PAPER TRADING SIMULATOR WITH FUNDAMENTAL AND SENTIMENTAL ANALYSIS OF THE COMPANY

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ABSTRACT

The world of trading is full of excitement and potential for profit, but it can also be a risky proposition. Many people are drawn to the idea of making money quickly and easily, but they are often unprepared for the challenges of trading. As a result, many people end up losing money.

In this case study, we investigated the possible solutions towards the Learning journey and analysis of a company not only to trade but also to know how a company or the companies of specific sectors are performing in the market. Technical analysis, fundamental analysis, and sentimental analysis are three key metrics that can be used to analyze a company. We are mainly focusing on fundamental and sentimental analysis to analyze a stock or a company. Several formulas, such as Graham's number, are used to evaluate how well a company is positioned for long-term success. The latest news can be a valuable resource for understanding how the public feels about a company, which can help to identify whether to trust a company. Additionally, we are providing an interface where users can trade a company's stocks with virtual money to make them confident before jumping into the original market.

These findings suggest that a stock or company's performance mainly depends on financials and sentimental values and trading these assets by practicing with virtual money can help us understand which strategies are going to work positively in the future.

Categories and Subject Descriptors

Full stack web development, Financial statements analysis

Keywords

Paper trading simulation, Fundamental analysis, Sentimental analysis

1. INTRODUCTION

According to a report by the Securities and Exchange Board of India (SEBI), the number of demat accounts in India has increased from 2.3 crores in March 2010 to 5.3 crores in March 2021 indicating a positive interest developed among youth regarding stock trading. It can be concluded from the above statement that we have seen almost 3 crores of new demat accounts from 2010 to 2021 i.e. 11 years, But this was just the beginning the number has shown exponential growth in the last 2 to 3 years having 8.4 crores of demat accounts in the year 2022 and according to the latest reports in 2023, there are 11 crores of active demat accounts across various brokers available which means it took 11 years for 3 crores users to join and start their trading journey between 2011 to 2021 but it took only 2 years to acquire approx. 5.7 crores of new traders between 2021 to 2023.

However, not all traders succeeded in their path and not everyone made profits the major reason behind this is a lack of analysis and just trading in the stock market as a gambling game. Good research and proper practice can make users take wise decisions and help them to get rid of their losses. Well, research involves analyzing their financial statements for a period of the last few years to see if the company is profitable and has a hope of growth. One of the formulas to analyze a company's fundamentals is using the Graham number. The Graham number is a metric to determine the highest price that an investor should pay for a particular stock. another famous metric to evaluate a company's performance is by calculating its Pitroski's score which takes into consideration the fact that a company's growth respective to its previous years must be positive and some factors like cash burn should be reduced, total assets value should have grown to its previous years, Liabilities must be reduced, Debt must be reduced and many more.

Not only fundamental analysis will help you in choosing the right stock but the sentimental value must also be considered. Sentimental value takes into consideration a few factors like the trust of users, the company's new decisions and plans introduced in the current time, Vision and motivation, sector, and industry. Hence news can be a good source of data to evaluate the sentimental value of a company of stock. There are a few other metrics like Alpha, and Beta which are used to calculate and evaluate a stock's growth and volatility in the past few years. Once done with the analysis part we are ready to start our journey to become a successful trader but we cannot directly jump into the real market because we might end up losing our whole capital. Hence it is advised to practice first before trying and experimenting in the real market. This is where the paper trading simulator could be used to test our strategies and practice trading by not investing real money but using virtual money. This will help beginners to gain confidence to avoid big losses when traded with real money.

2. LITERATURE REVIEW

One of the hot topics in today's generation is stock market trading, might be from a movie, web series, or the effects of social media influencers but everyone is aware of stock trading and many of them want to pursue their career in it, but this is not as simple as it seems to be it requires much patience and a good amount of time dedicated to practicing, learning new skills to enhance their trading journey. Many financial experts and stock trading practitioners have written many theories regarding stock price prediction using various techniques but there is no such surety if a particular theory is correct and can be trusted completely. Certainly, we can't deny the fact that stock price has some dependents, it reacts according to certain scenarios and specific conditions which could be calculated, measured, and analyzed using various metrics.

Numerous studies have been conducted on stock market prediction using technical, fundamental, and sentimental analysis through various computing techniques, financial formulas, Indicators, and analyzing the social media platforms like Twitter to get updated news regarding a specific company. This study attempted to undertake a systematic and critical review of about a hundred and twenty-two (122) pertinent research works reported in academic journals over 11 years (2007–2018) in the area of stock market prediction using machine learning. After all this research and proper back-testing researchers have come to the conclusion that all types of analysis are equally important to analyze a company and its stock price action. Technical analysis involves analyzing a stock price or predicting a stock price using certain technical indicators available in the market. There are numerous technical indicators available in the market with different purposes and works under different conditions.

Few of the authors believe certain estimated price formulas are effective and can give better results to predict a stock price but the probability of it working in the regular market is good enough various if the market is volatile then these formulas will give wrong predictions resulting in loss of capital. some of the formulas to calculate the estimated price using the daily price value are moving averages. we have many divisions or variants like 50-day, 100-day, and 365-day moving averages. A moving average is a calculation of future price based on the average traded price in a certain duration of time for a 50-day moving average we calculate the stock price average of the last 50 working days price to see how well it could be expected to grow. Whereas fundamental analysis involves calculating certain ratios which tell us about the company's growth and structure. these ratios are used to see if a company is profitable if it is performing better than its previous year's performance. These calculations include analyzing and understanding various financial terms to study a company's quarterly or yearly financial statements. financial statements mainly include balance sheets, cash flow, and income statements. balance sheet maintains all the details regarding a company's assets and liabilities, and new investments made in the growth of the company. The income statement includes the profits and losses a company is making in its financial year and the amount of cash they are burning. Cash flow maintains the overall cash circulation in the company including cash in and cash out.

The count of authors who believe in the depth of sentimental analysis importance is increasing day by day because sentimental analysis of a company deals with understanding common people's emotions towards the company including both positive and negative ways Because in critical situations like market crash scenarios people make the situation worse by getting panic and selling all the shares they have thinking they will lose the money resulting in fall of a stock price hence emotional stability and patience is key to success. The sentimental analysis also helps users to stay aware of the major decisions made in their favorite companies.

Paper trading simulation is helpful to practice the stock trades with

virtual money without any risk of losing money in the market, but learning with the real moments of stock. Few authors have worked on paper trading simulators where they explained the importance and benefits of beginning a career using paper trading than trading with real money because the risk is comparatively very high for a fresher who doesn't have much experience in trading but still is interested to learn the stock market and earn from the stock market.

Hence we can conclude from various kinds of research that analyzing and proper practice are the skills one must learn and master before investing precious time and money.

3. METHODOLOGY

This section of the paper discusses the data set used for displaying content for the user on the dashboard. We have used various APIs which provide stock price data for both the Indian and American stock markets. There are a few API providers like twelve data, alpha vantage, and Rapid API using which we can access data for free but as the data is free we have certain limitations regarding the usage of API. There are a few limitations on the API calls made per minute. To analyze a company's financial stability and we need to download its financial statements this also could be done using the API where we can extract the company's financial statement by entering the company name or stock name and then performing the necessary calculations to get the conclusion. We can see the flow diagram for API calls in Figure 1 below.
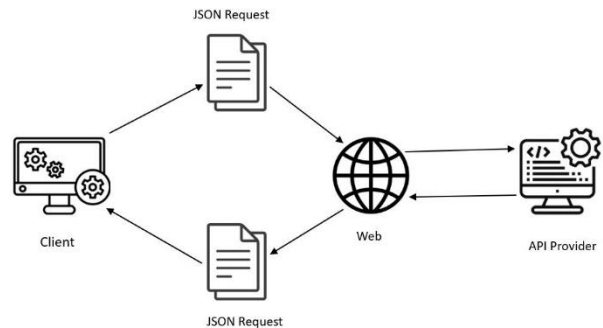

Figure 1: API calls flow diagram

Whenever a user requests the data of any particular stock by entering the ticker or stock symbol the client side will make a JSON request to the web and then the web communicates with the API provider for the data of user requested stock symbol and transfers the data to web and web sends the back the data in JSON format as a response to the client side. When we get the response in the JSON format we can adjust the data according to the format we want to display. JSON response is generally an ideal way to fill the data in the form of tables, cards, and lists for the user.
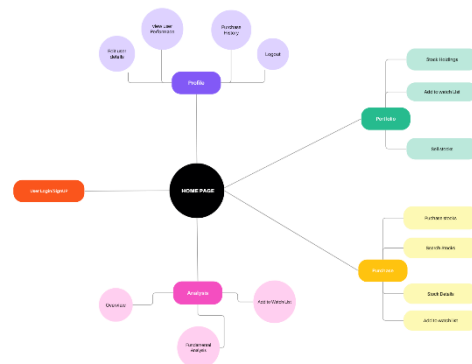

Figure 2: End user flow diagram

The above diagram describes and shows the flow of the end user from login to logout. User starts by either logging into their account if already exists or creating a new account by simply registering themselves by filling in some common details on the registration page. Once they have logged into their account they are redirected to the dashboard page or home page from the home page they have an option of navigating to any of the four pages Profile, Portfolio, Purchase, and Analysis. The dashboard page has some tools like currency exchange, real-time stock market status, and Indian, International times with an overview of a few stocks. There is a feature for checking news related to any company or stock which is a key part of the sentimental analysis of the company. Upon visiting the portfolio page there are three operations that could be performed and they are checking the stock holdings, adding to the watchlist, Sell the stocks which the user has purchased earlier. When navigating to the purchase page user will have four options and they are searching for stocks, buying stocks, getting stock details, and adding to the watchlist. The analysis page has three options to choose from they are an overview of the stocks, add to the watchlist, and check how much a company is fundamentally strong and what possible momentum can be expected from the stock financial. The last page is the profile page where the user can edit the profile, check the history of purchases and sell made by the user, and the performance of the user which is calculated based on the amount left and the initial amount when creating a new account hence it can know if the user has made profits or loss in his practice journey.

3.1. Technologies used

This part of the page mainly describes the overall journey as an end user to access the data and perform necessary operations, avail of the features available on the website. This website is a full-stack web development, dynamic and responsive project. The technologies used here include HTML, CSS, JS, and Bootstrap for frontend, JS to make all the API calls to get the data and restructure it to a viewable and user-friendly way. We have used MySQL to build our database where we can store all the required and necessary information related to user's profiles and their activities. JAVA and spring MVC are used as the backend technologies to communicate with the database and act as a medium of communication of data from the user to the database and vice versa. The website can be hosted using any hosting platform to make it live and accessible from anywhere. JQuery and AJAX are used to catch the API response and manage the API calls to the provider. Implementation of web sockets can also be done to get the live price data without the need of refreshing the content of the website. The API response.

4. WORKING

The whole flow starts with the registration screen where the user registers and successfully creates an account if there doesn't already exist whenever a new user creates an account dummy money of 1000000 i.e. ten lakhs is credited to their balance which will be available for trading stocks. If a user's data already exists in the database then they can directly log in to their account and continue trading. Once they are successfully logged in to their account they will have the option to navigate among the 5 pages which are mentioned below

- **Dashboard:** To check for live prices with graphs
- **Buy:** Buying both Indian and American stocks
- **Portfolio:** To check the number of shares holding
- **Analysis:** To analyze a company's fundamentals
- **Profile:** To edit the profile and check the user performance

4.1. Dashboard

The Landing page or dashboard is the first screen visible to the user once they log in to their account. The dashboard mainly consists of the graphs and real-time prices of a few famous stocks on Indian and international stock exchanges. Like Microsoft, Tesla, and Apple from NASDAQ which is an American stock exchange. There are a few tools

on the right side of the screen where we can see the current Indian standard time and American time, and if the market is open we can see a countdown of how much time is left for the particular stock market to close. There is a real-time currency converter to check what is the current price of a dollar in rupees or vice versa. Upon scrolling further we can find the latest news related to any particular stock to analyze and understand the sentimental scope of the company or stock.
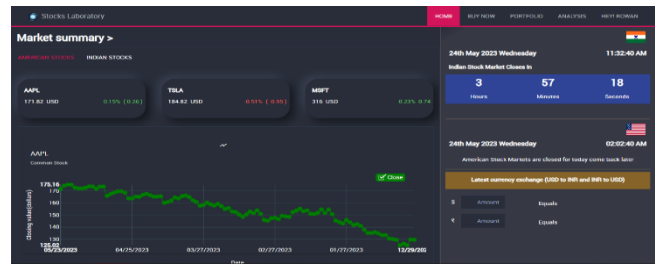

Figure 3: Dashboard

4.2. Buy

When visiting this page users can see the stock details and their real-time value and purchase if required.
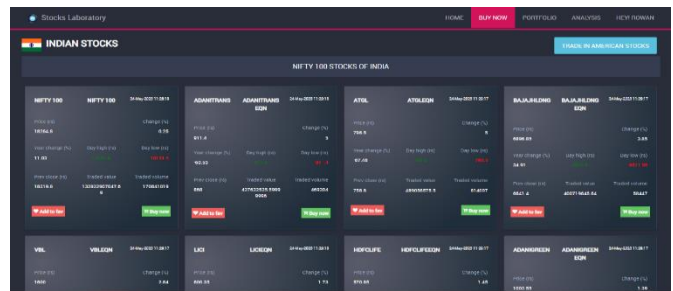

Figure 4: Buy Now page

If the user selects to purchase Indian stocks then after filling few details like quantity user can directly purchase and this data is updated in both portfolio and the profile. Whereas when an American stock is purchased then the total price is converted from dollars to rupees automatically and then displayed to the user upon successful purchase the portfolio and profile get updated. If a user wants to add any of the stock to their watchlist they can do it from here itself by just clicking the add to watchlist button.

4.3. Portfolio

This page mainly consists of the user's purchased stocks information, The quantity they own, and different shares they have from both Indian and American stock exchanges from here we can observe the stocks or directly sell the stocks if wanted to do so. To sell the stocks we just need to tap the stock name from the list and a popover will be displayed with the current market price of the stock and the average purchased price of that stock with the total profit or loss that stock has made in overall trades
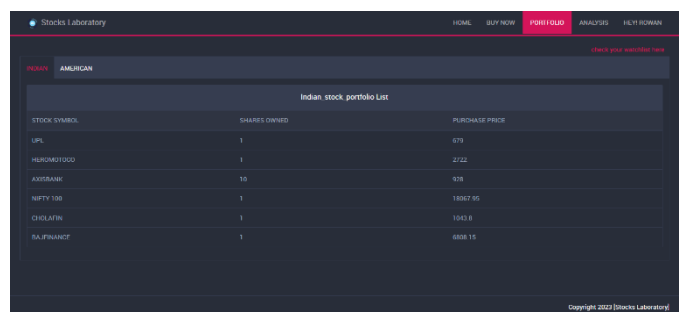

Figure 5: Portfolio

4.4. Analysis

This page has a key role in the project. This page consists of the stocks and their fundamental analysis could be done here. When clicking on a particular stock the user can see the overview of that company, what is the name of the company, where the company is located, in which sector and industry the company is working on, the company logo, company bio or motive, analyst target price describes what is the targeted price of that particular stock predicted by the analysts this is just a rough analysis and not reliable about the price is true.
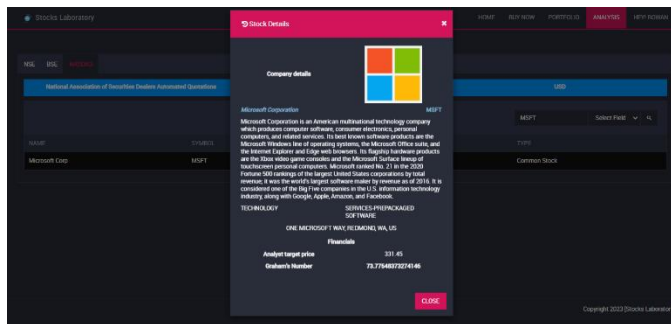

Figure 6: Portfolio

Finally, Graham's number is calculated using the two metrics earning per share or EPS and Book value per share or BVPS to calculate Graham's number we use the formulas given below

$$\text{Graham's number} = \sqrt{22.5 * EPS * BVPS}$$

$$EPS = \frac{Net\ income}{Number\ of\ shares\ outstanding}$$

$$BVPS = \frac{Stockholder's\ Equity - preferred\ stock}{Average\ shares\ outstanding}$$

$$P/E\ Ratio = \frac{Share\ price}{Earnings\ per\ share}$$

$$EV\ to\ EBITDA = \frac{Enterprise\ value}{EBITDA}$$

$$ROE = \frac{Net\ Income}{Average\ Total\ Equity}$$

$$ROA = \frac{Net\ Income}{Average\ total\ assets}$$

4.5. Profile

A profile page is where user can edit their personal details or see how well a user has performed with the virtual money, The total balance left, the initial balance, the amount utilized, and profits made. User can also track their history of all the orders they placed of both buy and sell.

5. RESULTS AND ANALYSIS

The results observed were quite beneficiary for a new trader or a person who has not even started his career as a trader can practice here to get some hands-on experience and the overall analysis provided regarding the company's performance or its fundamental strength was quite correct. When a user searches for a company or stock symbol then calculations are performed and if the company is not profitable then the same text is shown as "company is not profitable" as shown in Figure 7. which means investing in such companies can be much risky and there is a high chance of loss. We need to stay away from such companies and invest only in potentially good and financially
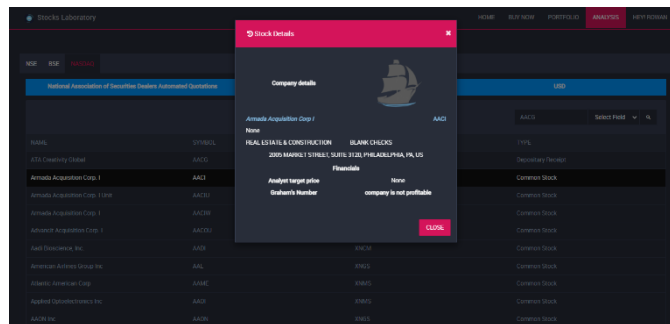
profitable companies.

Figure 7: Non-profitable company

The news feature has helped users to be aware of the latest development plans and to stay updated with company-related news. Being aware of the company's moments is beneficiary while trading and picking up the stocks which are expected to perform well and grow exponentially in the future.

6. CONCLUSION

The higher the company makes profits the more growth is reflected in the stock price hence fundamental analysis and financial statements analysis regularly needs to be done before trading in that particular stock. Similarly staying updated with the company's new steps and commitments is also equally important in the growth of the company and its investors. As we have seen that the number of investors has been increasing exponentially in the last 2 years, and this number is expected to grow at twice or thrice the speed due to the emerging interest among youth in stock market trading. The number of social media influencers is also growing at a very high speed hence people are motivated and looking forward to growing their careers as a stock market trader. Practicing on a regular basis with virtual money can help people gain confidence when trading with real money and this is also useful to understand how the market reacts in different situations.

The system could be made more efficient and reliable by making use of web sockets to get real-time data. As we are using free services we might get a little delay in live data and there are limits on the usage of APIs. All these studies could be put together with technical analysis to get a more accurate correct estimated data.

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