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# Predicting the Long-Term Stock Prices using Three-Layered Architecture by Prophet and BMA Model

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**ABSTRACT:** The number of individual investors within the market has increased by a whopping 1.42 crore in FY20-21 making it around 6 crores. In the financial market, there are an outsized number of indicators accustomed to describe the change of stock price, which provides an honest data basis for our stock price forecast. Different stocks are tormented by various factors due to their different industry types and regions. Therefore, it is very important to search out a multi factor combination suitable for a specific stock to predict the value of the stock which is being created and presented in our project.

The market lacks a simple app which has all in one facility for all stock market needs. The app will suggest people what stocks are good to invest in a long term and the risk associated with every stock. An Android app made to aid people and give them a detailed analysis of any stock can be made. It must be easy to use and affordable for everyone at the same time. Nowadays peoples prefer applicationsfor stock market prediction analysis so that they can easily analyse which stock is best for them in long term investment.

**KEYWORDS**: Machine Learning, Data Pre-processing, Data Mining, Dataset, Stock, Stock Market.

## I.INTRODUCTION

### *A. MOTIVATION*

- With over 60 million Stock Market Investors in India and most of them investing long term for their retirement, picking safe but rewarding stocks can become a headache. Looking for fundamentals, checking quarterly reports, keeping in touch with the current sentiment about different stocks becomes confusing and a tedious task to do.
- No current platform provides prediction service of any kind. Therefore,itwill be something made for the first time.
- Current Growth in increase in the number of investors in India which stands at about 14.2 million in 2020-2021.People's trust in the stock market has increased as returns generated by it compared to bank FDs are big.

### *B.OBJECTIVE*

- To increase the feeling of financial security by decreasing risk percentage.
- To determine the future movement of the stock value of a financial exchange.
- Stock market prediction tries to determine the future price of companies. The results will help in stock selection for individual investors.

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## II.LITERATURE SURVEY

Following given is the literature survey presented in accordance to our model. It shows different research papers based on the concept of stock market predictions. The first paper describes the concept of Elliott Wave Theory. The second paper talks about Decision Support System for Portfolio. Third paper gives the Integrated Long-Term Stock Selection Models Based on Feature Selection and Machine Learning Algorithms and last paper talks about Forecasting Stock Price Based on Frequency Components by EMD and Neural Networks. Thus, this literature survey would help in developing our model in an effective way.

| Title | Author | Year | Technology Used | Limitations |
|---|---|---|---|---|
| The Effectiveness of the Elliott Waves The- ory to Forecast Fi- nancial Markets: Ev- idence from the Currency Market | Eugenio D'Angelo,Giulio Grimaldi | 2017(Canadian Center of Sci- ence and Education) | Pattern Recognition | No working model included. |
| Decision Support Sys- tem for Stock Port- folio Selection Using Artificial Intelligence and Machine Learning | Sandeep Patalay,Madhu- sudhan Rao Bandlamudi | 2021(IIETA) | Hybrid Finan- cial Decision Support System (DSS) M5P model tree algorithm | Hybrid model is made but implementation details are not provided in detail. |
| Integrated Long-Term Stock Selection Mod- els Based on Feature Selection and Machine Learning Algorithms for China Stock Market. | XIANGHUI YUAN,JIN YUAN,TIANZH A JIANG,QURAT UL AIN | 2020(IEEE) | SVM,RANDOM FOREST , ANN | Model is not optimized, back testing results are not pub- lished. |
| Forecasting Stock Price Based on Fre- quency Components by EMD and Neural Networks. | WANGWEI SHU,QIANG GAO | 2020(IEEE) | Neural Networks- CNN, and LSTM | Does not take into consider- ation the risk factor related to any stock. |

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## III.THREE LAYERED ARCHITECTURE

To increase accuracy and not have dependency on one model a three-layered architecture is introduced. The stocks are tested on all three models and the stocks who pass are presented as output to the user. The three layers are –

1. Fundamental Model
2. Facebook Prophet Model
3. Best Moving Average Model (BMA Model).

**i) Fundamental Model:**

**1) Earning Per Share (EPS):**

Earnings per share (EPS) may be a company's earnings divided by the quantity of common stock it's outstanding. EPS indicates what proportion of money an organisation makes for every share of its stock and may be a widely used metric for estimating corporate value.

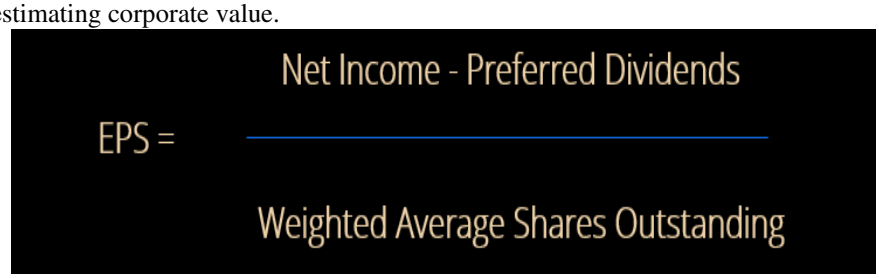


Fig 1- EPS Formula

**2) Return on Capital Employed (ROCE):**

Return on capital employed (ROCE) may be a financial ratio that may be wont to assess a company's profitability and capital efficiency. In other words, this ratio can help to know how well an organization is generating profits from its capital because it is put to use.


Fig 2-Return On Capital Employed formula

**3) Market Capital:**

Return on capital employed is calculated by dividing net operating profit, or earnings before interest and taxes (EBIT), by capital employed. differently to calculate it's by dividing earnings before interest and taxes by the difference between total assets and current liabilities.


Fig 3- Market Cap Formula

**ii) Facebook Prophet**

- The Prophet library is an open-source library designed for making forecasts for univariate time series datasets. It is easy to use and designed to automatically find a good set of hyperparameters for the model in an effort to make skilful forecasts for data with trends and seasonal structure by default.
- Prophet only supports univariate data. The features of this time series are representative of many business time series: multiple strong seasonality's, trend changes, outliers, and holiday effects. Prophet's advantage

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is that it requires less hyperparameter tuning as it is specifically designed to detect patterns in business time series.

- We use a decomposable time series model with three main model components: trend, seasonality, and holidays. They are combined in the following equation: $y(t) = g(t) + s(t) + h(t) + t$. $g(t)$ - trend function, $s(t)$ represents periodic changes, and $h(t)$ represents the effects of holidays which occur on potentially irregular schedules over one or more days. The error term t represents any idiosyncratic changes which are not accommodated by the model; later we will make the parametric assumption that t is normally distributed.
- Here we use only time as a regressor but possibly several linear and nonlinear functions of time as components. Business time series often have multi-period seasonality as a result of the human behaviours they represent.

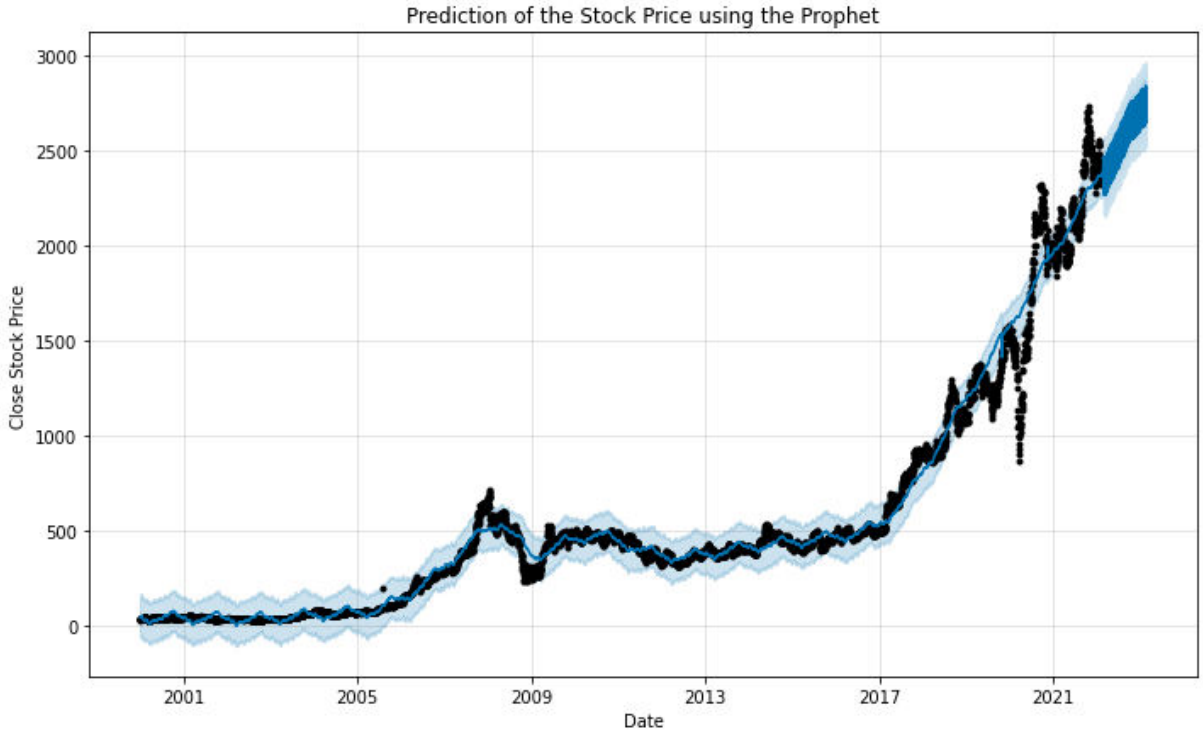


Fig 4 – Predictions by Facebook Prophet model based on Close Stock Price.

**iii) BMA Model:**

- The moving average (MA) is a simple technical analysis tool that smooths out price data by creating a constantly updated average price. The average is taken over a specific period of time, like 10 days, 20 days, 30 weeks, or any time period the trader chooses. There are advantages to using a moving average in your trading, as well as options on what type of moving average to use. Moving average strategies are also popular and can be tailored to any time frame, suiting both long-term investors and short-term traders.
- Every stock has a moving average which gives information about its supports. Finding the right moving average can be difficult and tedious process. Hence Best Moving Average Model is introduced. It takes the price info of the given stocks and plots the best moving average suitable to the particular stock.
- Whenever the stock crosses the BMA from below there is a BUY signal generated. It is a proven strategy which is both simple and effective.
- Every stock has a different BMA and we use individual BMA for every stock to treat it. The BMA's range from 20 days to 500 days.

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Fig 5 – Predictions by BMA model based on Close Stock Price confirming the theory.

## IV.ADVANTAGES

1. User can earn money and become rich in the long term.
2. The system is highly efficient and optimised.
3. The service availability will be 24X7.
4. The user will get reliable results from the system.
5. The application is available free of cost.

## V.APPLICATIONS

1.Stock market prediction aims to determine the future movement of the stock value of a financial exchange.
2.The accurate prediction of share price movement will lead to more profit that the investors can make.
3.It helps to build savings, protect money from inflation and taxes.

## VI.FUTURE SCOPE

- This research is tried and tested only on Indian Stock Market (BSE) but it can also be extended to other stock markets around the world.
- Secondly, in the design of model parameters, trial and error is usually adopted instead of systematic method to find the optimal size of parameters, such as the selection of optimal number of days for which variance is minimum.

## VII.CONCLUSION

In this paper, the multi-layered model is introduced into stock forecasting. The stock market has a large number of stock factors which describe the change of stock price. But the three-layered architecture is successfully able to suggest stocks using combination of stock Fundamentals, Prophet and BMA model with great accuracy without being reliant on a single model.It has led to the conclusion that it is possible to predict stockmarket with more accuracy and efficiency using machine learning techniques.

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