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Analysis of Factors Influencing Stock Market Simulator

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***Abstract*—The prices of stocks or shares in stock market are very dynamic in nature. These changes are due to some natural or manmade factors. The factors influence the stock market simulator in the areas of design, database, structure and many other things. The factors can be related to company performance for which efficient use of web crawler is needed or the factor can be change in dollar prices for which study of dynamicity of market should be considered. Some of these factors influence the stock market simulator drastically while few cause minor ripple. While designing stock market simulator, we should consider these factors, what their influence is and how we can illustrate their effects on stock market indices. This paper provides analysis of factors influencing the stock market simulator.**

Keywords—company news and performances; factors;natural calamities; opinion mining; sentiment analysis; stock market simulator.

I. INTRODUCTION

Astock market, equity market or share market is the aggregation of buyers and sellers (a loose network of economic transactions, not a physical facility or discrete entity) of stocks (also called shares).It represents ownership claims on businesseswhich may include securities listed on a public stock exchange as well as those only traded privately. Stock exchanges list shares of common equity as well as other security types, e.g. corporate bonds and convertible bonds. Companies gopublic which means they make their shares available to common people. Such companies list their shares on stock exchange. Some of well-known stock exchanges throughout the world are NSE (National Stock Exchange, India), BSE (Bombay Stock Exchange), New York Stock Exchange.

Stocks can be segregated into various types based on the domain of their company. For e.g., Mahindra and Mahindra have their stock listed on auto mobile sector, Dr Reddy's Lab has their stock listed on Pharmaceutical and Health sector, and so on.

The factors which influence the stock market are of dynamic nature. For the development of a good simulator, these factors would play a vital role.These factors would influence the methods to customize simulator, the technologies which would be used in the simulator and how effectively the simulator can be built. Apart from these factors, there are many other factors which would also influence the creation of simulator, but we have decided to selectthe ones which have major impact.

A stock market simulator created based on these factors will be able to simulate real world stock market indices. Still the authenticity and execution of these factors can be used to judge the effectiveness of our simulator as compared to real world stock market.

II. PROBLEM DEFINITION

The Factors identified which influence the stock market simulator share varying deal of change. One factor may cause to change entire schema and logic of the simulator while another factor may get fulfilled just by a simple change in simulator.

To identify the factors, we have studied the research done on prediction of stock values in Bombay Stock Exchange [1] and National Stock Exchange [2]. Wehave found that the majority of stocks follow a pattern. The pattern is consistent on both – the Bombay stock exchange as well as national stock exchange. These patterns are based on global as well as national events, natural as well as manmade interventions and due to Bandwagon effect.

The stock market simulator must be designed by considering these factors. Some of the influential factors for stock market simulator which we have identified by looking at the graphs and patterns are as follows:

- Natural Calamities
- Company news and performance
- Inflation and Deflation

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- Industry performance
- Market performance (Bearish or Bullish)
- Government policies
- Change of dollar prices
- Demographics associated
- General Market sentiments and trends
- Fluctuations in crude oil prices
- Economic and Political shocks
- Sudden shift from shares to other investing tools
- Bandwagon effect
- Regulations imposed by RBI (Reserve Bank of India) and SEBI (Security and Exchange Board of India)
- Elections
- Dividend announcements
- Availability of credit
- Effective regulation
- Intelligent users

The implementation of the influence of these factors onto the stock market simulator [3] can be roughly be represented using the following steps:

a) Search the news feed for the mentioned company's stock with the help of web crawler

b) Collect the relative information and apply opinion mining

c) Determine the inclination of the information i.e.whether it is positive or negative by performing sentiment analysis

d) Reflect the changes in the simulator dynamically at regular intervals with the help of appropriate fluctuations in the stock values

The effect of each of the factors on the stock market simulator depends on the economy or changes in theunderlying environment [4] in which the simulator is operating.

III. STOCKS AND THEIR DOMAINS

The next important step in the creation of the stock market simulator is the identification of the domain of the stack. This would enable the categorization of the stocks [5]. Thestock market simulator should segregate the stocks based on the domains and the related activities of the companies. There should be proper separation and compartmentalisation of stocks. This can be achieved if we train our system to separate the incoming stocks based on the data given before. This can be done by supervised learning and artificial neural network [6]. The system will get trained to identify which stock should go in what domain. When a new stock is listed in the stock market simulator, this system already learned and trained to identify, will segregate accordingly.

For e.g.,in the Yahoo Finance database, these are the stocks along with their domains:

- Apple, Tesla – Consumer Goods
- JP Morgan, Morgan Stanley – Finance
- Google, Microsoft – Technology
- Fedx, Netflix – Services

This domain separation helps in assigning which factors will influence which company according to their domain and what effects the factor will cause.

IV. ANALYSIS OF FACTORS

Outof all the factors mentioned which influence the stock market simulator, these five contribute the most. These factors are also of different domain, so majority of the aspects of stock market simulator are covered in these factors.

A. Company News and Performance

Company news and performanceis one of the most crucial factors which influence the stock market simulator. Majority of stocks in the equity market are of various companies. The news related to these companies holds a lot of significance in the stock market simulator. Proper evaluation of this news can generate a good influence on the functioning of stock market.

Let us consider some of the examplesof the news.

"ABC Companydeclares that they are soon going to be bankrupt"

"XYZ Company announces that from tomorrow the value of shares will increase due to good quarter performance"

"PQRCompany announces Employee Layoffs"

These news alter the whole geography of the stocks and subsequently the stock market simulator.

This factor makes the Stock Market Simulator to search news depending on the affairs of the company. If Company LMN is in focus, the stock market simulator searches for the news for company LMN as well as the companies directly or indirectly interacting with LMN. Every company irrespective of its size, deals with group of companies of different domains. So, while crawling for news, the simulator should also observe this aspect.

The news fetched by crawler for said company should be first filtered. After fetching the article or news portion, the simulator first identifies which part is beneficial and which part is dirty data. This opinion mining and generation of clusters can be done in many ways [7]. One of the ways being, use of Machine Learning [8].

If the system is trained to look for significant news part based on some rules, then fetched news can be filtered with a greater ease. This filtered news then will be analysed to check whether the news affects positively or negatively to the stocks of the company. This can be done with the help of sentiment analysis [9]. It checks the news for keywords. These keywords hold one true meaning. For e.g. if the simulator stumbles on the keyword(s) 'Good Performance for the quarter', it will be classified as positive part. Sometimes, the statements can be more complex. Such statements would need weighted average

of the identified inclinations to decide the final outcome. It will signify that the stock prices are expected to rise, and similar arrangement can be made to simulate the same. The simulated fluctuations will try to make the stock market simulator close to real world stock market.

B. Natural Calamities

The factor considers the entire natural phenomenon occurring in the world and determines whether that will have any effect over stock market simulator. It influences the stock market simulator in the areas of creation and manipulation of demographics. The natural calamities can be frequently occurring like regular volcanic eruptions and occasionally or rarely happening like earthquake. The degree of influence of this factor in stock market simulator depends on the variety of aspects. Some of them are like frequency of occurrence, the geographical area where the calamity took place and the degree with which it affects the whole world.

There are many examples of natural calamities which has already occurred and affected the whole world like tsunami, earthquake, volcanic activity and storms. We had seen the greater effect of these incidences on the stock market in terms of fluctuations of the stock prices. Hence the same should also be incorporated in the stock market simulator also. There must be dynamic change in the stock market with the news of any of such calamites. There can be an algorithm used to perform the necessary change in the stock market environment. The algorithm will consider the various factors mentioned earlier like the frequency, geographical area and degree of severity. The output rather should be the set of companies or the domain which would be affected and the magnitude of fluctuations in the stock prices [10].

The impact of this factor can be categorized as direct impact and indirect impact. The direct impact means that there would be areas where it would directly affect. While indirect impact means there would be some areas which will experience collateral change due to this factor. For example, if there is desert storm in the oil generating regions.Then it will influence the stocks related to oil and natural gas resources in the stock market simulator. This can be considered as direct impact. Due to this, there will be increase in price which will indirectly affect the stocks related to automotive industry. This can be considered as indirect impact. The simulation of this factor depends on all these parameters.

In some cases, even though natural calamities occur; the environment is made strong enough to fight back with very less on no effect on the day to day life. This rather becomes possible with the existence of a strong disaster management unit in such areas. It would be great to consider this scenario also while designing the influence of this factor on the simulator. For example, in Japan there are frequent volcanic eruptions and minor earthquakes. These earthquakes have little or no effect on the economy of the nation due to their disaster management unit. Hence as said earlier the geographical area also plays important role. The news of an earthquake in Japan would not have as much influence on world market as the news of earthquake in India.

C. Government Policies

This factor plays a major role in designing of stock market simulator. It revolves around which stocks to simulate and in what proportion. This factor influences the stock market simulator in the areas of timing and characteristics of the economy. The factor of Government policies is an indicator of how economy is thriving.

The regulation of government policies and economy goes hand in hand. The stock market simulator simulates this economy by being observant about the recent changes happening in the current affairs of the government and by measuring how these will affect the stocks of the companies in the simulator.

For example, suppose during the budget announcement, the central government proposes a major change in distribution of money. This new aspect has great impact on many public sectors. Now, the stock market Simulator will identify which sectors are affected. By studying those changes, it will change the environment which will be accosted to this new budget. This can be done my monitoring the environment and by being watchful about recent policies by the government. One major aspect where stock market simulator is majorly influenced will be in determining whether the change is positive or negative [11]. The new regulations by these government policies would affect the stock market environment in bullish manner or bearish manner.

There can be a case where a small amendment or some minor corrections in the constitution can have major effect over how stock market functions. On the surface this policy might have a ripple effect. This change of environment should also be created by the stock market simulator. There can be a case where a major government policy is implemented but that has less or no impact over stocks of the companies. In such scenario, the system of simulator should be intelligent enough, should be trained enough to know these significant differences.

This factor of government policies influences the stock market simulator in understanding the environment and curation of the environment based on recent developments by the government. These developments can act positively or negatively depending on the current scenario.

D. Sudden Shift to other Investing tools

This factor accounts to general tendency of investors. In every given economy, an average or common set of investors heed to advice given by the people who are expert in it. If the expert believes that the investment vehicle is beneficial, and he has benefited from it, the common folks will also do the same. These contribute to majority of investors which often rely on expert for help. The stock market simulator is influenced by these experts and their advices. If the expert suffers loss due to certain share, then their followers will also do the same. Itoften goes hand in hand with Bandwagon effect. This must be actively shown in stock market simulator.

This factor highlights the ongoing herd mentality of the market. Due to this factor, the stock market simulator should

adapt the mentality of investors. If they are fearful due to some sudden loss or depression in the economy, the stock market simulator is influenced. The stock market simulator would have comparatively less number of users in this period. The users who are still in the stocks in this period must be retained by the stock market simulator by doing various things. The simulator could provide an expert view of situation to ensure that people remain calm. The simulator should also aim to bring back the users who left the market due to some factors. In this way, the stock market simulator is influenced by sudden shift to other investing tools.

This factor also influences the stock market simulator by nudging it to have other investing tools aside from stocks. If this factor comes to affect more often, then above practices also will not be sufficient to keep investors in stock market simulator. The simulator can observe the trends and shift of investorsand then can plan to have the alternative investing tool in the simulator. Due to this, even if there is sudden shift to other investing tools, then also there can be a damage control situation by having other investing tools. In this way, user base can be retained in the simulator. This is done by careful scanning and evaluating the general tendency of the market and by keeping a close eye on alternative investing tools.

The factor of sudden shift to other investing tools can either influence the stock market simulator by making it employ practices to retain the user base or to create an alternative if the situation is severe. The first option can be used till the situation is under control as using the second option is difficult and painstaking to implement. The reason is although the simulator introduced the alternative option, there is risk that whole simulator must be tweaked to support this system.

E. Change in Dollar Prices

The dollar being used as mode of exchange in majority of countries, the change in dollar prices affect the stock market simulator in many ways. Although there is no direct relation of change in dollar prices to stock market simulator, the indirect and co-related dependence has greater influence on the stock market simulator in many ways. It affects both the parties of the environment. It affects the stock prices of the companies listed on the equity market and it also affects the position as well as trading potential of the investors in the market.

The fluctuations in dollar prices are dynamic in nature but their range is limited. They don't vary drastically. This has double edge influence over stock market simulator. Due to dynamic nature of prices, the stock market simulator should vary the environment making it friendly to invest in stock market. Due to short range of changes in dollar price, it should keep the system stable. Not maintaining any of these will lead to unnatural change in stock prices and thus it will be harmful for stock market simulator.

The dollar prices go hand in hand with buying and selling of crude oil and other resources. The dollar acts as exchange medium between two countries. So, if there is change in dollar prices, it would not directly affect the stock market, but it would affect these resources which in turn influences stock market simulator. The import export trade also gets influenced if there is change in dollar price.

The other area where there is influence of this factor in stock market simulator is in Forex department. The Forex department also known as Foreign exchange department, deals with currency exchange if anyone wants to buy the stock of different country. The stock market Simulator would constantly update its algorithm and protocols to match the newer data of dollar prices. The frequency of update and concurrency control are the two mechanisms which the stock market simulator should consider while implementing these changes.

This factor of change in dollar prices influences the stock market Simulator in many ways. It influences the stock market simulator in indirect ways. The dollar rate being assumed as universal mode of exchange, the change in dollar prices affects the way in which stock market simulator is being perceived.

V. CONCLUSION

The factors discussed from the base for developing the stock market simulator. We have observed that each of the factors has multifaceted influence on the functioning of stock market simulator. Hence we surely hope that the detailed analysis performed in this paper would surely aid the implementation of the simulator. It is being observed that the amalgamation of these factors in appropriate proportion would lead to an efficient and realistic simulator which would prove to be a good tool for the beginner. It would be helpful in understanding the environment without bearing the risk.

Apart from direct influence, these factors also influence the general tendency of the investors, the surrounding environment and the user engagement and interface in the stock market simulator.The surrounding environment can be reworked with the help of server-side support and constant updates.

This analysis of factors influencing the stock market simulator provides aidfor understanding the stock market environment and to design the stock market simulator in a better way. Rest of the mentioned factors also influence thesimulator, but the scope of those factors is limited. The analysis of the factors mentioned draws overall picture of stock market world and thus enhances us to make the stock market simulator as close as possible to the real-world stock market.

VI. FUTURE SCOPE

Detailing of the analysis of each of the factors can be done by taking the advice from the field expert. The next task which can be considered as a future scope is assignment of the weightage to each factor.As discussed earlier, the influence of each factor on the stock market is not uniform. So assigning weightage to each factor would help in varying the impact of that factor. One can think of using a neural network where the input is the influence of the factors with appropriate weight assigned. The stock market being ever-changing, monitoring

the market with the help of database integration can also aid in the analysis and development of the stock market simulator.

These factors discussed above will serve as guidelines for the initial development of the simulator. Rest of the mentioned factors will also contribute to the effective development of the simulator, but technical ground work done by these five factors will provide strong base for analysis and simulation of rest of the factors influencing the stock market simulator. Currently the paper proposes the idea about the simulator and put efforts towards analysing the major factors influencing the stock market simulator. As a future scope, the analysis can effectively be used to spawn the effective implementation of the simulator.

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