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Implementation of Stock Market Prediction Using Regression

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Abstract: *The stock market is a lucrative and interesting way to earn money. It revolves around buying and selling of stocks in order to generate profits. Many investment banks, hedge funds, employ a lot of developers, quants, and data scientists to make models to predict market movement, compute risk to reward ratios, etc. for their positions to decide the correct amount of exposure for each of their trade. These strategies and mathematical models are not publicly shared so that it doesn't lose its uniqueness. The project uses real life and live data and applies mathematical models and machine learning algorithms on it to gain tangible results (Profits or Losses). The project works by fetching data from the Upstox API for a given stock and then applying it to linear regression model. This way, the movement of the stock can be predicted. The project makes use of various statistical indicators such as Volume Weighted Average, Stochastic, etc. It also considers sentiment analysis for the particular stock using moneycontrol. The project will then execute trades automatically and track its position and exit whenever the trade goes against the predicted outcome or when the exposure is increased above a certain capital. Finally, all the trades are tracked and a timeline or a line graph is created to track the performance of the application over a given range of time.*

Keywords: *Regression, Risk-to-reward ratio, Selenium, Sentiment Analysis, Stock Market*

I. Introduction

The stock market can be a great stream to generate supplementary or side income. Investment Banks and hedge funds don't share their strategies and mathematical models publicly so that they don't lose their uniqueness. Currently, the research papers do not use live data for trading and hence no tangible success/failure of the project can be determined. This creates a need for a project that uses real life and live data and applies mathematical models and machine learning algorithms on it to gain tangible results. The project will focus on short term (intraday) trading. The application would use a combination of strict risk: reward ratios, machine learning and statistics to trade in the Indian Stock Market and analyze its efficiency. Also, primary objective is to minimize the loss per investment done by the investor.

II. Literature Survey

1. Stock market prediction: A big data approach [1]:

In this paper, both technical and fundamental approach is considered. Fundamental analysis is done using social media data by applying sentiment analysis. Social media has high impact on our lives today. This method includes collecting news from social media and then extracting sentiments expressed by that individual's post. Technical analysis is done using historical data of stock prices by applying machine learning.

2. Performance evaluation of ANN and neuro Fuzzy system in business forecasting [2]:

Majorly, two prediction techniques have been compared in this paper i.e. Adaptive Neuro Fuzzy inference system (ANFIS) and Artificial Neural Network (ANN). To check the performance, they have considered two examples. First, they take into consideration the sales dataset of cold drinks, the cold drink sales are computed by the system and results are generated. Second is the prediction done by the two techniques on the stock market, the data is taken from the NSE which is provided by the broker. Based on this live dataset, optimal results are generated to achieve successful trades.

1. A methodology for stock market analysis utilizing rough set theory [3]:
   The behavior between market and the investor is simple randomization which is difficult for the AI/Neural Network to analyze. In this paper they have described about rough set theory which is applied in AI so, that the AI could work efficiently in a dynamic environment. Basically, the normal stock market prediction is based on general quants. The problem for AI is to interpret these quants and also apply its own strategy based on learning. So, they have implemented rough set theory which is the overall collection of all the

random actions happened in day to day stock exchange and maintained in a dynamic database. Using this database, the AI will be able predict the stock market without any ambiguity.

2. Stock Market Prediction of S&P500 Using BFO Technique [4]:
   The present paper introduces the bacterial foraging optimization (BFO) technique to develop an efficient forecasting model for prediction of various stock indices. The connecting weights of the adaptive linear combiner-based model are optimized by the BFO so that its mean square error (MSE) is minimized. The short and long-term prediction performance of the model is evaluated with test data and the results obtained are compared with those obtained from the multilayer perceptron (MLP) based model.
3. Survey of Stock Market Prediction Using Machine Learning Approach [5]:
   The paper talks about non-linear nature of the Stock market. It also talks about people's sentiments and their approach. It talks about predicting the market using tips from other websites or brokers without any solid reason backing a particular prediction. In this paper well-known efficient regression approaches are explored to predict the stock market price from stock market data based. A gap or improvement in the paper can be that the results of multiple regression approach could be improved using more number of variables.
4. Stock Market Prediction Using Linear Regression [6]:
   Linear Regression is applied on a publicly available dataset which contains the closing price of the shares of Tata Consultancy Services (TCS). The paper focuses on providing the investors and corporate stakeholders with a method to forecast daily behavior of stock market. It also analyzes different regression algorithms and concludes that linear regression was able to fit the data in the most precise manner and hence shall be preferred instead of other algorithms.

III. Proposed System

The system will use linear regression, statistics and money management to predict the price movement of selected stocks in the Indian Stock Market. Then, it will automatically place the given trades at the given price with a strict take profit and stop loss. Also, the application will have dashboard to view statistics and analyze overall profit and loss over a given period of time. This will enable the trader to analyze the correct and wrong trades and also for tax purposes.

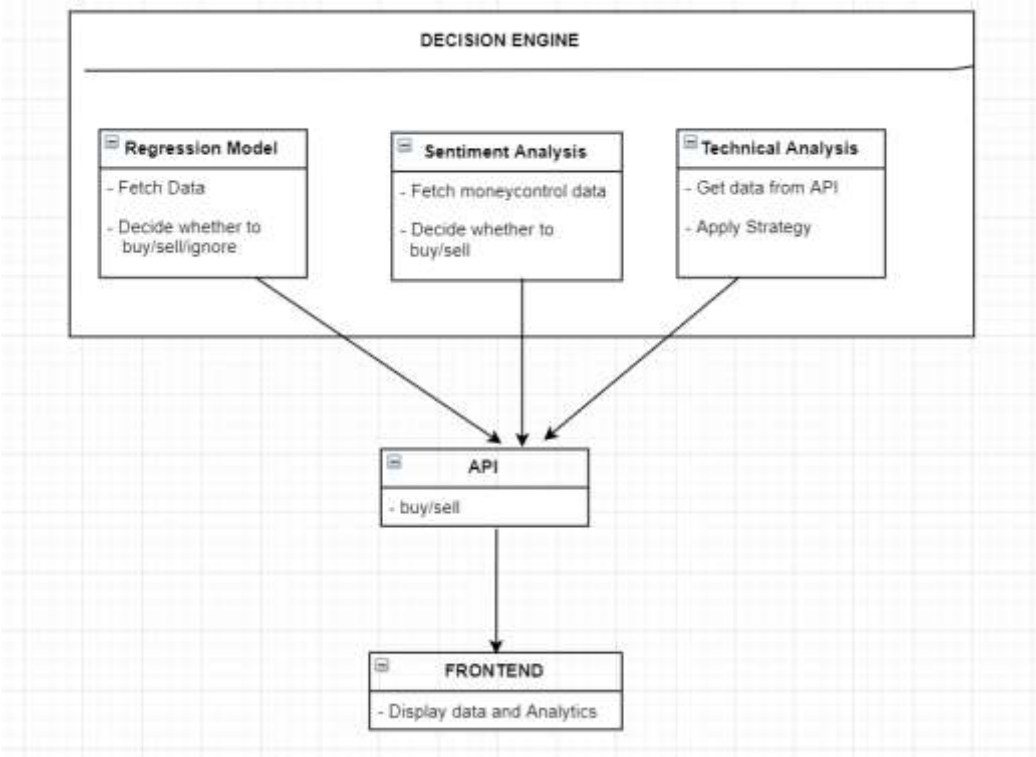

Fig.1 block diagram

The user registers to the system using their Email Address/Username, Password, Demat Account Details. Then, the user logs in. They are then presented with a dashboard through which they can track their profit/loss for the day. It will also have various analytics tools, like a line graph to track growth of capital and profit realization over time. On the backend side, various stocks are selected and monitored. Once a few

conditions of the model are satisfied, it will apply sentiment analysis [7] on stock news which can be taken from websites such as moneycontrol regression. This three-way confirmation would not only improve probability of success but filter out wrong signals and false positives.

The system starts by generating an access token early morning. Then, after the market opens, the system waits till 10 am to scrap the National Stock Exchange of India's website using Selenium, it then creates a list of the top gainers and losers of the day. After that, it uses the Upstox API to get the candlestick data for the past 7 days of the stocks shortlisted. It then, analyses whether various statistical, regressional and sentimental conditions of the selected stock and then shortlists the best candidate for the trade. Finally, the system uses the API to automatically place a trade in the market. The process repeats at 1 o'clock in the afternoon as well.

IV. Methodology

The project uses the popular SEMMA model developed by SAS Institute. SEMMA is an acronym for Sample-Explore-Modify-Model-Assess. This allows the team to divide the task into different parts and focus on developing a fast and minimum viable product instead of a monolith without proper testing and performance overview.

The process can further be dealt in an agile manner where updates and improvements are continuously deployed based on new and relevant findings.

V. Technology

The project focusses on Machine Learning and hence would require Python along with Scikit-learn library for the development of linear regression algorithm. NLTK (Natural Language Toolkit) library would be used for sentiment analysis using Naïve-Bayes algorithm from money control data. Also, the project requires use of statistics for the strategy. For scraping data for sentiment analysis, beautiful soup 4 is used. Selenium is used to get the latest data for gainers and losers from NSE India's website. It is also used to generate new API keys from Upstox Web portal. The project will run from a Raspberry Pi and will be fully automated without requiring any user interaction.

VI. Results and Discussion

The results of the project can be measured in terms of Return on Investment (ROI) from the initial amount over the period of a month, a quarter, or an year. The project focusses on small quantities and retailer-level positions in the market instead of operator level positions. Hence, the target audience is youngsters who want to invest their pocket money or other small savings for a short period of time, or new traders who want to trade in small quantities. The measurable return can be further compared with other indexed funds, mutual funds, and even the entire stock market itself. It is important to note that, one trade successful trade can overcome five, unsuccessful trades [8]. This is because of proper risk to reward ratios and money management techniques. The project uses a risk to reward ratio of 1:5. This means, for every trade taken, the system can either lose Rs. 1 or gain Rs. 5. Hence, upon executing say, a hundred trades with even 30% accuracy, our system remains profitable.

Fig. 2 Dashboard

Fig. 2 shows information cards that gives the initial investment, current balance, current day's profit and the ROI since the beginning.

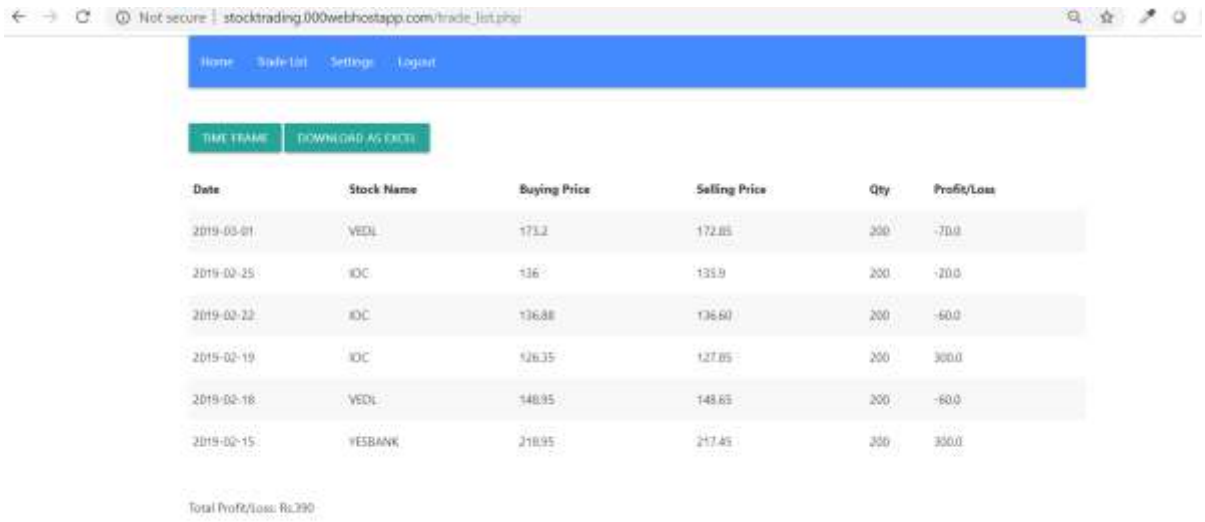

Fig. 3 Trade List

The application shows the trade list which gives detailed account of Stock name, buying and selling price, profit or loss incurred and the date on which the trade was taken. It then calculates the net profit or loss. We can also set a time frame we want. For example, if we wish to view last 10 days trade, we can set the time frame accordingly. We can download all this data as Excel.

VII. Future Scope

The project is limited to small, retail-level investments and similar to any system, is not scalable beyond a specific capital amount. The project could be modified further to incorporate other brokers such as Zerodha. Currently, only Upstox is supported due to its API access. Also, multiple strategies and machine learning, deep learning models can be applied on the different stocks and back-tested to find which stock follows which strategy. Then, while trading, the strategies can be hot-swapped based on the stock that is selected in the watchlist. Further, the strategy can also be applied to derivative trading (such as futures) instead of being limited to only equities as and when the position size increases. Legal feasibility of a project should also be studied before mass roll-out is done.

VIII. Conclusion

The project would not only benefit new traders but also those who want to trade in the Indian Stock Market but cannot do so because of their full-time job. This platform allows them to not just venture into the world of intraday trading and make profits which can be used as a secondary income source or as contingency or retirement funds. The project can also be flexibly used to check different strategies by modifying conditions in the decision center and also on tracking the overall growth of capital over a given span of time. From a Data Science standpoint, the project can be thought of as a great avenue into the world of statistics, machine learning and artificial intelligence building the foundation for further development and research.

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