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A Novel Approach for Mining patterns of Indian Stock Market Price Behavior

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Abstract: ***The behaviour of stock market is a big issue to the theory and practice of indices and risk management. The supporters of the efficient market hypothesis claim that stock price indices are basically random and as such any speculation based on past information is fruitless. This paper examines the steadiness exist between the stock patterns from random walk behaviour, by studying brightness and darkness of sensex. The stock market fluctuates (i.e. Day to day increasing and non-increasing of market index) is as natural as the rising and falling down. How many times in a year the stock market index rises or falls or remains steady and if there is any consistency occurs in the months the queries addressed in this paper. The fluctuation is characterized by a number 0 and 1, 0 denoting non-increasing state and 1 denoting an increasing state. Putting different colours between bit string to mining the behaviour of stock Indian stock market, such that if '1' appears then white colour and if '0' come the colour is black. Finally we conclude that there are some consistency exists in stock market month wise and year wise.***
Keywords: Indian Stock Market, Brightness, Darkness, Bit string algorithm

I. INTRODUCTION

In Fundamental analysis, Stock Market price movements are believed to derive from a security's relative data. Fundamentalists use numeric information such as earnings, ratios, and management effectiveness to determine future forecasts. In Technical analysis, it is believed that market timing is keys. Technicians utilize charts and modeling techniques to identify trends in indices. Roberts wrote: If the stock market behaved like a mechanically imperfect roulette wheel, people would notice the imperfections and, by acting on them, remove them. This rationale is appealing, if for no other reason than its value as counterweight to the popular view of stock market "irrationality," but it is obviously incomplete [1].

The stock market seemed to work in a way that allowed all information reflected in past prices to be incorporated into the current price. In other words, the market efficiently processed the information contained in past prices. Fama defined an efficient market as: a market where there are large numbers of rational profit maximizes actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants. The efficient market hypothesis has been formulated. The time has come to test it [2]. These later individuals rely on historical data in order to predict future outcomes. One area of limited success in Stock Market prediction comes from textual data. Information from quarterly reports or breaking news stories can dramatically affect the share price of a security. Most existing literature on financial text mining relies on identifying a predefined set of keywords and machine learning techniques. These methods typically assign weights to keywords in proportion to the movement of a share price. These types of analysis have shown a definite, but weak ability to forecast the direction of share prices.

The development of an efficient and deep capital market is essential for sustained growth in an emerging market economy like India. The capital market fosters economic growth by channelling real savings to capital formation, and can help raise the productivity of investment by improving the allocation of investable funds. It also allocates risks to those who can best bear it [3]. However, the quality of the market determines its effectiveness in meeting these objectives. Accordingly, to improve the quality of the market in terms of market efficiency, transparency, price discovery, preventing unfair trade practices, etc. and bringing it at par with international standards, a package of reforms comprising measures to liberalise, regulate and develop the Indian capital market have been implemented since the early 1990s. As a result of these initiatives, capital market in India has emerged as an important source of funds for Indian companies, and also as an avenue for the small and retail investors to productively channelizing their savings [4]. The Bombay Stock Exchange (BSE) of India has emerged as one of the largest stock exchange in the world in terms of the number of listed companies, comprising many large, medium-sized and small firms. As regards transaction cost, the Indian stock market compares with some of the developed and regional economies. The inflows off oreign capital have made a crucial contribution to the growth of the stock market. India has become a major destination, representing about a fourth of total portfolio

capital inflows to the emerging market economies group. India is no exception. Probably, it is the largest crisis after great recession of 1930s that originated from the housing sector and has affected both real and financial sectors. Indian stock market has seen its worst time with the global financial crises. Mostly all the industrial sectors experienced a consistent low in their stock prices. The IT sector has been badly hit. Nearly half of the IT sector firms' revenues come from banking and financial institutions. The IT companies have these investment banks as their clients. With the effect of financial crises, IT companies are not able to enhance their business with these investment banks, and, in turn, started retrenching their employees.

In this paper, we introduce a new idea to the Indian stock market for inverting money by investors keeping some base knowledge in mind. Here we have converted the sensex results of daily stock market in to bit string. Then mining some characteristics from this bit string and formulates behaviour of financial stock market price behaviour. Thus rest of the paper is organised as follows: Section 2 reviews the past related studies and makes a ground for the current study and in section 3 outlines the sources of data and the methodology employed in the study. Section 4 makes the analysis and discusses the results and Section 5 concludes.

In this paper we present a model for behavior increasing and non-increasing of stock patterns in day to day basis. Considering increasing states are bright states and non-increasing states are dark states. Study their behavior using MATLAB tool and such representation of stock market fluctuation leads to interesting conclusions.

II. LITERATURE REVIEW

An efficient capital market is one in which the prices of the securities are adjusted according to the availability and infusion of new information and therefore current prices of the securities reflect all the information about the security. Also, it can be termed as information ally efficient market [5-6]. The new information is regarded as the one which was not known before and is unpredictable. Efficient market Hypothesis testing in its three forms have long been a part of stock market researches. Their study provides empirical evidence on weak form efficiency in Bombay Stock Exchange over a period of 1987-1994.The Serial Correlation Coefficients Test and Runs test have been applied to the selected data. Weak-form efficient market hypothesis proved true; there they found correlation in the series by using Parametric tests such as Runs test and Smirnov normality test. The null hypothesis has also been rejected by the parametric tests such as Auto-correlation, Auto regression, and ARIMA model. This study reveals that emerging markets such as Dhaka Stock Exchange are at least weak-form efficient and investors can generate excessive returns [7].

According to them such weak-form efficiency analysis is important for investors and regulatory authorities to make such decisions which make these markets better [8]. The behaviour of the daily and weekly returns of five Indian stock market indices for random walk during April 1996 to June 2001 and found that Indian Stock Market Indices did not follow random walk [9]. The weak-form efficiency of the Pakistani market was incorporating closing prices on everyday basis using a time frame of data through January 1st 1996 to 31st December 2000. Applying the serial correlation and variance ration tests their study attempted to reject the random walk behaviour and considers the stock market inefficient. Many researchers and economists believe that the Pakistani stock market is volatile and its main reason lies in the manipulation that exists due to collaborative inside trading of the brokerage middlemen. There are linear and non-linear dependencies in most of the series. This implied that set of these emerging markets are mostly weak-form inefficient and investors can generate abnormal returns [10].

The weak form market efficiency of Karachi stock exchange over the period 1999 through 2010, found that overall stock market of Pakistan is weak form inefficient. The weak form of efficiency of Indian capital market during the period of global financial crisis in the form of random walk and the results he suggested that the market was efficient in its weak form during the period of recession. Therefore, it is inferred that some studies concluded weak form efficiency of the stock markets while others have found the evidence of weak form inefficiency. Further, there are very few studies performed to analyse the behaviour of Indian capital market in the fluctuations. Thus, this paper proceeds to provide us a innovative results to overcome the crises in Indian stock market [11-12].

III. PROPOSED WORK

The objective of this study is to examine the occurrence of rise and fall characteristics of Indian stock market from their historical sensex data. The data used in the research are the time series of daily closing prices of BSE Sensex. The rationale behind the selection of BSE as sample stock market of India is that most of the trading in the Indian stock market takes place on stock exchanges. The BSE has been in existence since 1875. Considering their closing price of each day, they are categorized as '0' and '1' in the research data. '0' means that the next day's index is lower or same to todays index i.e. the non- increasing behavior and '1'means that the next day's index is higher than today's index i.e. the increasing behavior. The sensex data selection takes place

year wise. For a particular year, the length of bit string is total number of trading days minus one. Formulation of bit string is defined by an algorithm called Bit String Algorithm. The steps of the algorithm generate the behavior study of Indian stock market.

A. Formulation of Bit String from Stock Market Behavior

Bit string or Binary sting is a collection of binary numbers i.e. 0 and 1. The importance of the string is each character showing the comparative study of two trading days. As we know in Indian stock market the number of trading days is fixed for a particular month excluding holidays. That means each year number of trading days almost same. All converted binary number is store in a linear array. An algorithm 1 maps the behavior of Indian stock market sensex to binary string.

1) Algorithm 1: Indian stock market sensex into binary string(S)

Input: Indian stock market closing price –S

Output: Bit string –A

a) N=Length(S);
b) FOR i= 1 to N-1
c) IF (S[i]<S(i+1))
d) A[i]=1;
e) ELSE
f) A[i] =0;
g) END FOR
h) Return A;

B. Stock Market Binary String Colouring

Bit strings of Indian stock market are mention in linear array year wise. For putting colour, each year binary data is divided into month wise. i. e. for a particular year we have twelve months and each month have minimum twenty trading days. Substring of each bit string is keep sequentially one after another starting from January to December. Now the linear array is converted into two dimensional array where row' s of the array contains twelve months and for each trading day, we have one column. For a particular year we have a binary matrix of twelve months vs trading days. An algorithm 2 describe how putting colours to the output binary string.

2) Algorthm 2: Stock Market Binary String Colouring (A)

Input: Bit string of a year-A

Output: Colour graph –G

a) M=Length(A);
b) FOR j= 1 to M-1
c) IF (A[j]==1)
d) B[j]="white";
e) ELSE
f) B[j] ="Black";
g) END FOR
h) Return G;

Above algorithm represents the colouring of binary number. If binary number occurs '0' then the colour is black otherwise white. The Indian stock market behavior is modified into black and white colour, where cell occurs white colour means increasing behavior otherwise non-increasing behavior. Our aim is to mining patterns exist in the colouring form. For this evidence we have use to important term brightness and darkness, where brightness is defined as number of white colour cell present in the Indian stock market. Similarly darkness is defined as total number of cells containing black colour. Both brightness and darkness of a particular year can calculated in form of percentage. That means in bit string the year is brightest probability of 1's is more compare to 0's otherwise less bright.

i. *Example 3.1:* Here we are defining in below table 1 the black and white colour between trading day from binary string.In this table each row represent month of particular year and each coloum represents behavior of Indian stock market in form of trading days. We have contributed in this example 1 5 months starting from January to May and each month considered only six trading day's coloum wise. Here length of binary string is 30 having number of I's 17 and number of 0's 13. After putting

colour to 0's having black and 1's having white. We can visualize from the table that the table is brighter than darkness because number of I's is more than number of 0's.

Table 1: Indian stock market behavior of a particular year

Month/Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6
JAN	1	0	1	1	1	1
FEB	0	1	1	0	0	1
MAR	1	1	1	0	0	0
APR	1	0	0	0	0	0
MAY	0	1	1	1	1	1

IV. EXPERIMENTAL STUDY

We use daily historic data for stocks of the BSE sensex from yahoo finance. The obtained data set includes stock closing prices for an entire year by year from 01/01/2001 to 1/1/2015. The analyses of the stocks are done using the closing values of each day by dividing monthly year wise. For a particular year we have 12 month and each month consider as row. By using algorithm 1 we have encode the Indian stock market closing price behavior into binary string. The output of algorithm 1will be the input of algorithm 2. Putting black and white colour by referring algorithm 2 we have find the brightness and darkness of a particular year. Likewise collect each year month wise data and kept in row wise we have mining inference percentage of brightness and darkness of particular month. For the result analysis we have used MATLAB having version R2013b. for the simulation purpose.

A. Result Analysis

Mining stock market behavior is very difficult task. Still we have to assume some techniques or models to predict future trends of financial stock market. In table 2 we have analyze the percentage of brightness and darkness of each financial year of BSE sensex data. We have examined that in the year 2003 number of 1's is more than other years. So we can say this is the brightest year between 15 years. From the year 2003 to 2007, we found some stability compare to other year. After 2007 upto 2012 these years, we can say dark year because between these years non-increasing behavior is more than increasing behavior. Also we have seen in figure 1that the percentage of brightness is measured between 40%-60% i.e. number of 1' s in a particular year is maximum 60% and minimum 40%. Likewise in table 3 we have find the simulation results for each month between the years 01/01/2001 to 1/1/2015. From the table derivation, we have concluded from figure 2 that between the years September month is brightest month compare to others, next is December and November. Also we have examined that all the month of a particular year obey the brightness percentage range 40%-60%.

Table 2: BSE sensex Brightness and darkness year wise

Year	Percentage of Brightness	Percentage of Darkness
2001	50.4	49.6
2002	51.8	48.2
2003	**58.23**	41.77
2004	56.4	43.6
2005	56.85	43.15
2006	56.9	43.1
2007	57.26	42.74
2008	44.67	55.33
2009	54.81	45.19
2010	54	46
2011	41.87	58.13
2012	55.92	44.08
2013	51.22	48.78
2014	57.5	42.5
2015	47.2	52.8

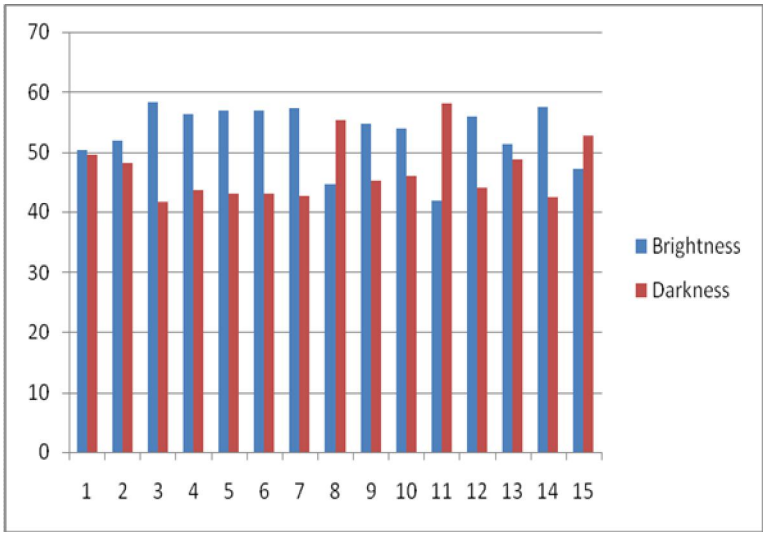

Figure 1: Fluctuatation in Indian stock market year wise

Table 3: BSE sensex Brightness and darkness month

Month	Percentage of Brightness	Percentage of Darkness
January	53	47
February	52.5	47.5
March	47.73	52.27
April	53.5	56.5
May	54	46
June	54	46
July	53.5	46.5
August	55	45
September	**60**	40
October	54	46
November	58	42
December	58	42

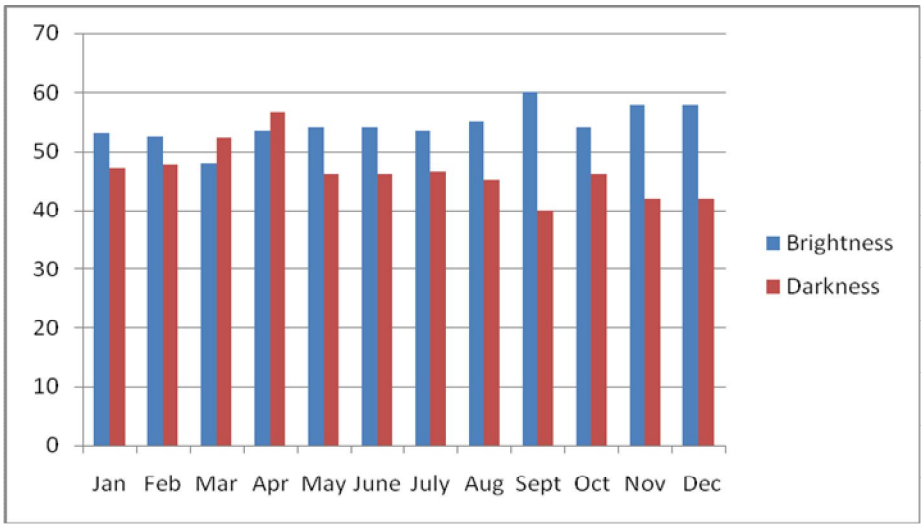

Figure 2: Fluctuatation in Indian stock market month wise

V. CONCLUSION

Many reasearch on Indian stock market price behavior have been based on the brief returns are influenced by monthly basis. In this paper we have suggested a result durinng daily behavior of Indian stock market. We have exmined that during the financial maximum number of increasing behavior will not exceded 60% above and the lower limit is 40%. We have stuied last fifteen years BSE sensex data and draw the inferences like 2003 is the most brigthest year among 15 years. Maximum rise during the year from 2003 to 2007. Then after 2007 market fluctuate up and down manner. From the monthly analysis we have also found that in the month of September Indian stock market grow thoughout all the year. The increasing persentage of November and December is nearer to September. We have also match the result with real data and find such matching characterstics. In future work we have to derived some prediction models and compare the results with predicted inferences.

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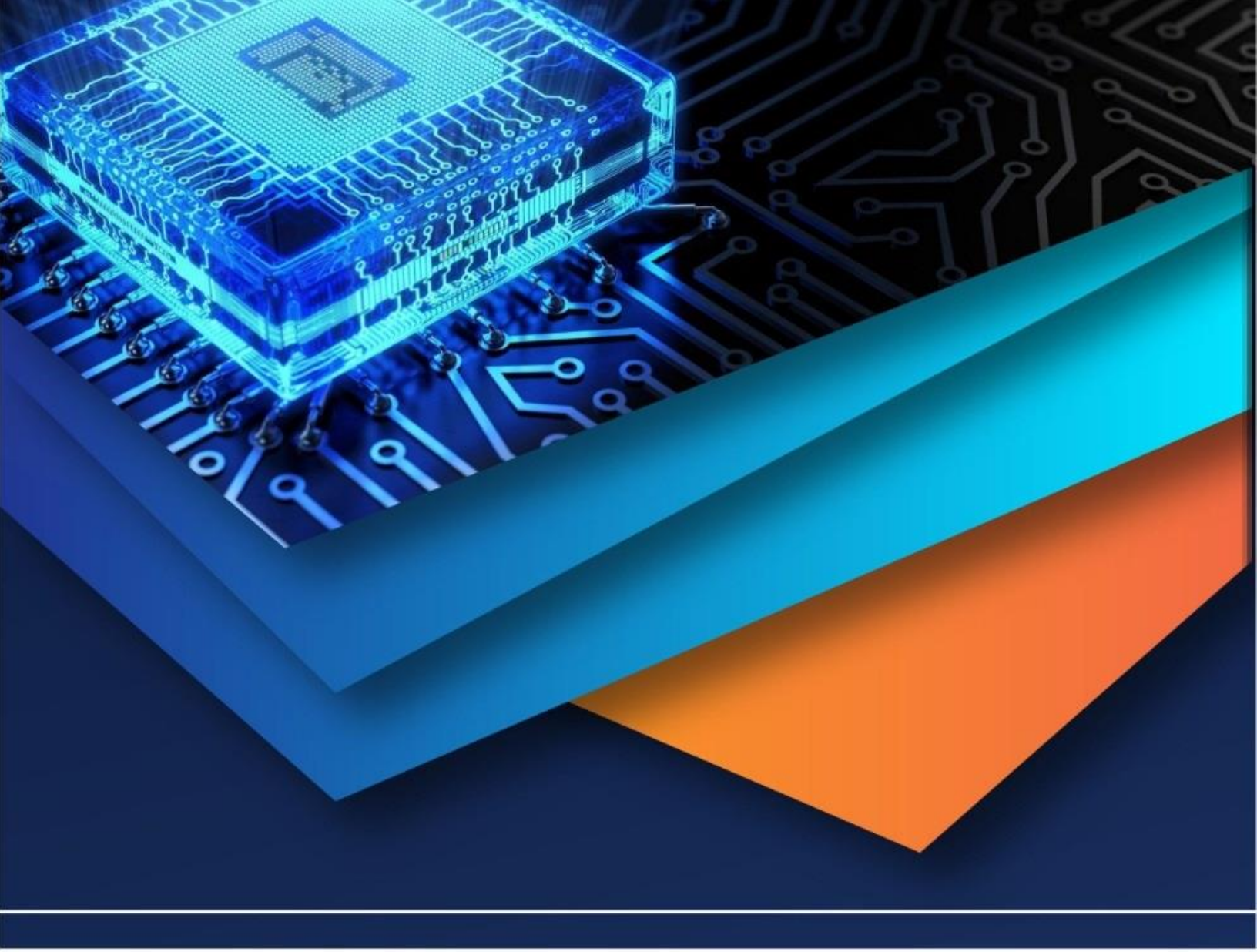

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