



SELECTION OF INVESTMENT SCHEMES USING FUZZY INFERENCE SYSTEM

Vikas Mongia

Head, Department of Computer Science, Guru Nanak College, Moga.

Abstract

Invest in right scheme prediction is a main issue of every concerned person. An investment becomes optimal if it gives maximum return in respect to your investment. There are several ways to approach investment goals. Some investors focus on generating highest possible returns, while staying within their comfort zone in term of risk. While other believes in goal based investment. This emphasizes investing with the objective of reaching specific life goals. This paper deals with the extraction of information from the experts to automatically identify and recognize the investment option according to your input parameters. Fuzzy Inference system is implemented to make the rules using Experts knowledge on investment scheme. The optimal investment can be predicted by five inputs and three outputs.

Keyword: FIS, Expert rules, PCA, Investment Option.

INTRODUCTION

Investment refers to the commitment of funds at present, in anticipation of some positive rate of return in future. Investment is very important because it helps to grow our money. But, the major in India is lack of awareness. So many investment options like bank deposits, mutual funds, equity, shares, gold, post office investments etc. are available in market but people are not aware of best scheme for their investment. In this study, investment options considered are short term mutual funds (MFS), long term mutual funds (MFL), short term fixed deposits (FDS), long term fixed deposits (FDL), share market (SM), and public provident fund (PPF).

Mutual funds are those funds that are collected from many investors to invest in securities such as stocks, bonds and money markets [1]. They are operated by money managers. One major benefit of mutual funds is that it is suitable for those investors that do not have awareness of market trends but have risk tolerance power. Mutual fund schemes can be classified as short term mutual funds termed as MFS and long term mutual funds termed as MFL. Selection between MFS and MFL depends upon various attributes such as Investment purpose like (income, growth, tax saving) and loan facility requirement because loan facility is generally not available in many MFS schemes.

Share Market termed as SM is another good option of investment that gives huge returns if the investment is done meticulously. This investment scheme is good for those investors that have good knowledge of share market and have high risk tolerance power [2]. Because, this investment in shares gives no guarantee that you will actually realize any sort of positive return.

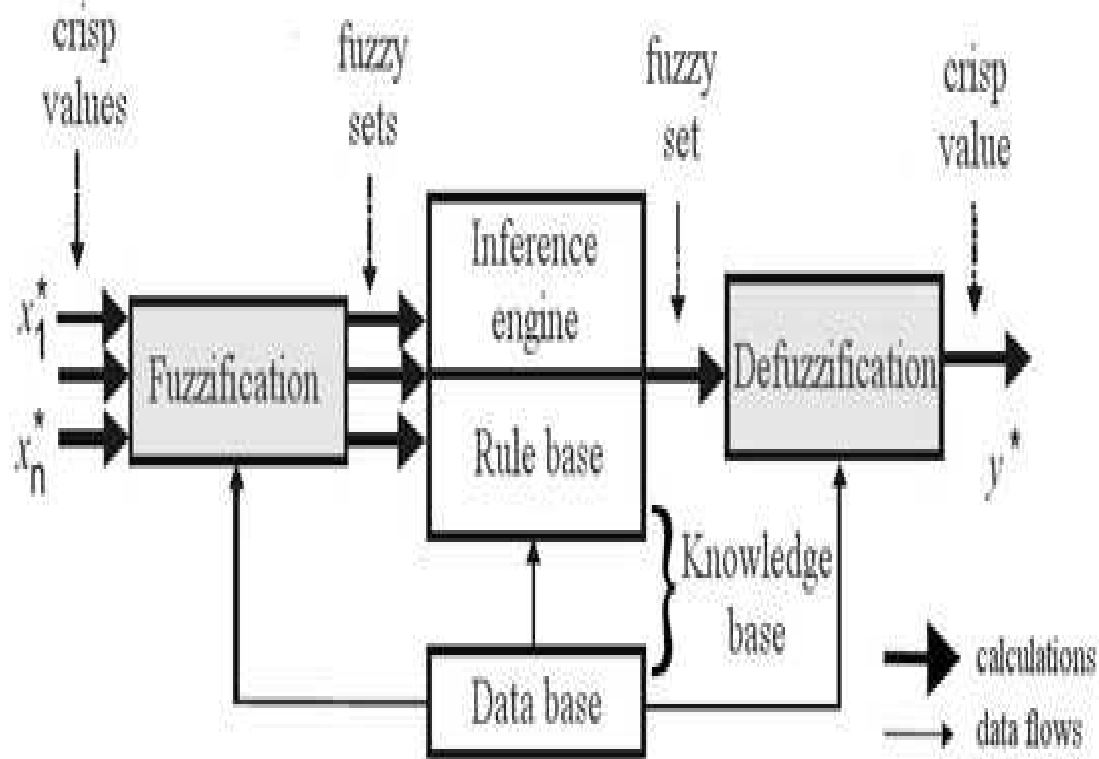
A fixed deposit is a financial instrument provided mainly by banks [3]. This is beneficial for savings because it gives saving and investment option for short and long period. Fixed deposits can be short term fixed deposits termed in this study as FDS and long term fixed deposits termed as FDL. Tenure of FDS varies from 7, 15 or 45 days to 1.5 year. FDL have tenure more than 1.5 year to 10 years. Some FDL's having tenure of 5 years and above also gives tax rebates to investors.

Public Provident Fund termed as PPF is another ideal investment scheme. PPF account is opened for the tenure of 15 years. It gives tax saving benefits to the investors. Another benefit of PPF is safe deposits and loan facility available against your deposits.

III FUZZY INFERENCE SYSTEM FOR INVESTMENT SCHEME

Negevitsky [4] mentioned that FIS is the process of formulating the mapping from input to an output. FIS is a composition of four components: fuzzy set, fuzzy membership function, fuzzy logic operation and production rules. [5] Fuzzy set is a set that does not contain crisp in it. It does not have clear boundaries. Membership function is a curve that shows mapping of inputs to outputs. Membership functions in FIS are trimf, trapmf, gaussmf, gauss2mf, gbellmf. Trimf and trapmf are used in this research [6]. FIS can be implemented using mamdani FIS and sugeno FIS. In this research, mamdani FIS is implemented with five input and two output. This research will help to determine the Best investment for investor.

Fig. 1 Block diagram of FIS [9]



This conclusion is made on the basis of rules as:

- If awareness = 'Low'
- AND Risk_tolerance = 'Low'
- AND Time_horizon = 'Long'
- AND Income = 'High'
- AND age = 'Young'
- THEN Investment_scheme = 'PPF'

IV. OUR APPROACH

As it is very difficult as well as computationally expensive to process the whole data set, so the first phase consists of dimensionality reduction by means of PCA. It is very important to reduce the dimension of the data set as it makes computationally efficient. In this paper Principal component analysis (PCA) has been used to evaluate the worth of a variable with respect to the choice (Investment option). PCA technique arranges these variables in descending order according to their rank and last three variables (Loan facility, Gender, Purpose of investment) have been removed out of eight variables. Only five variables i.e. Age, Risk_Tolerance, Awareness, Income, Time Horizon are considered for this study.

In this work, Mamdani FIS is implemented with MIN and MAX operators. Trimf and Trapmf functions are used to represent inputs and outputs. Centroid defuzzification is applied at the defuzzification stage. Dubois, D. and H. Prade [6] describes that it is not possible to use fuzzy results directly in the applications. Centroid defuzzification is used to convert fuzzy quantities into crisp quantities [7]. There are many other defuzzification methods such as weighted fuzzy mean, mean of maximum etc. Various rules have been designed to predict the investment decision for an investor. The AND operator is used to join these rules. The total number of final rules produced is 20.

The input attributes considered for the analysis of investment decision are: Age of customer, Income of investor, Risk tolerance, Awareness of investment options, Purpose of investment and Time horizon. On the basis of these input parameters, three output parameters are considered i.e. Bank, Market and PostOffice. Following figures show how the input and output parameters can be used in a fuzzy toolbox to make optimal investment.



Fig.1 FIS Model for Investment Decision

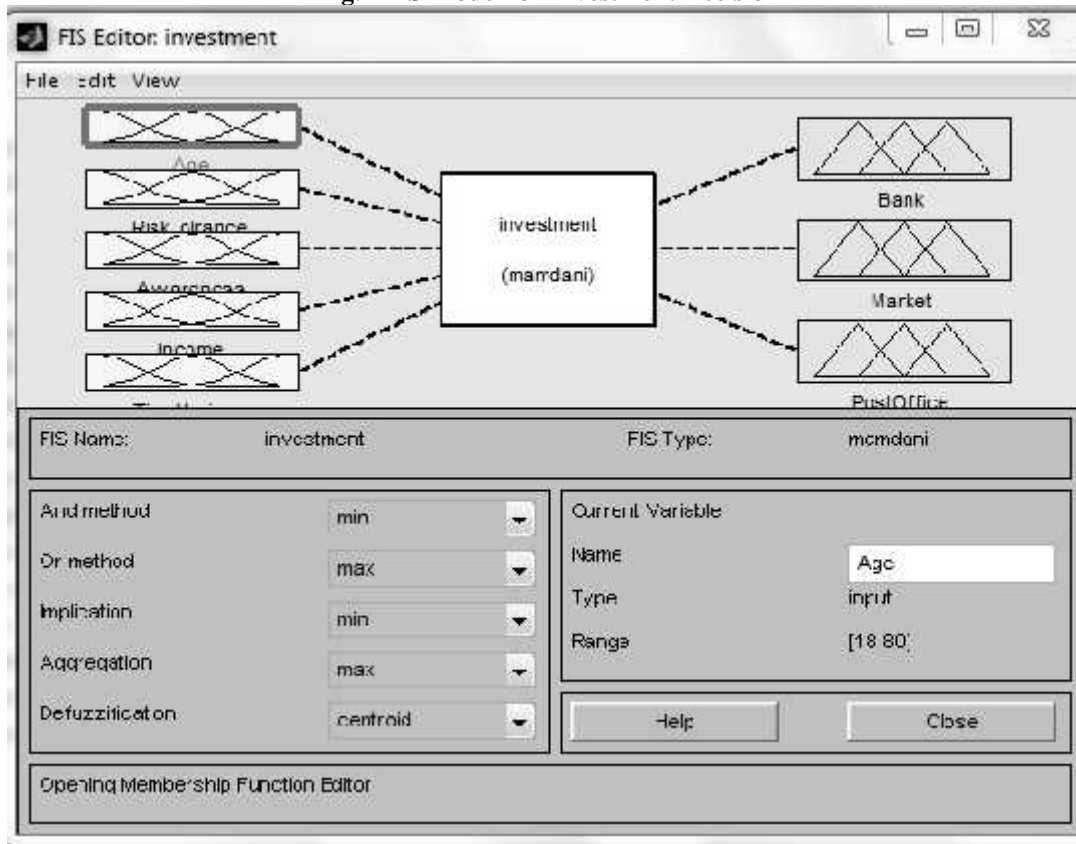


Fig. 2 Example of trapmf member function for Age

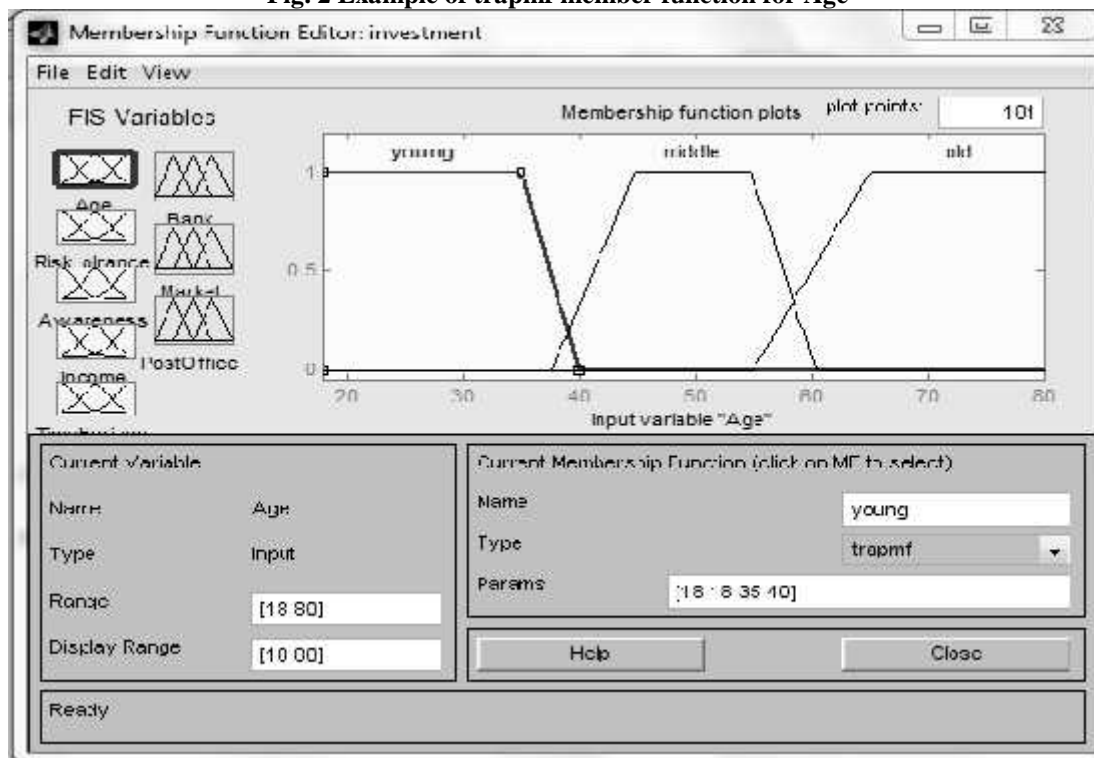




Fig. 3 Example of trapmf member function for Risk Tolerance

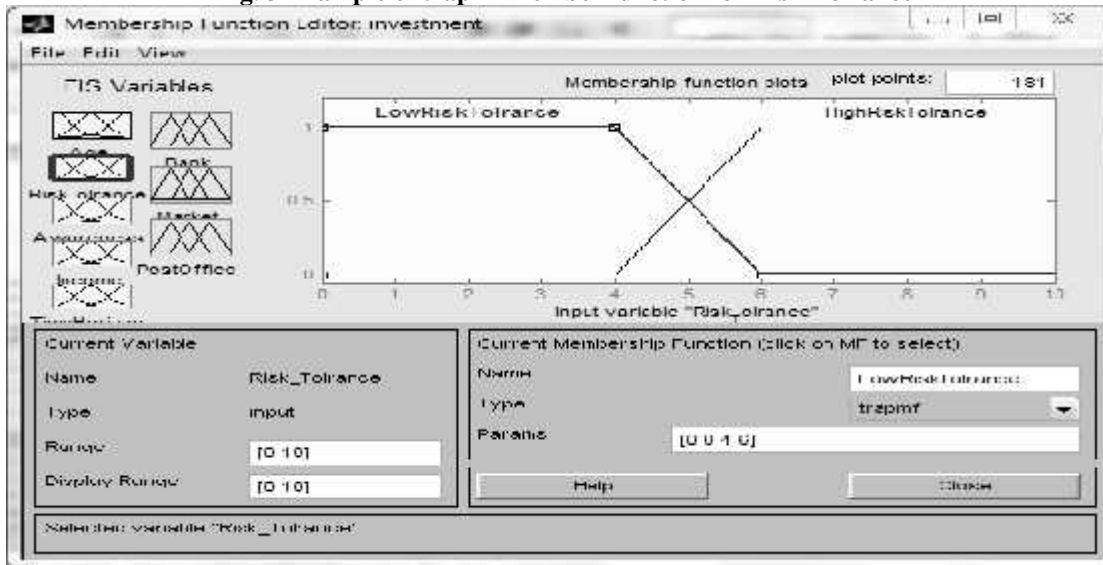


Fig.4 Example of trapmf member function Awareness

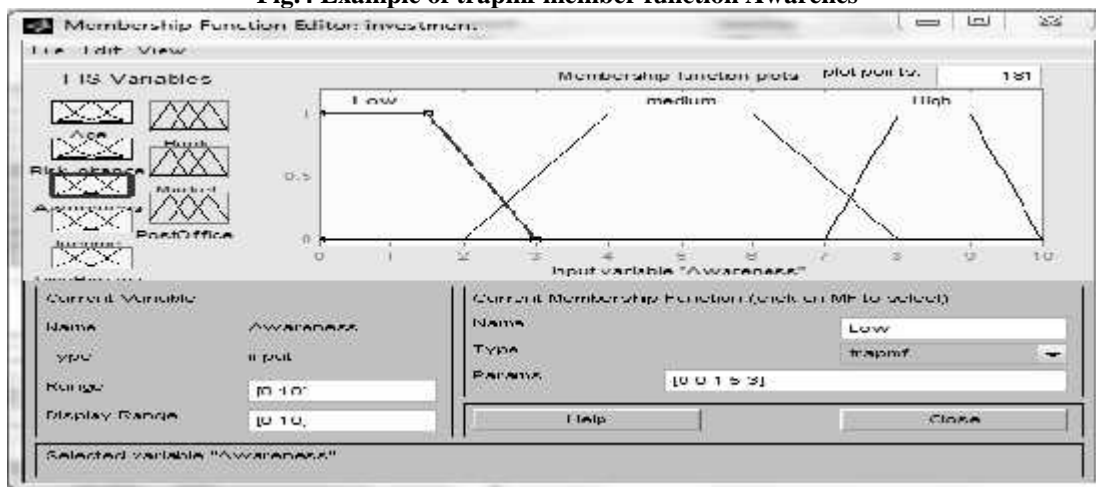


Fig. 5 Example of trapmf member function for Income

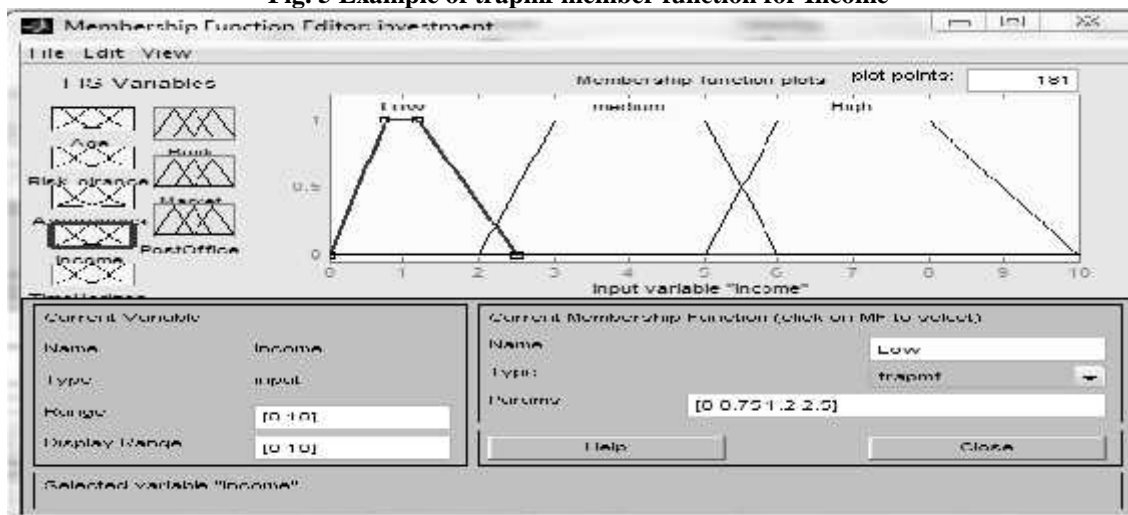
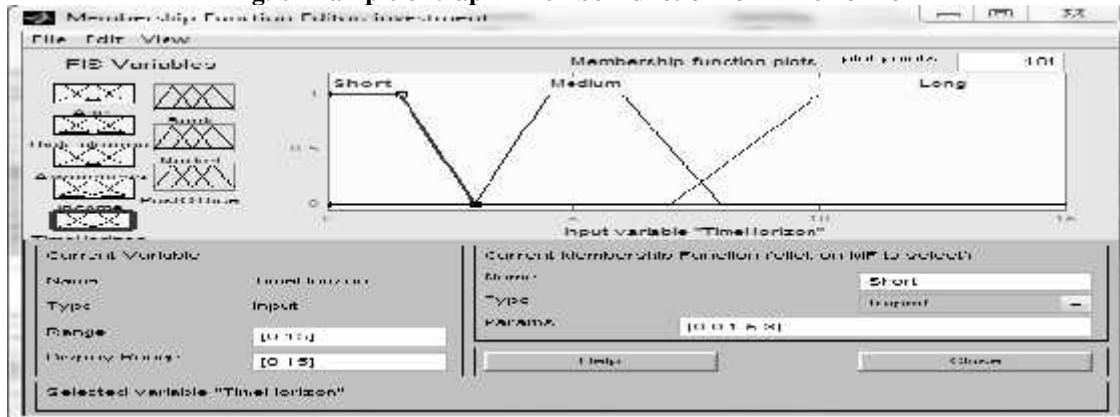




Fig. 6 Example of trapmf member function for TimeHorizon



Attribute 'Age' has domain values {young, middle, old}. Domain value 'young' has range 20-35 years and the range of domain values 'middle' and 'old' lies between 36-55 and 55 onwards respectively.

Another attribute 'Risk_tolerance' describes the risk taking ability of the investor. According to experts, people with high risk tolerance ability prefer to invest their money in stock market or mutual funds. Domain values of this attribute are {Low,High}.

'Awareness' is another attribute which specifies awareness of the customer to the present investment options. {Low, Medium and high} are the domain values of this attribute.

Domain values of attribute 'Income' are {low, medium, high}. Investor having their annual income under 200,000 comes under domain value 'low'. Range of 'medium' and 'high' is 2-5 Lac and above 5 Lac per annum respectively.

Another attribute 'purpose' has domain values {tax_saving, investment}. The investor whose primary objective is tax saving prefers those schemes that gives tax rebates under section 80C. Schemes for tax rebate considered in this study are PPF account, FDL and MFL.

Another scheme 'Time_horizon' attribute specifies the time duration for which investment is to be done. This attribute has domain values {short, medium, high}. Range of domain value 'short' is less than 3 years. It is 3-7 years for 'medium' and more than 7 years for 'high' domain value. The defuzzified output f is calculated based upon input parameters. In this research three defuzzified outputs Bank, PostOffice and Market are produced. The member functions of these outputs are shown in the following figures.

Fig. 7 Example of trapmf output member function for Investment option Bank

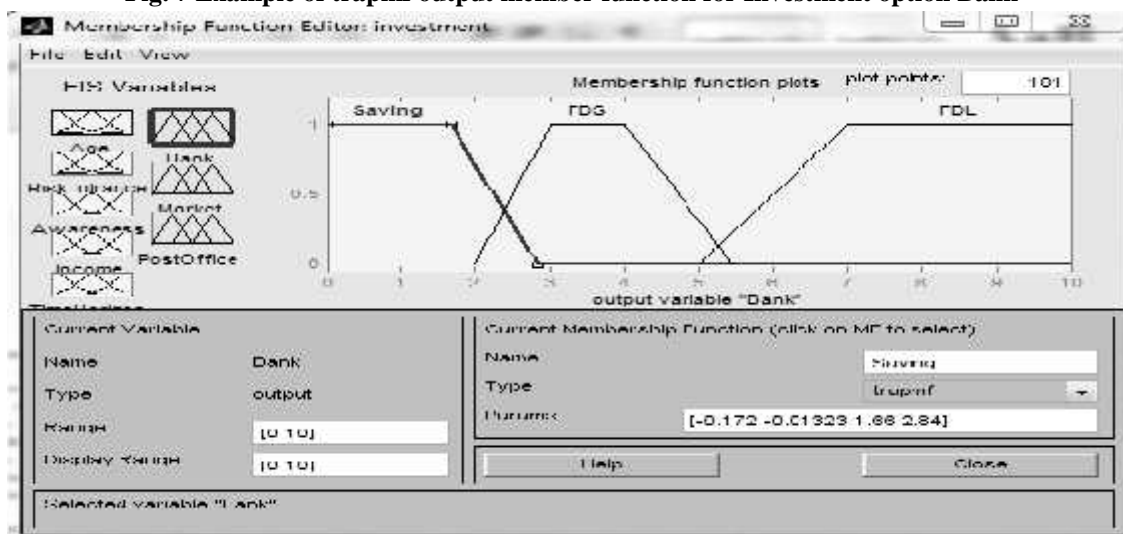




Fig. 8 Example of trapmf output member function for Investment option Market

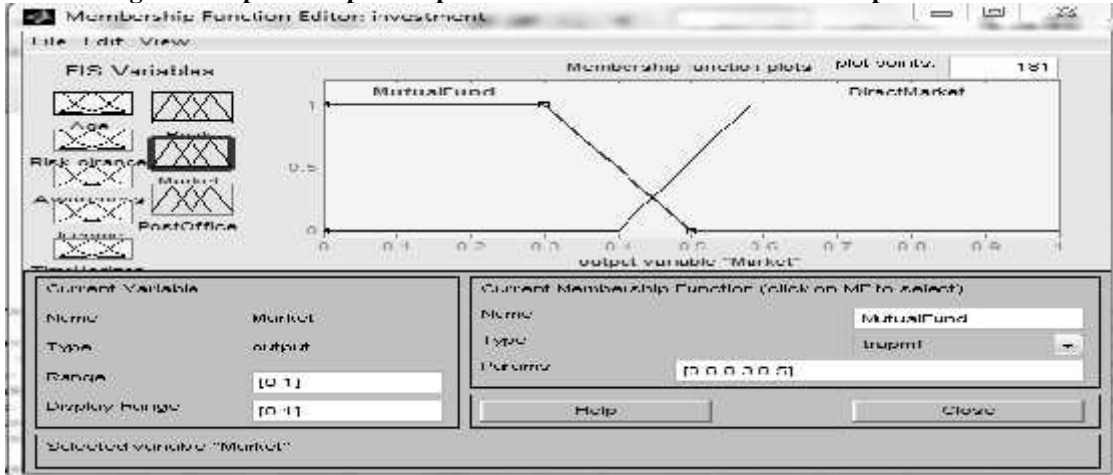
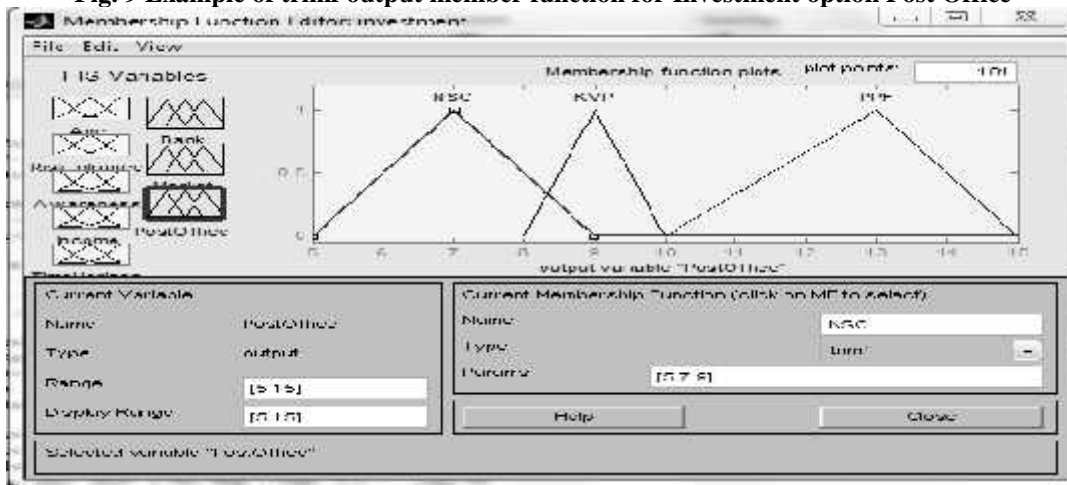


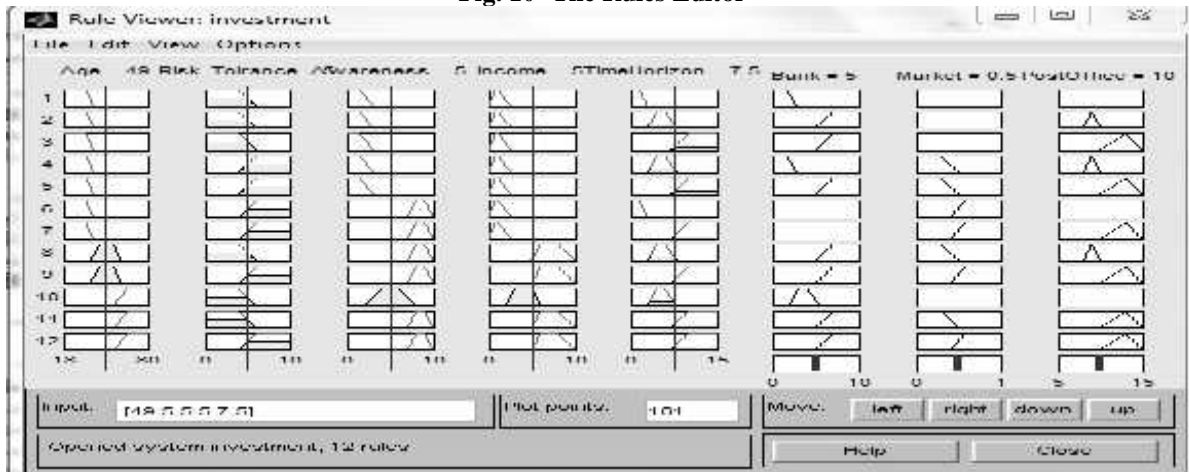
Fig. 9 Example of trimf output member function for Investment option Post Office



Result and Discussion

In this study data has been collected from different persons through questionnaires and interviews. And knowledge is acquired from various domain experts in investment area. On the basis of expert knowledge some rules are defined which improve the decision of investor. Then the result is analyzed on the basis the data has been performed. The results which have been obtained from Matlab Fuzzy Toolbox are shown below in Fig.10. This figure shows the effects of the inputs to the output. Figure shows the how investment decision is varied with the input variables

Fig. 10- The Rules Editor





CONCLUSION

This research shows that investor having lack of awareness and do not want to take risk, invest in banks and post office's schemes. The research also reveals that if investor has high income to invest then he can invest partially in different schemes. A supervised learning has been implemented in the study. A user interface has been provided to the user to input various parameters. On the Basis of these parameter an output showing best investment scheme for the investor is displayed on the screen.

FUTURE SCOPE

This approach is capable to handle multivariate data which makes it suitable for many other applications. This research is not bounded to particular area. In this work, this optimal technique is applied to improve accuracy of investment decisions. But, other applications like Analysis of education patterns, Human talent management, risk evaluation etc.

REFERENCES

1. Dr.Binod Kumar Singh“ A study on investors’ attitudetowards mutual funds as an investment option”, International Journal of Research in Management ISSN 2249-5908 Issue2, Vol. 2 (March-2012).
2. S. Saravana Kumar in his article “An Analysis of Investor Preference towards Equity and Derivatives” published in The Indian journal of commerce, July-September 2010.
3. Income Tax and Investment Journal – (AY-2008-09)–by A.N. Agarwal (Income tax expert), Rajesh Agrwal(CA), Sanjay Kulkari (CA), and Dr. Gajanan Patil.- ABC Publication- Nagpur.
4. Ho, G. T. S., H. C. W. Lau, et al. (2006). "An intelligent production workflow mining system for continual quality enhancement." The International Journal of Advanced Manufacturing Technology 28(7):
5. L. A. Zadeh, “Fuzzy set”, *Information and Control* 8: 338-353, 1965.
6. Quality improvement of leather tanning process using a novel sensor. Kasturi, V. ; Sch. of Eng. & Adv. Technol., Massey Univ., Palmerston North ; Mukhopadhyay, S.C. IEEE 2008.
7. Timothy J. Ross, “*Fuzzy Logic with Engineering Application*” Third Edition.
8. Nur Atiqah Rochin Demong, Jie Lu and Farookh Khader Hursain, ‘Multidimensional and Data Mining Analysis for Property Investment Risk Analysis’ World Academy of Science, Engineering and Technology vol:6 2012-12-21
9. Meenakshi Chaturvedi and Shruti Khare, study of saving pattern and investment preferences of individual household in india, volume no. 3 (2012), issue no. 5 (may), *issn 0976-2183*.