to the upside.

3.2.5 Bollinger Band

A Bollinger Band, developed by famous technical trader John Bollinger, is plotted two standard deviations away from a simple moving average. Many traders believe the closer the prices move to the upper band, the more overbought the market, and the closer the prices move to the lower band, the more oversold the market. John Bollinger has a set of 22 rules to follow when using the bands as a trading system.

Upper-Band= SMA-20 + 2 * standard deviation of 20 day closing 1.6

Lower-Band= SMA-20 + 2 * standard deviation of 20 day closing 1.7

%B = ((price – lower band) / (upper band – lower band))*100 1.8

%B quantifies a security's price relative to the upper and lower Bollinger Band. There are six basic relationship levels:

- %B equals 1 when price is at the upper band
- %B equals 0 when price is at the lower band
- %B is above 1 when price is above the upper band
- %B is below 0 when price is below the lower band

3.2.6 Statistical Regression

It is a way of determining a relation between variables. There are 2 independent variables here.

(i) Index
(ii) Stock Price

$y = mx + c$ ✉ trend line equation 1.9

where y = closing price , x = nth number, m =slope

$m = (sum(x*y)-sum(y)*sum(x))/sum((x-mean(x))^2)$ 2.0

$c = y - mx$ 2.1

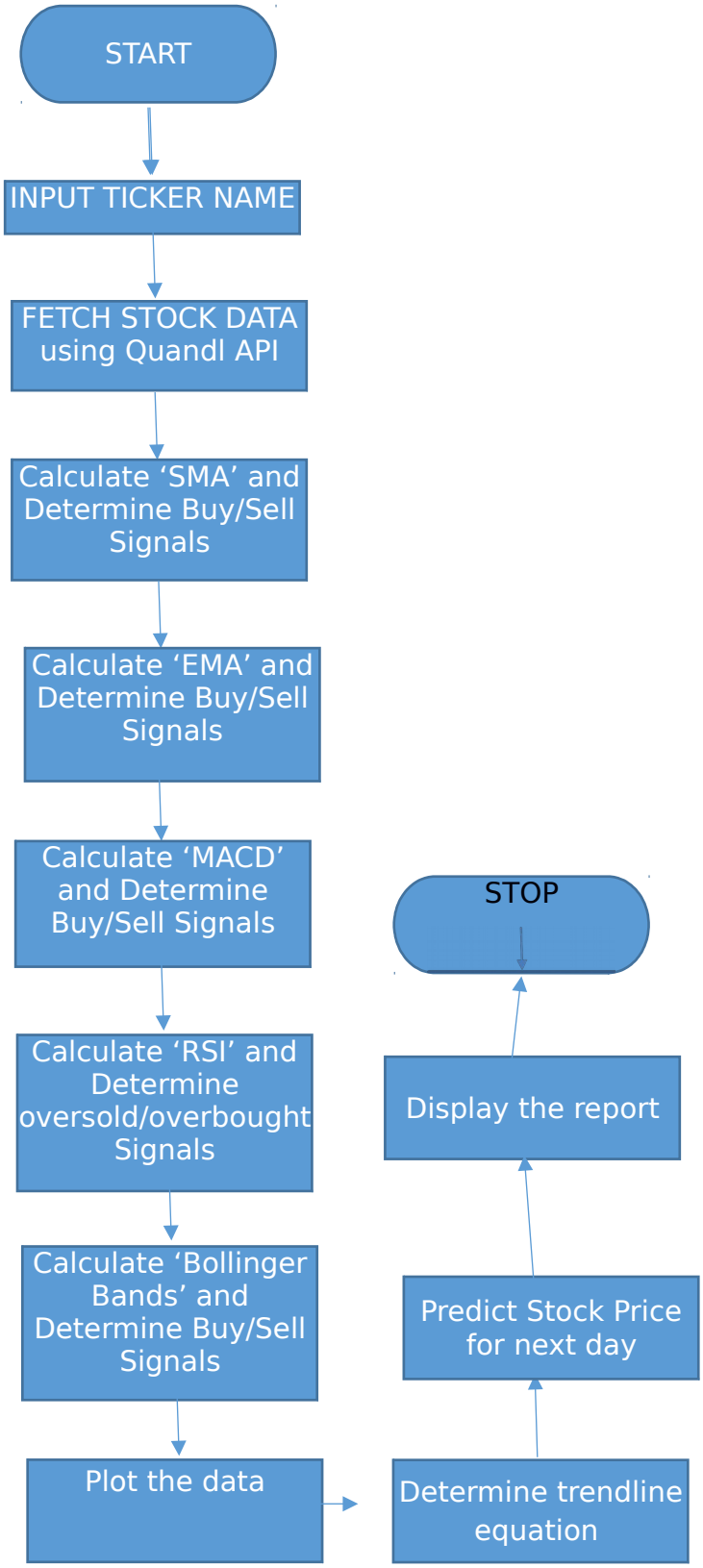
3.3 Determining Buy/Sell Signals:

- If previous SMA is lower than the previous Close Price and current SMA is greater than current Close Price then Buy Signal is generated.
- If previous SMA is greater than the previous Close Price and current SMA is lower than current Close Price then Sell Signal is generated.
- If previous EMA-20 is lower than the previous EMA-50 and current EMA-20 is greater than current EMA-50 then Buy Signal is generated.
- If previous EMA-20 is greater than the previous EMA-50 and current EMA-20 is lower than current EMA-50 then Sell Signal is generated.
- If previous MACD value is less than previous EMA-9 and current MACD value is greater than current EMA9 then Buy Signal is generated.
- If previous MACD value is greater than previous EMA-9 and current MACD value is lower than current EMA-9 then Sell Signal is generated.
- If [Close Price - lower band]<[Upper Band - Close Price] and both the differences are greater than 0 then buy Signal is generated
- If [Upper band – Close Price]<[Close Price – Lower Band] and both the differences are greater than 0 then Sell signal is generated

3.4 Predicting Stock Price:

- RBF Neural Network is used for predicting stock price for the next day.
- Previous 30 day stock price is used as training data.
- For ex., for index n, output is X. where n can be anything between 1 – 30
- For index 31^{st}, stock price is predicted which is the next day stock price
- Sklearn Library is used for implementing RBFNN

3.5 Flow Chart:



CHAPTER-5

CONCLUSION & FUTURE WORK

5.1 Conclusion

Technical Analysis of stock market is a method of evaluating securities by analyzing statistics generated by market activity. Chartist uses these data to determine whether they are going to invest in that stock. They look for the buy and sell signals. This project has also performed technical analysis over stock prices by using some of the mostly used indicators and oscillators. We have also tried to predict stock price for the next day.

Stock price is influenced by many factors including –internal information, news, speeches of ministers etc. So this does not give accurate results all the time. But it is better than blindly investing.

Hence, it can be concluded that a smart investing decision can be made if one uses technical indicators and oscillators and other sorts of information like news etc. before making an investment.

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