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AN OPTIMIZED APPROACH TO ANALYZE STOCK MARKET

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ABSTRACT

This paper deals with identifying frequent patterns from large amount of stock data. These frequent patterns are identified based on rise and fall of stock prices. Stock Market is the market for security where organized issuance and trading of stocks take place either through exchange or over the counter in electronic or physical form. It plays an important role in canalizing capital from the investors to the business houses, which consequently leads to the availability of funds for business expansion. We have two stages, in first stage we categorize the stock data based on medium growth, slow growth and fast growth using k-means algorithm. In the second stage we make use of exponential moving average (EMA) algorithm for generating useful trends in an attempt to develop a behavioral pattern in the prices of the different stocks.

KEYWORDS: Medium Growth (ZG), Slow Growth (SG), Fast Growth (FG), Clustering, Prediction

INTRODUCTION

Stock Prices are considered to be very dynamic and susceptible to quick changes because of the underlying nature of the financial domain.

Some of the Most Fundamental Problems in Characterizing any Stock Market are to

- Identify trends & clusters in the market
- Design efficient strategies for investor risk reduction
- Study the time evolution of the market
- Design an analysis framework that is easy to visualize
- Build models to predict future trends of the market.

The best that one can do is to try to reduce this uncertainty. Stock Market Prediction [1] (or Forecasting) is one of the instruments in this process. In the research, the data set of National Stock Exchange was extracted and applied to our model. As mentioned above our proposed model works in two separate units.

Categorizing the Data

In this first stage, we make use of K-means algorithm for classifying the data set into three different clusters, mainly

Medium Growth (ZG), Slow Growth (SG) and Fast growth (FG). Clustering of the data set is done on a daily basis and it provides the user an option to keep a check on the parameters of the stocks as per his/her own requirement.

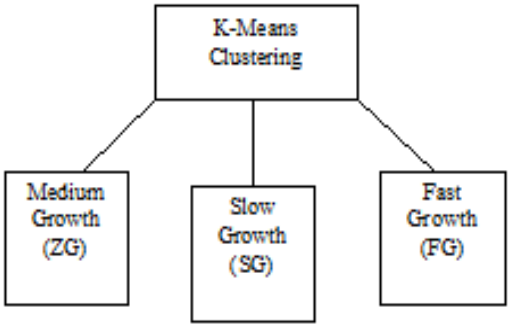


Figure 1: Diagrammatic Representation of K- Means Clustering

The Advantages of using K- Means Algorithm[3] are as follows

- If variables are huge, then K-Means most of the times computationally faster than hierarchical clustering, if we keep k smalls.
- Fast, robust and easier to understand.
- K-Means produce tighter clusters than hierarchical clustering, especially if the clusters are globular.

Behavioral Pattern Analysis and Prediction

It is the second stage; we make an attempt to study and understand the data set and derive a behavioral pattern which helps in the prediction of the stock prices. The factors considered while doing the prediction are the current prices of the stocks, the stock prices of the previous day and the number of days to be taken into consideration for the prediction of the stock price. More importance is given to the current data as compared to the historic data as it can provide more information in deriving a specific behavioral pattern. The algorithm used for this purpose is the EMA or Exponential Moving Average algorithm.

The advantages of using EMA algorithm are as follows

- The main advantages of moving averages is firstly that they smooth the data and thus provide a clearer visual picture of the current trend
- The moving average signals provide a precise answer to what the exact trend is.

METHODOLOGY

The detailed working of our two separate units of the model and the proposed architecture of our model are given as follows:

Proposed System Architecture

Our proposed architecture is a two staged model.

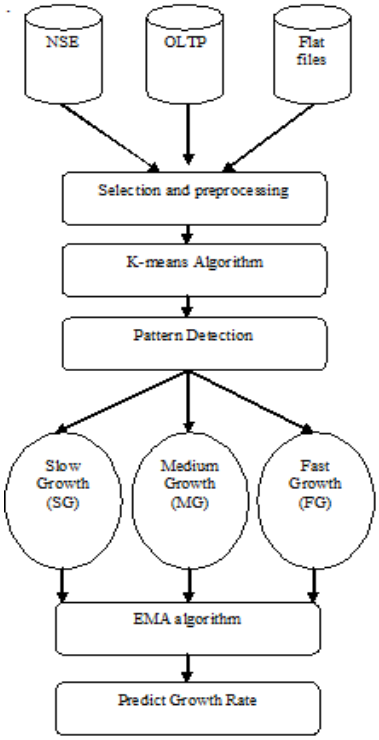


Figure 2: Proposed System Architecture

K- Means Algorithm

The algorithm which we are using for clustering purpose is K-Means algorithm.

The main idea is to define k centroids, one for each cluster. These centroids should be placed in a cunning way because of different location causes different result.

So, the better choice is to place them as much as possible far away from each other. This algorithm aims at minimizing an objective function, in this case a squared error function.

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \text{||xi (j) – c (j) ||^2} \quad (1)$$

Where ||xi (j) – c (j) ||^2 is a chosen distance measure between a data point xi (j) and the cluster centre c (j), is an indicator of the distance of the *n* data points from their respective cluster centers.

The Steps of the Algorithm

- Place K points into the space represented by the objects that are being clustered. These points represent initial group centroids.
- Assign each object to the group that has the closest centroid.
- When all objects have been assigned, recalculate the positions of the K centroids.

Repeat Steps 2 and 3 until the centroids no longer move. This produces a separation of the objects into groups from which the metric to be minimized can be calculated.

Exponential Moving Average (EMA) Algorithm

The algorithm which we are using for prediction purpose is the EMA or Exponential moving average algorithm[5].

The weighting for each older datum decreases exponentially, never reaching medium.

This formula can also be expressed in technical analysis terms as follows, showing how the EMA steps towards the latest datum point, but only by a proportion of the difference

EMA (today) = EMA (yesterday) + $\alpha \times$

(Price (today) – EMA (yesterday)) (2)

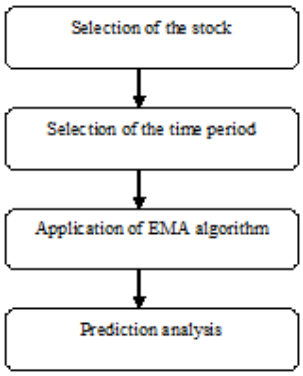
Expanding out EMA(yesterday) each time results in the following power series, showing how the weighting factor on each datum point p_1, p_2, etc., decreases exponentially:

EMA (today) = $\alpha \times (p1 + (1-\alpha)p2 +$

(1- α)^2 p3+ (1- α) ^3 p4+ (3)

Where p1 is price (today)

p2 is price (yesterday) and so on.



Figurer 3: Working of the EMA Algorithm

CONCLUSIONS AND FUTURE SCOPE

This concept can be used to reduce the error percentage in predicting the future stock prices. It increases the chances for the investors to predict the prices more accurately by reduced error percentage and hence increased profit in share markets. In a highly volatile like Indian stock market, the performance levels of this various functions reported in the paper will be very useful. Especially, the prediction of the market direction with fairly high accuracy will guide the investors and the regulators. We believe that this tool gives a promising direction to the study of market predictions and their performance measures. In the future, the usage of live data sets is possible in order to increase the accuracy of the application and guide the user in a much better manner. In addition to that, the EMA algorithm can be applied to the essential commodities as well as in currency exchange to expand the functionality of the application.

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REFERENCES

1. Jiawan Han, Micheline Kamber “Data Mining Concepts and Techniques” 2nd edition 2004.
2. Rajneet Singh Parimar and Rajesh V Arrigadi “An Optimized approach to analyze stock market using data mining technique.” 2011.
3. L. K. Soon and Sang Ho Lee, “Explorative Data Mining on Stock Data”
4. P.M. Madon & R. J. Mehta, How to Make Money on the Stock Exchange (D.B. Taraporevala Sons & Co., Fort, Bombay)
5. Martin. J. Pring, “Technical Analysis Explained” 4th edition, 2002.
6. Teweles, R. J., and Bradley, E. S. The Stock Market.
7. Wyss, B. O. Fundamentals of the Stock Market (McGraw-Hill, 2001)
8. Morris, K. M., and Morris, V. B The Wall Street Journal Guide to Understanding Money and Investing.