# An application of fuzzy soft sets to investment decision making problem in column matrix

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***Abstract*: In this paper we give a new method on investment decision making problem by means of the notions of ”period”, ”soft set” and ”matrix form”.**

***Keywords*: Soft sets, Fuzzy soft sets, Soft matrix theory, Period.**

## I. INTRODUCTION

An application of fuzzy soft sets to investment decision making problem based on the data collected from employees working in both government and private sector undertakings located in Coimbatore, Tamil Nadu, India. Clearly it is very important, the notion of ”period” (daily, weekly, monthly or annually) for investment decision making problems. The aim of this paper is to introduce a new method to include the notion of period using the soft set and matrix form theories.

## II. MAIN RESULTS

We recall the following definition which is needed throughout the paper.

**DEFINITION 2.1**

Let U be an initial universe, P(U) be the power set of U and E be the set of all parameters. A soft set (F, E) on the universe U is defined

$$(F, E) = \{(e, F(e)) : e \in E, F(e) \in P(U)\} \quad (1)$$

where $F : E \to P(U)$.

In [1] it was introduced soft matrix theory and used this theory to construct a soft max-min decision making method. In this paper we use different matrix forms obtained soft sets and new characteristic functions. Using the parameters given in [2], we introduce a new method by means of the notions of ”period”, ”soft set” and ”matrix form”.

The following information’s were given below. But the notion of period is not used in this application.

**FACTORS INFLUENCING INVESTMENT DECISION:**

$\mathbf{P_1}$ - Safety of funds

$\mathbf{P_2}$ - Liquidity of funds

$\mathbf{P_3}$ - High returns

$\mathbf{P_4}$ - Maximum profit in minimum period

$\mathbf{P_5}$ - Stable return

$\mathbf{P_6}$ - Easy accessibility

$\mathbf{P_7}$ - Tax concession

$\mathbf{P_8}$ - Minimum risk of possession

**INVESTMENT AVENUES:**

$\mathbf{I_1}$ - Bank Deposit

$\mathbf{I_2}$ - Insurance

$\mathbf{I_3}$ - Postal Savings

$\mathbf{I_4}$ - Shares and Stocks

**I**$_5$ - Mutual Fund

**I**$_6$ - Gold

**I**$_7$ - Real Estate

Let $U = \{I_1, I_2, I_3, I_4, I_5, I_6, I_7\}$ be the universal set and $E = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8\}$ be the set of all parameters. We consider the universal set and the set of parameters, respectively as follows:

$$U = \{I_i : 1 \leq i \leq n\},\ E = \{P_j : 1 \leq j \leq m\} \qquad (2)$$

Let the soft set (F, E) be defined as follows:

$$(F, E) = \{(P_j, A_j) : 1 \leq j \leq m,\ A_j \in P(U)\} \qquad (3)$$

Now we define new characteristic function of the soft set (F, E) as follows:

$$f(P_j)_i = \begin{cases} 1 & \text{if } I_i \in Aj \\ 0 & \text{if } I_i \notin Aj \end{cases} \qquad (4)$$

The matrix form of the soft set (F, E) is obtained as follows:

$$M = \begin{pmatrix} f(P_1)_1 & f(P_1)_2 & \cdots & f(P_1)_n \\ \vdots & \vdots & \ddots & \vdots \\ f(P_m)_1 & f(P_m)_2 & \cdots & f(P_m)_n \end{pmatrix} \qquad (5)$$

We create a matrix which shows an investment avenues using a parameter set E and defined the function h as follows:

$$h(P_{j1}, P_{j2}, \ldots, P_{jn}) = \begin{cases} 1 & \text{if } f_1(P_{j1})_i = \ldots = f_n(P_{jn})_i = 1 \\ 0 & \text{if others} \end{cases} \qquad (6)$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j_1,\ldots,j_n \in \{1, 2, 3, 4, 5, 6, 7, 8\}$.

Now we introduce our method as an application of profit situations via soft sets on different periods.

**FIRST PERIOD:**

Since it was not given any information about the period of data for private and government sector in [2], we consider investment avenues $I_i$, $1 \leq i \leq n$ with $\mu_{Fj(Pj)}(I_i) \geq 0.5$ as the **first period**. Then we obtain the following soft set:

$(F, E) = \{(P_1, A_1 = \{I_1, I_2, I_3, I_6\}), (P_2, A_2 = U), (P_3, A_3 = U), (P_4, A_4 = \{I_4, I_5, I_6, I_7\}), (P_5, A_5 = \{I_1, I_2, I_3\}), (P_6, A_6 = U), (P_7, A_7 = \{I_1, I_2, I_3\}), (P_8, A_8 = \{I_1, I_2, I_3, I_4, I_5\})\}$.

Let us write a matrix form of (F, E) using the characteristic function $f(P_j)_i$ of the set (F, E) as follows:

$$f(P_j)_i = \begin{cases} 1 & \text{if } I_i \in Aj \\ 0 & \text{if } I_i \notin Aj \end{cases}$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j \in \{1, 2, 3, 4, 5, 6, 7, 8\}$.

Then we obtain the following matrix:

$$M = \begin{pmatrix} 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 & 1 \\ 1 & 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8$) and rows show investment avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$).

We consider three cases which are given in [2]. For these cases, we give the matrix forms using soft sets in the first period.

**CASE I:**

Let $E_1 = \{P_1, P_3\}$ be a parameter set. Then we have the following soft set $(F_1, E_1)$ in the first period:

$$(F_1, E_1) = \{(P_1, A_1 = \{I_1, I_2, I_3, I_6\}), (P_3, A_3 = U)\}.$$

Then the matrix form of the soft set $(F_1, E_1)$ is obtained using the characteristic function $f_1(P_j)_i$ as follows:

$$M_1 = \begin{pmatrix} 1 & 1 \\ 1 & 1 \\ 1 & 1 \\ 0 & 1 \\ 0 & 1 \\ 1 & 1 \\ 0 & 1 \end{pmatrix}$$

where columns show parameters (resp. $P_1$, $P_3$) and rows show investment avenues (resp. $I_1$, $I_2$, $I_3$, $I_4$, $I_5$, $I_6$, $I_7$). The matrix form $M_1$ shows us that $I_1$, $I_2$, $I_3$ and $I_6$ are the best investment avenues for investor.

**CASE II:**

Let $E_2 = \{P_2, P_4, P_8\}$ be a parameter set. Then we have the following soft set $(F_2, E_2)$ in the first period:

$$(F_2, E_2) = \{(P_2, A_2 = U), (P_4, A_4 = \{I_4, I_5, I_6, I_7\}), (P_8, A_8 = \{I_1, I_2, I_3, I_4, I_5\})\}.$$

Then the matrix form of the soft set $(F_2, E_2)$ is obtained using the characteristic function $f_2(P_j)_i$ as follows:

$$M_2 = \begin{pmatrix} 1 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 1 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_2$, $P_4$, $P_8$) and rows show parameters (resp. $I_1$, $I_2$, $I_3$, $I_4$, $I_5$, $I_6$, $I_7$). The matrix form $M_2$ shows us that $I_4$ and $I_5$ are the best investment avenues for investor.

We give a matrix form for $M_1$ and $M_2$ using a parameter set $E_{1,2} = \{P_1, P_2, P_3, P_4, P_8\}$ and the function h defined as follows:

$$h(P_{j1}, P_{j2}) = \begin{cases} 1 \text{ if } f_1(P_{j1})_i = f_2(P_{j2})_i = 1 \\ 0 \text{ if others} \end{cases} \tag{7}$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j_1, j_2 \in \{1, 2, 3, 4, 8\}$. Then

$$M_{1,2} = \begin{pmatrix} 1 & 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 1 & 0 \end{pmatrix}$$

where columns show parameter pairs (resp. $(P_1, P_2)$, $(P_1, P_4)$, $(P_1, P_8)$, $(P_3, P_2)$, $(P_3, P_4)$, $(P_3, P_8)$) and rows show avenues (resp. $I_1$, $I_2$, $I_3$, $I_4$, $I_5$, $I_6$, $I_7$). For example, the parameter pair $(P_1, P_2)$ shows factors influencing investment decision which are both safety of funds and liquidity of funds.

**CASE III:**

Let $E_3 = \{P_2, P_5, P_6, P_7\}$ be a parameter set. Then we have the following soft set $(F_3, E_3)$ in the first period:

$$(F_3, E_3) = \{(P_2, A_2 = U), (P_5, A_5 = \{I_1, I_2, I_3\}), (P_6, A_6 = U), (P_7, A_7 = \{I_1, I_2, I_3\})\}.$$

Then the matrix form of the soft set $(F_3, E_3)$ is obtained using the characteristic function $f_3(P_j)_i$ as follows:

$$M_3 = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 1 & 1 & 1 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_2$, $P_5$, $P_6$, $P_7$) and rows show avenues (resp. $I_1$, $I_2$, $I_3$, $I_4$, $I_5$, $I_6$, $I_7$). The matrix form $M_3$ shows us that $I_1$, $I_2$ and $I_3$ are the best investment avenues for investor.

We give a matrix form for $M_1$, $M_2$ and $M_3$ using a parameter set $E_{1,2,3} = \{P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8\}$ and the function h defined as follows:

$$h(P_{j1}, P_{j2}, P_{j3}) = \begin{cases} 1 \text{ if } f_1(P_{j1})_i = f_2(P_{j2})_i = f_3(P_{j3})_i = 1 \\ 0 \text{ if others} \end{cases} \quad (8)$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j_1, j_2, j_3 \in \{1, 2, 3, 4, 5, 6, 7, 8\}$. Then the matrix form $M_{1,2,3}$ is obtained similarly $M_{1,2}$.

**SECOND PERIOD:**

We consider investment avenues $I_i$, $1 \leq i \leq n$ with $\mu_{Fj(Pj)}(I_i) \geq 0.75$ as the **second period.** Then we obtain the following soft set:

$(F^|,E) = \{(P_1, A_1 = \{I_1, I_2, I_3, I_6\}), (P_2, A_2 = \{I_1, I_4, I_5, I_6\}), (P_3, A_3 = \{I_6, I_7\}), (P_4, A_4 = \{I_4\}), (P_5, A_5 = \{I_1, I_2, I_3\}), (P_6, A_6 = \{I_1, I_2, I_3, I_6\}), (P_7, A_7 = \{I_2, I_3\}), (P_8, A_8 = \{I_1, I_2, I_3, I_4, I_5\})\}$.

Let us write a matrix form of $(F^|,E)$ using the characteristic function $f^|(P_j)_i$ of the set $(F^|, E)$ as follows:

$$f(P_j)_i = \begin{cases} 1 \text{ if } I_i \in Aj \\ 0 \text{ if } I_i \notin Aj \end{cases}$$

where $i \in \{1,2,3,4,5,6,7\}$ and $j \in \{1,2,3,4,5,6,7,8\}$

Then we obtain the following matrix:

$$M^| = \begin{pmatrix} 1 & 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 1 & 0 & 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_1$, $P_2$, $P_3$, $P_4$, $P_5$, $P_6$, $P_7$, $P_8$) and rows show investment avenues (resp. $I_1$, $I_2$, $I_3$, $I_4$, $I_5$, $I_6$, $I_7$).

Using the above similar arguments, for the second period we only consider **Case1** and **Case2** which is given in [2]. For these cases, we give matrix form using soft set in the second period. **Case3** can be shown by similar arguments.

**CASE I:**

Let $E_1 = \{P_1, P_3\}$ be a parameter set. Then we have the following soft set $(F^|_1, E_1)$ in the second period:

$$(F^|_1, E_1) = \{(P_1, A_1 = \{I_1, I_2, I_3, I_6\}), P_3, A_3 = \{I_6, I_7\})\}$$

Then the matrix form of the soft set $(F^|_1, E_1)$ is obtained using the characteristic function $f^|_1(P_j)_i$ as follows:

$$M_1^{|} = \begin{pmatrix} 1 & 0 \\ 1 & 0 \\ 1 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1 & 1 \\ 0 & 1 \end{pmatrix}$$

where columns show parameters (resp. $P_1$, $P_3$) and rows show investment avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$). The matrix form $M_1^{|}$ shows us that $I_6$ is the best investment avenue for investor. Hence we see that our result coincides with the result of **Case1** given in [2].

**CASE II:**

Let $E_2 = \{P_2, P_4, P_8\}$ be a parameter set. Then we have the following soft set $(F_2^{|}, E_2)$ in the second period:

$$(F_2^{|}, E_1) = \{(P_2, P_2 = I_1, I_4, I_5, I_6), (P_4, A_4) = \{I_4\}), (P_8, A_8 = \{I_1, I_2, I_3, I_4, I_5\})\}$$

Then the matrix form of the soft set $(F_2^{|}, E_2)$ is obtained using the characteristic function $f_2^{|}(P_j)_i$ as follows:

$$M_2^{|} = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_2$, $P_4$, $P_8$) and rows show investment avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$). The matrix form $M_2^{|}$ shows us that $I_4$ is the best investment avenue for investor. Again our result coincides with the result of **Case2** given in [2].

We give a matrix form for $M_1^{|}$ and $M_2^{|}$ using a parameter set $E_{1,2} = \{P_1, P_2, P_3, P_4, P_8\}$ and the function h defined as follows:

$$h(P_{j1}, P_{j2}) = \begin{cases} 1 & \text{if } f_1^{|}(P_{j1})_i = f_2^{|}(P_{j2})_i = 1 \\ 0 & \text{if others} \end{cases} \tag{9}$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j_1, j_2 \in \{1, 2, 3, 4, 8\}$. Then

$$M_{1,2}^{|} = \begin{pmatrix} 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

where columns show parameter pairs (resp. $(P_1, P_2)$, $(P_1, P_4)$, $(P_1, P_8)$, $(P_3, P_2)$, $(P_3, P_4)$, $(P_3, P_8)$) and rows show columns show avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$).

**THIRD PERIOD:**

Finally, we consider investment avenues $I_i$, $1 \le i \le n$ with $\mu_{Fj(Pj)}(I_i) = 1$ as the third period. Then we obtain the following soft set:

$$(F^{||}, E) = \{(P_1, A_1 = \{I_1, I_3\}), (P_2, A_2 = \{I_1, I_6\}), (P_3, A_3 = \emptyset), (P_4, A_4 = \emptyset), (P_5, A_5 = \{I_1, I_2, I_3\}), (P_6, A_6 = \{I_1, I_3, I_6\}), (P_7, A_7 = \emptyset), (P_8, A_8 = \{I_1, I_2, I_3\})\}.$$

Let us write a matrix form of $(F^{||}, E)$ using the characteristic function $f^{||}(P_j)_i$ of the set $(F^{||}, E)$ as follows:

$$f(P_j)_i = \begin{cases} 1 & \text{if } I_i \in Aj \\ 0 & \text{if } I_i \notin Aj \end{cases}$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j \in \{1, 2, 3, 4, 5, 6, 7, 8\}$.

Then we obtain the following matrix:

$$M^{||} = \begin{pmatrix} 1 & 1 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_1, P_2, P_3, P_4, P_5, P_6, P_7, P_8$) and rows show investment avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$).

We only consider **Case1** and **Case2** which is given in [2]. For these cases, we give matrix form using soft set in the third period.

**CASE I:**

Let $E_1 = \{P_1, P_3\}$ be a parameter set. Then we have the following soft set $(F_1^{||}, E_1)$ in the third period:

$$(F_1^{||}, E_1) = \{(P_1, A_1 = \{I_1, I_3\}), (P_3, A_3 = \emptyset)\}$$

Then the matrix form of the soft set $(F_1^{||}, E_1)$ is obtained using the characteristic function $f_1^{||}(P_j)_i$ as follows:

$$M_1^{||} = \begin{pmatrix} 1 & 0 \\ 0 & 0 \\ 1 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_1, P_3$) and rows show investment avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$). The matrix form $M_1^{||}$ shows us that $I_1$ and $I_3$ are the best investment avenues for investor.

**CASE II:**

Let $E_2 = \{P_2, P_4, P_8\}$ be a parameter set. Then we have the following soft set $(F_2^{||}, E_2)$ in the third period:

$$(F_2^{||}, E_2) = \{(P_2, A_2 = \{I_1, I_6\}), (P_4, A_4 = \emptyset), (P_8, A_8 = \{I_1, I_2, I_3\})\}$$

Then the matrix form of the soft set $(F_2^{||}, E_2)$ is obtained using the characteristic function $f_2^{||}(P_j)_i$ as follows:

$$M_2^{||} = \begin{pmatrix} 1 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

where columns show parameters (resp. $P_2, P_4, P_8$) and rows show investment avenues (resp. $I_1, I_2, I_3, I_4, I_5, I_6, I_7$). The matrix form $M_2^{||}$ shows us that $I_1$ is the best investment avenue for investor.

We give a matrix form for $M_1^{||}$ *and* $M_2^{||}$ using a parameter set $E_{1,2} = \{P_1, P_2, P_3, P_4, P_8\}$ and the function h defined as follows:

$$h(P_{j1}, P_{j2}) = \begin{cases} 1 & \text{if } f_1^{||}(P_{j1})_i = f_2^{||}(P_{j2})_i = 1 \\ 0 & \text{if others} \end{cases} \tag{10}$$

where $i \in \{1, 2, 3, 4, 5, 6, 7\}$ and $j_1, j_2 \in \{1, 2, 3, 4, 8\}$. Then

$$M_{1,2}^{||} = \begin{pmatrix} 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

where columns show parameter pairs (resp. $(P_1, P_2)$, $(P_1, P_4)$, $(P_1, P_8)$, $(P_3, P_2)$, $(P_3, P_4)$, $(P_3, P_8)$) and rows show avenues (resp. $I_1$, $I_2$, $I_3$, $I_4$, $I_5$, $I_6$, $I_7$).

Now we show these investment results for **Case1** and **Case2** on the table.

**FIRST PERIOD:**

| | $P_1$ | $P_3$ | $P_2$ | $P_4$ | $P_6$ | | $(P_1,P_2)$ | $(P_1,P_4)$ | $(P_1,P_8)$ | $(P_3,P_2)$ | $(P_3,P_4)$ | $(P_3,P_8)$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_1$ | 1 | 1 | 1 | 0 | 1 | $I_1$ | 1 | 0 | 1 | 1 | 0 | 1 |
| $I_2$ | 1 | 1 | 1 | 0 | 1 | $I_2$ | 1 | 0 | 1 | 1 | 0 | 1 |
| $I_3$ | 1 | 1 | 1 | 0 | 1 | $I_3$ | 1 | 0 | 1 | 1 | 0 | 1 |
| $I_4$ | 0 | 1 | 1 | 1 | 1 | $I_4$ | 0 | 0 | 0 | 1 | 1 | 1 |
| $I_5$ | 0 | 1 | 1 | 1 | 1 | $I_5$ | 0 | 0 | 0 | 1 | 1 | 1 |
| $I_6$ | 1 | 1 | 1 | 1 | 0 | $I_6$ | 1 | 1 | 0 | 1 | 1 | 0 |
| $I_7$ | 0 | 1 | 1 | 1 | 0 | $I_7$ | 0 | 0 | 0 | 1 | 1 | 0 |

**SECOND PERIOD:**

| | $P_1$ | $P_3$ | $P_2$ | $P_4$ | $P_6$ | | $(P_1,P_2)$ | $(P_1,P_4)$ | $(P_1,P_8)$ | $(P_3,P_2)$ | $(P_3,P_4)$ | $(P_3,P_8)$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_1$ | 1 | 0 | 1 | 0 | 1 | $I_1$ | 1 | 0 | 1 | 0 | 0 | 0 |
| $I_2$ | 1 | 0 | 0 | 0 | 1 | $I_2$ | 0 | 0 | 1 | 0 | 0 | 0 |
| $I_3$ | 1 | 0 | 0 | 0 | 1 | $I_3$ | 0 | 0 | 1 | 0 | 0 | 0 |
| $I_4$ | 0 | 0 | 1 | 1 | 1 | $I_4$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $I_5$ | 0 | 0 | 1 | 0 | 1 | $I_5$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $I_6$ | 1 | 1 | 1 | 0 | 0 | $I_6$ | 1 | 0 | 0 | 1 | 0 | 0 |
| $I_7$ | 0 | 1 | 0 | 0 | 0 | $I_7$ | 0 | 0 | 0 | 0 | 0 | 0 |

**THIRD PERIOD:**

| | $P_1$ | $P_3$ | $P_2$ | $P_4$ | $P_6$ | | $(P_1,P_2)$ | $(P_1,P_4)$ | $(P_1,P_8)$ | $(P_3,P_2)$ | $(P_3,P_4)$ | $(P_3,P_8)$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_1$ | 1 | 0 | 1 | 0 | 1 | $I_1$ | 1 | 0 | 1 | 0 | 0 | 0 |
| $I_2$ | 0 | 0 | 0 | 0 | 1 | $I_2$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $I_3$ | 1 | 0 | 0 | 0 | 1 | $I_3$ | 0 | 0 | 1 | 0 | 0 | 0 |
| $I_4$ | 0 | 0 | 0 | 0 | 0 | $I_4$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $I_5$ | 0 | 0 | 0 | 0 | 0 | $I_5$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $I_6$ | 0 | 0 | 1 | 0 | 0 | $I_6$ | 0 | 0 | 0 | 0 | 0 | 0 |
| $I_7$ | 0 | 0 | 0 | 0 | 0 | $I_7$ | 0 | 0 | 0 | 0 | 0 | 0 |

From above table, we see that investment avenues change according to period. Consequently, if we have period data then fuzzy soft set is not necessary for investment decision making problem. In this paper we construct the notion of period using membership value since we did not have real period data for government and private sector.

## III. CONCLUSION

In this paper, we introduce a new method for investment decision making problems. Our method needs the periods of the data (so it is very attractive) and uses only soft set theory (instead of fuzzy soft set theory). Investor decides more accurate investment avenue according to the factors influencing his investment decision. The concept of fuzzy soft set has rich potentials for developing such decision making models suitable for personal, social, technical, commercial and managerial issues.

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