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Fuzzy Rule Based System to Characterize the Decision Making Process in Share Market

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ABSTRACT: Investors are not always completely rational and they do not always work only with numbers. Sometimes, they use linguistic concepts to make their decisions. Fuzzy logic is helpful in handling such situations. This research proposes an innovative method for forecasting stock. The proposed stock forecasting method is a combination of Technical Analysis, Fuzzy logic. one of the most important issues for investors in stock market. In this paper, a fuzzy approach to stock market timing is investigated. A fuzzy decision system is constructed based on experiences and techniques of stock and future opportunist. The success of the system is measured by comparing system output versus stock price movement.

KEYWORDS: Fuzzy logic, timing, share stock market, Forecasting, Trading.

I. INTRODUCTION

“Few human activities have been so exhaustively studied during the past fifty years, from so many angles and by so many different sorts of people, as has the buying and selling corporation securities. The rewards which the stock market holds out to those who read it right are normious; the penalties it exacts from careless, dozing or ‘unlucky’ investors are calamitous - no wonder it has attracted some of the world’s most astute accountants, analysts and researchers” [1]. Forecasting the stock price and determining the market timing, when to buy and sell stocks, are the two main problems which most researchers and practitioners face in order to get high financial gain.

There are two main approaches to predict stock prices, namely fundamental analysis and technical analysis. Fundamental analysis is a method of forecasting the future price movement of a financial instrument which is based on examining the company's financials and operations such as sales, earnings, growth potential, assets, debt, management, products, and competition, macroeconomic data, politics, environment and other relevant factors. Technical analysis involves using past stock prices, volume, and other related data to forecast the future price movements [2]. Several techniques have been researched to predict the stock price and produce trading signals in order to determine when to buy and sell stocks.

The objective type fuzzy modeling has excellent learning capabilities and requires less computational effort. Subtractive clustering technique used operates on raw numerical data. Increasing the number of inputs affects the prediction system only to a small extent. Further this clustering technique provides similar degree of accuracy and robustness together with lesser computational complexity as compared to various other clustering techniques. These advantages along with the characteristic that no separate defuzzification is required, makes this prediction faster than several previous systems.

This study explores the possibility of applying fuzzy logic theory for handling vagueness and imprecision that characterize the decision making process. Fuzzy Logic framework is developed to carry out the required analysis for arriving at the governance rating of the firms. This research work will help the customer for decision making in share market A person carrying a share of a company holds that part of ownership in that company. Share is nothing but the Ownership of the company divided into small parts and each part is called as Share or Stock. Buy-Back is a corporate action in which a company buys back its shares from the existing shareholders usually at a price higher than market

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price. When it buys back, the number of shares outstanding in the market reduces and hence the market capitalization as per below relation:

$$\text{Market capitalization} = \text{Market value} * \text{Number of shares outstand}$$

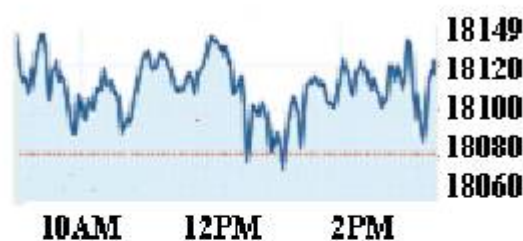
Companies also go for buyback with intent of projecting better financial ratios as indicated below:

$$\text{Earnings per share(EPS)} = \text{Earnings/ Shares out- standing}$$

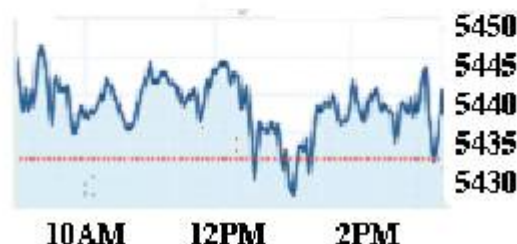
Since outstanding shares reduce, the company's earnings are now divided amongst less number of shares for calculating EPS value. From investor's point of view, higher the earnings per share, better it is as an investment option. Share market is the place where buying and selling of shares takes place. The buying and selling of shares takes place from anywhere wherever with the help of internet connected computer.

One should need the demat account, computer and internet connection and he/she can start the share trading or investing. When you place the buy order, the message is transferred to the exchange [either NSE {National Stock Exchange} or BSE {Bombay Stock Exchange}] and the order stays in the queue of exchange's other orders and gets executed if the price of that share comes to that value. Once you get the confirmation of this transaction, the shares purchased, will be sent to your demat account. The shares will be stored in demat account in electronic format. The Sensex is an "index". An index is basically an indicator. It gives you a general idea about whether most of the stocks have gone up or most of the stocks have gone down. In India the Sensex is an indicator of all the major companies of the BSE and the Nifty is an indicator of all the major companies of the NSE. If the Sensex goes up, it means that the prices of the stocks of most of the major companies on the BSE have gone up. If the Sensex goes down, this tells you that the stock price of most of the major stocks on the BSE have gone down. The Sensex represents the top stocks of the BSE and the Nifty represents the top stocks of the NSE. Besides Sensex and the Nifty there are many other indexes Many different types of investors hold the shares of a company. Fig.1 shows BSE and NSE data.

BSE GRAPH



NSE GRAPH



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II. LITERATURE SURVEY

Predictability of financial time series can be viewed in two different ways: forecasting by level (value) estimation models and forecasting by classification models. The first method relies on accurate prediction of the price level of stocks, indices, and other financial series instruments. (e.g., see Teixeira & Rodrigues, 1997; Chakraborty, 2006; Dutta *et al.*, 2006; Panda & Narasimhan, 2006; Sohn & Lim, 2007; Majhi *et al.*, 2009; Mostafa, 2009; Chen, Hsin & Wu, 2010, Shen *et al.*, 2011). The degree of accuracy and the acceptability of the forecast are measured by its deviation from the actual observations, thus minimizing forecasting errors. The second method is guided by forecasts on the direction/sign of the changes in price levels.

This latter approach is defended by some authors (e.g., see Wu & Zhang, 1997; Aggarwal & Demaskey, 1997; Tsaih, Hsu & Lai, 1998; Leung, Daouk & Chen, 2000; Chen, Leung & Daouk, 2003; Kim, Min & Han, 2006; Faria *et al.*, 2009; Lu, 2010; Na & Sohn, 2011), who claim that trading driven by a certain forecast with a small forecast error may not be as profitable as trading based on an accurate prediction of the direction/sign of the movement. At the same time, several researches in the area of business have used fuzzy logic to handle imprecise information and improved results.

Some of them are Shehab & Abdalla (2002) and Murcia, Borba, & Souto-Maior (2005) in a costing system; Sahin & Dogan (2003) in supplies and customers relationship; Jiang & Hsu (2003) in manufacturing and business cycle evaluations; Lin, Hwang, Becker (2003) in accounting frauds detection; Beynon, Peel, & Tang (2004) in price composition of auditing services; Wang & Hsu (2008) in tourism demand; Keles, Kolcak, & Keles (2008) in domestic debt; Wang, Chang, & Tzeng (2011) and Wu (2010, 2011) in automobile sales; and Cheng, Tsai, & Sudjono (2010) in project cash flow control.

In the area of finance, works related to stock selection (such as Tanaka & Guo, 1999; Inuiguchi & Tanino, 2000; León, Liern & Vercher, 2002; Wang & Zhu, 2002; Serguieva & Hunter, 2004; Tiryaki & Ahlatcioglu, 2009), option pricing (Thavaneswaran, Appadoo & Paseka, 2009), and insolvency prediction (Tseng & Lin, 2005; Vigier & Terceño, 2008; Chen, Huang & Lin, 2009) have also used fuzzy logic.

III. OBJECTIVES

- To develop an algorithm based on technical analysis and neural fuzzy network to apply to forecasting and trading stock.
- To evaluate the efficiency of the developed algorithm.
- To map many different financial indicators into new inputs that can be “fuzzified”. Use fundamental indicators with fuzzy logic to set up long-term investment plans and use technical indicators with fuzzy
- Logic to set up short-term investment plans.
- To create membership functions; to associate between inputs and outputs via fuzzy rules.
- To translate the fuzzy output into a crisp trading recommendations.

Utilization of the Study

The research has benefits as follow:

- To help traders and investors in forecasting the stock price and determining the market timing.
- To investigate the effect of using technical analysis and neural fuzzy network to forecasting and trading stocks.

IV. PROPOSED METHODOLOGY AND DISCUSSION:

Algorithm:

A. **Decision tree:** A **decision tree** is a structure that includes a root node, branches, and leaf nodes. Each internal node denotes a test on an attribute, each branch denotes the outcome of a test, and each leaf node holds a class label. The topmost node in the **tree** is the root node. Mining big data is the process of extracting knowledge to uncover large hidden information from the massive amount of complex data or databases

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DT induction is a top down recursive divide and conquer algorithm for multi-class classification task (Han et al., 2011). It is easy to interpret and explain, also requires little prior knowledge. Nonlinear relationships between features do not affect the tree performance. The goal of DT is to iteratively partition the data into smaller subsets until all the subsets belong to a single class or the stopping criteria of DT building process are met. During the early 1980s, Quinlan (1986) proposed ID3 (Iterative Dichotomiser 3) algorithm that used information theory to select the best feature, A j. The A j with the maximum Information Gain is chosen as root node of the tree.

Input:
 $D = \{x_1, \dots, x_i, \dots, x_N\}$, training data set;
 k , number of iterations;
DT learning scheme;
Output: rule-set; // A set of classification rules.
Method:
1: rule-set = \emptyset ;
2: for $i = 1$ to N do
3: $x_i = \frac{1}{N}$; // initialising weights of each $x_i \in D$.
4: end for
5: for $j = 1$ to k do
6: if $j=1$ then
7: create D_j , by sampling D with replacement;
8: else
9: create D_j , by D_{j-1} and D with maximum weighted X ;
10: end if
11: build a tree, $DT_j \leftarrow D_j$ by randomly selected features;
12: compute $error(DT_j)$; // the error rate of DT_j .
13: if $error(DT_j) \geq$ threshold-value then
14: go back to step 6 and try again;
15: else
16: rules $\leftarrow DT_j$; // extracting the rules from DT_j .
17: end if
18: for each $x_i \in D_j$ that was correctly classified do
19: multiply the weight of x_i by $(\frac{error(DT_j)}{1-error(DT_j)})$; // update weights.
20: end for
21: normalise the weight of each $x_i \in D_j$;
22: rule-set = rule-set \cup rules;
23: end for
24: return rule-set;
25: create sub-data set, $D_{misclassified}$ with misclassified instances from D_j ;
26: analyse $D_{misclassified}$ employing algorithm 4.

B. Naive Bayes classifiers :

Naive Bayes classifiers can handle an arbitrary number of independent variables whether continuous or categorical. Given a set of variables, $X = \{x_1, x_2, x_3, \dots, x_d\}$, we want to construct the posterior probability for the event C_j among a set of possible outcomes $C = \{c_1, c_2, c_3, \dots, c_d\}$. In a more familiar language, X is the predictors and C is the set of categorical levels present in the dependent variable. Using Bayes' rule:

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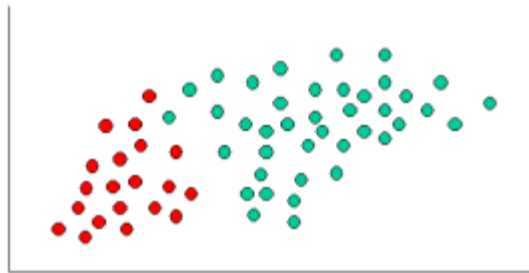
$$p(C_j | x_1, x_2, \dots, x_d) \propto p(x_1, x_2, \dots, x_d | C_j) p(C_j)$$

where $p(C_j | x_1, x_2, \dots, x_d)$ is the posterior probability of class membership, i.e., the probability that X belongs to C_j . Since Naive Bayes assumes that the conditional probabilities of the independent variables are statistically independent we can decompose the likelihood to a product of terms: and rewrite the posterior as:

$$p(C_j | X) \propto p(C_j) \prod_{k=1}^d p(x_k | C_j)$$

Using Bayes' rule above, we label a new case X with a class level C_j that achieves the highest posterior probability.

The Naive Bayes Classifier technique is based on the so-called Bayesian theorem and is particularly suited when the dimensionality of the inputs is high. Despite its simplicity, Naive Bayes can often outperform more sophisticated classification methods.



To demonstrate the concept of Naive Bayes Classification, consider the example displayed in the illustration above. As indicated, the objects can be classified as either GREEN or RED. Our task is to classify new cases as they arrive, i.e., decide to which class label they belong, based on the currently existing objects.

Since there are twice as many GREEN objects as RED, it is reasonable to believe that a new case (which hasn't been observed yet) is twice as likely to have membership GREEN rather than RED. In the Bayesian analysis, this belief is known as the prior probability. Prior probabilities are based on previous experience, in this case the percentage of GREEN and RED objects, and often used to predict outcomes before they actually happen.

Thus, we can write:

$$\text{Prior probability for GREEN} \propto \frac{\text{Number of GREEN objects}}{\text{Total number of objects}}$$

$$\text{Prior probability for RED} \propto \frac{\text{Number of RED objects}}{\text{Total number of objects}}$$

C. Importance of methodology:

- As stock market data are highly time-variant and are usually in a nonlinear pattern, predicting the future trend (i.e., rise, decrease, or remain steady) of a stock is a challenging problem.
- Uncovering market trends, planning investment strategies, identifying the best time to purchase the stocks and what stocks to purchase are included in stock market. For approaching these enormously complex and dynamic problems with data mining tools with help of fuzzy approach.
- By using fuzzy clustering technique, the whole training set can be divided into subsets which have less size and lower complexity.
- Objective fuzzy modelling used to build the prediction system requires numerical inputs. The IF-THEN rules formed have vague predicates in their antecedent part while the consequent part is a linear or quadratic combination of the antecedent variables. Since the consequent parts of rules are crisp values rather than vague

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and fuzzy ones, there is no need to defuzzify the output. This characteristic of the objective fuzzy modeling technique favours it over several other fuzzy modeling techniques and is utilized to improve the prediction efficiency.

- The objective type fuzzy modelling has excellent learning capabilities and requires less computational effort.

D. There are six main factors which affect the share market :

I. Market growth: A fast growing market is generally considered attractive, and pulls a lot of organisation's resources in an effort to increase gains. A case in point is the technological market widely considered by experts as a fast growing market, and tends to attract a lot of competition. The strength of this growth in the stock market has been corporate earnings. When a company says there is "strong market growth", they mean that the overall demand for the product they are selling has increased. The positive market growth has also improved the overall standard of living of the people in the country. India market growth looks optimistic and bright in the recent years to come. The service sector contributes around 54% of the annual Gross Domestic Product while the share of the industrial and agricultural sectors is 29% and 17% respectively. India is steadily becoming one of the global business giants with its booming market scenario.

II. Monsoon: The "monsoon effect" does have an impact on demand for fertilizers and tractors, and to a lesser extent, two-wheelers and consumer durables. The spatial distribution of the monsoon appears to wield a greater influence on sales growth rates, than does the absolute quantum of rainfall in a year. About 60% of Indian Agriculture is monsoon dependent. With rainfall this time being deficient by 45%, the agriculture sector has been hit hard. If monsoon showing no sign of rain, the rural income is bound to decrease, this eventually will affect the organization's plans and economic conditions. If the monsoon situation does not improve, it could result in downgrading of GDP growth estimates, downgrading corporate earnings estimates, a fall in the premium given to Indian markets and a consequent fall in Indices and stock market.

III. Policy/ Political Impact: After independence the development of India's economy was based on socialist-inspired policies. These policies like "Licence Raj" and others to protect from the world markets. The political Economy of India is rapidly changed with the liberalization of the economy in the 1990's. It has now moved towards a market based system and is the world's second fastest growing major economy after China. India recorded the highest GDP growth rate of 9% in 2007. SEBI, the country's stock market regulator: Only eight stock exchanges enjoy "permanent" recognition from the Securities and Exchange Board of India (SEBI) out of a total of 24 equity bourses in the country. These "permanent" bourses include Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) -- the two stock exchanges synonymous with the Indian equity market. Other bourses that have been granted 'permanent' status by the regulator include Ahmadabad Stock Exchange, Bangalore Stock Exchange, Calcutta Stock Exchange, Madhya Pradesh Stock Exchange, Madras Stock Exchange and Delhi Stock Exchange (DSE). While presenting the Budget for 1992-93, the Finance Minister had announced a decision to allow reputed foreign investors, such as Pension Funds etc., to invest in India capital market. To operationalise this policy announcement, it has become necessary to evolve guidelines for such investments by Foreign Institutional Investors (FIIs). For granting registration to the FII, SEBI shall take into account the track record of the FII, its professional competence, financial soundness, experience and such other criteria that may be considered by SEBI to be relevant. Besides, FII seeking initial registration with SEBI shall be required to hold a registration from the Securities Commission, or the regulatory organization for the stock market in the country of domicile/incorporation of the FII.

IV. Foreign Investment: The entry of more foreign investors into emerging markets may lead to pressure to upgrade trading systems and modify legal systems to support more trading and the introduction of a greater variety of financial instruments. The removal of barriers to foreign investment can improve the operation of domestic capital markets.

V. Ratio Analysis : Ratio Analysis is the heart of financial analysis, which shows the economic

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condition of business. The aim of ratio analysis is to find out relative study, conciseness, and analysis of business activities. Financial ratio are useful because they summarise briefly the results of detailed and complicated computations for a company. On the basis of purpose the financial ratio has four major types. Liquidity Ratio, Leverage Ratios, Activities Ratios, Profitability Ratios.

VI. **Agent activities:** Indian stock exchange allows a member broker/agent to perform some activities. Act as an agent to Buy or Sell share/securities for their clients and charge commission for the same.

E. FUZZY CONTROLLER

Figure 3 gives the structure of a fuzzy controller, which is essentially the structure of a Mamdani technical fuzzy controller. Trend in prices information is the Crisp input which is fuzzyficated to mapped on fuzzy sets. We evaluate stock price and the trend in prices over some period of time and then decide whether to trade based on simple rules. The result is in each case a real number in the interval [0,1].

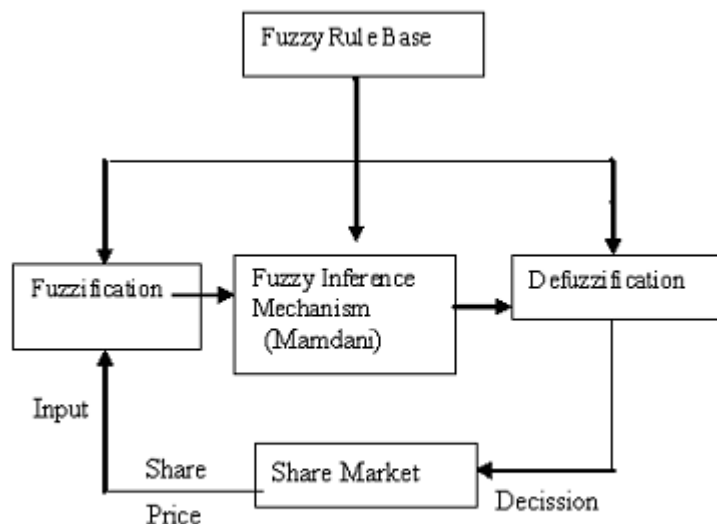


Fig.3 Fuzzy Controller

A. Fuzzy Rules

Rule1:- If (market_ growth is low) and (monsoon is low) and (policy_ and_ political impact is low) and (foreign_investment is low) and (ratio_ analysis is low) and (agent_ activities is low) then (Decision is hold).

Rule2:-

If (market_ growth is medium) and (monsoon is medium) and (policy_ and_ political impact is low) and (foreign_investment is low) and (ratio_ analysis is medium) and (agent_ activities is low) then (Decision is hold).

Rule3:-

If (market_ growth is medium) and (monsoon is high) and (policy_ and_ political impact is high) and (foreign_investment is low) and (ratio_ analysis is medium) and (agent_ activities is medium) then (Decision is purchase).

Rule4:-

If (market_ growth is high) and (monsoon is high) and (policy_ and_ political impact is high) and (foreign_investment is high) and (ratio_ analysis is medium) and (agent_ activities is medium) then (Decision is purchase).

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Rule5:-

If (market_ growth is high) and (monsoon is medium) and (policy_ and_ political impact is high) and (foreign_ investment is medium) and (ratio_ analysis is high) and (agent_ activities is medium) then (Decision is purchase).

Rule6:-

If (market_ growth is high) and (monsoon is low) and (policy_ and_ political impact is high) and (foreign_ investment is high) and (ratio_ analysis is high) and (agent_ activities is high) then (Decision is purchase).

Rule7:-

If (market_ growth is high) and (monsoon is medium) and (policy_ and_ political impact is medium) and (foreign_ investment is medium) and (ratio_ analysis is medium) and (agent_ activities is high) then (Decision is purchase).

Rule8:-

If (market_ growth is medium) and (monsoon is high) and (policy_ and_ political impact is high) and (foreign_ investment is high) and (ratio_ analysis is high) and (agent_ activities is high) then (Decision is purchase).

Rule9:-

If (market_ growth is low) and (monsoon is low) and (policy_ and_ political impact is low) and (foreign_ investment is low) and (ratio_ analysis is medium) and (agent_ activities is medium) then (Decision is sell).

Rule10:-

If (market_ growth is low) and (monsoon is medium) and (policy_ and_ political impact is medium) and (foreign_ investment is high) and (ratio_ analysis is high) and (agent_ activities is high) then (Decision is sell).

Rule11:-

If (market_ growth is high) and (monsoon is medium) and (policy_ and_ political impact is high) and (foreign_ investment is high) and (ratio_ analysis is high) and (agent_ activities is high) then (Decision is purchase).

Rule12:-

If (market_ growth is high) and (monsoon is low) and (policy_ and_ political impact is high) and (foreign_ investment is high) and (ratio_ analysis is medium) and (agent_ activities is medium) then (Decision is purchase).

Rule13:-

If (market_ growth is low) and (monsoon is low) and (policy_ and_ political impact is medium) and (foreign_ investment is medium) and (ratio_ analysis is medium) and (agent_ activities is medium) then (Decision is hold).

V. SYSTEM EVALUATION

Any investment always involves a tradeo: between risk and reward. The higher the reward an investor seeks, the greater the risks and uncertainties are likely to be. Over any given period, stock prices will fluctuate widely in response to company news, changes in industry conditions, the overall economics and potential climate, unexpected events, and shifts in investor psychology.

The proposed fuzzy logic system was used on the following dataset. Historical data for Stocks and Corporate Data can be provided as standard products, i.e. without filtering for user selected data points, or on customized basis.

The data used in simulation is daily closing prices and daily exchange volumes of stocks. The basic information of these stocks, including stock code, name, number of samples (one day for one sample) and the first day, are listed in Table II. The last day of the simulation period, 2017-Mar-06, is the same for all the sample stocks.

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We are considering different following fields for Fuzzy Rule Based System to Characterize the Decision Making Process in Share Market.

Sr No	Fields (Values)
1	SERIES
2	OPEN
3	HIGH
4	LOW
5	CLOSE
6	LAST
7	PREVCLOSE
8	TOTTRDQTY
9	TOTTRDVAL
10	TIMESTAMP
11	TOTALTRADES
12	ISIN

We are using sample training dataset of stock exchange. Here we are using dataset of 06 Mar 2017.

	A	B	C	D	E	F	G	H	I	J	K	L	M
	SYMBOL	SERIES	OPEN	HIGH	LOW	CLOSE	LAST	PREVCLOSE	TOTTRDQTY	TOTTRDVAL	TIMESTAMP	TOTALTRADES	ISIN
1	20MICRONS	EQ	36.3	36.85	36	36.45	36.15	36	37322	1361829.65	6-Mar-17	188	INE144J01027
2	3IINFOTECH	EQ	5.2	5.25	5.15	5.2	5.2	5.1	1168403	6071872.05	6-Mar-17	456	INE748C01020
3	3MINDIA	EQ	11028.25	11090	10705	10919.65	10974.95	10919.1	802	8792593.25	6-Mar-17	343	INE470A01017
4	63MOONS	EQ	78.7	79.65	78.55	78.9	78.95	78.95	33224	2624059.95	6-Mar-17	931	INE111B01023
5	8KMILES	EQ	619	631	610.1	614.7	615	620.9	66292	41124915.65	6-Mar-17	3590	INE650K01021
6	A2ZINFRA	EQ	41.7	42	40.35	40.9	40.75	41.7	520277	21497292.1	6-Mar-17	3150	INE619I01012
7	AARTIDRUGS	EQ	591.4	591.45	580.9	583.6	581.15	582	4240	2487878.85	6-Mar-17	539	INE767A01016
8	AARTIIND	EQ	744	751.9	717.1	734	744.2	741.75	35665	26405140.75	6-Mar-17	2752	INE769A01020
9	AARVEEDEN	EQ	75.7	75.9	71.5	74.1	73.85	74.4	8606	634884.2	6-Mar-17	135	INE273D01019
10	ABAN	EQ	231.35	234.25	230.75	232.15	232.7	230.95	494408	114850541.6	6-Mar-17	7199	INE421A01028
11	ABB	EQ	1230	1237.95	1192.55	1200.4	1200	1228.4	26793	32454755.8	6-Mar-17	2977	INE117A01022
12	ABBOTINDIA	EQ	4499	4499	4456	4490.5	4492	4476.25	1961	8801915.3	6-Mar-17	437	INE358A01014
13	ABFRL	EQ	154.45	155	149.9	150.8	150.3	153.75	350731	53413208.25	6-Mar-17	9119	INE647O01011
14	ABGSHIP	BZ	24.3	25	24.25	24.25	24.25	25.5	46551	1130854.35	6-Mar-17	192	INE067H01016
15	ABIRLANUVO	EQ	1487	1492.7	1455.2	1463.7	1461.1	1485.65	164353	241136849.6	6-Mar-17	6771	INE069A01017
16	ABMINTLTD	BE	173	173	167.5	167.5	167.5	165	200	33917	6-Mar-17	9	INE251C01017
17	ACC	EQ	1398	1407.4	1388.55	1393.45	1394.8	1393.7	151011	210813694.1	6-Mar-17	8289	INE012A01025
18	ACCELYA	EQ	1500	1525	1453.9	1462.5	1461	1489.85	1902	2819479.5	6-Mar-17	564	INE793A01012
19	ACE	EQ	54.75	55.5	54.4	54.95	55.05	54.4	189485	10422950.65	6-Mar-17	867	INE731H01025
20	ACROPETAL	BZ	1.65	1.65	1.65	1.65	1.65	1.6	13442	22179.3	6-Mar-17	10	INE055L01013
21	ADANIANT	EQ	95.05	95.85	94.05	95.4	95.2	94.7	2240085	213018926.5	6-Mar-17	9251	INE423A01024
22	ADANIPOWER	EQ	297.85	304.9	296.45	303.15	304	296.35	1877927	564294453.4	6-Mar-17	29453	INE742F01042
23	ADANIPOWER	EQ	37.1	38.9	36.9	38.55	38.85	37.05	6301171	238759350.7	6-Mar-17	10657	INE814H01011
24	ADANITRANS	EQ	63.45	63.45	62.05	62.35	62.25	62.55	729958	45701730.2	6-Mar-17	4593	INE931S01010

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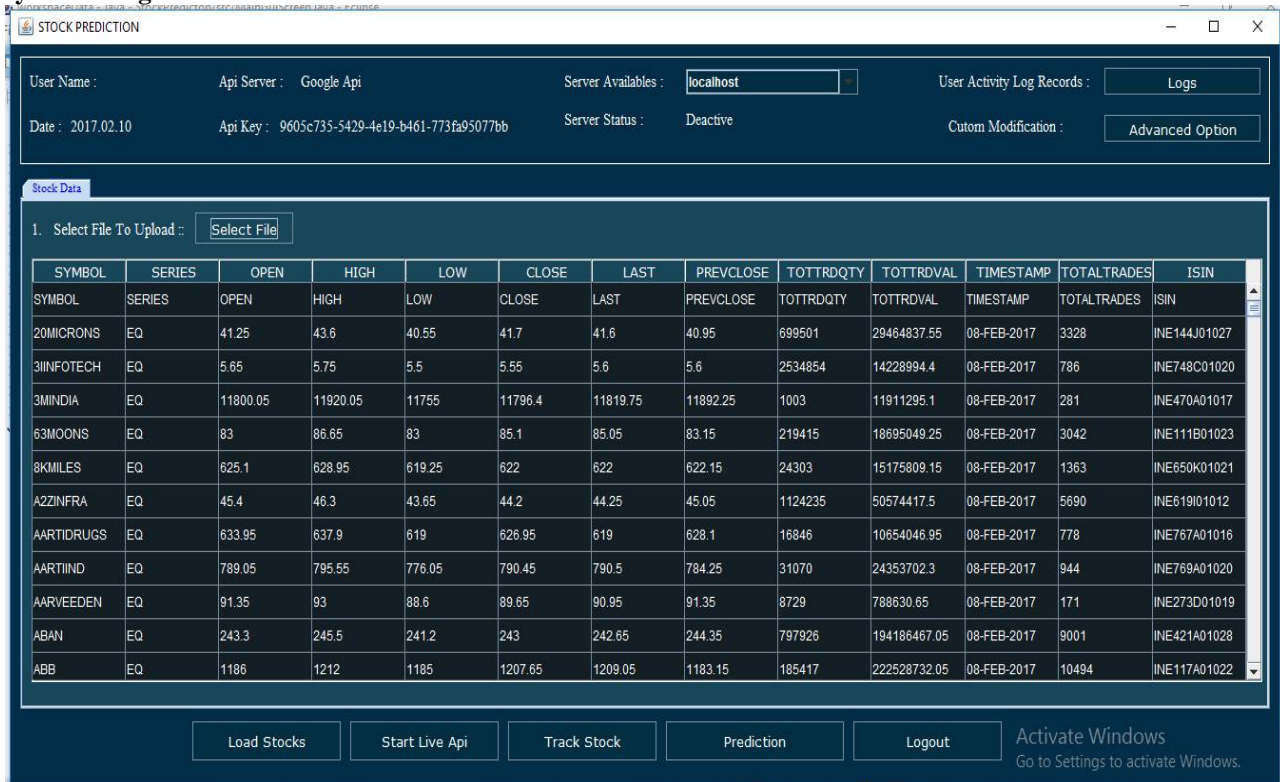
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26	ADFFOODS	EQ	164.2	171.4	164.05	168.1	167.5	152.4	873568	146397828	6-Mar-17	11637	INE982B01019
27	ADHUNIK	EQ	7.65	7.85	7.55	7.7	7.8	7.6	70090	542029.6	6-Mar-17	583	INE400H01019
28	ADHUNIKIND	EQ	104.8	112.1	103.4	105.95	105	108.05	33302	3560024.2	6-Mar-17	276	INE452L01012
29	ADLABS	EQ	81.5	85	80.8	83.55	83.55	80.75	524412	43679213.1	6-Mar-17	4315	INE172N01012
30	ADORWELD	EQ	299.95	300.1	297	297.25	297	298.95	3587	1069901.75	6-Mar-17	143	INE045A01017
31	ADSL	BE	30	30.95	29.65	30	30.25	30.45	25646	771641.05	6-Mar-17	116	INE102I01027
32	ADVANIHOTR	EQ	52.1	52.9	51.6	51.85	51.6	51.7	2440	127561.1	6-Mar-17	37	INE199C01026
33	ADVENZYMES	EQ	1722	1722	1677	1686.55	1693.05	1711.95	43861	74359056.15	6-Mar-17	3373	INE837H01012
34	AEGISCHEM	EQ	195.85	200	195.5	198.6	197.1	194.2	218243	43055837.8	6-Mar-17	2501	INE208C01025
35	AFL	EQ	75.85	77.65	72.2	72.5	72.7	77.1	180039	13387210.9	6-Mar-17	2184	INE020G01017
36	AGARIND	EQ	504.4	512	495	503	500	499.55	91186	45818107.5	6-Mar-17	3328	INE204E01012
37	AGCNET	EQ	87	90.5	77.55	85.85	86	89.05	24600	2087232.4	6-Mar-17	336	INE676A01019
38	AGRITECH	EQ	29	32.25	29	30.3	30.2	30.8	19486	589749.8	6-Mar-17	38	INE449G01018
39	AGROPHOS	SM	21.45	22.5	21	22.25	22.1	21.5	162000	3590700	6-Mar-17	17	INE740V01019
40	AHLEAST	EQ	226.5	227	222	225	225	223	1688	379319.05	6-Mar-17	30	INE926K01017
41	AHLUCONT	EQ	313.05	323.65	306.05	310	308.5	318.35	8464	2636791.5	6-Mar-17	672	INE758C01029
42	AHLWEST	EQ	217.85	217.85	209.1	214.9	217.6	211.4	506	108682	6-Mar-17	10	INE915K01010
43	AIAENG	EQ	1445	1464.9	1435.1	1459.6	1459.2	1443.9	57974	84404907.05	6-Mar-17	2566	INE212H01026
44	AICHAMP	BE	26.4	27.5	26.4	27.5	27.5	26.25	26	687.5	6-Mar-17	2	INE768E01024
45	AIFL	EQ	387.95	400	381	385.25	388.45	380.55	52483	20342251.55	6-Mar-17	1594	INE428O01016
46	AJANTPHARM	EQ	1724.95	1734.3	1708.2	1717.5	1718.9	1723.4	51958	89390205.75	6-Mar-17	3929	INE031B01049
47	AJMERA	EQ	190.7	191.8	186.1	189.5	190	189.7	150233	28452803.6	6-Mar-17	4521	INE298G01027

System Design: 1.



User Name : Api Server : Google Api Server Available : localhost User Activity Log Records : Logs

Date : 2017.02.10 Api Key : 9605c735-5429-4e19-b461-773fa295077bb Server Status : Deactive Custom Modification : Advanced Option

Stock Data

1. Select File To Upload :

SYMBOL	SERIES	OPEN	HIGH	LOW	CLOSE	LAST	PREVCLOSE	TOTTRDQTY	TOTTRDVAL	TIMESTAMP	TOTALTRADES	ISIN
20MICRONS	EQ	41.25	43.6	40.55	41.7	41.6	40.95	699501	29464837.55	08-FEB-2017	3328	INE144J01027
3INFOTECH	EQ	5.65	5.75	5.5	5.55	5.6	5.6	2534854	14228994.4	08-FEB-2017	786	INE748C01020
3MINDIA	EQ	11800.05	11920.05	11755	11796.4	11819.75	11892.25	1003	11911295.1	08-FEB-2017	281	INE470A01017
63MOONS	EQ	83	86.65	83	85.1	85.05	83.15	219415	18695049.25	08-FEB-2017	3042	INE111B01023
8KMILES	EQ	625.1	628.95	619.25	622	622	622.15	24303	15175809.15	08-FEB-2017	1363	INE650K01021
A2ZINFRA	EQ	45.4	46.3	43.65	44.2	44.25	45.05	1124235	50574417.5	08-FEB-2017	5690	INE619I01012
AARTIDRUGS	EQ	633.95	637.9	619	626.95	619	628.1	16846	10654046.95	08-FEB-2017	778	INE767A01016
AARTIIND	EQ	789.05	795.55	776.05	790.45	790.5	784.25	31070	24353702.3	08-FEB-2017	944	INE769A01020
AARVEEDEN	EQ	91.35	93	88.6	89.65	90.95	91.35	8729	788630.65	08-FEB-2017	171	INE273D01019
ABAN	EQ	243.3	245.5	241.2	243	242.65	244.35	797926	194186467.05	08-FEB-2017	9001	INE421A01028
ABB	EQ	1186	1212	1185	1207.65	1209.05	1183.15	185417	222528732.05	08-FEB-2017	10494	INE117A01022

Load Stocks Start Live Api Track Stock Prediction Logout Activate Windows
Go to Settings to activate Windows.

Fig1: Stock Prediction Module

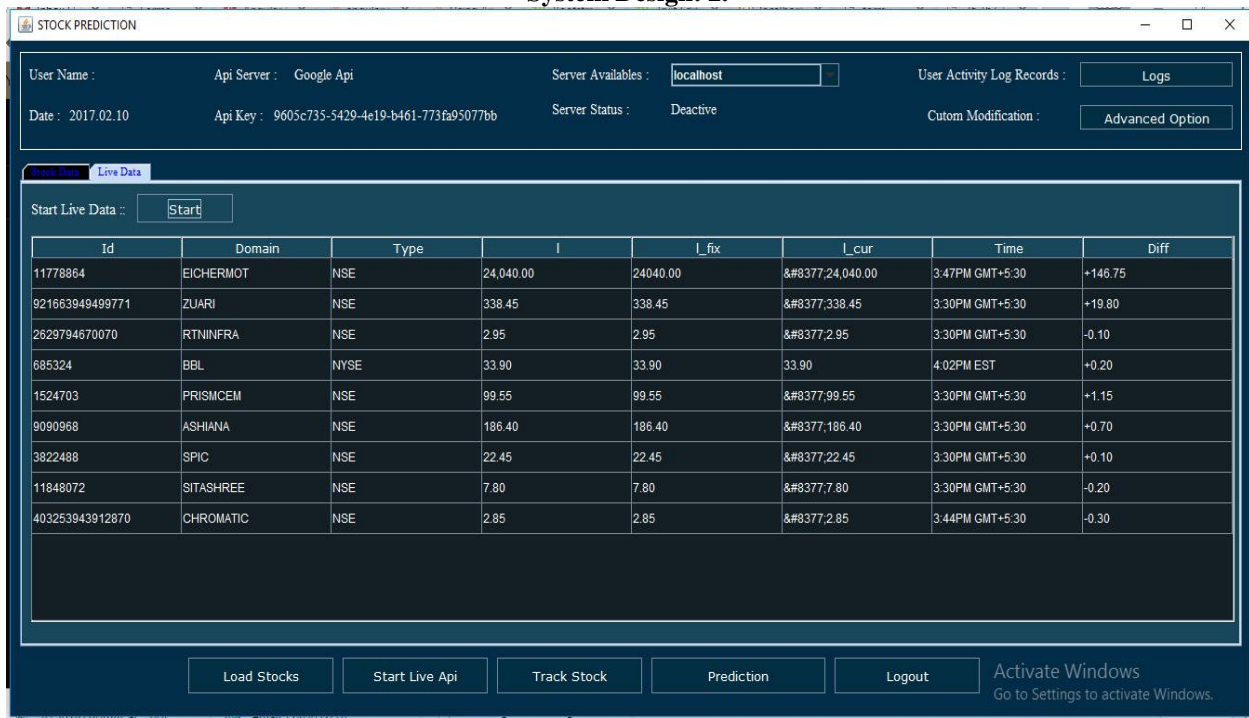
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System Design: 2.



User Name : Api Server : Google Api Server Available : localhost User Activity Log Records : Logs

Date : 2017.02.10 Api Key : 9605c735-5429-4e19-b461-773fa95077bb Server Status : Deactive Custom Modification : Advanced Option

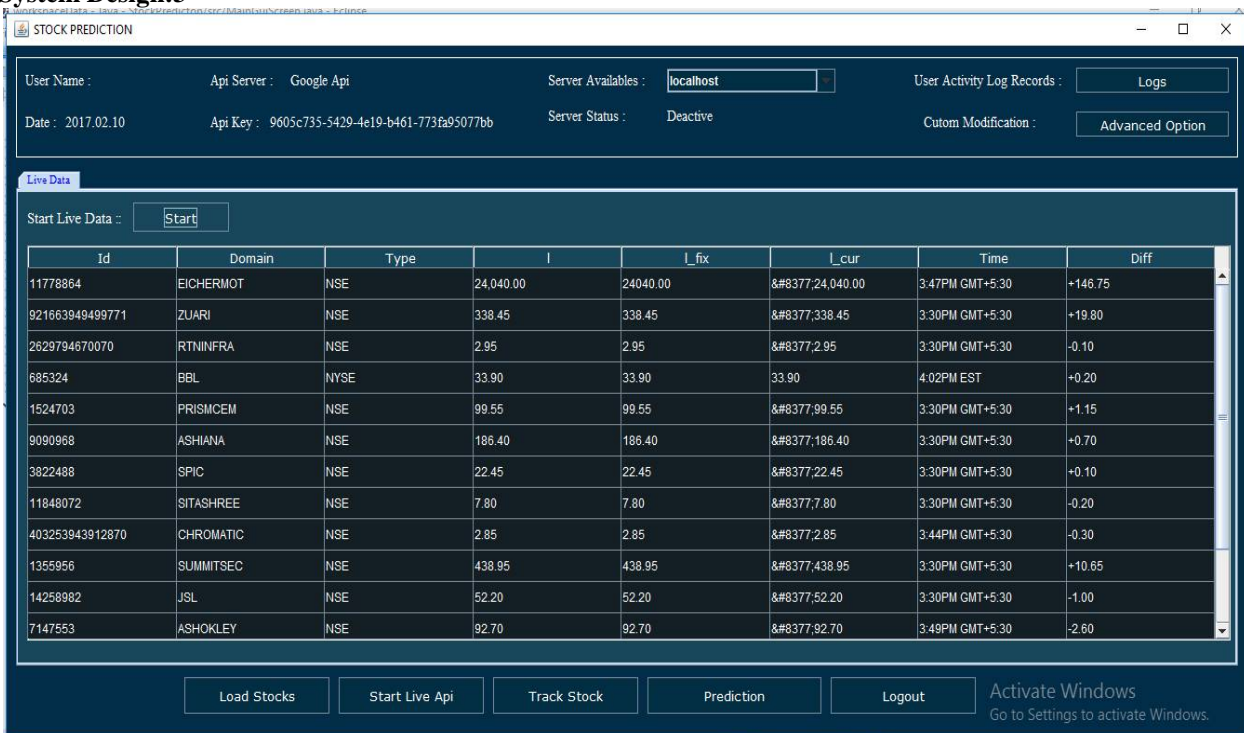
Start Live Data ::

Id	Domain	Type	I	L_fix	L_cur	Time	Diff
11778864	EICHERMOT	NSE	24,040.00	24040.00	₹24,040.00	3:47PM GMT+5:30	+146.75
921663949499771	ZUARI	NSE	338.45	338.45	₹338.45	3:30PM GMT+5:30	+19.80
2629794670070	RTNINFRA	NSE	2.95	2.95	₹2.95	3:30PM GMT+5:30	-0.10
685324	BBL	NYSE	33.90	33.90	33.90	4:02PM EST	+0.20
1524703	PRISMCEM	NSE	99.55	99.55	₹99.55	3:30PM GMT+5:30	+1.15
9090968	ASHIANA	NSE	186.40	186.40	₹186.40	3:30PM GMT+5:30	+0.70
3822488	SPIC	NSE	22.45	22.45	₹22.45	3:30PM GMT+5:30	+0.10
11848072	SITASHREE	NSE	7.80	7.80	₹7.80	3:30PM GMT+5:30	-0.20
403253943912870	CHROMATIC	NSE	2.85	2.85	₹2.85	3:44PM GMT+5:30	-0.30

 Activate Windows
Go to Settings to activate Windows.

Fig2: Stock Prediction Module

System Design:3



User Name : Api Server : Google Api Server Available : localhost User Activity Log Records : Logs

Date : 2017.02.10 Api Key : 9605c735-5429-4e19-b461-773fa95077bb Server Status : Deactive Custom Modification : Advanced Option

Start Live Data ::

Id	Domain	Type	I	L_fix	L_cur	Time	Diff
11778864	EICHERMOT	NSE	24,040.00	24040.00	₹24,040.00	3:47PM GMT+5:30	+146.75
921663949499771	ZUARI	NSE	338.45	338.45	₹338.45	3:30PM GMT+5:30	+19.80
2629794670070	RTNINFRA	NSE	2.95	2.95	₹2.95	3:30PM GMT+5:30	-0.10
685324	BBL	NYSE	33.90	33.90	33.90	4:02PM EST	+0.20
1524703	PRISMCEM	NSE	99.55	99.55	₹99.55	3:30PM GMT+5:30	+1.15
9090968	ASHIANA	NSE	186.40	186.40	₹186.40	3:30PM GMT+5:30	+0.70
3822488	SPIC	NSE	22.45	22.45	₹22.45	3:30PM GMT+5:30	+0.10
11848072	SITASHREE	NSE	7.80	7.80	₹7.80	3:30PM GMT+5:30	-0.20
403253943912870	CHROMATIC	NSE	2.85	2.85	₹2.85	3:44PM GMT+5:30	-0.30
1355956	SUMMITSEC	NSE	438.95	438.95	₹438.95	3:30PM GMT+5:30	+10.65
14258982	JSL	NSE	52.20	52.20	₹52.20	3:30PM GMT+5:30	-1.00
7147553	ASHOKLEY	NSE	92.70	92.70	₹92.70	3:49PM GMT+5:30	-2.60

 Activate Windows
Go to Settings to activate Windows.

Fig3: Stock Prediction Module

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VI. RESULT ANALYSIS

In our analysis we employed three different metrics namely, precision, recall & F1, which have been widely used in classifier performance analysis.

- **Precision:**

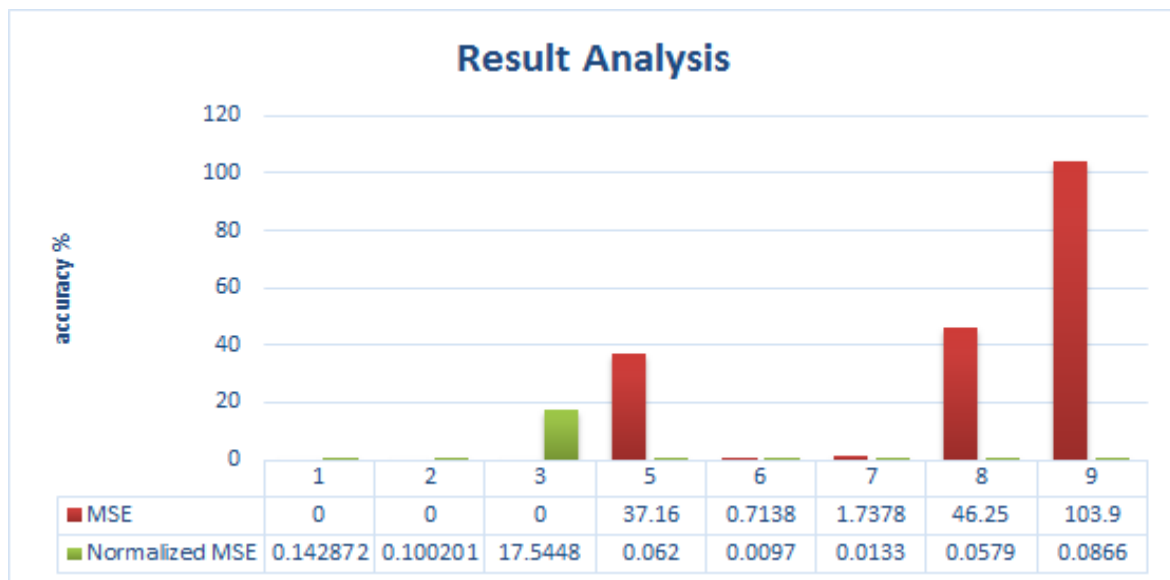
Precision is the number of True Positives divided by the number of True Positives and False Positives i.e the number of positive predictions divided by the total number of positive class values predicted. It is also called the Positive Predictive Value (PPV).

- **Recall:**

Recall is the number of True Positives divided by the number of True Positives and the number of False Negatives i.e.it is the number of positive predictions divided by the number of positive class values in the test data. It is also called Sensitivity or the True Positive Rate.

- **F1 Score:**

The F1 Score is the $2 * ((\text{precision} * \text{recall}) / (\text{precision} + \text{recall}))$. It is also called the F Score or the F Measure. Put another way, the F1 score conveys the balance between the precision and the recall.

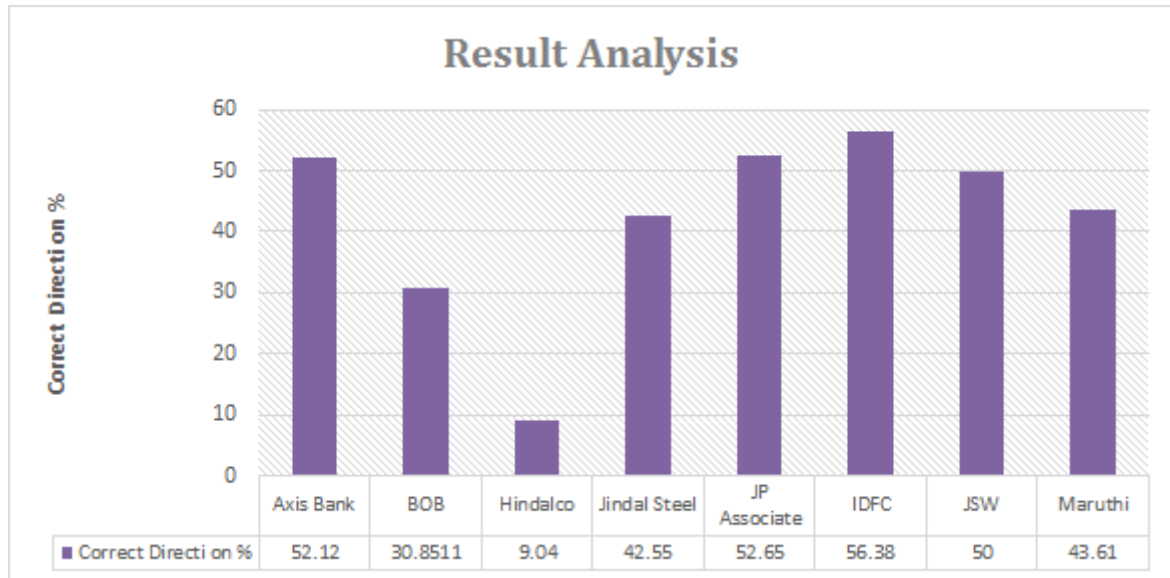


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VI. CONCLUSIONS

This research work will help the customer for decision making in share market. Furthermore, based on fuzzy rule based system stock exchange data could be used to overcome uncertainty, vagueness and imprecision of share market. This research aims to answer the research challenges by developing an optimal ensemble method for information discovery on the basis of DT Algorithm. This result shows that acceptable performance is obtained in a rapid change market.

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