

Journal on Innovations in Teaching and Learning Vol: 1(1), 2022 REST Publisher; ISSN:2583 6188 Website: http: //restpublisher.com/journals/jitl/



# Predicting Stock Market by Fibonacci Series Approach with Using Various Neural Network Methods

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**Abstract:** The stock market (SM) is an extremely significant part of the financial industry. Its demand is steadily increasing. SM prediction is the technique of estimating the foreseeable value of a business's stock or other assets that are traded on an exchange for financial instruments. Analysis of the SM is critical for investors and financial companies for making accurate decisions. As historical SM data and Machine Learning (ML) algorithms progress, so does the fascination with employing ML in stock analysis. This study delves deeply into SM analysis using ML with a focus on the use of various ML techniques and approaches. The first step in research is data collecting, which involves gathering historical SM data from sources that includes financial databases, online surveys and APIs. This research focus on stock market of each day prediction based on historical price changes by predictive relationship that exists among Fibonacci series for each organization financial market. These datasets are sourced from Kaggle, and each has 5021 instances from January 2000 to February 2020. Data was scaled, and values were retraced using three Fibonacci percentages, as well as the starting and finishing levels, utilizing several neural network (NN) approaches such as Artificial NN (ANN), Deep NN (DNN), and K-NN. The model's accuracy was measured using the Root-Mean-Square Error (RSME) metric. The RMSE comparison to the dependent variable with lowest value has establish the accuracy level which anticipated being lower in the DNN technique that will be used as the test scenario.

Keywords: Stock market, Deep neural network, Artificial Neural Network, Fibonacci series, financial business

### 1. INTRODUCTION

The SM is a collection of investors, stockbrokers and traders who purchase or sell share trades. There are numerous businesses that put their shares listing on the market, which makes their stocks appealing to shareholders. Until the age of 16, investors have experimented with various methods to learn more about various companies in order to increase the return on their investments [1]. It is critical for improving the economic standing of emerging countries such as India. The need for SM is increasing dramatically. Stack holder should be awareness about the share that get attention for more than a decade because of its amazing revenues. The SM trades a large amount of income on a regular basis, making it one of the most successful financial channels. Currently, SM is the indicators of a country's economy [2]. Several individuals spend large sums of money in the SM, yet they frequently suffer significant losses since they rely on stockbrokers, who advise shareholders with respect to basics about shares, technical, and time series analysis. Investors are looking for an innovative solution for such difficulties. This is wherein prediction of Stock Price enters into play, since anticipating the value of stocks is critical. The identification of major reversal points in financial markets has become of primary interest to stakeholders, particularly the portfolio manager.

An anticipation of these reversal points in the market index allow these stakeholders manager to maximize their returns in addition of maintaining the market balance. Moreover, it allows the investors to decide whether to long or short their holdings in the financial markets [3]. The security analysts use an array of techniques and tools to determine the key reversal points. Fundamental analysis and technical analysis are widely used to ascertain the buy-propositions and the sell-propositions. These propositions primarily are based on the difference between the value and price of any given securities. A buy proposition would be suggested where price exceeds the value. The underpriced or overpriced and under security or over security is based on the same [4]. In addition of advising the buy or sell proportions based on the valuation or pricing of the securities is important to determine the market directions which are bearish or bullish

trend. These trends may not based on the financial and economic rationale of pricing securities but may also include political, social, global and other factors effecting the financial markets [5]. Correlations and association of data among them will generate a pattern that play an unavoidable role for prediction as well as foreseeing about happened for making decisions easier. Interesting patterns types are the sequences which are readily defined as a set of components identified by a particular and unique order. The Fibonacci sequence is a widely recognized and commonly utilized sequence whereby each value is the summation of the two numbers that came before it. It appears to represent nature's fundamental concept underlying numerous of life's occurrences and happenings. Besides from the contrary, the above sequence can be separated into ratios, that investors declare offer insight towards wherein a certain financial market might proceed. Traders utilize the following percentages are 23.6%, 38.2%, 50%, 61.8%, 78.6%, 100%, 161.8%, 261.8%, and 423.6%. Fibonacci series finding inspired the development of five trading tools namely retracements, arcs, extensions, time zones and fans. Fibonacci Retracements have considered as horizontal lines which determine support and resistance regions. Forecast upcoming value of resistance and support might be seen of as a time-series regression issue that may be resolved using a ML algorithm for fitting the model.

Fundamental analysis is based on the financial information about a security, being more focused at ascertaining the fair price to determine the predictable price [6]. While the usage of technical analysis broadly for determining market probable direction [7]. Technical analysts consider the Dow Theory by Charles Dow, who has provided the underlying principle to technical analysis. These analysts have believed the forecasting SM is an interesting research area for several researchers. Reliable forecasting of stock price enable shareholders making better informed choices about purchasing and selling companies at the most appropriate moment. In recent decades, numerous researchers have investigated the predictable nature of stock values using ML techniques. The primary goal of this research is to determine the most effective ML techniques for predicting stock values. This goal was achieved by an evaluation of 12 research publications on the application of ML methods for predicting stock values. In order to differentiate this study from the present one, rather than choosing random papers, it concentrates on two major sectors banking as well as healthcare. The findings of this study reveal that DNN has offered the greatest outcomes for the majority of the selected NN method independent of the industry in which they are utilized, for essential limitation of the study [8]. ML may be a game changer [9]. In this work, some testing is carried out by using various ML algorithms to anticipate the opening price of two bank shares namely Kotak Bank and HDFC bank. The subsequent ML algorithms are K-NN, DNN and ANN [10]. Stock predictions are based on the day's starting price of both bank for each days in daily basis dataset.

#### 2. LITERATURE REVIEW

This literature review covers current studies on the application of ML in SM forecasting. The review contains research from a various sources includes journals, conference proceedings, and thesis. NN methods and time series analysis are examples of ML-based SM forecasting techniques. The review also discusses the benefits and drawbacks of these approaches and their implementation in the SM. The analysis found that ML can provide beneficial data about the SM, yet there remains space for advancement with respect to efficiency and resilience. The intrinsic value for any securities is determined by the amount of assets backing the equity instrument [11]. Financial statement of an organization and the ratios calculated in accordance with data provided in these financial statements generate the key for determining the investment value for all available data security [12]. While the market price is function of its volume demanded by investors and the volume supply by the divesture. It is highly motivated by the perceived impression of both financial as well as non-financial variables inclusive of guess, hope, fear, mood, events, etc. [13]. There is a strong reasoning for arguing about intrinsic value may vary from the expected market price [14]. Fundamental analysis and technical analysis play an important in this regards accomplished using the technical analysis.

Technical analysts are different to the fundamental analyst focus on data about the variables wonted to influence the future price. Technical analyst argues that the market price incorporating determining value of all factors other than speculative fundamentals [15]. Value reflection in price varies as the close price to that of the value that determined by the extent of the symmetry in the data as to its homogeneity in extent and timing of availability in concerned. Because the theory of efficient markets assumes symmetric distribution of information and it grows increasingly critical to anticipate price instead of value, as profit is derived from price instead of value. The review finishes by making recommendations for further research in the topic [16]. The average person is concerned over stock trading due to its best method for building money while execute well. Forecasting stock prices is a complex endeavor since it takes a great deal of data on market shares as well as trends. SM s is fundamentally turbulent and dynamic. Stock price behavior is highly variable and difficult to predict.

Previously, stock forecasting was conducted employing fundamental, econometric and technical methods. The sheer amount and data complexity produced in current markets render classic analytical tools ineffective. ML has grown into a more valuable tool for stock assessment. ML uses complex algorithms to examine big data sets, can assist find trends and patterns that may indicate future stock price movements. ML may also be employed to determine the relationship among stock prices as well as external factors which also has the potential to determine when is the best moment to buy, sell, or hold a stock. ML algorithms can be used to properly estimate stock prices. It also serves for identifying market irregularities like improper trading as well as manipulation. SM price predictions are currently a hotly debated study topic among traders and investors. When making rapid and accurate decisions in this forecast activity, investors want actual data. In recent years, most academics have established algorithms that anticipate a stock's average movements as well as price. The presented article presents an overview of several current forecasting techniques, including ML and sentiment analysis, focusing on the dataset, metrics and forecast types employed for predicting stock values. The findings, outcomes, research gaps, and potential future applications of all these methodologies employed are also reviewed. ML predicts present SM index values by training past performance sequentially and promptly employing DNN, whereas ML predicts current SM index values by training its history values [17].

ANN was used to do sequential timed sequencing [18]. SM prices develop en masse and fluctuate by every second. The SM is a sophisticated and tough framework from which individuals can either profit or lose its life investments. This research study aims to forecast the future of the SM. Predicting SM movements may represent a significant disadvantage on the SM. Social media accurately reflects individual's thoughts and emotions about recent developments. Twitter has contributed significantly to scholars' interest in the human emotions research. The primary analysis focused on public opinion on Twitter, which was supported by trading projections and linked to alternate social media. To accomplish the purpose, this study primarily use ML approaches to investigate numerous SM-related elements. Building SM prediction algorithms from stock datasets has shown to be a viable way for extracting data using ML. Data mining on this data may be valuable for SM forecasting. The goal of this research is to determine how effectively existing changes, such as rises and drops in the company's costs, correlate with public perceptions communicated through the company's tweets [19]. This article suggests a heuristic method for initializing weights in a NN using the Fibonacci sequence. Experiments were performed with various network architectures and datasets, and outcomes were compared to other initialization strategies including Zero, Random, Xavier, and He. It had been discovered that for small datasets, the Fibonacci initialization strategy achieves 94% test accuracy is higher than Random 85% and comparable to the Xavier 93% and He 96% methods. Furthermore, medium-sized datasets research found that the efficiency of the Fibonacci weight initialization approach is comparable to that of the Random, Xavier, and He initialization strategies [20].

#### 3. RESEARCH METHODOLOGY

The issue in buying and keeping stocks is viewed as a regression problem, as well as the framework employs Fibonacci retracement suited in K-NN, ANN and DNN with Time Steps. Data is scaled for keeping it steady in order to avoid the problem of bursting gradients, which occurs in regression. This is interpreted as data pre-processing in order to compare diverse variables on a level basis. The value sequence in time series data is critical, and to measure the algorithm's capabilities, the ordered dataset get split through training and testing datasets following rescaling. The overall dataset from the year 2000 to 2020, the complete dataset get split into 80% as training dataset and the 20% as testing dataset. The Fibonacci retracement is assigned with close price of the respective kotak and HDFC bank dataset. The retracement involves 0.0%, 23.6%, 38.2%, 61.8% and 100.0% whereas the range of Fibonacci retracement is considered with different color zones. The zone with orange color consist of 0.0% to 23.6%, green color zone involves 23.6% to 38.2%, cyan color zone deals with 38.2% to 61.8% and finally blue color zone contains range with 61.8% to 100% of the respective bank close price shown in figure 1.



FIGURE 1. HDFC bank stack holder close price from year 2000 to 2020

To conceptualize the issue as a single procedure for each occurrence, the training and testing dataset as inputs has been transformed toward the appropriate array structure as expected by the NN methods using numpy.reshape(). Presently, the NN methods are ready to be configured for the aforementioned issue. The different NN methods have employed, with two layers of 25 neurons each, and the previous layer's concealed output serves as the input for the subsequent one. The reshape input array is set to 1 because this information only contains one time-step and one characteristic. The layers of NN methods have employed the sigmoid activation function because they use the standard function in Keras. The network has been trained for two epochs with a batch size of one for HDFC bank dataset, and three epochs with batch size one for dataset. After the model is fitted, its performance on the training and testing datasets is evaluated. Before creating forecasts, the error units are transformed to exactly the identical units as the original data. Predictions are subsequently developed based on the model's train and test data. The initial four Fibonacci percentages are 0%, 23.6%, 38.2% and 61.8% along with maximum price percentage as 100% have been utilized as retracement levels for NN methods for assist in predicting the closing price flow trends for the upcoming year.

Figure 1 illustrates the HDFC bank original data for Fibonacci retracement training from the 2000 to 2020 year dataset. The retracement level raise from 0 to 23.6% till year 2007 and raised to range 23.6% to 38.2% and 38.2% to 61.8% at 2008 which get slowly reduced to 0 to 23.6% range at 2009. Again the close price retracement gets raised till 61.8% to 100% on the year 2011 and get reduced to 0 to 23.6% in the same year. There is a progressive raise up to 61.8% to 100% until 2019. Hence, the fluctuation of Fibonacci retracement is analyzed. Similarly, it is done for kotak bank dataset for training the original dataset.

Figure 2 has illustrated the HDFC bank original training data represented with green color, the prediction for the testing dataset is red color and the predited forecasted data is mentioned from the year testing data is considered whereas the color of forecasted line is blue in color respectively.





FIGURE 2. HDFC bank close price for training, testing and forecasting data

## 4. RESULT AND DISCUSSION

Monitoring the value of support and resistance level represents the procedural studies execute to determine the trend that causes the price swings, and depending on stockholders may determine when to sell or buy stocks. Although, this is a prediction issue that can be applied to previous sequential data and addressed using time series regression, two sequential datasets including history prices are used. To conduct an analysis of the results obtained through fitting the DNN model with the initial four Fibonacci percentages, as well as the maximum prices with highest percentages for tracking the price trend, the error metric is employed for assessing the accuracy of the values employed in prediction. The results and their evaluation are detailed below. Finally, Fibonacci retracement determines for the training data, which is shown in Figure 3. The unseen test data for 20% is presented separately in figure 4 whereas the correlation among is determined to assess the original and predicted pricing values performance.



FIGURE 3. HDFC bank close price for original testing data



FIGURE 4. HDFC bank close price for forecasted testing data

RMSE is employed to determine the stock price through Fibonacci retracement efficiency. RMSE is defined as the square root of the mean of square of all the errors. RMSE is utilized for minimizing the error or discrepancy among the goal and achieved output values.



**FIGURE 5**. comparisons of RSME score for various NN methods

Figure 5 illustrates the uptrend pattern as well as the price reverses at 23.6% of Fibonacci retracement level using resistance level as well as following a downtrend pattern for swing low in support level. Thus, it reached when traders anticipate maximum demand, at which point equities can be purchased.

#### 5. CONCLUSION

Stock price predictions are influenced by a variety of factors, making it difficult for investors to make an informed selection. The SM has its own methodologies for assessing market conditions, and using these as models has actually decreased tiresome manipulation burden for investors. The significant technical analysis represent about level representation of support and resistance which are utilized for forecasting the stock prices future trend of. Investors can analyze the uptrend and downtrend while deciding whether to buy or sell shares, while recognizing these levels employing the Fibonacci retracement can be considered an effective instrument that supports trader analysis. Machine learning is used to construct this trading technique, and DNN is the ideal model for analyzing time series while comparing with other models. In this study, the Fibonacci retracement was effectively used to forecast previously undiscovered market values and important trend lines using DNN. The proposed model indicates that the error findings were minimum and near to the dependent variable minimal value, resulting in the intended range. The findings implemented determine the anticipated results are positive for the level of support and resistance with great accuracy.

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