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The Application of Fuzzy prioritization method in the investment

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Abstract—In this paper, fuzzy prioritization method is applied to the investment areas. In order to help the investment company select to the best investment enterprise from many investment enterprises to achieve maximum efficiency, we provide for the proposed investment enterprise in scientific and rational, accurate evaluation. This method is effective for the area of investment. Finally, two numerical examples are given to illustrate the method.

Keywords-Fuzzy priority matrix; Binary relative comparison matrix; Investment

1. Introduction

Fuzzy method was founded by Zadeh professor of American scientists in the 1960s this century, because in reality a lot of economic phenomenon is fuzzy and design of a kind of evaluating model and method in practice by a relevant experts evolves. This method has both strict quantitative score, but also to hard to quantitative analysis of fuzzy phenomena are subjective qualitative description, the comprehensive evaluation method based on fuzzy membership degree theory, the qualitative evaluation into quantitative evaluation, the qualitative and quantitative analysis closely combine, and can be well controlled man-made interference factors. This method in a comprehensive, rationality and scientificalness, an improved, therefore, we can say it is a more suitable for projects of comprehensive evaluation method of evaluation, and is also a recent rapid developing a new method.

Fuzzy orderoptimum ranking is a practical determine the membership function method. It passes to many pairwise comparison between things to determine some characteristic under the order and thus to decide on the characteristics of these things the membership functions of the overall shape. Sorting method according to the contrast estimate different, can be divided into relative comparison, contrast average method, prior relation sequencing method and similar preferred contrast method, etc.

With the rapid development of China's urban economy, "Investment Company" this new thing is found in various websites and newspapers are growing opportunities for investment. Which enterprise is invested to achieve greater efficiency, significant investment is particularly important to the investment company, so scientific and rational, the proper evaluation to enterprise is very important for the investors.

Definition1.1[1] Let $X=\{x_1,x_2,\cdots,x_n\}$, according to some characteristics of the establishment in X fuzzy relation as $C\in F(X\times X)$, the matrix is expressed as $C=(c_{ij})\in M_{m\times n}$. Let c_{ij} denotes when compared to x_i and x_j that with the x_i composition than the superior x_j. Requirements:

$$\left.\begin{array}{l} 1)c_{ii}=0 \\ 2)c_{ij}+c_{ji}=1(i\neq j) \end{array}\right\} \tag{1.1}$$

Satisfy (1.1) is called the fuzzy relations between fuzzy priorities, the matrix $C=(c_{ij})_{m\times n}$ is called fuzzy priority matrix.

Definition1.2[1] Binary relative comparison level refers to the elements of each pair $(x_i,x_j)\in X\times X$ are given the number of $(f_j(x_i),f_i(x_j))$,

$$0\le(f_j(x_i))\le 1,0\le(f_i(x_j))\le 1,$$

its significance is in comparison with x_i and x_j, if x_i with certain characteristics, then the degree of $f_j(x_i)$, then x_j degree with the characteristics $f_i(x_j)$, if $i=j$, $f_i(x_i)=1$. Let

$$\varphi = \begin{pmatrix} 1 & f_2(x_1) & \cdots & f_n(x_1) \\ f_1(x_2) & 1 & \cdots & f_n(x_2) \\ \vdots & \vdots & & \vdots \\ f_1(x_n) & f_2(x_n) & \cdots & 1 \end{pmatrix} \tag{1.2}$$

then the fuzzy matrix φ is called a binary relative comparison matrix.

2. Ranking method and steps

Let $X = \{x_1, x_2, \cdots, x_n\}$ denotes collection of n objects, we need to row a order of advantages and disadvantages of them according to their certain characteristics. As the complexity and fuzziness of things, we often encounter the situation is difficult to determine the order, so we can compare the basic binary on the basis to determine the overall order, that is the first comparison between two, then the following steps to determine the overall order. Investors sometimes optimistic about the number of enterprises, in the end which enterprises are chosen relate to the success or failure of investment, so we need to give it the correct number of enterprises, scientific and rational order.

2.1 Many experts generally are easy to obtain binary relative comparison level of enterprises saw in the binary various enterprises according to pair wise comparison based on the actual situation, and will set a table.

2.2 We can obtain the binary relative comparison matrix according to the table are given by expects, then we have the fuzzy priority matrix by formula $(f_j(x_i), f_i(x_j))(i \neq j)$ will be normalized, that is fuzzy priority matrix correspond-ing elements:

$$c_{ij} = \frac{f_j(x_i)}{f_j(x_i) + f_i(x_j)} \tag{2.1}$$

$$c_{ji} = \frac{f_i(x_j)}{f_j(x_i) + f_i(x_j)} \tag{2.2}.$$

2.3 We take infimum from non-diagonal elements of each line of fuzzy priority matrix , then we row a order according to the numerical size of the infimum and find the line of the largest infimum, so we can find the first location object (not necessarily unique), such as maximum in the i line, the first object is excellent x_i, crossed out the i line of the i column, for the same judge, the second location object can be obtained , and so on, all objects can be discharged the merits of a certain order, according to the merits of the order of the overall scientific and rational choice to invest enterprises, investors aim to achieve.

3. EXAMPLES

Example 1: An investment company want to seize market opportunities to investment in a fund to an enterprise and obtain maximize revenue, the company invites some experts to evaluate the program set $X = \{x_1, x_2, x_3, x_4\}$. The four enterprises are: x_1 denotes the car enterprise, x_2 denotes the textile enterprise, x_3 denotes the oil enterprise, x_4 denotes the network enterprise, respectively. The following table shows the binary is relatively level is given by many experts:

$f_j(x_i)$	x_1	x_2	x_3	x_4
x_1	1	0.8	0.7	0.5
x_2	0.7	1	0.4	0.3
x_3	0.5	0.7	1	0.8
x_4	0.3	0.6	0.9	1

So, the binary relative comparison matrix is:

$$\begin{pmatrix} 1 & 0.8 & 0.7 & 0.5 \\ 0.7 & 1 & 0.4 & 0.3 \\ 0.5 & 0.7 & 1 & 0.8 \\ 0.3 & 0.6 & 0.9 & 1 \end{pmatrix}.$$

By the formula (2.1), we have fuzzy priority matrix:

$$C = \begin{pmatrix} 0 & \frac{8}{15} & \frac{7}{12} & \frac{5}{8} \\ \frac{7}{15} & 0 & \frac{4}{11} & \frac{1}{3} \\ \frac{5}{12} & \frac{7}{11} & 0 & \frac{8}{17} \\ \frac{3}{8} & \frac{2}{3} & \frac{9}{17} & 0 \end{pmatrix} = \begin{pmatrix} 0 & 0.533 & 0.583 & 0.625 \\ 0.467 & 0 & 0.364 & 0.333 \\ 0.417 & 0.636 & 0 & 0.471 \\ 0.375 & 0.667 & 0.529 & 0 \end{pmatrix}.$$

We take indiums from non-diagonal elements of each line of fuzzy priority matrix, the largest of four indiums in the first line is 0.533, the car enterprise is superior to the first object, crossed out the first line of the first column, for the same judge, we can find the network enterprise superior is the second object, and so on, the oil enterprise can be obtained is superior to the third object, the textile enterprise is superior to the fourth object.

Example 2: Another investment company want to seize market opportunities to investment in a fund to an enterprise and obtain maximize revenue, the company invites some experts to evaluate the program set $X = \{x_1, x_2, x_3, x_4, x_5, x_6\}$. The six enterprises are: x_1 denotes the runing water enterprise, x_2 denotes the electric fan enterprise, x_3 denotes the washing machine enterprise, x_4 denotes the instant noodles enterprise, x_5 denotes the leather belt enterprise, x_6 denotes the cotton-padded jacket enterprise, respectively. The following table shows the binary is relatively level is given by many experts:

$f_j(x_i)$	x_1	x_2	x_3	x_4	x_5	x_6
x_1	1	0.9	0.6	0.3	0.3	0.4
x_2	0.5	1	0.8	0.5	0.7	0.9
x_3	0.2	0.1	1	0.4	0.5	0.2
x_4	0.7	0.4	0.9	1	0.8	0.3
x_5	0.8	0.5	0.7	0.2	1	0.5
x_6	0.9	0.1	0.6	0.4	0.2	1

So, the binary relative comparison matrix is:

$$\begin{pmatrix} 1 & 0.9 & 0.6 & 0.3 & 0.3 & 0.4 \\ 0.5 & 1 & 0.8 & 0.5 & 0.7 & 0.9 \\ 0.2 & 0.1 & 1 & 0.4 & 0.5 & 0.2 \\ 0.7 & 0.4 & 0.9 & 1 & 0.8 & 0.3 \\ 0.8 & 0.5 & 0.7 & 0.2 & 1 & 0.5 \\ 0.9 & 0.1 & 0.6 & 0.4 & 0.2 & 1 \end{pmatrix}.$$

By the formula (2.1), we have fuzzy priority matrix:

$$C=\begin{pmatrix} 0 & \frac{9}{14} & \frac{6}{8} & \frac{3}{10} & \frac{3}{11} & \frac{4}{13} \\ \frac{5}{14} & 0 & \frac{8}{9} & \frac{6}{9} & \frac{7}{12} & \frac{9}{10} \\ \frac{2}{8} & \frac{1}{9} & 0 & \frac{6}{15} & \frac{5}{12} & \frac{2}{8} \\ \frac{7}{10} & \frac{4}{9} & \frac{9}{15} & 0 & \frac{8}{10} & \frac{3}{7} \\ \frac{8}{11} & \frac{5}{12} & \frac{7}{12} & \frac{2}{10} & 0 & \frac{5}{7} \\ \frac{9}{13} & \frac{1}{10} & \frac{6}{8} & \frac{4}{7} & \frac{2}{7} & 0 \end{pmatrix}=\begin{pmatrix} 0 & 0.643 & 0.750 & 0.300 & 0.273 & 0.308 \\ 0.357 & 0 & 0.889 & 0.556 & 0.583 & 0.900 \\ 0.250 & 0.111 & 0 & 0.400 & 0.417 & 0.250 \\ 0.700 & 0.444 & 0.600 & 0 & 0.800 & 0.429 \\ 0.727 & 0.417 & 0.583 & 0.200 & 0 & 0.714 \\ 0.692 & 0.100 & 0.750 & 0.571 & 0.286 & 0 \end{pmatrix}$$

We take indiums from non-diagonal elements of each line of fuzzy priority matrix, the largest of six indiums in the fourth line is 0.429, the instant noodles enterprise is superior to the first object, crossed out the fourth line of the fourth column, for the same judge, we can find the leather belt enterprise superior is the second object, and so on, the electric fan enterprise can be obtained is superior to the third object, the cotton-padded jacket enterprise is superior to the fourth object, the runing water enterprise is superior to the fifth object, the washing machine enterprise is superior to the sixth object.

From above two examples, we conclude that the fuzzy prioritization method is applied to the investment areas can help the investment company select to the best investment enterprise from many investment enterprises to achieve maximum efficiency.

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