

# Design new instruments in the portfolio of investors in the capital market of Iran

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**Abstract:** Scientific investments in line with the interests of the investor to maintain optimal shape, in recent years was the favorite matter of Capital market investors . There are plenty of investment opportunities and various forms of investment portfolio, increased the importance of how to design portfolios. In this study, we try to use methods The model is designed to achieve optimal portfolio, too. In this regard, PROMITHEE and Fuzzy AHP Using data from five years to four transport industry, technical services, rubber and plastics and intermediates Financial and 26 sub-categories to design two portfolios and their evaluation have finally revealed Better tools for designing investment portfolios.

**Keywords:.** PROMETHEE, Fuzzy AHP, capital markets, investment portfolio

## INTRODUCTION

In today's investment world, investors are facing border investment, beyond the borders of a country. Today capital Rather than seeking equity shares of listed companies in the stock exchange of a country trying to find a reputable international stocks are. It matters how the investment portfolio makes up more than ever before. The traditional approach for the analysis and selection Stock fundamental analysis and technical analysis are as follows. Investors are always used technical analysis, the dating More. The logic behind technical analysis is that stock prices primarily a function of demand and supply conditions is. Often technical analysis chart is derived from the survey. But the fundamental analysis of companies and industries, and the Investment portfolio is by design. In this study is to use scientific methods, design methods and comparing the results to the investment portfolio.

### The nature and structure of the investment decision process

The term investors can encompass a wide range of activities. It could include investments in certificates of deposit, Bonds, common stock or mutual funds investment. Although those for professional investors utilize other assets such as proof of purchase, the right for buying and selling stocks, bonds, convertible and tangible assets such as gold , jewelers for doing their investments. The investment is to convert funds into one or more types of assets which will be maintained for a while. According to the Raised concepts the investment process is of particular importance as a result of investments.

Expressing the investment process in a coherent state, requiring analysis of the nature of investment decisions. In this case activities related to the decision-making process of decomposition, crucial factors in the operational environment affecting the decision of investors will be examined. In recent years equity ratio was high returns than savings and bonds .

Whether in this case all investors to earn higher returns, invest in common stock? The answer is That high returns always entail high risk and all investment decisions based on the relationship between risk and return for takes place. Traditionally, the process of making investment decisions performed in two stages:

Experience and analysis of Stock Exchange : This is The first stage of the investment decision-making process, including assessment and securities analysis individually analyzing the securities . Exchange valuation and is time consuming and difficult. To do this we must identify the Securities and factors affecting them . In the next stage, to evaluate and estimate the price or value of the securities a valuation model should be used. Exchange value is a function of future expected returns of securities and its risk.

Portfolio management: after the securities were evaluated t a portfolio(Investment set ) should be selected. The concept of why and how to create portfolio is well known. Many of the tasks done in this field takes place in the form of maths and statistics.

In the rest of the paper it was attempted to evaluate how best manage portfolios and theories raised in this area.

### Portfolio Theory

In 1950, Harry Markowitz provided the basic portfolio model which was regarded as the basis for the modern theory. Before Markowitz investors were familiar with the concepts of risk and return. Although they were familiar with the concept of risk, but usually were not able to measure it. Markowitz was the first to scientifically explain the portfolio concept and create diversity. He showed quantitatively that how portfolio diversification can reduce portfolio risk of an investment. It can be said that the first law of portfolio management is to create diversity. Because investors are unsure about the future must diversify to reduce risk to capital self-destruct investment. In other words, forming a diverse portfolio, the risk is greatly reduced. For example, in crisis of America's economic 1987, only less than 5% of the common fund investors faced losses.

Markowitz decided to organize the methods and ideas in the form of a formal framework and respond to the fundamental question:

Is the portfolio risk equal with a total risk of individual securities, which together make up portfolio? Markowitz, with the presentation portfolio risk measurement sought to compute risk and expected portfolio return. His model is based on the expected return models and features which is the risk securities theoretical framework for analyzing risk and return options.

Markowitz also introduced the concept of efficient portfolio. Optimal portfolio is the mix of securities in a way that is efficient in the sense of portfolio in a way that its per its rate of return in exchange for certain is minimized. Investors can by determining the expected rate of portfolio return minimize the risk of this level of efficiency and identify the efficient portfolio. Rational investors seek to find efficient portfolio because it will maximize expected return for a given level of risk, or the least risk returns will be determined.

Markowitz analysis using a set of inputs wants to identify the efficient portfolio. These inputs includes :

#### Expected Returns $E(R)$ , For any securities that are concerned

Standard deviation of returns,  $SD(R)$ , As a measure of risk for each one of the securities.  
covariance between the rate of return on securities.

expected return for any portfolios is easily calculated on weighted average expected return of securities. Weight that is used to mean is the proportion of investible funds invested in each one of the investment securities. the combined weight of 100% of the investible funds, the expected portfolio return is computed as follows:

$$E(R_p) = \sum_{i=1}^n W_i E(R_i)$$

In the above equation, we have:

$E(R_p)$  The expected return portfolio

wt: portfolio weight for the  $i$  th securities

$E(R_i)$ : the expected returns of securities:

Regardless of the number of assets in a portfolio, or the share of total investible funds in each of the assets, expected portfolio return be always equal to the weighted average of the expected returns of each asset. Another major computing of the portfolio models is to compute the portfolio risk. In Markowitz model the risk is measured by variance and standard deviation. In this part, modern portfolio appear on the theory that a risk of the portfolio alone includes Risk-weighted average of individual securities is not included in portfolio. in the other words

$$\sigma_p^2 \neq \sum_{i=1}^n W_i \sigma_i^2$$

Precisely because of this disparity is that investors can reduce the portfolio risk. portfolio risk not only to the average

Risk-weighted individual constituent securities depends portfolio, but the covariance between returns of portfolios formed relations Depends on the portfolio. portfolio risk is a function of the risk of any of the securities and the covariance between the return of any of the securities Securities, this concept is shown in the following variance

In this equation:

2p

The variance of portfolio returns  $\sigma^2$ :

2

variance of returns of securities  $i$   $\sigma_i^2$ :

$i$  and  $j$  covariance between the return of securities  $ij$   $\sigma_{ij}$ :

$w_i$  percentage of funds investments in securities:

In order to calculate the impact of the relationship between yield securities portfolio a correlation between each pair of securities  $i$  and  $j$  is estimated. the correlation coefficient is a statistical measure that shows the relationship between both securities and its rang as follows:

+ positive correlation = 1

$\rho = -1$  perfectly negative correlation (inverse) = -1

$\rho = 0$  zero correlation

The combination of securities, all of which are quite positive correlation do not have any effect on reducing risk, because such a portfolio risk can includes the weighted average risk portfolio of any of the securities and in the quite positive correlation mode, the more the number of securities be added to portfolio risk, securities again includes constituents of the weighted average of all securities and there will not be risk.

The combination of securities, all of which are quite positive correlation Portfolio not have any effect on reducing risk, because risk It includes the weighted average risk portfolio any of the securities in quite positive correlation mode, the number of securities Again Portfolio be added to Portfolio risk securities including constituents of the weighted average of all securities would be no Portfolio There will be no reduction in risk.

The combination of the two securities which are correlated reduced portfolio risk is zero. When securities that have not The correlation between the returns are added to the portfolio, Portfolio risk can be reduced considerably. However, risk Portfolio in this case can not be completely eliminated. Finally, a combination of two securities with negative correlations can be completely eliminates the risk of the portfolio is complete.

To calculate the correlation coefficient covariance is required to calculate its calculation method is as follows:

$$\sigma_{AB} = \sum_{i=1}^m [R_{Ai} - E(R_A)][R_{Bi} - E(R_B)]P_i$$

In this equation:

B and A covariance among securities AB  $\sigma_{AB}$ :

A One of the possible returns of securities:  $R_A$

A value of expected returns of securities:  $E(R_A)$

The relationship between the variance is as follows:

$$\sigma_{AB} = \rho_{AB} \sigma_A \sigma_B$$

According to the above equation portfolio risk calculation formula is as follows:

$$\sigma_p^2 = \sum_{i=1}^n W_i^2 \sigma_i^2 + \sum_{i=1}^n \sum_{j=1}^n W_i W_j \rho_{ij} \sigma_i \sigma_j$$

### Portfolio Performance Criteria

Portfolio in performance measurement, investors have realized returns and risk are examined. So, wherever criteria

Or technical use of these two factors (risk and return) should be included in the analysis. When performance is evaluated Portfolio Takes place, the overall return on investment, including dividends and increases or decreases in stock prices, is used. In addition, two factors The standard deviation and beta, as two risk criteria used in the analysis of investment.

As well as the concepts of risk and return, three researchers named William Sharp,, CAPM using theoretical concepts of capital markets and Trainer Jack and Michael Jensen, criteria to evaluate the performance of their Portfolio in 1960. Often these criteria Portfolio performance combination is said to have been risk adjusted. Goes on to examine each of these criteria described above:

(245, Tehran, 1388)

**Sharp criteria:** William Sharp, a composite measure of performance Portfolio provided that the proportion of the variability of output or –efficiency ratio The surplus is the total risk based capital market theory is formed. The criteria are as follows:

$$RVAR = \frac{TR_P - RF}{SD_P}$$

In this equation:

P average total return during the specified time period Portfolio: TRP  
 The average risk-free rate of return during the period: RF  
 Portfolio standard deviation of returns during the period: SDP  
 The above equation, Portfolio excess return above the risk-free rate or efficiency measures, as well as the risk premium

Called. The standard deviation is used in the denominator of the equation and measure total risk or variability of returns Portfolio

Should consider the following: RVAR is. About Efficiency measures the total surplus per unit of risk.

RVAR

Portfolio performance will be much better as well.

RVAR.the more the pvar the better the performance of portfolio.

**Trainer criteria:** almost simultaneously with Sharp, Jack Trainer also –similar measure called the efficiency ratio to return volatility or the Excess return to the systemic risk presented. Such as Sharp, Trainer also seeks to establish a relationship between risk and return on its Portfolio Outcome. Trainer criteria Portfolio average excess return during a particular period with its systematic risk (beta Portfolio the size

Making it) connects. Return to the volatility of return is as follows:

$$RVOR = \frac{TR_P - RF}{\beta_P}$$

They RVOL Portfolio is much to indicate better performance. RVOL Portfolioha can be based on the level of Ranked. If Portfolioha varied enough Ranking will be the same whatever the variation Portfolioha reduce the likelihood of conflict between high ranking will be based on two criteria. If Portfolio has enough It. RVAR it could not be further from rank to rank diversity RVOL Trainer, Jensen standard differential returns or alpha. –RVOL benchmark standard differential efficiency Jensen: One of the criteria related to And is calculated as follows:

$$\alpha_p = (R_p - RF) - [\beta(R_M - RF)]$$

Jensen performance measure can be accomplished through regression portfolio excess returns that are supposed to be evaluated against Market risk premium estimate. If the above equation is very positive alpha indicates excellent performance. If negative alpha

6  
 (x) Dμ  
 l d u  
 '1/0 D  
 a b c f

And if alpha is zero denoting a low yield indicates that Portfolio Manager, based on risk adjusted market Is adapted.

**A review on the FUZZY AHP method**

May be better fuzzy and fuzzy calculations used for a final decision. MADM indicators in a Whatever a decision to be more involved in human resources as well as complex systems, fuzzy phenomenon more dominant explanation

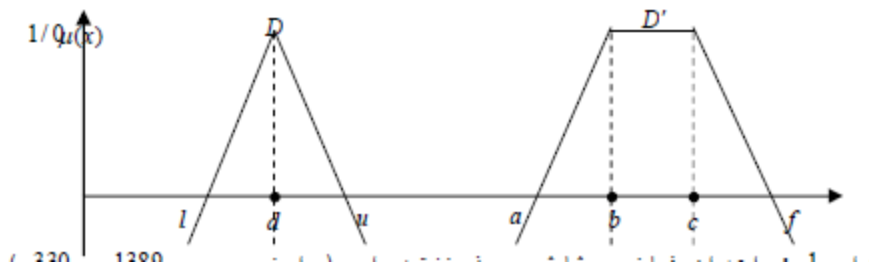
The system. The main foundation of these arguments is that by Professor Lotfi Asgarizadeh also known as the "incomparable Compare the "explanation is given. That is, the more complex a system is, the power of human judgment The accuracy and significance for the behavior of the system becomes less, so that

the accuracy and importance as the rejection of each other. The S of (A), then a fuzzy subset S a true value), member of the set) x based on fuzzy set theory, if A set of ordered pairs is as follows:

$$A = \{x, \mu_A(x)\}; \forall x \in S$$

The membership represents the absolute importance (or probability), A (x) such that  $\mu_A(x)$  but A in the x represents the membership degree (320, subjective and depends on the content of the collection. (Asgharpour, 1389 any fuzzy subset}) D (x)  $\mu_A(x)$ , ( $\{ =$  and L represents the numbers on the real line x such that  $D \cap ]0,1[ \in A(x) \mu_A(x)$  Represents It takes. The fuzzy number is about to examine a specific amount D x values the fact that fuzzy number 5 shows an example of fuzzy numbers.

Figure 1: triangular and trapezoidal fuzzy numbers (Asgharpour, 1389)



May be better fuzzy and fuzzy calculations for a final decision in a model using index MADM Be. Whatever a decision to be more involved in human resources as well as complex systems, fuzzy phenomenon more dominant explanation These systems are. Fuzzy set theory was proposed in 1965 by Professor Lotfi Asgarizadeh ever to developments We turned into triangular fuzzy numbers. The DM must decide Fuzzy AHP is a lot of theory and practice. In this method, Values obtained using the decision matrix to give up as follows:

$$\begin{matrix}
 & X_1 & X_2 & & X_n \\
 X_1 & \left[ \begin{array}{c} (1,1,1) \\ (l_{12}, m_{12}, u_{12}) \\ \dots \\ (l_{1n}, m_{1n}, u_{1n}) \end{array} \right] & & & \\
 X_2 & \left[ \begin{array}{c} (\frac{1}{l_{12}}, \frac{1}{m_{12}}, \frac{1}{u_{12}}) \\ (1,1,1) \\ \dots \\ (l_{2n}, m_{2n}, u_{2n}) \end{array} \right] & & & \\
 & \left[ \begin{array}{c} (\dots) \\ (\dots) \\ \dots \\ (\dots) \end{array} \right] & & & \\
 X_n & \left[ \begin{array}{c} (\frac{1}{l_{1n}}, \frac{1}{m_{1n}}, \frac{1}{u_{1n}}) \\ (\frac{1}{l_{2n}}, \frac{1}{m_{2n}}, \frac{1}{u_{2n}}) \\ \dots \\ (1,1,1) \end{array} \right] & & & 
 \end{matrix}$$

The weight vector indices calculated using the following formulas

$$S_i = \frac{\sum_{j=1}^m M_{ij}^j}{\sum_{i=1}^n \sum_{j=1}^m M_{ij}^j}$$

the rate of  $M_1 > M_2$  POSSIBILITY IS DEFINED AS THE FOLLOWS:

$$V(M_1 \geq M_2) = \begin{cases} m_1 \geq m_2 \Rightarrow V(M_1 \geq M_2) = 1 \\ l_2 \geq u_1 \Rightarrow V(M_1 \geq M_2) = 0 \\ \text{otherwise} \Rightarrow \frac{l_2 - u_1}{(m_1 - u_1) - (m_2 - l_2)} \end{cases} \quad M_1 = (l_1, m_1, u_1) \quad , \quad M_2 = (l_2, m_2, u_2)$$

$$V(M \geq M_1, M_2, \dots, M_k) = \min V(M \geq M_i) \quad i = 1, 2, \dots, k$$

$$V(M \geq M_1, M_2, \dots, M_k) = \min V(M \geq M_i) \quad i = 1, 2, \dots, k$$

$$i'(A_i) = \min V(S_i \geq S_k) \quad k = 1, 2, \dots, n \quad k \neq i$$

$$V' = (d'(A_1), d'(A_2), \dots, d'(A_n))^T$$

$$W = (d(A_1), d(A_2), \dots, d(A_n))$$

The weight vector indices calculated using the following formulas

**A Review On Promethee Method**

Decision models to help make the right decision and scientific development have found that the two groups of multi-objective and multi-model Shvnd.mdl split characteristic of multi-objective often is to design, targeting and optimization simultaneously target Widely used. MADM 21) In recent years, methods are used. (Momeni, 1387

In this regard, with increased decision-making procedures, how to choose the right method is more important. Models in Considered one of the best PROMETHEE recent years to choose the best method is provided that this method studies (1,1,1) PROMETHEE known six types of decision-making methods that have been developed by Burns and colleagues .

(22, are: (Part, 1390)

PROMETHEE I :Alternatives to partially ranks. :

PROMETHEE II :Discrete alternatives to completely ranks. :

PROMETHEE III:Preferred and non-preferred relationships based on the mean and standard PROMETHEE IV

:deviation defines preferential index. : Can be used for unlimited options. :

PROMETHEE V :A multi-criteria approach for selecting options with regard to the limits defined. :

PROMETHEE VI :A model of the human brain. :

TABLE 2. briefly describes the criteria of this methodology.

No.	Name	Parameter	Equation	Remarks
1	ORDINARY CRITERON	-	$p(d) = \begin{cases} 0 & d = 0 \\ 1 & d > 0 \end{cases}$	
2	PPAR	Q	$p(d) = \begin{cases} 0 & d \leq q \\ 1 & d > q \end{cases}$	
3		P	$p(d) = \begin{cases} \frac{d}{p} & d \leq p \\ 1 & d > p \end{cases}$	
4	LINEAR	q.p	$p(d) = \begin{cases} 0 & d \leq q \\ \frac{1}{2} & q < d \leq p \\ 1 & d > p \end{cases}$	
5		q.p	$p(d) = \begin{cases} 0 & d \leq q \\ \frac{d - q}{p - q} & q < d \leq p \\ 1 & d > p \end{cases}$	
6		$\delta$	$p(d) = 1 - e^{-\frac{d^2}{2\delta^2}}$	

### RESEARCH METHODOLOGY

The research project will be explained in detail in this section. The study design is explained by the purpose, time horizon , Data collection tools, samples to be addressed. The variables used in the model for operational Defined. Finally, the proposed model is described and evaluated its reliability

#### Research Plan

Set program or research project, carried out systematic planning and implementation of research results is an essential part of the research process covering And each of these sections includes preliminary steps are different. In order to satisfy and facilitate the exchange of research findings In relation to a coherent and structured research process, linear and cyclic structures in the research process is concerned.

#### Purpose of the RESEARCH

The present research from this perspective, is descriptive. For the purpose of describing the various characteristics of investment companies, instruments

Medical Decision, rubber and plastics engineering and technical services listed in the Tehran Stock Exchange done.

Research for the purpose of research, into three categories: basic, applied and development research is divided. Fundamental research consists of theoretical activities.

And empirical foundations to achieve new knowledge in the form of a phenomenon to be done regardless of the particular application. Research

Use of the phrase activities with purpose and practical use of knowledge or scientific theories done. Developing research

The systematic research activities with the aim of producing materials, new technology and techniques, and improving basic services (In production based on the results of research and practical experience done. (Ahmadi, 1389.20

#### Time horizon

This was a periodic study as a 5-year period from the beginning of 1385 until the end of 1389 in the covers. The reason for choosing these returns, spanning a time period of capital market activity, which includes both the recession and the boom is.

#### To collect data

Methods and tools used in this research is the following:

At the completion of the theoretical fundamentals of library resources and case studies used. –

Tehran Stock Exchange–To extract the audited financial statements of the companies searched electronic databases used

Be.

In determining the weight of financial ratios of the survey questionnaire used. –

Used. –Excel Software is designed on the model of personal and

variables	Class variable
Current ratio	Liquidity ratios
Quick ratio	
Turnover ratio of accounts	
	efficency
The ratio of debt to total Property	

#### Samples

The population of this research, subsidiaries transport industry, rubber and plastics, engineering services and intermediation Mali are listed on the Tehran Stock Exchange. A sample population are all

### The operational definition of variables

In this study, ranking transport industry, rubber and plastics, engineering services and intermediation Financial listed in the Tehran Stock Exchange, which is variable by survey experts were interviewed as was divided in Table 2. Experts of the two members of the official auditor and four faculty members with 20 till 30 years experience.

- Class variable
- Liquidity ratios
- Current ratio
- Quick ratio
- Turnover ratio of accounts
- Find out
- Inventory turnover ratio
- Activity Ratio
- (Performance)
- Return on Sales
- Total asset turnover ratio
- Return on assets
- Return on Equity
- take stock
- Of power
- Pay Debts
- The ratio of debt to total
- Property

Table 2: Variables used to rank companies

### The algorithm in use.

The model presented in this section and used in order to evaluate the performance and ranking financial intermediation, Transportation, Engineering Services and rubber and plastic Tehran Stock Exchange and analysis and the establishment of investment portfolio in Figure 2 outlines the steps will be described.

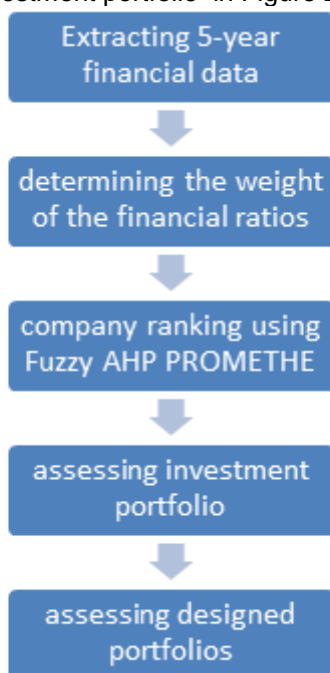


Figure 2: Stages of research

The following describes the steps of the algorithm described above:

At this stage mining companies audited financial statements companies, financial intermediation, transport, and technical services Engineering plastic and rubber accepted in Tehran Stock Exchange for the years 1385 to 1389 the system Designed by researcher) EMA Managing Research and Development of Islamic studies. Using the software Financial ratios are calculated mean for each company. This (VB.NET



programming in the sphere of The software is designed to record information with any company in its financial statements, financial ratios can be got.

And making financial ratios as an indicator, W 2. The project goal is to achieve a gravimetric like To achieve a model for designing investment portfolios. Fuzzy AHP and PROMETHEE methods Financial ratios are as follows:

No.	Index	Financial ratio
1	$F_1$	
2	$F_2$	
3	$F_3$	
4	$F_4$	
5	$F_5$	
6	$F_6$	
7	$F_7$	
8	$F_8$	
9	$F_9$	

*The financial ratio*

Current ratio  $F_1$  1

2 quick ratio  $F_2$

3 Accounts receivable turnover ratio  $F_3$

4 of inventory turnover  $F_4$

5 Return on Sales  $F_5$

6  $F_6$  assets turnover ratio

7 Return on Assets  $F_7$

8 return on equity  $F_8$

9 ratio of total assets to  $F_9$

Table 3: Standard Financial Ratios

In some cases DM should not be assumed that its decision matrix should be used for MADM judgment . in a way that 2 F F with the relative importance of financial ratio indicators (or option) to be used in conjunction with each other. So that if the financial ratio 1

One of the following scenarios: F 2 F compare the decision-maker will tell you the importance of financial ratio.

- } Very little or quite important or very favorable  
very strong preferences or importance or utility}
- strong preference or importance or utility}
- } A little bit or slightly above or slightly better
- } Preference or importance or the same utility

According to Table 4 below, the judgment becomes small quantities between 1 and 9:

Preferences (oral judgment) value

More importantly  Mrhj or completely  or completely  quite favorable

numerical number	preferences	
9	Extremely Preferred	Extremely Preferred
7	Very Strongly Preferred	Very Strongly Preferred
5	Strongly Preferred	Strongly Preferred
3	Moderately Preferred	Moderately Preferred
1	Equally Preferred	Equally Preferred
8 و 6 و 4 و 2	-	

Table 4: preferences and oral judgment A multi-index models) may better fuzzy and fuzzy calculations) MADM index in a model Be used for a final decision.

In the above equation, we have:

The expected return Portfolio:  $E(R_p)$

Amin securities  $i$  weight Portfolio for:  $W_i$

$i$  yields contribution:  $E(R_i)$

Notably, stock prices and dividend yield per share through the table in different years by the formula it will be counted :

In the above equation, we have:

#### **Dividends: $D_t$**

The share price at end of period:  $P_E$

The share price at the beginning:  $P_B$

#### **Risk portfolios are calculated as follows**

##### **Findings**

The samples intended for financial information and listed companies in Tehran Stock Exchange till 5 years Is 1389. For this purpose we prepared and audited financial statements of the companies related to the collection and transportation industries Transportation, rubber and plastics, engineering and technical services and financial intermediation have an example of the financial statements in Appendix 1 Is visible. The data center resources management and development Research and Islamic Studies affiliated to the Securities and Exchange Tehran Stock Exchange company information and resources to address <http://www.rdis.ir/CMPAnnouncements.asp> address Have been extracted. , <Http://www.irbourse.com/hx> The following is a weighted average ratios of the financial companies in various industries  $w_i$  calculated according to the following financial ratios and weight vector 3 specified. - Have. The results of the calculations in Table 4

$$w_i = (0/05, 0/1, 0/15, 0/3, 0/4)$$

Because the last years of the new record are less important than why weights in ascending order 0 for / 0 for 1386, ... and 4/1, 0 to 1385 / weight 05,  $w_i$  taken. As can be seen, in the vector (Zeshui, 1389 is considered. (2007,166zeshui)

$I_4$	$I_3$	$I_2$	$I_1$	$I_i / F_i$
4/605	1/089	1/319	0/97	$F_1$
4/389	0/541	0/888	0/630	$F_2$
1/072	4/093	2/112	3/182	$F_3$
0	4/376	1/829	60/47	$F_4$
0/423	0/006	0/213	0/09	$F_5$
0/093	1/094	0/973	0/822	$F_6$
0/086	0/039	0/176	0/078	$F_7$
0/120	0/983	0/7	0/308	$F_8$
0/264	0/794	0/702	0/75	$F_9$

$F_9$	$F_8$	$F_7$	$F_6$	$F_5$	$F_4$	$F_3$	$F_2$	$F_1$	$F_i / A_i$
0/79	0/39	0/09	0/87	0/10	1/01	1/26	0/93	1/16	$A_1$
0/71	0/23	0/07	0/77	0/08	19/96	5/11	0/33	0/78	$A_2$
0/69	0/36	0/12	0/48	0/27	3/66	2/05	0/77	1/23	$A_3$
0/72	1/05	0/23	1/47	0/15	0	2/18	1/01	1/41	$A_4$
0/93	-0/98	-0/04	0/70	-0/07	3/08	3/98	0/27	0/69	$A_5$
0/66	0/27	0/09	0/95	0/10	3/14	5/12	0/47	1/22	$A_6$
0/61	0/13	0/05	0/44	0/11	1/91	2/99	0/61	1/06	$A_7$
1/49	1/06	-0/25	0/55	-0/56	6/80	2/94	0/16	0/49	$A_8$
0/48	0/22	0/12	1/14	0/10	3/57	3/77	0/92	1/61	$A_9$
0/72	-0/06	-0/01	0/84	-0/01	2/32	2/37	0/54	1/19	$A_{10}$
0/84	-0/07	0/01	1/32	0	3/06	3/82	0/53	1/12	$A_{11}$
0/55	0/27	0/16	2/68	0/05	10/83	6/76	0/89	1/46	$A_{12}$
0/94	8/31	0/09	0/45	0/24	4/89	1/58	0/44	0/80	$A_{13}$
0/73	0/67	0/19	1/87	0/11	4/16	7/60	0/58	1/26	$A_{14}$
0/30	0/10	0/07	0/08	0/97	0	0/83	2/75	2/97	$A_{15}$
0/07	0/14	0/14	0/10	1/74	0	1/15	16/90	17/54	$A_{16}$
0/28	0/17	0/12	0/14	0/84	0	1/63	3/30	3/59	$A_{17}$
0/30	0/21	0/14	0/21	0/71	0	4/90	3/99	4/10	$A_{18}$
0/34	0/14	0/09	0/10	0/84	0	0/70	2/34	2/45	$A_{19}$
0/19	0/06	0/05	0/05	0/65	0	0/63	7/21	7/50	$A_{20}$
0/37	0/09	0/06	0/04	1/60	0	0/10	2/13	2/34	$A_{21}$
0/20	0/18	0/14	0/16	0/87	0	1/26	1/02	1/17	$A_{22}$
0/09	0/04	0/03	0/04	-8/03	0	0/15	6/15	6/40	$A_{23}$
0/18	0/07	0/06	0/06	3/02	0	0/65	3/27	3/30	$A_{24}$

0/33	0/11	0/08	0/09	0/77	0	0/65	1/76	1/89	$A_{25}$
0/51	0/14	0/06	0/05	1/12	0	0/21	1/86	2/02	$A_{26}$

We used to rank options, should PROMETHEE weight and Fuzzy AHP methods in this study because we Each phase calculate financial ratios in normal environments. This matrix is used for the purpose of the questionair.

Standard financial ratios with respect to the above table and PROMETHEE paired comparison in the method used to calculate the index weight

Calculated using the method of weight Antwerp.

Designed questionnaire among experts that four faculty members and two members of the Iranian Society of CPAs

Were administered. After forming matrices decision using the geometric mean of the final matrix obtained as follows:

Then, using Antwerp, we calculate the weight vector following financial ratios:

$$w_i = (0/05,0/15,0/19,0/17,0/14,0/12,0/09,0/05,0/03)$$

we thin this part of the matrix to facilitate the decision making matrix obtained above, to the fuzzy environment

$$l_i = \min(b_i) \quad , \quad m_i = \frac{\sum_{i=1}^t b_i}{p} \quad , \quad u_i = \max(b_i)$$

$$\tilde{b}_i = (l_i, m_i, u_i)$$

Element matrices decision, the following formulas are used to determine the matrix elements .

(1,1,1)	(1,2/33,3)	(3,3/67,5)	(3,4/33,5)	(3,5,7)	(0/33,4/11,7)	(0/2,5/4,9)	(0/14,5/38,9)	(0/2,4/07,7)
(0/33,0/56,1)	(1,1,1)	(3,4/33,5)	(3,3/67,5)	(0/33,3/44,5)	(0/2,3/4,5)	(0/33,5/44,9)	(0/14,5/38,9)	(0/2,4/07,7)
(0/2,0/29,0/33)	(0/2,0/24,0/33)	(1,1,1)	(1,2/33,3)	(0/33,2/11,3)	(0/33,2/11,3)	(0/33,6/11,9)	(0/14,6/05,9)	(0/2,5/4,9)
(0/2,0/24,0/33)	(0/2,0/29,0/33)	(0/33,0/56,1)	(1,1,1)	(0/2,3/4,5)	(0/2,1/4,3)	(3,6/33,9)	(0/14,5/38,9)	(0/2,3/4,5)
(0/14,0/23,0/33)	(0/2,1/13,3)	(0/33,1/22,3)	(0/2,1/8,5)	(1,1,1)	(0/2,2/73,5)	(3,7,9)	(0/2,6/07,9)	(0/33,3/44,5)
(0/14,1/11,3)	(0/2,1/8,5)	(0/33,1/22,3)	(0/33,2/11,5)	(0/2,1/84,5)	(1,1,1)	(5,7,9)	(0/14,5/38,9)	(5,7,9)
(0/11,1/75,5)	(0/11,1/08,3)	(0/11,1/07,3)	(0/11,0/2,0/33)	(0/11,0/19,0/33)	(0/11,0/15,0/2)	(1,1,1)	(0/14,4/71,9)	(0/33,4/11,7)
(0/11,2/42,7)	(0/11,2/42,7)	(0/11,2/41,7)	(0/11,2/42,7)	(0/11,1/74,5)	(0/11,2/42,7)	(0/11,2/44,7)	(1,1,1)	(5,6/33,7)
(0/14,1/78,5)	(0/14,1/78,5)	(0/11,1/75,5)	(0/2,1/8,5)	(0/2,1/13,3)	(0/11,0/15,0/2)	(0/14,1/11,3)	(0/14,0/15,0/2)	(1,1,1)

According to the decision matrix obtained above, using the formulas discussed in the previous section to calculate the weight vector We fuzzy environment. Weight-adjusted indices and index weights are as follows:

$$W' = (1,0/974,0/926,0/89,0/924,0/959,0/812,0/939,0/777)$$

$$W = (0/122,0/119,0/113,0/108,0/112,0/117,0/098,0/114,0/097)$$

And Fuzzy AHP method using vectors and matrices weight the decision obtained in the previous steps. Action to rank the transport industry, rubber and plastics, engineering and technical services and financial intermediation are PROMETHEE

Explains:

For this purpose, we will act as follows.

$I_4$	$I_3$	$I_2$	$I_1$	$I_i / F_i$
4/605	1/089	1/319	0/97	$F_1$
4/389	0/541	0/888	0/630	$F_2$
1/072	4/093	2/112	3/182	$F_3$
0	4/376	1/829	2/78	$F_4$
0/423	0/006	0/213	0/09	$F_5$
0/093	1/094	0/973	0/822	$F_6$
0/086	0/039	0/176	0/078	$F_7$
0/120	0/983	0/7	0/308	$F_8$
0/264	0/794	0/702	0/75	$F_9$

$$W = (0/122,0/119,0/113,0/108,0/112,0/117,0/098,0/114,0/097)$$

According to the decision matrix and vector above weight and multiplied by the amount of any financial ratio values obtained in the respective weight of the craft That were ranked as follows:

$$I_1 = 1/075 \quad I_2 = 1/006 \quad I_3 = 1/454 \quad I_4 = 1/312$$

$$I_3 > I_4 > I_2 > I_1$$

As it became clear, the rubber and plastic industry ranked highest intermediation industry Financial, technical and engineering services industry and the transportation industry as the second, third and fourth respectively.

→PROMETHEE extended six criteria according to plan in the third quarter, methods: PROMETHEE Shaped, V preferred to define the function that puts the decision-makers are normal benchmark, benchmark of the criterion V-shaped with indifference area and Gauss criteria. In this study due to the proliferation of options, we measure the level of the standard V, Criteria The priority for the q linear form we use. Based on these criteria, the change in scores from zero to Is absolutely a priority item. q's. If the difference is more than The charges. According to the decision matrix and vector under the weight of fine PROMETHEE ranked by industry

The calculations is stated in Appendix 5:

$I_4$	$I_3$	$I_2$	$I_1$	$I_i / F_i$
4/605	1/089	1/319	0/97	$F_1$
4/389	0/541	0/888	0/630	$F_2$
1/072	4/093	2/112	3/182	$F_3$
0	4/376	1/829	2/78	$F_4$
0/423	0/006	0/213	0/09	$F_5$
0/093	1/094	0/973	0/822	$F_6$
0/086	0/039	0/176	0/078	$F_7$
0/120	0/983	0/7	0/308	$F_8$
0/264	0/794	0/702	0/75	$F_9$

$$w_i = (0/05,0/15,0/19,0/17,0/14,0/12,0/09,0/05,0/03)$$

$\phi^+$	$\phi^-$	$\phi^+$	$I_i$
-0/0015	0/0477	0/0462	$I_1$
-0/0345	0/0642	0/0298	$I_2$
0/0638	0/0316	0/0954	$I_3$
-0/0278	0/1054	0/0776	$I_4$

Ranking of carrier industry companies		
Ranking method: Fuzzy AHP		
Company	Index	Rank
A2	1.194	1
A1	0.955	2

Ranking of engineering services industry companies		
Ranking method: Fuzzy AHP		

Company	Index	Rank
A3	1.073	1
A4	0.938	2

Ranking of rubber and plastic industry companies		
Ranking method: Fuzzy AHP		
Company	Index	Rank
A12	2.637	1
A13	1.982	2
A14	1.925	3
A8	1.389	4
A6	1.348	5
A9	1.345	6
A11	1.189	7
A5	0.947	8
A7	0.889	9
A10	0.887	10

Ranking of financial intermediation industry companies		
Ranking method: Fuzzy AHP		
Company	Index	Rank
A16	4.524	1
A20	1.953	2
A18	1.699	3
A24	1.241	4
A17	1.181	5
A15	0.949	6
A19	0.821	7
A21	0.785	8
A26	0.691	9
A25	0.662	10
A23	0.650	11
A22	0.578	12

Ranking of carrier industry companies		
Ranking method: PROMETHEE		
Company	Index	Rank
A2	0.0897	1
A1	-0.0897	2

Ranking of engineering services industry companies		
Ranking method: PROMETHEE		
Company	Index	Rank
A3	0.1008	1
A4	-0.1008	2

Ranking of rubber and plastic industry companies		
Ranking method: PROMETHEE		
Company	Index	Rank
A12	0.6685	1
A8	0.2905	2
A6	0.2850	3
A9	0.2780	4

A5	0.2444	5
A7	0.2180	6
A10	0.2145	7
A13	0.1704	8
A11	-0.1409	9
A14	-2.2284	10

Ranking of financial intermediation industry companies		
Ranking method: PROMETHEE		
Company	Index	Rank
A16	0.1663	1
A18	0.0264	2
A24	0.0069	3
A17	-0.0001	4
A20	-0.0016	5
A15	-0.0101	6
A21	-0.0162	7
A22	-0.0162	7
A19	-0.0163	8
A25	-0.0203	9
A26	-0.0207	10
A23	-0.0977	11

Investment portfolio P1
Ranking method: PROMETHEE      ranking result: I2<I4<I1<I3
Number of shares: 4
Companies included in portfolio: A20, A16, A13, A12

Investment portfolio P2
Ranking method: PROMETHEE      ranking result: I1<I2<I4<I3
Number of shares: 4
Companies included in portfolio: A1, A2, A8, A12

Portfolio P1:

$$\begin{array}{lll}
 COV_{A_{12}, A_{20}} = -0/5312 & COV_{A_{12}, A_{16}} = -0/4727 & COV_{A_{12}, A_{13}} = -0/6278 \\
 COV_{A_{16}, A_{20}} = 0/1809 & COV_{A_{13}, A_{20}} = 0/1694 & COV_{A_{13}, A_{16}} = 0/7347
 \end{array}$$

پر تعوی  $P_1$

پر تعوی  $P_2$

Portfolio P2:

$$\begin{array}{lll}
 COV_{A_{12}, A_1} = 0/2915 & COV_{A_{12}, A_2} = -0/5335 & COV_{A_{12}, A_8} = 0/6387 \\
 COV_{A_2, A_1} = 4/2916 & COV_{A_8, A_1} = -0/2149 & COV_{A_8, A_2} = -0/3264
 \end{array}$$

Portfolio P2:  
Portfolio P1:

$\rho_{A_{12}, A_{20}} = -0/9783$	$\rho_{A_{12}, A_{16}} = -0/2315$	$\rho_{A_{12}, A_{13}} = -0/6731$
$\rho_{A_{10}, A_{20}} = 0/3688$	$\rho_{A_{10}, A_{20}} = 0/7565$	$\rho_{A_{10}, A_{16}} = 0/8723$
$\rho_{A_{12}, A_1} = 0/0768$	$\rho_{A_{12}, A_2} = -0/1948$	$\rho_{A_{12}, A_6} = 0/9526$
$\rho_{A_1, A_1} = 0/9335$	$\rho_{A_1, A_1} = -0/1909$	$\rho_{A_1, A_1} = -0/4019$

### DISCUSSION AND CONCLUSIONS

Fuzzy AHP and PROMETHEE investment portfolios have been designed for the purpose of this study was to evaluate and compare methods.

P less as a portfolio, so the portfolio is 1 P. According to the results of the above and since the Sharp benchmark portfolio 2 As the method for designing a portfolio to be introduced. Fuzzy AHP and better

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