



INTERNATIONAL JOURNAL OF RESEARCH IN COMMERCE, IT AND MANAGEMENT

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JOURNAL AND OTHER ARTICLES

- Schemenner, R.W., Huber, J.C. and Cook, R.L. (1987), "Geographic Differences and the Location of New Manufacturing Facilities," Journal of Urban Economics, Vol. 21, No. 1, pp. 83-104.

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FORCASTING OF FINANCIAL MARKETS - APPLICATION OF FUZZY ASSOCIATION RULES

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ABSTRACT

The article has been designed to forecast financial market indicators using rule based fuzzy system. The fuzzy system has been applied on Gold commodity future market, Carbon credit and CNX Nifty Index. The report is devoted to articulate the impact of rule based fuzzy system for forecasting the above mentioned parameters. Fuzzy rule have been designed by considering the standard deviation of the above parameters as a rule input variable and is applied on the moving average of 2 days, 7 days and 15 days of the input variable that is the future commodity gold prices, carbon credit and the CNX Nifty Index. Around 42 rules have been designed by considering the bullish, bearish, near bullish, near bearish and active bullish and active bearish etc. The article effectively forecast future gold price and the bullish and bearish nature of market. It also forecast the Index along the cycle of bullish and bearish. In-sample prediction has supported the rule based fuzzy system as an effective methodology of forecasting.

KEYWORDS

Commodity Future Market, Fuzzy Association Rules, Fuzzy Inference System, Financial Market Forecasting.

INTRODUCTION

The article primarily discusses financial market forecasting using fuzzy system based association rules. The fuzzy system has been applied on Gold futures, Carbon credit and CNX Nifty Index. The fuzzy logic based inference system design to capture the historical movements of above parameters. The inference system has been designed to capture the time-varying volatility and factor the variability for the prediction of financial prices. In place of single input series, the study has used multiple input series of the same data through different periods of moving averages and factored the variability with time-varying volatility. Fuzzy rules have been designed by considering the standard deviation of the above parameters as a rule input variable and is applied on the moving averages of 2 days, 7 days and 15 days of the input variable that is the future gold prices, carbon credit and the CNX Nifty Index. Around 42 rules have been designed by considering the bullish, bearish, near bullish, near bearish and active bullish and active bearish etc. The outcome of the study is quite impressive as the prediction is significant. The model can also be used for prediction of other financial parameters.

FUZZY LOGIC IN FINANCE

Fuzzy systems have been widely used in expert systems, machinery, home appliances and robotics. Recently, applications in the finance field have also been reported, exploiting the ability of fuzzy systems to model the vague and imprecise information. Fuzzy systems have been used with various technical indicators in previous studies. It shows that the returns generated with the fuzzy systems are significantly larger than linear regression models, neural networks and other investment strategies. The results combining technical analysis and fuzzy logic were very promising. Since different artificial intelligence methods have different strengths and limitations, hybrid systems have also been studied to obtain synergetic combinations of methods models and architectures. In particular, combinations of fuzzy systems with neural networks and/or genetic algorithms appear to be popular in real-world implementations.

Traditionally science, engineering and mathematics showed virtually no interest in studying uncertainty. It was considered undesirable and the idea was to eliminate it. In fact, eliminating uncertainty was considered as one of the manifestations of progress. This attitude towards uncertainty was prevalent in the 19th century and faced serious challenges by the advent of probability theory in the early half of the 20th century. When constructing a system for some given purpose, one's ultimate goal is to obtain a system that is as useful as possible for the given purpose. This implies that a system should be a proper mixture of the three fundamental characteristics of systems: credibility, complexity and uncertainty. Ideal we would want a system of high credibility, low complexity and low uncertainty. Unfortunately these three ideas conflict with one other. Thus to achieve a system with better performance we need to reach a tradeoff between these three characteristics.

The relationship between credibility, complexity and uncertainty is quite intricate and has not yet been fully understood. However, it is already well established that uncertainty has a pivotal role in any effort to maximize the usefulness of constructed systems. Although usually undesired in system, when considered alone, it becomes very valuable when considered in connection with credibility and complexity. A slight increase in relevant uncertainty may often significantly reduce complexity and at the same time increase credibility of the system. Uncertainty is thus an important commodity in the knowledge business, a commodity that can be traded for gains in other essential characteristics of systems by which we represent knowledge. Because of this important role, uncertainty started being no longer viewed in science and engineering as an unavoidable plague, but rather as an important resource that allows us to deal effectively with problems with systems involving complexity.

By the early half of the 20th century it was believed that only probability theory can be applied to fully capture the essence of uncertainty. The equivalence of probability and uncertainty was challenged in the latter half of the 20th century by an important generalization in mathematics, namely, the fuzzy set theory which was introduced by L. Zadeh in 1965. In the fuzzy set theory, the requirement of sharp boundaries as in the classical sets is abandoned. This implies that the membership of an object in a fuzzy set is not a matter of 'present' or 'absent' as in classical sets but is a matter of degree.

Fuzzy logic is now a well established tool in the field of engineering, but its application in finance is still less developed.

FUZZY LOGIC BASICS

Fuzzy Logic was initiated in 1965 by Lotfi A. Zadeh, professor of computer science at the University of California in Berkeley. Basically, Fuzzy Logic (FL) is a multivalued logic that allows intermediate values to be defined between conventional evaluations like true/false, yes/no, high/low, etc. Notions like rather tall or very fast can be formulated mathematically and processed by computers, in order to apply a more human-like way of thinking in the programming of computers. Fuzzy systems are an alternative to traditional notions of set membership and logic that has its origins in ancient Greek philosophy. The precision of mathematics owes its success in large part to the efforts of Aristotle and the philosophers who preceded him. In their efforts to devise a concise theory of logic, and later mathematics, the so-called "Laws of Thought" were posited. One of these, the "Law of the Excluded Middle," states that every proposition must either be True or False. Even when Parmenides proposed the first version of this law (around 400 B.C.) there were strong and immediate objections: for example, Heraclitus proposed that things could be simultaneously True and not True. It was Plato who laid the foundation for what would become fuzzy logic, indicating that there was a third region (beyond True and False) where these opposites "tumbled about." Other, more modern philosophers echoed his sentiments, notably Hegel, Marx, and Engels. But it was Lukasiewicz who first proposed a systematic alternative to the bi-valued logic of Aristotle.

Fuzzy Logic has now emerged as a profitable tool for the controlling and steering of systems and complex industrial processes, as well as for household and entertainment electronics, as well as for other expert systems and applications like the classification of satellite data and application in various pure sciences.

LITERATURE REVIEW

As financial forecasting has been addressed for such a long time period, the number of proposed method is tremendously large. Statistical linear models such as the linear regression, the autoregressive model (Yule, 1927), the moving average and autoregressive moving average (Box et al., 1994) have dominated for decades. But statistical linear models have inferior performance because the dynamic of financial time series are strongly nonlinear (Qi and Maddala, 1999). More sophisticated nonlinear models such as the bilinear model (Granger and Anderson, 1984), the threshold autoregressive model (Tong and Lim, 1980), the smoothing transition autoregressive model (Chan and Tong, 1986) and the autoregressive conditional heteroscedastic model (Eagle, 1982) were also developed and applied to forecast financial time series. However, nonlinear statistical models are limited in that they make strong assumptions about the properties of the data, thus introducing a high degree of bias in to the models. The emergence of artificial intelligence techniques has seen their enormous application to financial forecasting, such as expert systems (Tsaih et al., 1998), genetic algorithms (Bauer, 1994), fuzzy logic (hiemstra, 1994), wavelets (Bjorn, 1995; Pan and Wang, 1998), chaos theory (Trippi, 1995) and neural networks (Chou et al., 1996; Kryzanowski et al., 1993; Mani et al., 1995; Pi and Rognavldsson, 1995). Among them, neural networks are the most popular and successful tools. There is extensive literature about the application of neural networks in financial forecasting (Azoff, 1994; Beastaens et al., 1995; Goonatilake and Treleaven, 1995; References, 1995; Trippi and Turban, 1994; Turban and Trippi, 1992; Van 1996; Wong and Selvi, 1998). One of the most popular Journals published on the application of neural networks in finance is the Journal of Computational Intelligence in Finance. Various applications of neural networks in financial forecasting range from options price (Barucci et al. 1996; English and Mayhew, 1995; Lajbcygier et al., 1995; Yao et al., 2000), foreign exchange rate (Green and Pearson, 1995; Hwa and Seng, 1995; Lee, 1995; Staley and Peter, 1995; Yao and Tan, 2000; Yao et al., 1996; Zhang and Michael, 1998), stock price and index (Abecasis and Lapenta, 1997; Kohara et al., 1996; Schoneburg, 1990; White 1988; Wittkemper and Steiner, 1996), mutual fund (Chiang et al., 1996), interest rate (Guenther, 1995; Steven and Noh, 1997), commodity price and index (Edelman et al., 1999; Grudnitski and Osburn, 1993), treasury bond (Cheng et al., 1996), and emergent markets (Jang and Lai, 1994; Siriopoulos et al., 1995).

METHODOLOGY

The fuzzy rule used in the model uses variance as rule based parameter for designing different rules. Different days moving average considered as input variable along with variance as the rule based variable. Fuzzy rules have been designed by considering the standard deviation of the above parameters as a rule input variable and are applied on the moving average of 2 day, 7 days and 15 days of the input variable that is the future commodities like Gold and Carbon. It is also applied on CNX Nifty Index for equity price forecasting. Around 42 rules have been designed by considering the bullish, bearish, near bullish, near bearish and active bullish and active bearish etc. Investors generally invest in financial market my looking in to future perspective yield over a medium and long time periods. This calls for preparing a forecasting model by factoring the medium and long term returns into the current yield. Using this, the study has made a fuzzy based association rules by relating the current yield with the moving averages yields of 2days, 7days and 15days. This fuzzy association model provides ideal framework for forecasting financial markets prices by developing fuzzy association rules based logic. The study has considered current yield, its volatility and the moving averages of returns for above mentioned days as inputs and involving these inputs about 35 fuzzy association rules based logic to forecast financial market prices. Various Logics have been developed to capture the bullish and bearish trends of financial markets prices.

INPUT DATA FOR THE FUZZY INFERENCE SYSTEM (FIS)

Real time data of commodity prices of Gold and Carbon taken from the NCDEX Exchange India. Both Gold and Carbon are being most traded and active commodities and are always high on demand. Hence the selection of the commodities are taken since its price variation are very much reflected in most of the factors of economy as whole as very much affected by the financial market and stock prices of the Trading Exchange. While prices for many physical commodities tend to revolve around supply-demand data, Gold and Carbon need to be treated more like a financial market that responds to fear and anxiety. Both Commodities prices typically move higher in times of crisis and panic. Gold and Carbon prices usually move higher during periods of high inflation, which tend to bring on higher interest rates. Gold and Carbon futures prices also have an inverse relationship with the price of the U.S. dollar.

S&P CNX Nifty is a well diversified 50 stock index accounting for 21 sectors of the economy. It is used for a variety of purposes such as benchmarking fund portfolios, index based derivatives and index funds. The study also forecast needs future movements using the Fuzzy based Association Rules.

Moving average of the Average day futures prices is taken in case of Gold future for 2 day, 7 days, and 15 days. For each of the moving average future price we analyse the variance, its fluctuation range, and its bearish and bullish trend is observed. For CNX Nifty Index we consider Return from moving average value of the Index

The bearish and bullish trend is classified into three different categories:

- Active bearish
- New bearish
- Mild bearish
- Active bullish
- New bullish
- Mild bullish

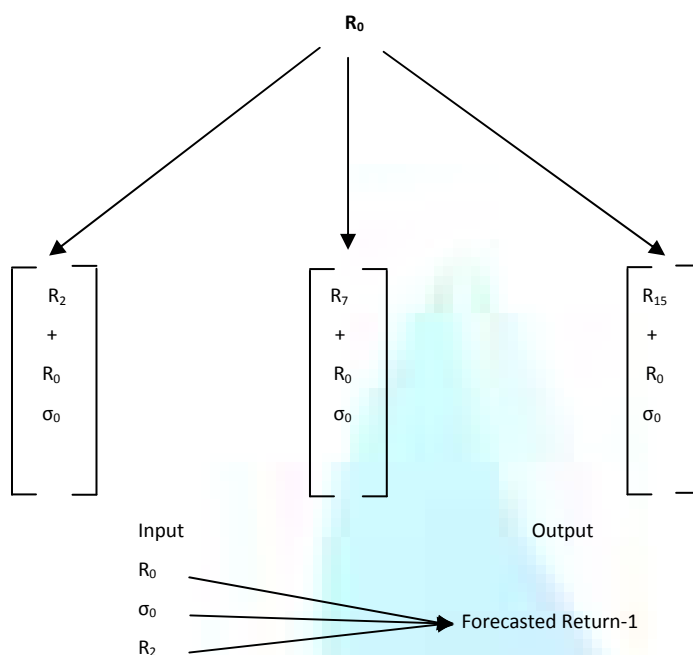
Daily data for 3 years have been considered to forecast the future prices/returns using the 35 fuzzy association rules based logic.

ASSOCIATION RULES

Appropriate Membership function is chosen so as to reflect the above stated trends in a proper diversified manner and so that all the factors are represented appropriately by them. Appropriate rules are defined so as to train the fuzzy system and enable it to process the inputs and on the basis of decision rules and the Membership function of the fuzzy system we get the output. The study has designed fuzzy association based logic system to optimize to forecasting methodology. In this case the current return and its volatility is considered as the primary inputs and the co-occurrence inputs are the moving averages of the

primary inputs. The fuzzy association rule based logic has been developed considering the primary inputs and co-occurrence inputs are the associated variables. The logic is depicted below.

FIGURE 1: FUZZY ASSOCIATION RELATION



From each input set will provide a particular level of output and the objective of the fuzzy rules based association is to find that input set which provides the optimum level of output.

The objective of this thesis was to setup up a fuzzy inference system so as to predict the future price of Gold, Carbon and the Return on CNX Nifty Index. Data from the Commodity Market (NCDEX) and actual CNX Nifty Index for the past 3 years has been analyzed. The shape of the membership function, number of fuzzy regions and the fuzzy terms are defined for the data. Here mainly triangular membership functions are made using the Gaussian function. The fuzzy membership functions are the same for the inputs and the outputs. Two cases were taken, one with 5 membership functions and another with 3 membership functions. Fuzzy terms used for the 6 membership functions were (active bearish, new bearish, mild bearish, mild bullish, new bullish, active bullish) and for the 3 membership function case.

FIGURE 2: 6 TRIANGULAR MEMBERSHIP FUNCTIONS

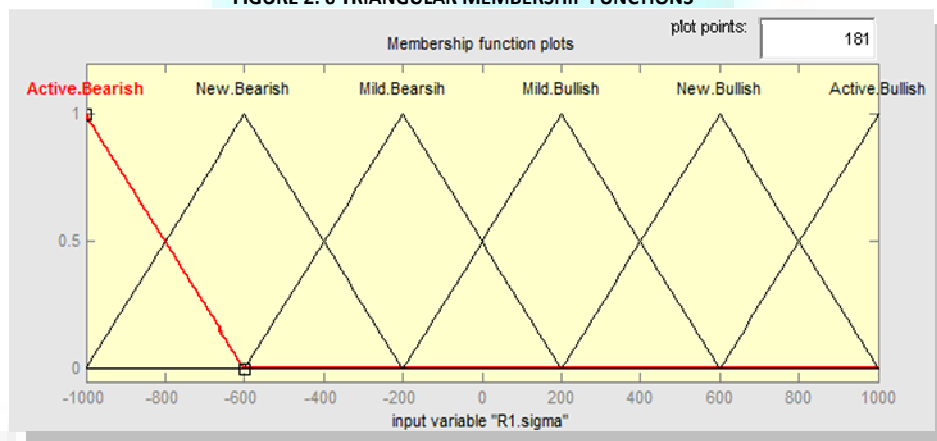
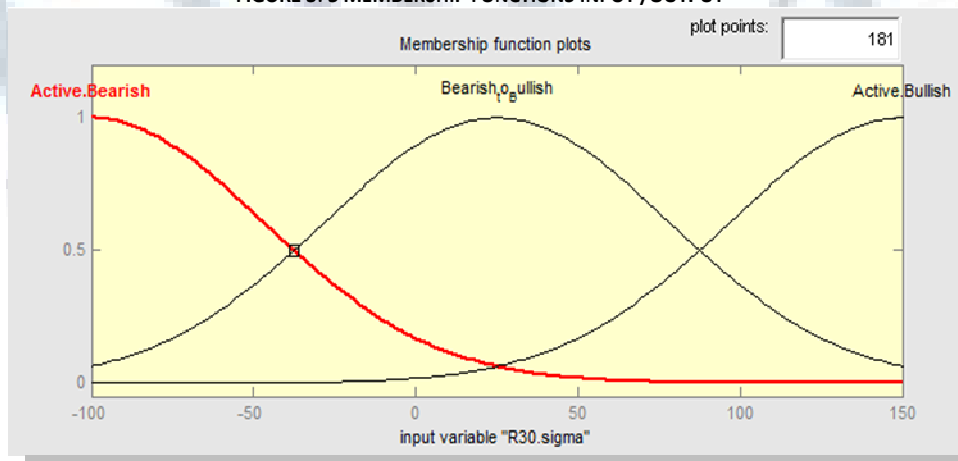


FIGURE 3: 3 MEMBERSHIP FUNCTIONS INPUT /OUTPUT



1. The space associated with each fuzzy term over the universal discourse for each variable was then calculated and divided evenly over the 5/9 membership functions.
2. For each available core data a fuzzy rule was established. For self generation of the rules, certain MATLAB codes were written which took the data as input and gave output the rule from that given input-output pair. The idea is to 1st divide the input output space into fuzzy regions. The fuzzy rule was established by directly mapping the physical value of the variable to the corresponding fuzzy membership function. Most of the time for a given value, it always falls into more than one fuzzy region. In such a case the value was assigned to the fuzzy region with maximum degree
3. These steps were repeated for the entire given core data and a rule were established for each of the dataset.
4. These set of rules along with the centroid defuzzification method form the Fuzzy Inference System.

GOLD MARKET IN INDIA

India is the largest importer of gold jewellery contributing to 25% of world's gold demand. It imports about 663 tonnes of gold annually mainly in the form of small cast bars known as TT bars or biscuits. India is also the largest consumer of gold worldwide.

Gold trading has existed for centuries and has been a keystone for economies throughout history, continuing to have global financial impacts today. Gold has not only been a means of exchange but also is regarded as a store of value and an excellent hedge against inflation. In addition to being a monetary commodity, gold has a number of uses in jewellery, dentistry, etc. and is also an important industrial commodity because it is an excellent conductor of electricity and is extremely resistant to corrosion, making it critically important in electronics and other high-tech applications. Gold is one of those markets that provide a wide range of viable investment vehicles for almost any type of investor. In addition to the physical gold itself in the form of gold bullion or gold coins, investors can express their opinions about the outlook for gold prices in gold futures and options, stocks of companies involved in metals and mining including the gold mining penny stocks and gold exchange-traded funds.

The price of gold depends on a host of factors, which makes it very difficult to predict. In a fashion similar to shares, gold is an asset class by itself. In fact, in many villages and small towns of India, gold is preferred to bank deposits as a savings and investment instrument. Till few years ago, to gain from price volatility, one would have to hoard and trade in gold physically. Not any more, however. With the commodity futures market operating in full swing, one has the option of not physically stocking gold to gain from its price movements.

CARBON MARKET IN INDIA

India may be the leader in the number of carbon credits issued so far and the number of clean development (CDM) projects registered with international CDM body, but it already lags behind China in the volume of average annual credits expected till 2012. India has cornered nearly 43% of the Carbon credits (CERS) issued so far by the CDM executive board, the highest international body under the Kyoto Protocol to register projects and issue credits. In comparison, only 17% of the CERS have been issued to China. But the expected average annual CERS from registered projects till 2012 has China (44%) far ahead of India (15%), although India, with 259 projects, leads China (101) in the number of registered projects. Carbon credits, or CERS (Carbon Emission Reductions), are tradable credits earned for investing in projects aimed at reducing greenhouse gas emissions. One CER is equivalent to one tonne of carbon dioxide reduced. Under the Kyoto Protocol, governments and companies in the European Union can use these credits to offset their carbon emissions and meet part of their reduction targets. Carbon credits are generated mainly in the developing countries because of the lower project cost. "Indian companies have mainly concentrated on renewable energy (biomass, wind power, etc.) or waste heat recovery projects that generate much less CERS compared with the Chinese who have several projects in high CER-yielding HFC23 projects. Each tonne of HFC23, a by-product of the refrigerant gases production process, is equivalent to 11,700 tonnes of carbon dioxide. Naturally, destroying small quantity of HFC23 can fetch a very large volume of CERS. Also, these projects attract more investments since they are relatively cheap to execute and earn more credit.

S&P CNX NIFTY

The 50 or S&P CNX Nifty nicknamed *Nifty 50* or simply *Nifty* (NSE: ^NSEI), is the leading index for large companies on the National Stock Exchange of India. The Nifty is a well diversified 50 stock index accounting for 22 sectors of the economy. It is used for a variety of purposes such as benchmarking fund portfolios, index based derivatives and index funds S&P CNX Nifty is owned and managed by India Index Services and Products Ltd. (IISL), which is a joint venture between NSE and CRISIL. IISL is India's first specialised company focused upon the index as a core product. IISL has Marketing and licensing agreement with Standard & Poor's (S&P), who world leaders are in index services.

- The total traded value for the last six months of all Nifty stocks is approximately 65.68% of the traded value of all stocks on the NSE
- Nifty stocks represent about 65.34% of the total market capitalization as on Mar 31, 2009.
- Impact cost of the S&P CNX Nifty for a portfolio size of Rs.2 crore is 0.16%
- S&P CNX Nifty is professionally maintained and is ideal for derivatives trading.

RESULTS AND DISCUSSION

Following the above mentioned steps the following FIS has been setup for Gold Future.

FUZZY INFERENCE SYSTEM USING MATLAB

FIGURE 4: FUZZY INFERENCE SYSTEM OF GOLD

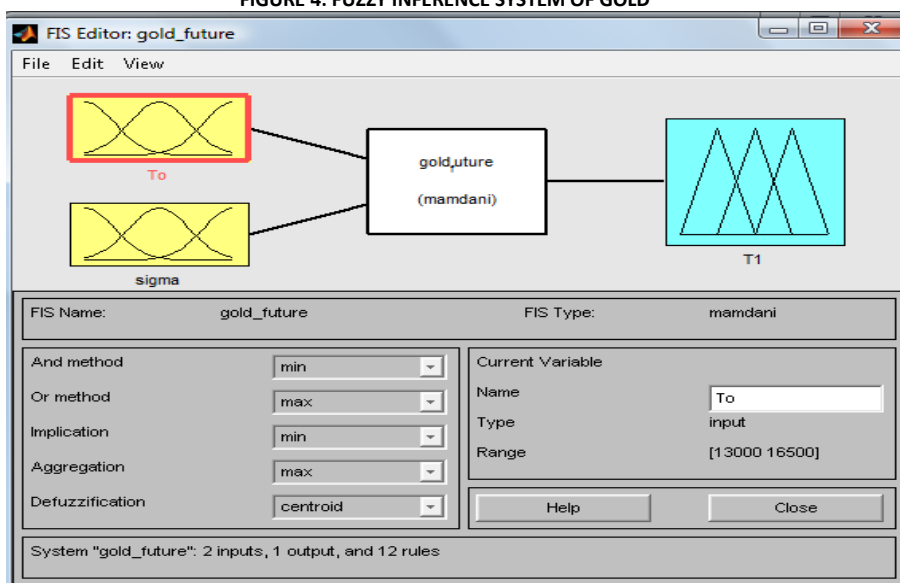
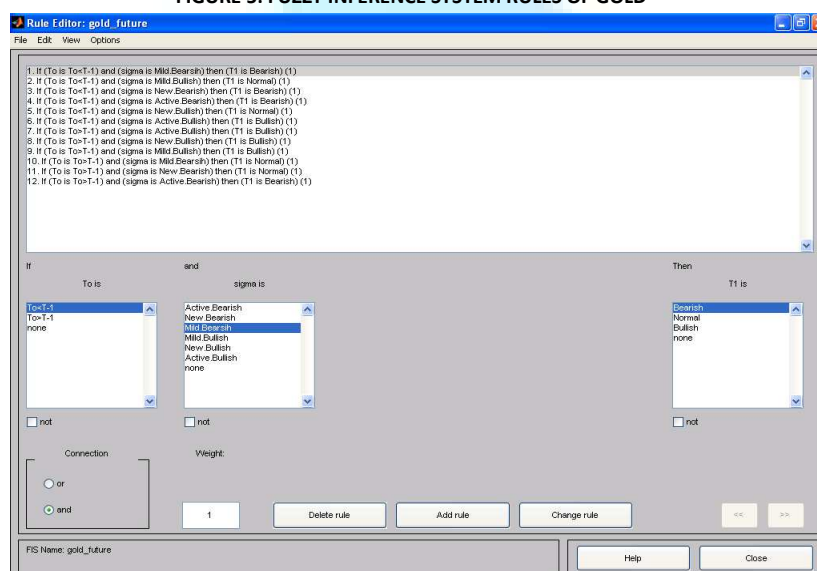


FIGURE 5: FUZZY INFERENCE SYSTEM RULES OF GOLD



Following the above mentioned steps the following FIS has been setup for Carbon Future.

FIGURE 6: FUZZY INFERENCE SYSTEM OF CARBON

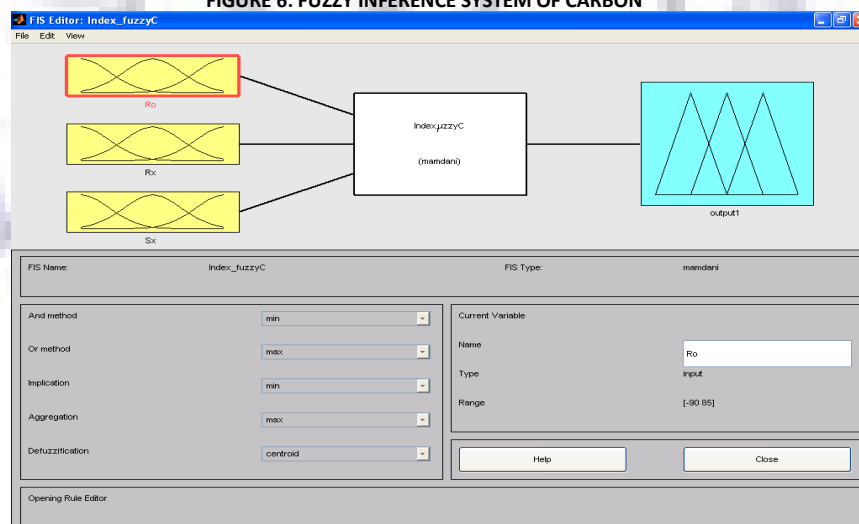


FIGURE 7: FUZZY INFERENCE SYSTEM RULES OF CARBON

Rule Editor: Index_fuzzyC

File Edit View Options

1. If (Ro is bearish) and (Rx is negative_return) and (Sx is -ve-sigma) then (output is less-ret) (1)
 2. If (Ro is bearish) and (Rx is negative_return) and (Sx is less-ve-sigma) then (output is less-ret) (1)
 3. If (Ro is bearish) and (Rx is negative_return) and (Sx is towards+sigma) then (output is inl-ret) (1)
 4. If (Ro is bearish) and (Rx is negative_return) and (Sx is +start_sigma) then (output is inl-ret) (1)
 5. If (Ro is bearish) and (Rx is negative_return) and (Sx is +sigma) then (output is post-ret) (1)
 6. If (Ro is bearish) and (Rx is neg-to-post_return) and (Sx is +sigma) then (output is post-ret) (1)
 7. If (Ro is bearish) and (Rx is neg-to-post_return) and (Sx is +start_sigma) then (output is post-ret) (1)
 8. If (Ro is bearish) and (Rx is neg-to-post_return) and (Sx is towards+sigma) then (output is inl-ret) (1)
 9. If (Ro is bearish) and (Rx is neg-to-post_return) and (Sx is less-ve-sigma) then (output is inl-ret) (1)
 10. If (Ro is bearish) and (Rx is neg-to-post_return) and (Sx is -ve-sigma) then (output is less-ret) (1)
 11. If (Ro is bearish) and (Rx is positive_return) and (Sx is -ve-sigma) then (output is less-ret) (1)
 12. If (Ro is bearish) and (Rx is positive_return) and (Sx is less-ve-sigma) then (output is less-ret) (1)
 13. If (Ro is bearish) and (Rx is positive_return) and (Sx is towards+sigma) then (output is inl-ret) (1)
 14. If (Ro is bearish) and (Rx is positive_return) and (Sx is +start_sigma) then (output is post-ret) (1)
 15. If (Ro is bearish) and (Rx is positive_return) and (Sx is +sigma) then (output is post-ret) (1)
 16. If (Ro is average) and (Rx is positive_return) and (Sx is +sigma) then (output is post-ret) (1)
 17. If (Ro is average) and (Rx is positive_return) and (Sx is +start_sigma) then (output is post-ret) (1)
 18. If (Ro is average) and (Rx is positive_return) and (Sx is towards+sigma) then (output is post-ret) (1)
 19. If (Ro is average) and (Rx is positive_return) and (Sx is -ve-sigma) then (output is less-ret) (1)

If Ro is and Rx is and Sx is Then output is

Ro is: bearish, average, bullish, none
 Rx is: negative_return, neg-to-post_return, positive_return, none
 Sx is: -ve-sigma, less-ve-sigma, towards+sigma, +start_sigma, +sigma, very+sigma, none

not not not not

Connection: or, and (selected)
 Weight: 1

Delete rule Add rule Change rule

FIS Name: Index_fuzzyC Help Close

Following the above mentioned steps the following FIS has been setup for CNX NIFTY Index.

FIGURE 8: FUZZY INFERENCE SYSTEM OF CNX NIFTY

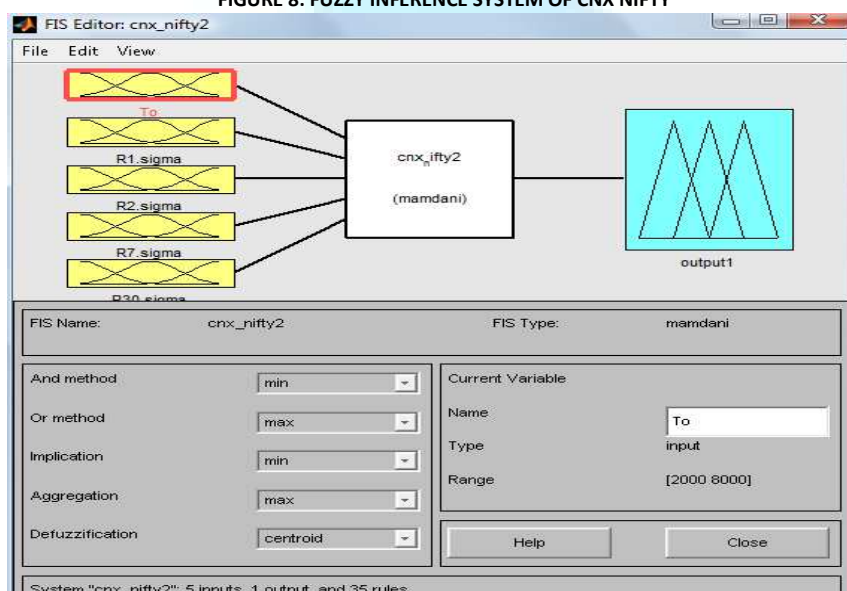


FIGURE 9: FUZZY INFERENCE SYSTEM RULES OF CNX NIFTY

Rule Editor: cnx_nifty2

File Edit View Options

1. If (To is T1<To) and (R1.sigma is Active Bearish) and (R2.sigma is Active Bearish) and (R7.sigma is Active Bearish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 2. If (To is T1<To) and (R1.sigma is New Bearish) and (R2.sigma is Active Bearish) and (R7.sigma is Active Bearish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 3. If (To is T1<To) and (R1.sigma is New Bearish) and (R2.sigma is New Bearish) and (R7.sigma is Active Bearish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 4. If (To is T1<To) and (R1.sigma is New Bearish) and (R2.sigma is New Bearish) and (R7.sigma is Bearish_to_Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 5. If (To is T1<To) and (R1.sigma is New Bearish) and (R2.sigma is New Bearish) and (R7.sigma is Bearish_to_Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 6. If (To is T1<To) and (R1.sigma is Mild Bearish) and (R2.sigma is Mild Bearish) and (R7.sigma is Bearish_to_Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 7. If (To is T1<To) and (R1.sigma is Mild Bearish) and (R2.sigma is Mild Bearish) and (R7.sigma is Bearish_to_Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 8. If (To is T1<To) and (R1.sigma is Mild Bearish) and (R2.sigma is Mild Bearish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 9. If (To is T1<To) and (R1.sigma is Mild Bullish) and (R2.sigma is Mild Bullish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 10. If (To is T1<To) and (R1.sigma is New Bullish) and (R2.sigma is Mild Bullish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 11. If (To is T1<To) and (R1.sigma is New Bullish) and (R2.sigma is New Bullish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bearish) then (output is less-ret) (1)
 12. If (To is T1<To) and (R1.sigma is New Bullish) and (R2.sigma is New Bullish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bullish) then (output is less-ret) (1)
 13. If (To is T1<To) and (R1.sigma is New Bullish) and (R2.sigma is New Bullish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bullish) then (output is less-ret) (1)
 14. If (To is T1<To) and (R1.sigma is New Bullish) and (R2.sigma is New Bullish) and (R7.sigma is Active Bullish) and (R30.sigma is Active Bullish) then (output is less-ret) (1)

If To is and R1.sigma is and R2.sigma is and R7.sigma is and R30.sigma is Then output is

To is: T1<To, T1=To, none
 R1.sigma is: Active Bearish, New Bearish, Mild Bearish, Mild Bullish, New Bullish, Active Bullish, none
 R2.sigma is: Active Bearish, New Bearish, Mild Bearish, Mild Bullish, New Bullish, Active Bullish, none
 R7.sigma is: Active Bearish, Bearish_to_Bullish, Active Bullish, none
 R30.sigma is: Active Bearish, Bearish_to_Bullish, Active Bullish, none

not not not not not

Connection: or, and (selected)
 Weight: 1

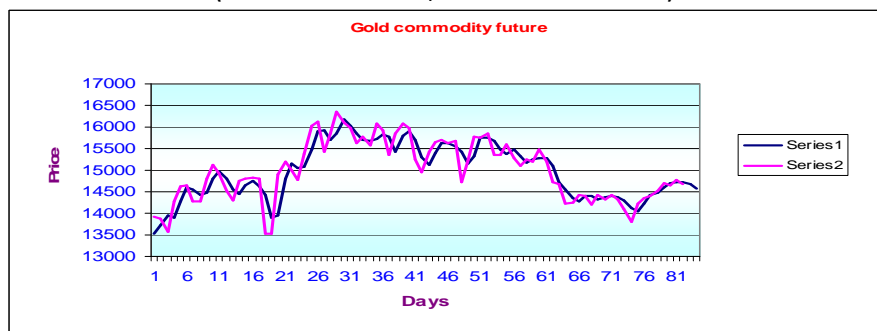
Delete rule Add rule Change rule

FIS Name: cnx_nifty2 Help Close

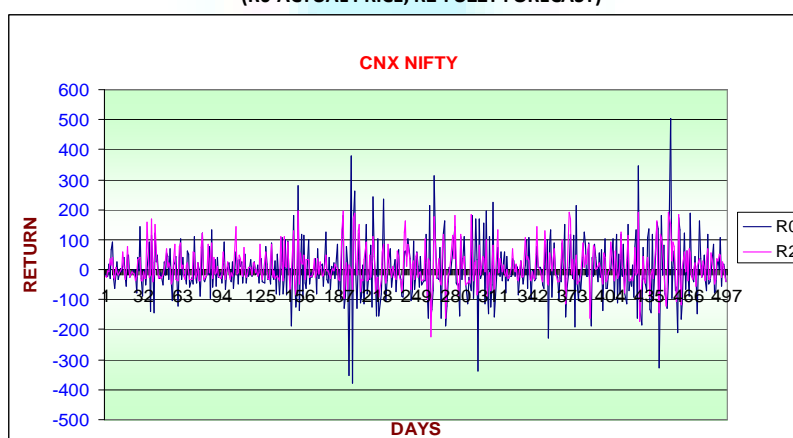
RESULT OF THE RULE BASE FORMED IS SHOWN BELOW

The following graph shows the results by overlapping the actual values and the values obtained from the fuzzy inference system. It must be noted that some of the obtained values were at places where no training of the FIS had been performed.

**GRAPH 1: OUTPUT FOR GOLD FUTURES
(SERIES1- ACTUAL PRICE, SERIES2-FUZZY FORECAST)**



**GRAPH 2: OUTPUT OF CNX INDEX OF TWO DAYS
(R0-ACTUAL PRICE, R2-FUZZY FORECAST)**



**GRAPH 3: OUTPUT OF CARBON FUTURES OF SEVEN DAYS
(R0-ACTUAL PRICE, R2-FUZZY FORECAST)**

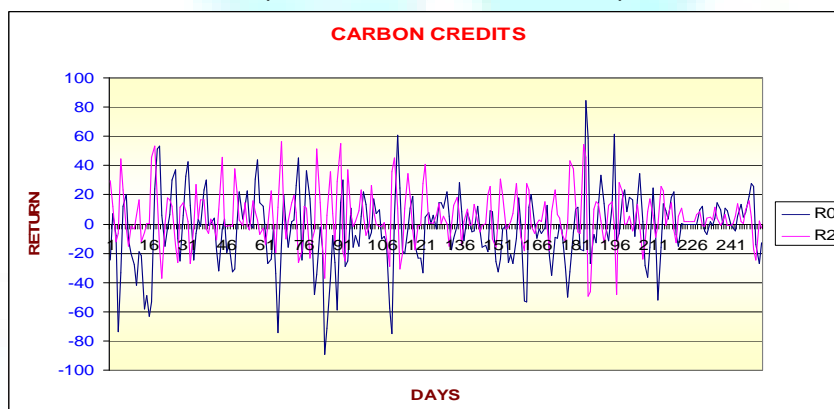


TABLE 1: FORECASTED VIS-À-VIS ACTUAL

| Gold Future | | Carbon Future | | CNX –NIFY Index | |
|---------------|---------------|---------------|---------------|-----------------|---------------|
| Closing Price | 667.03 | Closing Price | 324.09 | Closing Price | 935.08 |
| FR-2 | 642.50 | FR-2 | 322.28 | FR-2 | 934.29 |
| FR-7 | 603.96 | FR-7 | 361.25 | FR-7 | 960.42 |
| FR-15 | 501.45 | FR-15 | 328.31 | FR-15 | 929.52 |

FR: Forecasting Return

Using the fuzzy Association rules the study as forecasted future prices of Gold future, Carbon future and CNX Nifty Index. The rule based fuzzy logic has provided very close approximation of forecasted price with its actual price. However after going through the Standard deviation of actual, against the various rules based combinations of forecasted price, it is found that for Gold future the inputs combination R0 and R2, from Carbon future the inputs combination R0 and R2 and CNX Nifty Index future the inputs combination R0 and R2 provide the optimum forecast.

CONCLUSION

The study has used fuzzy logic based inference system to capture the historical movements of Gold prices, Carbon future and CNX Index, so as to, predict the future movements. The inferences have been designed to capture the time varying sigma and factor the variability for the prediction of movements. In place of single input series, the study has used multiple input series of same data through different periods of moving averages and factored the variability with time varying sigma. The system, so designed, is quite robust and the predictions are quite accurate once number of input series increases over time. Additional human knowledge or core information can be incorporated in the system easily and quickly in the form of rules without, thus the final mode can also incorporate the core data knowledge as well as any input from an experienced user. It's easy in use and setting up makes it more meaningful and useful for analysts. The study can further be extended by designing different FIS which can capture the minute cyclical movement of input series by factoring the wavelength of each minute cycle. In place of 'day closing' data we can also consider minute-wise/high frequency data to capture the non-linearity of the series movements.

REFERENCES

- Agrawal, Rakesh; Imielinski, Tomasz; Swami, Arun (1993): "Mining Association Rules between Sets of Items in Large Databases," Proceedings of the 1993 ACM SIGMOD International Conference on Management of Data, 22(2), 207-16.
- Agrawal, Rakesh; Srikant, Ramakrishnan (1994): "Fast Algorithms for Mining Association Rules," Proc. 20th Int. Conf. Very Large Data Bases, VLDB.
- Alex A. Freitas (1998), "Data Mining and Knowledge Discovery with Evolutionary Algorithm," Springer.
- Alex Berson, Stephen Smith, Kuert Thearling (1999), "Building Data Mining Application for CRM," Mc Grow -Hill.
- Bakk. Lukas Helm, Priv. Doz. Dr. Michael Hahsler (2007), "Fuzzy Association Rules An Implementation in R," Vienna, 2.8.2007.
- Christer Carlsson, Mario Fedrizzi, Robert Fuller (2004), "Fuzzy Logic in Management," Kluwer Academic Publishers.
- Earl Cox (2005), "Fuzzy Modelling and Genetic Algorithms for Data Mining and Exploration," Elsevier Inc.
- Francis Eng-Hock Tay, Francis Tay Eng Hock, Lixiang Shen, Lijuan Cao, "Ordinary shares. exotic methods: Financial Forecasting using Data Mining Techniques," World Scientific publication.
- George J. Klir, Bo Yuan (1995), "Fuzzy Sets and fuzzy Logic Theory and applications," Prentice Hall PTR.
- Gyenesei, A. (2000): "Mining Weighted Association Rules for Fuzzy Quantitative Items," Proceedings of PKDD Conference, 416-423.
- http://economictimes.indiatimes.com/India_gets_43_Of_Carbon_Credits/articleshow / 2245328.cms
- J.F. Baldwin, (1996), "Knowledge from data using fuzzy methods," Pattern Recognition Letters, vol. 17, pp 593-600.
- Kuok, Chan Man; Fu, Ada; Wong, Man Hon (1998), "Mining Fuzzy Association Rules in Databases," SIGMOD Record Volume 27.
- L.A. Zadeh, (1968), "Fuzzy algorithms," Info. & Ctl., Vol. 12, pp. 94 -102.
- L.A. Zadeh, (1984), "Making computers think like people," IEEE. Spectrum, 8/1984, pp. 26 - 32.
- L.A. Zadeh, (1965), "Fuzzy Sets," Information and Control, Vol. 8, pp. 338-353, 1965
- L.A. Zadeh, (1973), "Outline of a new approach to the analysis of complex systems and decision processes," IEEE Transactions on Systems, Man, and Cybernetics, Vol. 3, No. 1, pp. 28-44, Jan. 1973.
- L.A. Zadeh. (1996), "Fuzzy Logic = Computing With Words," IEEE Transactions on Fuzzy Systems, Vol. 4, pp. 103-111. IEEE Press, Piscataway, NJ, USA.
- Maeda, A., Ashida, H., Taniguchi, Y. and Takahashi, Y. (1995), "Data Mining System using Fuzzy Rule Induction," Proceedings of 1995 IEEE International Conference on Fuzzy Systems.
- Rakesh Agrawal, Ramakrishnan Srikant, (1994), "Fast Algorithms for Mining Association Rules in Large Databases," VLDB, 1994, pp. 487-499.
- Sotiris Kotsiantis, Dimitris Kanellopoulos, (2006), "Association Rules Mining: A Recent Overview," GESTS International Transactions on Computer Science and Engineering, Vol.32 (1), pp. 71-82
- Srikant, Ramakrishnan; Agrawal, Rakesh (1996), "Mining Quantitative Association Rules in Large Relational Tables," SIGMOD Conference, pp. 1-12.

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I am sure that your feedback and deliberations would make future issues better – a result of our joint effort.

Looking forward an appropriate consideration.

With sincere regards

Thanking you profoundly

Academically yours

Sd/-

Co-ordinator