A REVIEW ON STOCK MARKET PREDICTION TECHNIQUES

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Abstract

Prediction of future price of stock is an active area of research in financial world. Stock markets are influenced by many external factors. Fundamental analysis and technical analysis are popular and widely used methods to predict the future price of stock. This paper presents a survey of three stock price prediction techniques namely fundamental analysis, technical analysis and sentiment analysis and also discuss the main concepts of each techniques. Fundamental analysis involves income statements and report of the company, return on equity and balance sheet etc. Technical analysis deals with the past historical data. Sentiment analysis based on the social media data. Additionally, this paper also presents a survey of stock prediction models. Based on the reviewed papers, it is suggested that hybrid method can improve the prediction accuracy and reduce the error.

Keywords: Artificial neural network, fundamental analysis, technical analysis and sentimental analysis

I. INTRODUCTION

Stock market or share market is a place wheresecurities and ownership stakes in companies and organizations are traded and issued. It facilitates the stock brokers to trade company stocks and other securities. Therefore, stock market is the meeting place of the stock traders. New York Stock Exchange (NYSE), Toronto Stock Exchange (TSE), NASDAQ, Shanghai Stock Exchange (SSE), London Stock Exchange (LSE) and Bombay Stock Exchange (BSE) are popular stock markets where the investors can buy and sell the stocks[1].

An accurate prediction of stock price is very important for investors as well as common people. Due to the non-linear, non-stationary, highly noisy and chaotic nature of stock [2], developing an accurate prediction model is a highly challenging task. Moreover, stock price also depends on many factors including historical price, political events, government bonds, social media data, news and production of the company [3].

Several techniques have been applied to predict either closing price or moving price of stock market. Efficient Market Hypothesis (EMH) and random walk theory are the two important theories utilized in traditional stock market prediction model [4]. EMH states that future price is unpredictable using past historical stock data. On the contrary, random walk theory shows that
the future stock price does not depend on past stock price. Figure 1 shows the categorization of stock market prediction techniques. Three traditional methods used for stock forecasting are fundamental analysis, technical analysis and sentimental analysis. Fundamental analysis based on the annual financial reports of the company and other factors. Technical analysis based on the past historical data. Sentiment analysis deals with the twitter message and RSS news feed [5]. The aim of this study is to review the stock market prediction techniques along with their efficiency. Merits and demerits of these techniques are also presented.

The rest of the paper is structured as follows. Section 2 presents the stock market forecasting using fundamental analysis. Section 3 discusses the technical analysis. Section 4 describes the stock prediction based on sentimental analysis. Section 5 gives the conclusion of this study followed by relevant references.

II. FUNDAMENTAL ANALYSIS BASED TECHNIQUES

Fundamental analysis deals with the parameters that affect the demand and supply. It calculates the stock values by examining various factors. The important factors used for fundamental analysis are annual reports of the company, income statements, return on equity, its products, balance sheet, market environment and changes in the government policies and future prospects etc., [1][2]. Information gathering and interpretation plays a vital role in fundamental analysis. Additionally, fundamental analysis also uses the gap between the occurrence of an event and the market response to the event.

The stock market investor can use all these factors and decide upon the feasibility to invest on that particular company. They can additionally use ratios for further analysis including Price-to-Earning ration (P/E ratio), Price-to-Book ratio (P/B ratio), debt to equity ratio, Return on Equity(ROE),Dividend yield, PEG ratio, current ratio and Net Profit Margin. In fundamental analysis, it is assumed that the current price and the future stock price depends on the intrinsic or real value of the stock and the expected return. The merit of the fundamental analysis is that it is suitable for long term stability and growth. But, it is very tough task to design an automated prediction model by formalizing all this knowledge [6].
Erhan Beyaz et al. [5] presented stock prediction models using fundamental indicators, technical indicators and combined indicators. Designed models were tested on 140 companies. Results showed that the fundamental analysis outperform the technical and combined analysis.

Chen et al. [7] designed a method which uses fundamental indicators for future price prediction. This approach involves calculating the weight of financial indicators, evaluating and selecting individual stocks, selecting financial news features, determining stock trading signals based on financial news, and forecasting stock price trend.

III. TECHNICAL ANALYSIS BASED METHODS

Technical analysis is a mathematical approach to predict the future stock price based on the past historical stock data. It evaluates the future stock price by analyzing only past prices, volume and market activity unlike the fundamental analysts who determined the real or intrinsic value [6]. In technical analysis, a detailed analysis of the daily, weekly, monthly, quarterly and yearly fluctuations was done to predict the future price. Some of the widely used technical indicators are Moving Average (MA), Relative Strength Index (RSI), Moving Average Convergence/Divergence (MACD) and Stochastic oscillator [8][9].

Technical analysis provides a clear picture of the stock movement using different types of charts. Different individuals can interpret charts in different manners. Recently, soft computing models such as Artificial Neural Network (ANN) and Fuzzy logic have been applied to predict the future price. Stock prices are nonlinear, dynamic and volatile in nature. ANN has potential to learn and generalize from the non-linear data trend is well suited stock market prediction. ANN is robust against missing data or noisy data. Further to this, ANN can approximate non-linear functions and provide better prediction accuracy compared to other conventional method [1]. Several networks like Multilayer Perceptron (MLP), Recurrent Neural Network (RNN), Elman network and Radial Basis Function Network (RBFN) have been successfully adopted for stock market analysis.

Anthony et al. [1] provided a detailed survey of ANN employed for stock prediction. Although ANN has exhibited better performance, many researchers are still trying to enhance the prediction accuracy using hybrid method.

Chander et al. [2] developed a prediction using Discrete Wavelet Transform (DWT) and ANN. Only approximation coefficients are taken as feature vectors to be trained by MLP. Trained ANN employed to predict future stock price. Result revealed that the hybrid method outperforms the other methods. Kamley et al. [10] used MLP system to predict the long term and short term price value. Results demonstrated that the MLP can predict the future value with high prediction accuracy.

Some studies showed that the prediction accuracy of ANN improved using some meta-heuristic algorithms like bio inspired computing algorithms [11]. Hegazy et al. [12] designed a prediction model utilizing Least Square (LS)-Support Vector Machine (SVM) (LS-SVM), Flower Pollination Algorithm (FPA), Bat Algorithm (BA), Modified Cuckoo Search (MCS),
Artificial Bee Colony (ABC) and Particle Swarm Optimization (PSO) are used to tune the parameters of LS-SVM. Results proved that the forecasting model developed combining ANN with bio inspired algorithm can enhance the stock prediction ability.

IV. SENTIMENT ANALYSIS BASED METHODS

The goal of sentiment analysis is to determine the attitude of a writer or speaker with respect to some topic. The attitude may be his/her evaluation or judgement and intended emotional communication. Sentiment analysis also called as opinion mining refers to the use of natural language processing, text analysis and computational linguistics to identify and extract subjective information in source materials [13].

With the advent of internet and on-line trading, huge amounts of data pertaining to stocks are available. Stock related data that is available online can be thought of as two types: numerical data in the form of past historical prices and textual information which contains the news articles available in the blogs or websites of news media [14]. In the earlier work, most of the researchers and financial analyst used fundamental indicators, technical indicators and combined indicators to predict the future stock price. Recently, the online content in the form of news articles has become an important role player in the stock market prediction.

Sentiment analysis divided into ANN based methods and lexicon-based methods. ANN methods use the standard machine learning algorithm for classification whereas lexicon-based methods use lexicons which are pre-compiled list of words.

Deng et al. [15] developed a stock prediction model using technical indicators and sentimental analysis. Results proved that the combined analysis gives best results than single model either technical or sentimental analysis.

Hájek et al. [16] used textual information from the annual reports as one of the indicators for predicting future stock price. Proposed model combined the fundamental analysis and sentiment analysis in order to improve the prediction accuracy.

Kordonis et al. [17] proposed a prediction model based on twitter data. Proposed model collects past tweets, process them and investigate the ability of various soft computing approaches like Support Vector Machine (SVM) and Naïve Bayes Bernoulli classification. Results showed that there is a correlation between stock price and twitter data.

V. CONCLUSION

This paper presented a comprehensive survey of stock price prediction methods. By the use of these techniques, it is possible to design an efficient system to predict the future stock price. But, it is important to design a prediction system with desired accuracy and less computational cost. This paper also discussed the prediction models developed by many researchers using fundamental indicators, technical indicators and sentimental analysis. Additionally, it is also possible to employ any of the discussed stock prediction techniques and design a hybrid or integrated model to predict the stock price mode accurately. From the reviewed papers, it is
concluded that forecasting model which considers only one method may not be accurate. Therefore, incorporating technical with sentimental analysis might increase the prediction accuracy.

REFERENCES


