

# PREDICTION OF STOCK MARKET TREND USING TECHNICAL AND FUNDAMENTAL ANALYSIS

<sup>1</sup>Ashritha N.K., <sup>2</sup>G.Nitin, <sup>3</sup>Nilima Yadav, <sup>4</sup>Sahana Shetty

<sup>1,2,3</sup>Student, <sup>4</sup>Associate Professor

<sup>1</sup>Department of Computer Science and Engineering,

<sup>1,2,3,4</sup>School of Engineering and technology, Jain University, Bengaluru

**Abstract :** Investing in stocks and shares is always uncertain. Stock market trend predictions will give the idea of how the stock prices are going to change and in turn helps the stock holders from the stock market risks.

This paper focuses on predicting the future stock market trend using technical and fundamental analysis which involves collecting the historical data of the company's stock, management information, economic information. Then the correlation between the previously collected data and the current stock values is analysed. The constructed model can then be used to make future prediction about stock values.

**Keywords** — Stock market trend, prediction, Technical analysis, Fundamental analysis, Indicators

## I. INTRODUCTION

The stock market process includes lots of uncertainty and many risk factors. Hence knowing the stock market trend plays a very important role. There are three types of analysis possible for prediction: technical, fundamental and Sentimental. The fundamental analysis is the process which depends on the company's business and financial statements.

Technical analysis is the science of predicting the prices using historical price data.

Data science is widely used for technical analysis. Big data or extremely large data sets are widely used to identify patterns, trends and predict the outcome of certain events.

Big data is associated with the main factors which include volume, velocity, variety and veracity. Volume relates to the amount of data being collected and stored. Velocity is the speed with which the data is sent or received. Variety relates to the different formats of data in the market while, Veracity indicates the uncertain data.

### 1.1 Fundamental analysis:

Fundamental analysis is the examination of the underlying forces that affect the well-being of the economy, industry groups, and companies. As with most analysis, the goal is to derive a forecast and profit from future price movement at the company level, fundamental analysis may involve examination of financial data, management, business concept and competition.

At the industry level, there might be an examination of supply and demand forces for the products offered. For the national

economy, fundamental analysis might focus on economic data

to assess the present and future growth of the economy. To forecast future stock prices, fundamental analysis combines economic, industry, and company analysis to derive a stock's current fair value and forecast future value. If fair value is not equal to the current stock price, fundamental analysts believe that the stock is either overvalued or undervalued and the market price will ultimately gravitate towards fair value.

Fundamentalists do not heed the advice of the random walkers and believe that markets are weak-form efficient. By believing that prices do not accurately reflect all available information, fundamental analysts look to capitalize on perceived price discrepancies.

## 1.2 Technical analysis:

Technical analysis is a process in which the predictions are done using the historical data of the particular stock which is to be predicted. A core principle of technical analysis is that a market's price reflects all relevant information impacting that market. A technical analyst therefore looks at the history of a security or commodity's trading pattern rather than external resources like economic, fundamental and news events.

Technical analysts widely use different market indicators for different purpose. These indicators are used to help assess whether a stock is trending or not, and if it is, the probability of its direction and of continuation.

## II. METHODOLOGY

In this paper, we propose a hybrid approach based on the combination of both technical and fundamental indicators for the process of knowing the stock market trend and to predict the value at risk after a particular period of time. So we propose a new model for stock market trend prediction based on our hybrid approach.

The objective of this system is to help the stock holders and the new investors to know about when to sell and buy the stocks, and also helps to know the value at risk for a particular period of time.

### 2.1 Proposed system

The following diagram represents the workflow of the system:

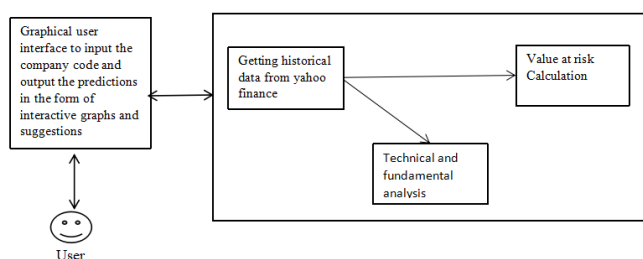


figure 2.1

User interacts with the UI by giving the data like stock name, indicator for the graph, time range and number of days for value at risk calculation. User gets the output from the same UI in the form of interactive graph and the suggestions.

The internal system has 3 functionalities:

1. Data acquisition
2. Data analysis : Technical and fundamental analysis
3. Value at risk calculation

### 2.2 Fundamental indicators

Fundamental analysis focuses on using earnings, revenues, return on equity, profit margins, future growth and other data in order to determine a company's underlying potential and value.

Fundamental parameters used in this project are:

1. P/E ratio(price to earnings)
2. P/BV ratio (price to book value)
3. PEG ratio (price earnings growth)
4. Dividend yield

### 2.3 Technical indicators

Technical indicators are the mathematical calculations based on the price, volume or the open interest of the security contract.

By analyzing the historical data, the indicators are used to predict the movement of future stock price.

Technical indicators used in this project are:

1. MACD (Moving average convergence and divergence)
2. RSI (Relative strength index)
3. CCI (Commodity Channel Index)
4. WR (Williams percent range)
5. KDJ

## III. STOCK MARKET PREDICTION

### 3.1 Data Set Description

We will get the historical data and the fundamental data from the yahoo finance online according to the ticker mentioned by the user.

The data contains the open price, close price, high, low and volume of the number of days mentioned by the user.

The data set of the historical data will be in the following format:

table 3.1

| Date        | Open   | High   | Low    | Close   | Adj close | Volume  |
|-------------|--------|--------|--------|---------|-----------|---------|
| 29-Apr-2019 | 2265.9 | 2285.0 | 2256.9 | 2280.95 | 2280.95   | 2926892 |

All these columns of data are used in finding the different indicator values of the stock, which are used in predicting the stock market trend.

The balance sheets and the other financial data are used for fundamental analysis, and the data is the following format:

Balance Sheet:

table 3.2

|                      |         |
|----------------------|---------|
| Total cash           | 644k    |
| Total cash Per share | 0.04    |
| Total debt           | 366.38M |
| Total debt/Equity    | 165.41  |
| Current ratio        | 0.84    |
| Book value per share | 12.25   |

### 3.2 Extracting the data:

The required data is only taken from the acquired data by considering only few columns of data required for the data analysis process using technical and fundamental analysis.

### 3.3 Indicators using

Indicators using in this system for the prediction process are :

1. Moving average Convergence Divergence (MACD): It is one of the useful technical indicator used in the prediction process. It has two lines: fast and slow. Fast line is the difference between 26 day exponential moving average and the 12 day exponential moving average. Slow line is the 9-day moving average, and is also called as signal line.

$$\text{MACD} = \text{Fast Moving average} - \text{Slow Moving Average}$$

2. Relative Strength Index (RSI): It is one of the momentum oscillator. Momentum is the rate of rise or fall in price. It computes the momentum as the ratio higher close price to the lower close price. Stocks having strong positive change have higher RSI compared to the stocks having the strong negative change.
3. Commodity Channel Index (CCI): It is one of the indicators that measures the current price level relative to an average price level over a given period of time. CCI is high when the prices are far above their average and low when the prices are far below the average

$$\text{CCI} = (\text{TP} - \text{A}) / (0.015 * \text{MD})$$

Where,

$$\text{TP (Typical price)} = (\text{high} + \text{low} + \text{close}) / 3$$

SMA - Simple Moving average

MD - Mean deviation

A - n period moving average of typical price

4. Williams % R: It is one of the momentum indicators which is the inverse of the fast stochastic oscillator. It measures the close relative to the high low range over a given period of time. The default for the Williams %R is 14 periods (can be days, weeks, months). 14-period %R will use the most recent close, highest high and lowest low over the last 14 periods. 125-day %R covers almost 6 months.

$$\%R = -100 * ((\text{highest high} - \text{close}) / (\text{highest high} - \text{lowest low}))$$

Where,

Highest high - highest high in past n periods

Lowest low - lowest low in past n periods

Close - current closing price

5. KDJ : It is one of the technical indicators used to predict and analyze changes in the stock trends and price patterns. It is also known as random index. It is most suitable for the analysis of short-term stock. It is derived form of stochastic oscillator indicator with the addition of another line called J line. The moments when the %K crossing %D indicates selling or buying.

The J line represents the divergence of the %D value from the %K value. The value of J can go beyond [0, 100] for %K and %D lines.

$$RSV_n = (Close_n - Low_n) / (High_n - Low_n) * 100$$

$$K_n = 2/3 * K_{n-1} + 1/3 * RSV_n$$

$$D_n = 2/3 * D_{n-1} + 1/3 * K_n$$

$$J_n = 3 * K_n - 2 * D_n$$

Where,

n : number of observation days

Low\_n : lowest periods in n periods

High\_n : highest price in n periods

Close\_n: closing price at the end of observation period

The fundamental parameters used for the prediction of the stock market trend are:

1. P/E ratio: Ratio shows how much stock investors are paying for each rupee of earnings. It shows if the market is overvaluing or undervaluing the company.

P/E ratio is used to value stable and mature companies that earn profits. A high PE indicates that the company's earnings are expected to grow fast.

$$P/E \text{ ratio} = \text{MarketValuePerShare} / \text{EarningsPerShare}$$

2. P/BV ratio : Ratio is used to compare a company's market price to its book value. Book value is the amount that will remain if the company liquidates its assets and repays all its liabilities.

$$P/BV \text{ ratio} = \text{MarketValuePerShare} / \text{BookValuePerShare}$$

3. PEG ratio : This is the ratio used to know the relationship between the price of a stock, earnings per share (EPS) and the company's growth.

$$PEG \text{ ratio} = \text{EarningsPerShare} / \text{EarningsPerShareGrowth}$$

4. Dividend yield: It is dividend per share divided by the share price. A higher value of dividend yield tells that the company is doing well.

$$\text{Dividend yield} = \text{Annual Dividend} / \text{Share price}$$

### 3.4 StoctStats

In this system, we are using a python package called

StockStats, which helps in calculating the indicator values.

It is the package that supplies a wrapper 'StockDataFrame' based on pandas.DataFrame with inline stock indicators/statistics support.

It is installed by running the following command in the anaconda prompt:

pip install stockstats

With the help of this package, we can directly get the indicator value just by sending the data along with the indicator which we want to get.

### 3.5 Value at risk

Value at risk is the statistic that tells about the level of financial risk involved with that particular stock of the company over a specific time period. This is one of the most important metric used for investing in the new stocks.

There are so many ways to determine the value at risk, we are using Monte-carlo simulation to calculate the value at risk.

Monte carlo simulation :

The Monte Carlo method is based on creating a substantial huge number of possible future prices using a simulation algorithm.

The steps taken to calculate VaR using Monte Carlo Simulation are as follows:

1. First the preferred probability distribution is selected.
2. The appropriate parameters are entered.
3. A series of random numbers are generated from the probability distribution and random numbers generated. 10,000 samples are generated 100 times to make 1,000,000 samples which represent returns of the assets.
4. Using the chosen confidence level, VAR is calculated by taking a percentile of the returns and multiplying the percentile value by the notional value and square root of the holding period.

Formula of VaR is as follows:

$$\text{VaR}_\alpha = -F^{-1}(R^k)_\alpha \times N \times \sqrt{h}$$

Where,

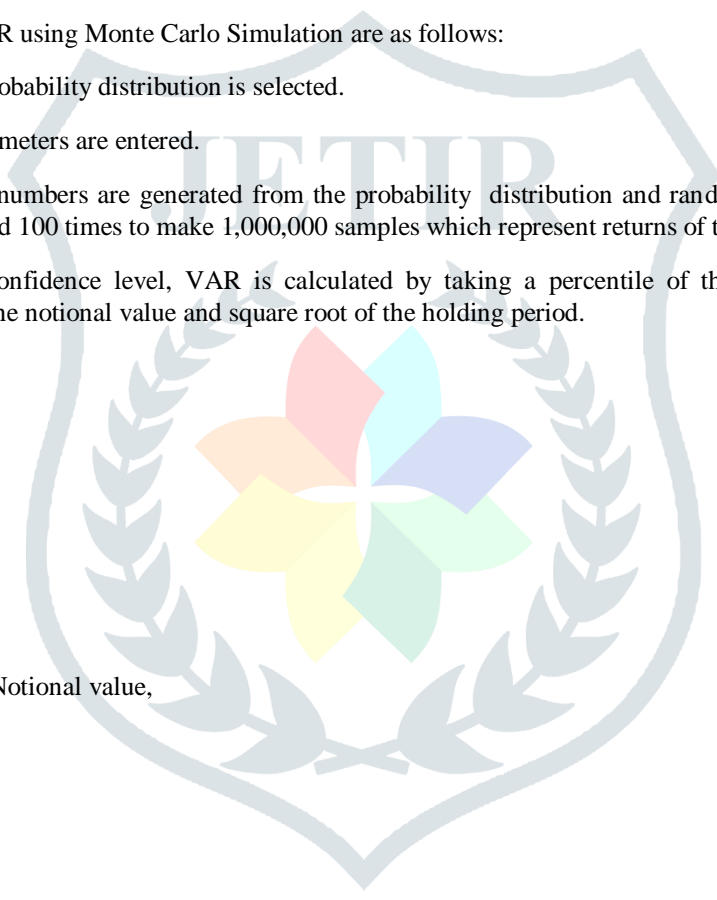
$F^{-1}$  = distribution of returns,

$\alpha$  = confidence level,

$R^k$  = k-day return values

$N$  = Amount to be invested or Notional value,

$h$  = holding period



#### IV. RESULTS AND DISCUSSION

In the project we will get the stock market trend and the value at risk as the results, along with the interactive graph of the indicator chose for a selected time period. The details of the indicator values and few fundamental parameters are also displayed.

Here are few sample output of the 3i InfoTech Limited company’s stock, 1 year data is taken for the analysis and the graph of the closing prices is displayed (figure 6.1).

The value at risk after 365 days, suggestions and the details of the indicators and parameters used are shown in figure 6.2.



figure 4.1



figure 4.2

#### V. CONCLUSION

As the stock market is a risky task, this proposed system can be used to predict the stock market trend which is useful for the stock holders whether to buy, sell or hold the stocks according to the technical and fundamental analysis.

In future, sentimental analysis can be applied to this system, in which the individual opinions and social media data is also considered.

## REFERENCES

- [1] Nausheen S, Anil Kumar M, Amrutha K K, "Survey on sentiment analysis of stock market".
- [2] Minh Dang, Duc Duong, "Improvements methods for stock market prediction using financial news articles," 3<sup>rd</sup> National Foundation for Science and Technology development conference on Information and Computer Science, pp. 125-129, 2016.
- [3] Meryem Ouahilal, Mohammed El Mohajir, Mohamed chahhou, Badr Eddine El Mohajir, "Optimizing stock market price prediction using hybrid approach based on HP filter and support vector regression," pp. 290-294, 2016.
- [4] Haiying Huang, Wuyi Zhang, Gaochao Deng, James Chen, "Predicting stock trend using fourier transform and support vector regression," 17<sup>th</sup> International Conference on Computational Science and Engineering, pp. 213-216, IEEE 2017.
- [5] Han Lock Siew, Md Jan Nordin, "Regression techniques for the prediction of stock price trend," pp. 1-5.
- [6] Rupesh A. Kamble," Short- and long-term stock trend prediction using decision tree," International Conference on Intelligent Computing and Control systems, pp-1371-1375, 2017
- [7] Ze Zhang, Yongjun Shen, Guidong Zhang, Yongqiang Song, Yan Zhu, "Short term prediction for opening price of stock market based on self-adapting variant PSO-Elman Neural Network", pp-225-228, IEEE 2017.
- [8] Ryota Kato, Tomoharu Nagao, "Stock market prediction based on interrelated time series data," Symposium on Computers and Informatics, pp-17-21, IEEE 2012
- [9] Mustain Billah, Sajjiad Wahee, Abu Hanifa, "Stock Market Prediction Using an Improved Training Algorithm of Neural Network," 2<sup>nd</sup> International Conference on Electrical, Computer and Telecommunication Engineering, pp-8-10 December 2016, Rajshahi-6204, Bangladesh
- [10] N.Srinivasan, C.Lakshmi, "Stock Prediction and Analysis Using Intermittent Training Data With Artificial Neural Networks," International Conference on Innovations in Information, Embedded and Communication Systems (ICIIECS), 2017.
- [11] Guiying Wei, Lei Zhou, Weiwei Zhang, "Stock Trends Prediction Combining the Public Opinion Analysis," IEEE 2015 International Conference on Logistics, Informatics and Service Sciences (LISS), pp-27-29 July, 2015.
- [12] Yaojun Wang, Yaoqing Wang, "Using Social Media Mining Technology to Assist in Price Prediction of Stock Market,".
- [13] Carol Hargreaves, Yi Hao, "Does the use of Technical and Fundamental Analysis improve Stock Choice?".