Int. J. of Mathematical Sciences and Applications,
Vol. 1, No. 3, September 2011

www.journalshub.com

APPLICATION OF FUZZY SOFT SETS TO INVESTMENT DECISION MAKING PROBLEM

Dr.A.Kalaichelvi
Associate Professor
Department of Mathematics
Avinashilingam
Institute for Home Science and
Higher Education for Women
University
Coimbatore – 641 043
e mail: kalaichelviadu@yahoo.com

P.Haritha Malini
M.Phil. Scholar
Department of Mathematics
Avinashilingam
Institute for Home Science and
Higher Education for Women
University
Coimbatore – 641 043
e mail: hari24malini@ymail.com

ABSTRACT

Soft Set theory is one of the recent topics gaining significance in finding rational and logical solutions to various real life problems which involve uncertainty, impreciseness and vagueness. In this article the authors attempted to apply fuzzy soft sets to investment decision making problem based on the data collected from female employees working in both government and private sector undertakings located in Coimbatore city, Tamil Nadu, India.

INTRODUCTION

Decision making is the process of choosing the best among the alternatives available. It involves identification of various alternatives and systematic analysis of each alternative to identify one that serves best the accomplishment of the desired objective. The decision making process involves a series of activities viz. definition of goals to be achieved, identification of alternatives, analysis of each alternative, selection of the best alternative and evaluation of the outcome. Whether it is an ordinary day-to-day decision or critical and sensitive decision, application of suitable decision making models ensures that the decision taken are rational and logical and serves best the objectives intended for.

Here the authors have attempted to develop a model, using Fuzzy Soft Sets, for 'Investment Decision'. Investment refers to activity involving commitment of funds, usually surplus funds, with an intention to earn return at an expected rate. An investor has various alternative avenues of investment for his savings to flow in accordance with his preference. A wise investor knows that money is losing its value by passage of time due to rise in prices or inflation. So he prefers to invest his funds in select avenues that fetch return, atleast sufficient enough to compensate such inflationary effects.

BASIC DEFINITIONS

Definition 1[1]: Let U be a nonempty finite set of objects called universe and let E be a nonempty set of parameters. An ordered pair (F, E) is said to be a Soft setover U, where F is a mapping from E into the set of all subsets of U. That is, $F : E \rightarrow P(U)$.

It has been interpreted that a soft set indeed is a parameterized family of subsets of U.

Example 1[2]: Let $U=\{c_1,c_2,c_3\}$ be the set of three cars and E ={costly(e_1), metallic colour(e_2),cheap(e_3)} be the set of parameters ,where $A=\{e_1,e_2\} \subset E$. Then$(F,A)=\{F(e_1)=\{c_1,c_2,c_3\},F(e_2)=\{c_1,c_3\}\}$is the crisp soft set over U which describes the " attractiveness of the cars" which Mr. S(say) is going to buy .

Definition 2[3]: Let U be a universe. A fuzzy set X over U is a set defined by a function μ_x representing a mapping $\mu_x : U \rightarrow [0,1]$. Here, μ_x called membership function of X, and the value $\mu_x(u)$ is called the grade of

membership of $u \in U$. The value represents the degree of ubelonging to the fuzzy setX. Thus, a fuzzy set X over U can be represented as follows,

$$X = \{(u/(\mu_x(u)):u \in U, \mu_x(u) \in [0,1]\}$$

The set of all the fuzzy sets over U will be denoted by F(U).

Definition 3[2]: Let U be a universal set, E a set of parameters and A⊂E. Let F(U) denotes the setof all fuzzy subsets of U. Then a pair (F,A) is called fuzzy soft set over U, whereF is a mapping from A to F (U).

Example 2[2]: Let U={c_1,c_2,c_3} be the set of three cars and E ={costly(e_1), metallic colour(e_2),

getup (e_3)} be the set of parameters,where A= {e_1,e_2}⊂E. Then

(G,A)={G(e_1)={c_1/0.6,c_2/0.4,c_3/0.3},G(e_2)={c_1/0.5,c_2/0.7,c_3/0.8}} is the fuzzy soft setover U describes the " attractiveness of the cars" which Mr. S(say) is going to buy.

Definition 4[4]: Let (F,A) and (G,B) be two fuzzy soft sets over a common Universal set. Then a relation R of (F,A)on (G,B) may be defined as a mapping R **:** $A \times B \rightarrow P(U^2)$ such that for each $e_i \in A$, $e_j \in B$ and for all $u_l \in F(e_i)$, $u_k \in G(e_j)$, the relation R is characterized by the following membership function, $\mu_R(u_l, u_k) = \mu_{F(e_i)}(u_l) \times \mu_{G(e_j)}(u_k)$, where $u_l \in F(e_i)$, $u_k \in G(e_j)$.

APPLICATION OF FUZZY SOFT SETS

In order to apply the concept of Fuzzy Soft Sets to Investment Decision Making problem, data were collected using convenient sampling technique from hundred female employees working in both government and private sector undertakings located in Coimbatore, Tamil Nadu, India.

Based on the response from the sample respondents the authors identified the following factors that influence their investment decision and also the various avenues of investment they prefer.

Factors influencing investment decision

P_1 – Safety of funds:

It is certainty of return on capital and the assurance of protection to the funds invested under changing conditions.

P_2 – Liquidity of funds:

It refers to the easy conversion of investment into liquid cash to meet any finical requirements of the investor without loss of time.

P_3 – High returns:

It is the basic objective of an investor. He aims higher return that facilitates rapid growth of funds invested.

P_4 – Maximum profit in minimum period:

The choice of investment is influenced by the relation between period of investment and rate of return. Investors choose investment avenues in which higher return is possible in shorter period of time.

P_5 – Stable return:

It refers to the consistent return from investment. If the return from investment is volatile in nature, the choice of investor may prove to be wrong when he could realize only a low rate of return.

P_6 – Easy accessibility:

It refers to the physical location of the institutions offering investment avenues and also the simplicity of procedures and formalities involved in the process of investment.

P_7 – Tax concession:

Certain investments and returns from investments are eligible for deduction under income tax. An investor who is particular to avail tax concession prefers such eligible investments.

P_8 – Minimum risk of possession:

It refers to the risk due to theft or dispute in title.

INVESTMENT AVENUES

Following are the investment avenues which are mostly preferred by the sample respondents

I_1 – Bank Deposit

I_2 – Insurance

I_3 – Postal Savings

I_4 – Shares and Stocks

I_5 – Mutual Fund

I_6 – Gold

I_7 – Real Estate

To apply Fuzzy Soft Sets to this investment decision problem, consider the various investment avenues as the universal set U={ I_1, I_2, I_3, I_4, I_5, I_6, I_7 } and the factors influencing investment decision as the set of parameters E (i.e) E={ P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8 }.

Based on the opinion of the respondents, the Fuzzy Soft Sets (F_i , P_i), i = 1 to 8 were framed by considering the membership value $\mu_{F_i(P_i)}$ (I_j) as the ratio between the number ofrespondents who opined the presence of the factor P_i on the investment avenue I_j and the total number of respondents.

(F_1, P_1) = F_1(Safety of funds) = {I_1/1, I_2/0.9, I_3/1, I_4/0.2, I_5/0.3, I_6/0.8, I_7/0.4}

(F_2, P_2) = F_2(Liquidity of funds) ={I_1/1, I_2/0.5, I_3/0.7, I_4/0.9, I_5/0.8, I_6/1, I_7/0.5}

(F_3, P_3) = F_3(High Returns)={I_1/0.5, I_2/0.5, I_3/0.5, I_4/0.7, I_5/0.6, I_6/0.8, I_7/0.9}

(F_4, P_4) = F_4(Maximum profit in minimum period) ={I_1/0.4, I_2/0.2, I_3/0.4, I_4/0.8, I_5/0.6, I_6/0.7, I_7/0.7}

(F_5, P_5) = F_5(Stable Return)= {I_1/1, I_2/1, I_3/1, I_4/0.1, I_5/0.1, I_6/0.3, I_7/0.2}

(F_6, P_6) = F_6(Easy accessibility) ={I_1/1, I_2/0.9, I_3/1, I_4/0.7, I_5/0.7, I_6/1, I_7/0.6}

(F_7, P_7) = F_7(Tax concession)= {I_1/0.7, I_2/0.9, I_3/0.9, I_4/0.3, I_5/0, I_6/0, I_7/0}

(F_8, P_8) = F_8(Minimum risk of possession)= {I_1/1, I_2/1, I_3/1, I_4/0.9, I_5/0.9, I_6/0, I_7/0.1}

The authors developed a decision making model using fuzzy soft relations by considering a set of factors preferred by an investor to identify the investment avenue that suits best requirements of the said investor.

Case 1: Preference of Investment Factors by the investor X -

Safety of Funds (P_1) and High Returns (P_3).

The problem can be solved by virtue of the definition 4, a fuzzy soft relation (R,C)among the fuzzy soft sets (F_1, P_1)and (F_3, P_3) of the investment avenues which ensures Safety of funds and High returns is formed.

(R,C) = R (Safety of Funds, High Returns)

= {I_1/0.5, I_2/0.45, I_3/0.5, I_4/0.14, I_5/0.18, I_6/0.64, I_7/0.36}

Therefore, the investment avenue which best satisfies the requirement of investor X is the investment avenue which has the largest membership value in the above relation. Here I_6 has the largest membership value (0.64). Hence Gold best suits the requirement of investor X.

In the same manner the choice of investment avenue of any investor can be arrived at depending on any set of factors preferred by such investor. Some of such are given below:

Case 2: Preference of Investment Factors by the investor Y -

Liquidity of Funds (P_2), Maximum profit in minimum period (P_4) and Minimum risk of possession(P_8).

(R,C)=R(Liquidity of Funds, Maximum profit in minimum period, Minimum risk of possession)

$= \{I_1/0.4, I_2/0.10, I_3/0.28, I_4/0.648, I_5/0.432, I_6/0, I_7/0.035\}$

Here I_4 has the largest membership value (0.648). Hence Shares and Stocks best suits the requirement of investor Y.

Case 3: Preference of Investment Factors by the investor Z -

Liquidity of Funds (P_2), Stable Return (P_5), Easy accessibility (P_6) and Tax concession (P_7).

(R,C) = R (Liquidity of Funds, Stable Return, Easy accessibility, Tax concession)

$= \{I_1/0.7, I_2/0.405, I_3/0.63, I_4/0.0189, I_5/0, I_6/0, I_7/0\}$

Here I_1 has the largest membership value (0.7). Hence Bank Deposit best suits the requirement of investor Z.

CONCLUSION

Inthe real life situations there are vast number of problems that warrant rational, logical and scientific decisions that fit best for the accomplishment of desired objective. The concept of fuzzy soft sets has rich potentials for developing such decision making models suitable for personal, social, technical, commercial and managerial issues.

REFERENCES

1. English Kuppusamy Ramamoorthy Nagarajan and Ganesamoorthi Meenambigai, “An Application of Soft Sets to Lattices” Kragujevac Journal of Mathematics, Vol.35, No.1, pp.75-87, 2011.
2. B.Chetia and P.K.Das, “An Application of Interval-Valued Fuzzy Soft Sets in Medical Diagnosis” Int. J. Math. Sciences, Vol.5, No.38, 2010.
3. Naim Cagman, Filiz Citak and Serdar Enginoglu, “Fuzzy Parameterized Fuzzy Soft Set theory and its application” Turkish Journal of Fuzzy Systems Vol.1, No.1,pp.21-35, 2010.
4. Arindam Chaudhuri, Dr.Kajal De and Dr.Dipak Chatterjee, “Solution of the Decision Making *Problems using Fuzzy Soft Relations”* International Journal of Information Technology, Vol.15, No.1, 2009.