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A SOFT SET BASED APPROACH FOR DECISION MAKING OF VARIOUS INVESTMENTS CHOICES IN THE CURRENT DYNAMIC SITUATION IN INDIA-POST REFORM ERA

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Abstract
In today's competitive environment, different kinds of investment avenues are available to the investors. All investment modes have advantages & disadvantages. An investor tries to balance benefits and shortcomings of different investment modes before investing. Right decision making is highly essential in such kind of problems. Usually mathematical models are too complicated and we cannot find the exact solution because various types of uncertainties present in these types of problems. In 1999 D. Molodtsov proposed theory of soft set for dealing with uncertainties and vagueness. Soft Set theory has been applied to data analysis and decision support system In this paper an attempt has been made to develop a soft set based model to solve a decision making problem of various investments choices according to investor's preferences.
***Keywords:* -** Soft Set, Choice Value, Decision Matrix, Investment Avenues

1. Introduction
The First Generation reforms had its origin in 1985 when the New Economic Policy declared emphasised on improvement in productivity, absorption of modern technology and fuller utilisation of capacity and finally on the greater role for the private sector.
Then there comes the manifestation of 'second generation reform' which referred to a general continuation of the process of economic reform and liberalisation initiated by the Centre at the behest of the International Monetary Fund in the early 1990s. Under the policy statement it was quoted 'developing countries should adopt a policy, the effectiveness of which can be tested against the criterion of whether the state is fulfilling ``its proper role in a market economy by creating a level playing field for all sectors and implementing policies for the common good, particularly social policies that will help to alleviate poverty and provide more equal opportunity. 'With the onset of the second generation reform process the Government pointed towards a systemic shift to a more open economy with greater reliance upon market forces, a larger role for the private sector including foreign investment, and a restructuring of the role of Government.
Currently India is under 3rd generation of reforms. An important feature of India's reform programme is that it has ***emphasized gradualism and evolutionary transition***, making it ready to emerge as a leader in the world economy.
With the series of multiple sides reshaping of Indian economy will result into the best version of the growing economy.
Though there may a plenty of issues to take as a major ingredient of discussion but the present paper holds its onus mainly on diverse investment options that are available in current changing scenario. Investment influences the rate of economic growth and growth factor also affects the level of investment in the respective economy. Therefore this paper finds a very good opportunity to analyse in a very unique

way variety of investment options that are available to individual investor in India. All investment modes have both the facets in the form of their advantages & disadvantage. An investor tries to balance these benefits and limitations of different investment modes before investing in them. The best option is likely a combination of products that balance risk with the potential for growth. Individual's investment strategy depends on one's investment goal and the ability to take risk. The higher the risk, the more return one can expect and vice versa. In such a situation, it is common for investors to get confused about how and where to invest. Keeping all these things in mind, we have picked up 12 investment avenues to suit the requirement of every type of investor, which can be relied on in the current scenario.

Listing of Investment options[9,10,11,12]

1- **PPF-** PPF are risk-free investments offering returns of about 9%.They are risk free because they are backed by the Government of India. Moreover, the interest earned is also tax free. Investment, subjected to the limit of Rs 1.5 lakh under 80C.
2- **Bonds offered by the Government and Corporates -** Bonds are another avenue that is risk free. The bonds offered by the government are risk free because the Government usually doesn't default on the payment. As far as corporate bonds are concerned, bonds offered by large firms with sound business models are preferable.
3- **Real Estate-** Various projects such as smart cities will provide ample opportunities to investors in the real estate sector. But investors should be careful of a few companies which are embroiled in controversies and legal battles with the government and consumers.
4- **NSC-**National Saving Certificate (NSC) is a saving bond by the Indian government, primary used for small savings and tax saving. NSC is a risk-free investment option. It is part of the Indian postal service. NSC has a fixed term of 5 years. The rate of interest is currently 7.9% compounded annually. Investment up to Rs 1,00,000 per annum qualifies for tax rebate under Section 80C of the Income Tax Act. There is no maximum limit for investment and the minimum limit is Rs 100. Saving certificates can also be used as collateral security to get a loan from banks. The interest received is taxable. NSC is a good investment option with low risk and for shorter investment horizons up to 5 years.
5- **Mutual Fund-** A mutual fund is an investment product that uses stocks to earn money for a large group of investors. The fund's manager pools money from investors and uses it to buy many stocks. Some mutual fund managers buy and sell shares of stock daily or even hourly. Mutual funds vary in their degree of risk, as well as the cost to investors, who must pay for the fund manager's expertise and efforts. A well-managed mutual fund can provide the benefits of stock investing without as much risk
6- **Commodities**-Investing in commodities involves predicting the future price of a product or resource. Commodities investors buy futures contracts, which represent the right to buy a commodity, such as crude oil, corn or wheat, for a set price at a given time in the future. If the commodity's price exceeds the amount on the contract, the investment pays off. Global supply and demand impact commodity prices, which makes investing in commodities a complex process with many variables.
7- **Investments in banks-** Fixed Deposit or FD is accrues 9.25% of annual returns for non-senior citizen, depending on the bank's tenure and guidelines, which makes it's widely sought after and safe investment alternative. The minimum tenure of FD is 15 days and maximum tenure is 5 years and above. Senior citizens are entitled for exclusive rate of interest on Fixed Deposits, current rate of return is average 10% annual.
8- **Investment in Insurance policies-** Insurance features among the best investment alternative as it offers services to indemnify your life, assets and money besides providing satisfactory and risk free profits. Indian Insurance Market offers various investment options with reasonably priced

premium. Some of the popular Insurance policies in India are Home Insurance policies, Life Insurance policies, Health Insurance policies and Car Insurance policies.Some top Insurance firm in India under whom you can buy insurance scheme are LIC, SBI Life, ICICI Prudential, Bajaj Allianz, Birla Sunlife, HDFC Standard Life, Reliance Life, Max NewYork Life, Metlife, Tata AIG, Kotak Mahindra Life, ING Life Insurance, etc.

9- **Investments in Stock Market-** Indian Stock market is very fluctuating. A smart portfolio positioned for long-term growth includes strong stocks from different industries. Before investing in stock market one should be prepared to assume risk equivalent to sum invested in the market. Investing in share market yields higher profits. Influenced by unanticipated turn of market events, stock market to some extent cannot be considered as the safest investment options. However, to accrue higher gains, an investor must update himself on the recent stock market news and events

10- **Investments in Equity-** Private equity is a type of asset consisting of equity securities in private companies that are not publicly traded on stock exchange. A private equity investment will generally be made by a private equity firm, a venture capital firm or an angel investor. Private Equity is expanding at a fast pace. India acquired US $13.5 billion in 2008 under equity shares and featured among the top 7 nations in the world. In 2010, the total equity investment is predicted to increase upto USD 20 billion. Indian equities promise satisfactory returns and have more than 365 equity investments firms functioning under it.

11- **Investment in Gold-** Gold does not carry much risk at least in India, the most traditional and the dominant form of investment in India is buying gold in India.

12- **Investment in MIS-** POMIS is a five-year investment with a maximum cap of Rs 9 lakh under joint ownership and Rs 4.5 lakh under single ownership. The interest rate is set each quarter and is currently at 7.8 per cent per annum, payable monthly. The investment in POMIS doesn't qualify for any tax benefit and the interest is fully taxable.

2. Literature Review

Bhaskaran et.al (2012) studied the behaviour of the investor to identify the better investment avenues available in India. The investment strategy is a plan, which is created to guide an investor to choose the most appropriate investment portfolio that will help them to achieve their financial goals within a particular period of time. By increasing personal wealth, investing can contribute to higher, overall economic growth and prosperity. The process of investing helps companies where they can raise their capital through financial markets. Specific types of investments provide other benefits for the investor, corporate as well as the society. The Indian investors are very much aware about the concept of portfolio allotments and risk and return of the investment. The mantra of the investment is „"Prevention is better than Cure" which is expected with more income but less risk

Joseph et.al (2014), studied the awareness level of the people on various investment opportunities, factors considered for investment. They suggested that every investor has to acquire a specific knowledge of various kinds of investment opportunities available in the financial market and appraisal of investment for avoiding loss[1].

Selvi (2015) studied investor's attitude towards investment avenues. She found that Indians are traditionally known for their orientation towards savings and preference for safe investments. Post independent India has been continuously witnessing higher rates of savings. The increase is more pronounced during the recent years. On the investment side, many new instruments have been introduced during the last two decades to attract the public. The advertisements for various investment schemes are not adequate, as majority of the respondents are aware of the various schemes only through parents, friends and relatives. family culture plays a dominant role in investments decisions. Among the conventional investment avenues, bank deposits and gold are the most preferred avenues, while insurance schemes and post office instruments are getting increased attention. Majority of the respondents have not preferred to invest their savings in UTI and Mutual funds which are the latest investment schemes and hence the government should take appropriate steps to persuade the investors to invest in the above schemes[8].

Ramanathan et.al (2016), comparative study was carried out based on the secondary data and the results proved that investing in Nifty indices are more profitable than investing in Gold ETF and physical form of gold. They suggested that the investors should go through the offer documents, scheme objectives and also performance analysis thoroughly before investing in Gold Exchange Traded Funds[4].

Kumar et.al (2017),studied level of awareness regarding investment avenues among educated working women. They found that role of women has undergone tremendous changes in the past few decades. Women have made a mark in all the sectors of Indian economy. They want and deserve equality and respect in society. The Constitution of India has also granted equal rights and status to women. The Government of India has implemented policies and programmes for women empowerment[5].

Priya et.al (2018) studied the investment preference of high net worth individual of selected manufacturing and services sector in Salem district. They analysed that how selection of investment preference got affected by demographic variables could help the individuals to improve their financial planning. It helps the individuals to understand about what are the factors which he needs to concentrate on to manage the finance well[7].

3. Preliminaries of Soft Set

Molodtsov initiated the concept of soft theory as a new mathematical tool for dealing with uncertainties which is free from difficulties. Soft set theory has a rich potential for applications in several directions, few of which had been shown by Molodtsov in his pioneer work[6] .

In this section, we present the notion and definitions of soft sets introduced by Molodtov

- **Definition of soft set**

Let *U* be a universal set and let E be a set of parameters. Let *P (U)* denotes the power set of *U*. A pair (*F*, *E*) is called a soft set over a given universal set *U*, if and only if F is a mapping of a set of parameters *E*, into the power set of *U*. That is, $F: E \to P(U)$. clearly, a soft set over *U* is a parameterized family of subsets of a given universe *U*. Also, for any $e \in E, F(e)$ is considered as the set of e-approximate element of the soft set (*F*, *E*)

- **Definition 2: Union, intersection and complement of soft set**

$Let\ [a_{ij}],[b_{ij}] \in SM_{m\times n}$.Then the soft matrix $[c_{ij}]$ is called

(a) union of $[a_{ij}]$ and $[b_{ij}]$, denoted by $[a_{ij}] \cup [b_{ij}]$, if $[c_{ij}] = \max\{a_{ij}, b_{ij}\}$ for all i and j

(b) intersection of $[a_{ij}]$ and $[b_{ij}]$, denoted by $[a_{ij}] \cap [b_{ij}]$, if $[c_{ij}] = \min\{a_{ij}, b_{ij}\}$ for all i and j

(c) complement of $[a_{ij}]$, denoted by $[a_{ij}]^{o}$, if $[c_{ij}] = 1 - a_{ij}$ for all i and j

4. Problem Formulation

Let $U = \{I_1, I_2, I_3, I_4, I_5, I_6, I_6, I_7, I_8, I_9, I_{10}, I_{11}, I_{12}\}$ be the set of investment plans

Where

U= universe of discourse, I_1 =Banks, I_2 =LIC, I_3 =PPF, I_4 =Bonds, I_5 =Mutual Funds, I_6 = Real Estate, I_7 =Commodity Market, I_8 =Gold, I_9 = Equity Shares, I_{10} = Future & Options, I_{11} = National Saving Certificates (NSC), I_{12} =Monthly Income Scheme (MIS)

And

$E = \{e_1, e_2, e_3, e_4, e_5\}$

where

e_1 = Safety, e_2 = Return, e_3 = Liquidity, e_4 = Convenience, e_5 = Tax Planning are the set of parameters.

Suppose that Mr. X wants to invest in U according to the chosen parameters (safety, return, liquidity, convenience, tax planning)
The problem is to select the best investment plan which is suitable with the choice parameters set by Mr.X

5. Decision Making Based on Soft Sets

❖ Algorithm

1. Input the soft set (F,E)
2. Input all possible combinations of choice parameters of investor which is a subset of E
3. Find choice value of Investment plan I_k
4. Find k, for which C_k = max C_i
   Then I_k is the optimal choice . If k has more than one value, then any one of them could be chosen by investor by using his/her option.

❖ Choice Value of an object h_i

The choice value of an investment plan $I_k \in U$ is C_i, given by

$$C_i = \sum_j I_{ij},$$

Where I_{ij} are the entries in the table of soft set

6. Result and Discussion

Table 1: Information Matrix of Investment Modes

U	Investment Modes	e_1 (Safety)	e_2 (Return)	e_3 (Liquidity)	e_4 (Convenience)	e_5(Tax Planning)
I_1	Banks	High	Low	High	High	Medium
I_2	LIC	High	Medium	Medium	Medium	High
I_3	PPF	High	Medium	Low	Medium	High
I_4	Bonds	Medium	Medium	Medium	Medium	Low

I_5	Mutual Funds	Medium	High	Medium	Medium	Low
I_6	Real Estate	High	High	Low	Low	High
I_7	Commodity Market	Low	Medium	Medium	Medium	Low
I_8	Gold	High	Medium	Medium	Medium	Medium
I_9	Equity Shares	Low	Medium	Low	Low	Low
I_{10}	Futures & Options	Low	Medium	Medium	Medium	Low
I_{11}	National Saving Certificates	High	Medium	Medium	Medium	High
I_{12}	Monthly Income Scheme	High	Medium	Medium	High	High

Table -1 shows information matrix of investment modes. Where (I_1, I_2,…..I_{12}) are different investment modes and (e_1, e_2…,e_5) are set parameters.

The mapping of each soft sets over U as follows:

$$(F,e_1)=\{\{low=I_7,I_9,I_{10}\};\{Medium=I_4,I_5\};\{High=I_1,I_2,I_3,I_6,I_8,I_{11},I_{12}\}\}$$

$$(F,e_2)=\{\{low=I_1\};\{Medium=I_2,I_3,I_4,I_7,I_8,I_{10},I_{11},I_{12}\};\{High=I_5,I_6,I_9\}\}$$

$$(F,e_3)=\{\{low=I_3,I_6,I_9\};\{Medium=I_2,I_4,I_5,I_7,I_8,I_{10},I_{11},I_{12}\};\{High=I_1\}\}$$

$$(F,e_4)=\{\{low=I_6,I_9\};\{Medium=I_2,I_3,I_4,I_5,I_7,I_8,I_{10},I_{11}\};\{High=I_1,I_{12}\}\}$$

$$(F,e_1)=\{\{low=I_4,I_5,I_7,I_9,I_{10}\};\{Medium=I_1,I_8\};\{High=I_2,I_3,I_6,I_{11},I_{12}\}\}$$

Let High =1, Low = 0, Medium = 0.5

Table 2: Quantification of Information Matrix of Investment Modes

	Investments	e_1	e_2	e_3	e_4	e_5
I_1	Banks	1	0	1	1	0.5
I_2	LIC	1	0.5	0.5	0.5	1
I_3	PPF	1	0.5	0	0.5	1
I_4	Bonds	0	0.5	0.5	0.5	0
I_5	Mutual Funds	0.5	1	0.5	0.5	0
I_6	Real Estate	1	1	0	0	1

I_7	Commodity Market	0	0.5	0.5	0.5	0
I_8	Gold	1	0.5	0.5	0.5	0.5
I_9	Equity Shares	0	0.5	1	0	0
I_{10}	Futures & Options	0	0.5	0.5	0.5	0
I_{11}	National Saving Certificates	1	0.5	0.5	0.5	1
I_{12}	Monthly Income Scheme	1	0.5	0.5	1	1

Table -2 shows quantification of information matrix of investment modes. Here 1 means high, 0 means 0 and 0,5 means medium

- **Multi-Soft Set Process**

The various possible combinations are constructed by taking chosen parameters, combination two parameters, combination of three parameters, combination of four parameters and combination of five parameters from the above mentioned parameters.

- **Decision Making by soft set**

Suppose that, an investor has chosen two parameters e1 and e2 according to their choice. It means he/she wants both maximum safety and maximum returns. So out of the available investments in U, he/she is to select that investment which qualifies with all (or with maximum number of) parameters of the soft set P

Let P= {e_1=Safety and e_2=Returns) of the set E

- **Tabular Representation of a soft Set.**

The soft set (F,P) above on the basis of the set P of choice parameters . We represent this soft set in a tabular form as shown below.

Table 3: Tabular Representation of a soft set (F,P)

U	e_1	e_2
I_1	1	0
I_2	1	0.5
I_3	1	0.5
I_4	0	0.5
I_5	0.5	1
I_6	1	1
I_7	0	0.5
I_8	1	0.5
I_9	0	0.5
I_{10}	0	0.5
I_{11}	1	0.5

I_{12}	1	0.5

Table 4: Choice Value of a soft set

U	e_1	e_2	Choice Value
I_1	1	0	1
I_2	1	0.5	1.5
I_3	1	0.5	1.5
I_4	0	0.5	0.5
I_5	0.5	1	1.5
I_6	1	1	2
I_7	0	0.5	0.5
I_8	1	0.5	1.5
I_9	0	0.5	0.5
I_{10}	0	0.5	0.5
I_{11}	1	0.5	1.5
I_{12}	1	0.5	1.5

Here Max $C_i = I_6$

Max of Min (e1 & e2) = I_6 (Real Estate)

Decision: An investor can invest in real estate if their choice parameters are safety and returns

Similarly we made other possible combinations of parameters. Decisions are shown in Table (5)

❖ **Decision Making by soft set using possible combinations of parameters**

Table 5: Summary Table of Soft Parameters and Investment Decision

SOFT PARAMETERS	INVESTMENT DECISION
F(SAFETY, RETURNS)	REAL ESTATE
F(SAFETY , LIQUIDITY)	BANK
F(SAFETY, CONVENIENCE)	BANK, MIS
F(SAFETY , TAX PLANNING)	LIC, PPF, REAL ESTATE, NSC,MIS
F(RETURNS , LIQUIDITY)	MUTUAL FUNDS, EQUITY SHARES
F(RETURNS, CONVENIENCE)	MUTUAL FUNDS, MIS
F(RETURNS,TAX PLANNING)	REAL ESTATE
F(LIQUIDITY, CONVENIENCE)	BANKS
F(LIQUIDITY , TAX PLANNING)	PPF, REAL ESTATE, NSC
F(CONVENIENCE, TAX PLANNING)	MIS

F(SAFETY, RETURNS, LIQUIDITY)	LIC, MUTUAL FUNDS, GOLD, NSC
F(SAFETY, RETURNS, CONVENIENCE)	MIS
F(SAFETY, RETURNS , TAX PLANNING)	REAL ESTATE
F(SAFETY, LIQUIDITY , CONVENIENCE)	BANKS
F(SAFETY, LIQUIDITY, TAX PLANNING)	BANK, LIC, NSC, MIS
F(SAFETY, CONVENIENCE, TAX PLANNING)	MIS
F(RETURNS, LIQUIDITY , CONVENIENCE)	BANK, MUTUAL FUND , MIS
F(SAFETY, LIQUIDITY , TAX PLANNING)	MIS
F(LIQUIDITY, CONVENIENCE, TAX PLANNING)	BANK , MIS
F(SAFETY, RETURNS, LIQUIDITY, CONVENIENCE)	BANK, MIS
F(SAFETY, RETURNS, LIQUIDITY, TAX PLANNING)	LIC, REAL ESATE, NSC, MIS
F(SAFETY, LIQUIDITY,CONVENIENCE TAX PLANNING)	BANK , MIS
F(LIQUIDITY,CONVENIENCE TAX PLANNING)	BANK, MIS
F(SAFETY,RETURNS LIQUIDITY,CONVENIENCE TAX PLANNING)	MIS

7. Conclusion

Soft set theory provides a very ideal solution even in case of Investment decision making situation. Though the financial objectives and perceptions vary from one investor to another still, with this paper we generalized the concept of soft sets in the field of different investment options in the current fast changing scenario. We have used multi soft set based model for supporting multicriteria group decision making. An application of investment plan has been used to solve a decision making problem of various investments choices according to investor's preferences. And the results found can be applied in generalized way in context to the respective parameter. This particular tool is having multi disciplinary approach, in order to extend this work; one can consider applying soft sets to multicriteria group decision making problems of different management field.

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