



Analysing and Handling Anomalies in Stock Market Using Fuzzy System

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Abstract: *Study of Indian Stock Market is conducted in this case. Market price fluctuates depending upon number of factors. In the analysis of the stock exchange we have considered trust factor, Scandals, insider trading etc. while analyzing these factors we have studied that their exist number of anomalies. The pattern which we have analyzed is different from the actual pattern. The up and downs present within the companies are not correct. Companies show more profits so that their shares have higher ratings in the market. Because of which number of frauds are detected in the market. In order to judge whether the parameters lie within the range or not fuzzy logic is used. Probabilistic fuzzy logic(PFL) is used in order to determine the values of the stock. Membership functions are also considered in this case.*

Keywords: *PFL, Trust Factor, Market Price, fuzzy logic, membership function, stock market.*

I. INTRODUCTION

National Economy is affected by the performance of the share market. This is true not only for the national trading but also it is true for global economy. The transactions are conducted in the stock market at dynamic rate. The market fluctuate form high to low and vice versa. When performance of the company goes down than companies tries to update their investments and hide the value of their stocks so that the trust of the population can be maintained. Because of the above said situation anomalies in the Indian market exists. In the proposed work we have analyzed these anomalies. Market is uncertain in nature which depends upon current political situation as well. Because of the above factors the comparison between various companies stocks have different result as not expected. These anomalies are studied in this paper. We divide the anomalies into following categories.

- 1) Structural factors.
- 2) Behavioral biases.
- 3) January effect.

The structural factor will involve unfair competition. This means that competitors compete on unfair means. The companies which are large compete with the company of smaller stature. This will result in one sided affair. The smaller company will suffer loss in this case. There exist commercial laws which can be followed in order to eliminate structural factor. Market transparency is another factor which can cause the structural anomalies with the stock market.

The main thing which is considered in this case is the capital assets which are available with the companies. Also where those assets are is important factor in determining the problems associated with the companies.

Behavioral factor will consider the physiological, economical and emotional factors which can affect the decision of the individual on economic decisions. This will result in the impact on the decision which is made on the market.

January effect is also a anomaly which is present and effect the stock market. In this period the shares of the smaller companies sell at higher prices than the shares of the bigger companies. The example will be of Infosys. The 1% increase in the profit means increasing huge amount of the sale. However for a smaller organization only small increase in sale may result in increasing 1% of profit. So people buy shares of smaller companies in the end of the year. Stock Portfolio is complex multiple attribute problem. For this purpose various stocks has to be analyzed. All the attributes associated with the stock are analyzed in the proposed paper. Multi Agent systems are designed in order to suggest which stocks to invest in at which time. For this purpose fuzzy logic can be used. This will be helpful in making the decision regarding the stocks. Membership functions are designed. These membership functions will determine whether the stock is profitable. Fuzzy expert system is designed in this case. Fuzzy expert system is the one which will operate on fuzzy logic rather than Boolean logic. Fuzzy logic is used to decide the membership function. Fuzzy rules are decided on the basis of if-then rules. Thus using fuzzy system a recommender system is being designed which can help the user take the decision regarding the stock based on the use parameters.

II. ARCHITECTURE OF FUZZY EXPERT SYSTEM

A fuzzy expert system consists of four components: fuzzy conversion unit, knowledge base, decision making logic, and fuzzy de-conversion unit which should be embedded in the architecture detail for fuzzy expert system construction. The Architecture of the fuzzy expert system is shown in the fig 2.1.

Fuzzy inference engine

It is a program which analyzes the rules and knowledge stored within the database and finds the result. There are different selection for the fuzzy inference engine depending on the aggregation, implication and operators used for s-norm and t-norms.

User interface

Users are those who are going to make the decision about the stock. The interface can be graphical or command user in nature. The interface which is provided in this case is graphical in nature.

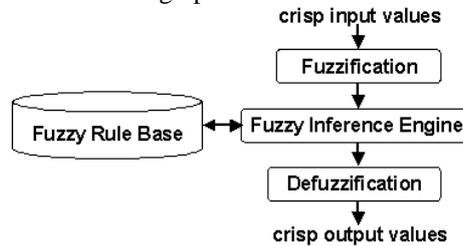


Fig 2.1 Showing the construction and formation of the fuzzy rules

In order to design the fuzzy system MATLAB interface is used. Fuzzy rule base Experts’ experience is used to build up the fuzzy rules. These rules are conditional statements and in general can be represented as IF x is X and y is Y and ... THEN o is O; where x and y are linguistic input variables. X and Y are possible linguistic values for x and y; respectively. They are modeled as fuzzy.

III. DESIGN THE FUZZY EXPERT SYSTEM FOR PORTFOLIO RECOMMENDATION

The proposed fuzzy system aims at evaluating stock exchange of BSE. This is done so that a portfolio can be designed and then recommended to the users. This will help the users in their investment process. The proposed system designs a portfolio which lists the stocks starting from the best stock and then moving toward the worst stock. The stocks to be included in the portfolio are decided from the rank list. Top stocks has been selected and included within the portfolio. The undertaken risk is also included in the fuzzy expert system. The basic goal of developing a system is:

- a) The support will be provided to the users who which to invest in the stock market.
- b) High level of interaction between the decision maker and the market.
- c) The profile of the preference by the stakeholders will be created.
- d) Environment of work and development is created.
- e) The interaction between high level decision makers and system is created.

The fuzzy expert system supporting the decision about the stock market will be created. The user will get enough information to determine which stock is profitable.

IV. PROPOSED SYSTEM

The proposed system utilizes the concept of the fuzzy system in order to determine the anomalies present within the BSE. Number of model has been suggested to explain the anomalies present within the stock market. Most of the models have been failed since the lack of informative contents used by the models. The proposed model uses the fuzzy system to derive the membership functions in order to determine the stock which is going to be in profit or not. The average convergence and divergence can be used in order to determine the stock to buy and reject. MACD is a technical analysis model which is created in 1970. This indicator comprises of two exponential moving averages, which help to measure momentum in the security. The MACD is simply the difference between these two moving averages plotted against a centreline. When the MACD is positive, it signals that the shorter term moving average is above the longer term moving average and suggests upward momentum. The opposite holds true when the MACD is negative - this signals that the shorter term is below the longer and suggest downward momentum. When the MACD line crosses over the centreline, it signals a crossing in the moving averages. In constructing the MACD we will consider the following factors

- 1) A 12 days exponential moving averages of closing prices
- 2) A 26 days exponential moving averages of closing prices
- 3) Subtract the larger EMA from smaller EMA
- 4) A 9 day MACD is calculated from the equation

$$EMA = price(t) * k + EMA(y) * (1 - k)$$

In the above equation t represent today, y represent yesterday, N represent total number of days and $k = 2 / (N + 1)$

The intersection of the line will indicate whether to buy or sell a stock. The trading rules for MACD for inference system will be as follows

if MACD is above the signal line then BUY

if MACD is below the signal line then SELL

The relative strength index is used in order to determine the status of the stock which is to be buy or sell. RSI is given as follows

$$RSI=100-100/(1+RS)$$

Where *RS* is average of *n*-days up closes/ average of *n*-day down closes; *n* is the number of days passes, most analysts accomplishes 9 - 15 days RSI. In order to get a proper display of the property, 14 days is used in this work. The *RSI* ranges from *u* to 100. Different sectors and industries have varying threshold levels when it comes to the *RSI*. Stocks in some industries will go as high as 75 to 80 before dropping back and others have a tough time breaking past 70. The following classification rules were used in this work:

IF RSI increases to above 70 (implies overbought) THEN SELL.

IF RSI is between 30 and 70 (implies normal) THEN HOLD

IF RSI decreases to below 30 (implies oversold) THEN BUY

The parameters for the technical analysis are specified in the tabular form as follows

Table 1: Showing technical indicator factors.

Technical Indicator	Parameter
MACD	Long=26
	Short=12
	Trigger=9
RSI	N=14
Stochastic Oscillator	K=10
OBV	D=3
	Moving Average
	Method=Exponential

The Stochastic Oscillator(SO) will give the stock last closing price. The SO will be plotted between 0 to 100. This will indicate the oversold and undersold conditions associated with the stock. K will indicate the line drawn below the SO and D indicates the line drawn over the SO. The average method which is used in order to consider the stock buy and sell feature is exponential in nature.

The observed Balanced Volume is used as another parameter to determine the selling and buying of the share. This technical indicator reflects movements in volume of stocks. The OBV is calculated by taking the total volume for the trading period and assigning it a positive or negative value depending on whether the price is up or down during the trading period. When there is a rise in the prices at the trading period, the volume is assigned a positive value, while a negative value is assigned when the price is down for the period. The positive or negative volume total for the period is then added to a total that is accumulated from the start of the measure. While studying the OBV, it is more important to focus on the trend in the OBV than the actual value of the OBV measure. On Balance Volume is calculated by adding the day's volume to a cumulative total when the security's price closes up, and subtracting the day's volume when the security's price closes down. If today's close is greater than yesterday's close then

$$OBV=Yesterday\ OBV+today\ Volume$$

Else, If today's close is less than yesterday's close then:

$$OBV=Yesterday\ OBV-today\ Volume$$

Else, If today's close is equal to yesterday's close then:

$$OBV=Yesterday\ OBV$$

The trading rules for this indicator can be of the following form:

IF line is Upward then BUY

Else IF line is Downward then SELL

The parameters for the technical indicators are specified according to the default guidelines in technical analysis. For the MACD indicator, 26 and 12 weeks are used as the long-term and the short-term moving average, respectively. The trigger line for the MACD is the 9 weeks moving average of the MACD. The RSI indicator uses a period of 20 weeks.

4.1 Fuzzy Inference System

The fuzzy inference system will be used in order to formulate the rules in order to detect stock which is to be bought or sell. The above said parameters like MACD , RSI will be considered in this case. The fuzzy rules to be utilized will be as follows

IF MACD is HIGH and RSI is LOW and SO is LOW and OBV is HIGH THEN BUY

IF MACD is LOW and RSI is HIGH and SO is HIGH and OBV is LOW THEN BUY

IF MACD is HIGH and RSI is MED and SO is MED and OBV is HIGH THEN BUY

IF MACD is LOW and RSI is MED and SO is HIGH and OBV is LOW THEN SELL

IF RSI is HIGH and SO is HIGH and OBV is LOW THEN BUY

IF RSI is MED and SO is MED and OBV is LOW THEN SELL

IF MACD is LOW and RSI is MED and SO is MED THEN HOLD

IF MACD is LOW and RSI is MED and SO is MED and OBV is LOW THEN HOLD

V. RESULT

The result has been obtained by the use of the MATLAB FIS(FUZZY Inference System). The fig. are shown indicating input, output, surface values and variations present within the results.

5.1 Input and Output variables used

The input and output variables used within the fuzzy inference rules will includes MACD,SO,RSI etc. all are listed in the following fig

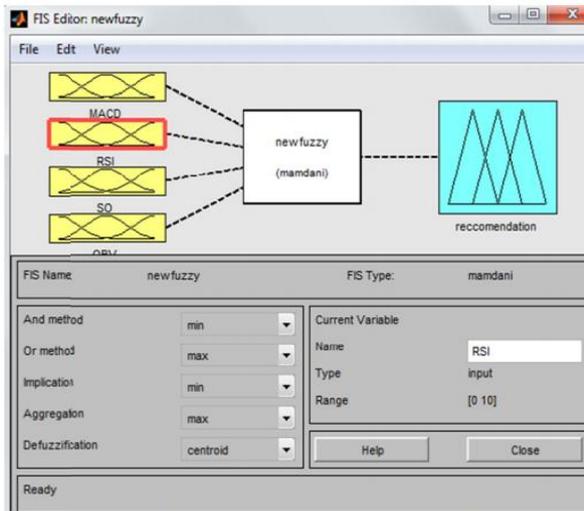


Figure 2. Input and Output Variables

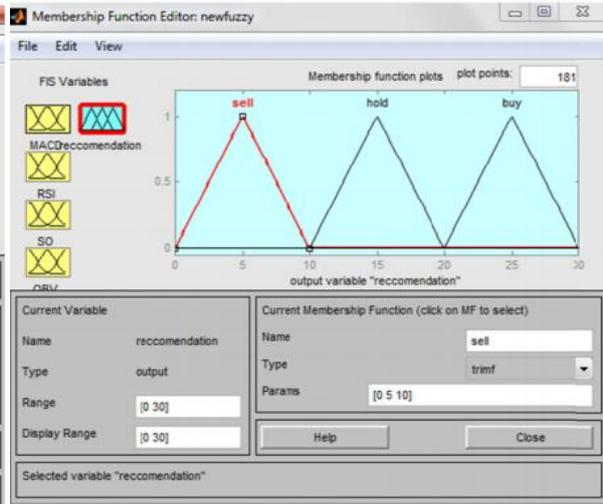


Figure 3. The Membership Function

5.2 Membership Function

The membership function indicates the RSI, OS and output variable.

5.3 Fuzzy Rules Set

After defining the membership functions fuzzy rules are defined which will produce the final result.

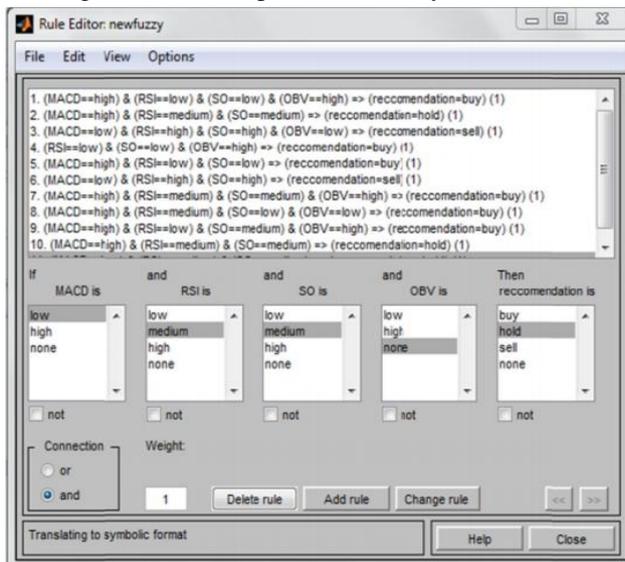


Figure 4. The Rule Editor

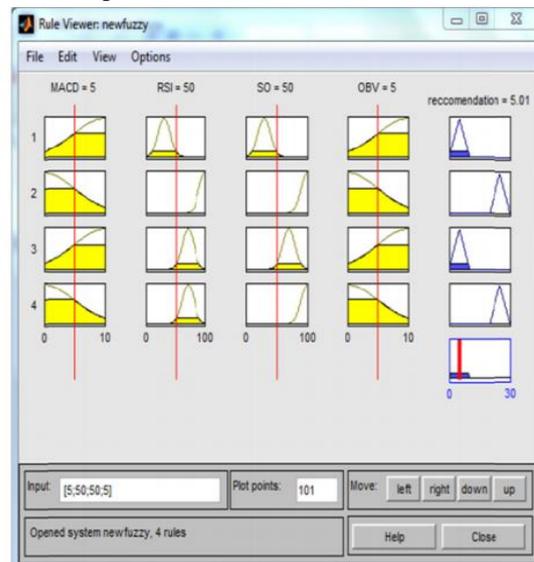


Figure 5. The Rule Viewer

By looking at the result user can evaluate the anomalies present within the stock and makes their decision about buy or selling of the stock.

VI. CONCLUSION

In the proposed work MACD, RSI etc factors are used in order to stabilize the anomalies present within the market. The proposed paper makes the user comfortable in the selling and buying process which could lead to conflicts in the absence of the proposed paper. The MATLAB tool is used in order simulate the results produced and make the accurate judgments.

With the help of the proposed system user can get to know which stock to hold and which stock to sell under extreme situations. The entire process is listed mathematically. In the future we try to focus on the accurate model which could lead to increasing precision in the decision making process towards the stock market.

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