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The Survey on Combined Approaches FAHP-TOPSIS and FAHP-DEA in Ranking and Efficiency Survey Accepted Companies in Tehran Stock Exchange

(Case Study: Automotive and Petrochemical Companies)

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Abstract

This study analyzes a barrier of developing Exchange named lack of information related to performance of organization. This paper proposes a combined approach to decision making that Examine companies financial performance and offers an optimal way to solve the problem of ranking and efficiency survey. FAHP-TOPSIS approach is used to rating companies and FAHP-DEA approach is used for efficiency survey of companies. These approaches were used for efficiency measurement and rating of the companies in the two industries including automobile and petrochemical industry in 6-year period from 1385 to 1390. Based on the results, Maroon Co., Persian Gulf, and Kharg and in automobile industry Saze Pooyesh CO, Bahman group and Iran Auto Parts gained the best place in the ranking of corporate financial performance. Also, in terms of efficiency, in petrochemical industry Maroon Co., Persian Gulf, Jahrom and Kharg and in automobile industry Saze Pooyesh CO, Iran Auto Parts, Nasir Machin and Saipa Dizel are efficient.

Key words

Performance Evaluation, Financial Ratios, Fuzzy AHP, Data Envelopment Analysis

1 INTRODUCTION

Obviously, investing in the stock exchange is an important part of economy and undoubtedly, the greatest amount of capital is traded through stock exchanges around the world; and national economy is strongly influenced by the stock market performance. Also, this market is an available investment tool both for professional investors and the general public. Stock exchanges are affected by a series of macro-economic and non-economic factors and many other variables. The multiplicity and anonymity of factors influencing on capital markets had cause to uncertainty about investment (Emadzadeh et al, 2011, p.32). Performance evaluation systems are a tool for monitoring and planning organization activities and should be specially considered. This tool is used to correcting and updating of all organization aspects and even to change organization objectives. There is a famous sentence about performance measurement: "nothing is manageable, unless to be measured" (Hanafizade et al, 2011, p.88). Nowadays, due to the complexity and diversity of investments, the evaluation and ranking of companies is an important issue. Since there is no specific method to evaluate the performance of companies and to separate efficient companies from non-efficient in the Iranian capital market, it is necessary to promote a model for identifying efficient and superior firms; so that directors of companies attempt to deal with problems and at a higher level investors act in a more certain way. While entry of mathematics and operations research branches to the field of performance evaluation and efficiency of organization and to decision maker centers, have created a profound transformation in this area. Although traditional and simple methods such as ROA and ROE indicators are still used to assess performance, but modern methods such as BSC (Balanced Scorecard), FAHP (Fuzzy Analytic Hierarchy Process), DEA (Data Envelopment Analysis) and MCDEA (Multi Criteria Data Envelopment Analysis) are widely used for organization performance evaluation and ranking. Some of similar studies became in continue:

Khajavi et al (2005) examined the application of data envelopment analysis in determining a portfolio of most efficient companies of Tehran Stock Exchange. An input-oriented CCR model with covering form was used in this study. The results showed that among 90 studied companies, 29 companies equal to 32 percent of

the total number are efficient and the others are inefficient (Khajavi et al, 2005, pp.75-89). Moddel (2000) comprise relative performance of 24 MBA higher education programs using DEA (Moddel, 2000, pp.333-359). Paradi and Schaffnit (2004) evaluate the performance of a major Canadian bank branches using DEA and presented two models based on. The first model named production model which consider sources in which there is most profits for the branch director and the other named strategic model consider financial sources that is more important for higher level directors (Paradi, schaffnit,2004,pp.719-735). Darke and Hall (2003) used nonparametric DEA method to assessment of Japan banks efficiency. Their results showed that loans related issues are the main factor affecting the performance of Japanese banks, especially in small regional banks (Darke & Hall, 2003, 891-917). Wu et al (2006) compared banks which use Fuzzy DEA and compared results with DEA (Wu, et al, 2006). Staub et al (2010) studied Brazil banks efficiency. They use DEA in this study. Results indicated that more than 30 percent of banks have a poor performance and are subject to bankruptcy, As well as more than 50% of the banks have an average efficiency and only 20 percent are efficient (Staub et al, 2010, pp.204 - 213). Cummins and Nini (2002) investigated that insurance companies how to use their capital. In fact they investigated that whether insurers optimize their capital maintenance and usage or not? They used data envelopment analysis technique for the assessment; and capital was considered as one of the input variables in their model. The results indicated optimized areas of insurers' investment. Approximately 65 percent of insurers invested optimize (Cummins, Nini, 2002, PP.15 - 53).

So, this study examines financial performance of accepted firms of Tehran Stock Exchange according to financial ratio, and consequently, provides accumulated decision-making approach to achieve more accurate judgments for investor's decision-making.

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2 Research Questions

Can we determine standard ranking for financial performance of Tehran Stock Exchange companies according to FAHP- TOPSIS multiple approaches?

Can we estimate efficiency Tehran Stock Exchange companies according to FAHP-BCC multiple approaches?

3 Research Methodology

This research intends to help understanding the various issues occur in companies and to perceive and develop the decision making models mentioned in companies ranking. Thus considering its results, this study could be developmental and on the other hand, due to its application in solving current problem in our country's stock exchange (ranking and separation of efficient from non-efficient companies and optimized investment) would be applicable. Accordingly, the present study is descriptive, and since the survey research is used to assess the characteristics of a statistical population, and the data in this study has been obtained for a specified period of time (1385 - 1390), this is a cross-sectional survey study. One of the goals of this study is to provide a model for the performance assessment of accepted companies in Tehran Stock Exchange and calculating efficiency of them and separating successful and unsuccessful companies. This study examines financial ratios of firms as criteria and indicators of decision-making. Using average of observations for each company, the ratios calculated for companies in these two industries (automotive and Petrochemical) in the specified time interval, also the criteria weights are calculated using multi-criteria decision making techniques. So the indicators (financial ratios) of all years for each of the samples was determined and calculated in the information preparation phase. Since there are 28 companies in the automotive and automobile parts industry and 15 companies in the petrochemical industry and given 16 indicators and performance criterion, and because the cross-sectional method has been used in this study, the data is expressed based on "year – observation" means the number of observations in investigated years. Hence, a firm with 2 years presence in the exchange market, include 2 "years- observation" and one with 4 years history, has 4 "years- observation". So, there is 77 years- observation for the petrochemical firms and 168 year- observation for the automotive and automobile parts firms. Also, this study includes 1232 financial ratios for the petrochemical firms and 2688 ratios for the automotive and automobile parts firms. Generally, 245 years- observation and 3920 financial ratios were calculated for both industries. Then, the AHP questionnaire was distributed between decision-making experts (professors of finance, capital market investors) and the data on paired comparisons of financial ratios used to determine the indexes weights were collected. The time scale range (1- Non-preferred to 9- strongly preferred) is used in this questionnaire. First, the main criteria and then sub-criteria were compared with each other. In this questionnaire, six paired comparisons matrixes were developed. In the first matrix, five research's main criteria (liquidity, leverage, activity, profitability and growth) were compared by thirteen experts (professors of finance and capital market analysts) and their weights were determined. In turn, weights of sub-criteria were determined by paired comparison matrix. Then, weights of sub-criteria were multiplied in calculated financial ratios and the main criteria of research were assigned. Given the main criteria and determining

inputs and outputs by DEA solver software and using the Constant returns to scale method in an output oriented manner, efficient and inefficient companies for both industries were separated. Also by TOPSIS software we were rating them. This study has no statistical sample and all accepted companies in both automotive and petrochemical industries are examined.

Since FAHP method was used in this study to determine weights of indicators and sub-indicators, therefore the validity of the questionnaire is dependent on AHP which is assigned by the rate of compatibility in paired comparisons. Reliability (validity) of this questionnaire is measured by compatibility rate means that if the compatibility rate be more than 0.1, the questionnaire can be modified and re-distributed, so that this rate be lower than 0.1 for all paired comparisons (Najafi Pashaki, 2002, p.29). Since the compatibility rate for this study is 0.1, so we can say that the present questionnaire is valid (table 1). It should be noted that the criteria and sub-criteria was determined after library studying and consulting with some experts. After preparing the questionnaire, it was distributed between financial professors of Tehran University and consequently some of sub- indicators were confirmed and some of them were removed, also some sub- indicators were added to the conceptual model. So the expert's advice increased the validity and reliability of the Questionnaire.

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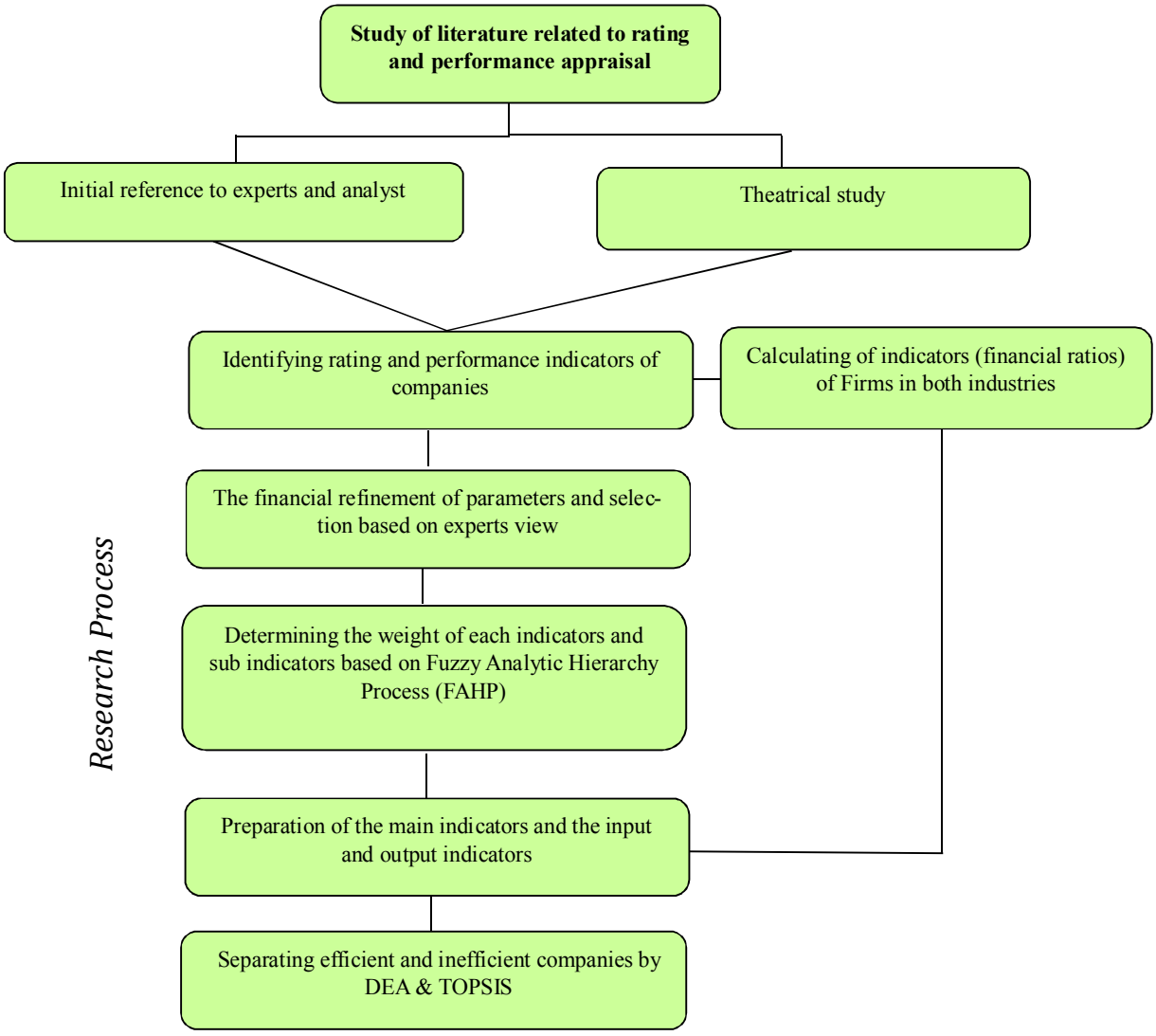
Table 1) integrated fuzzy comparison matrices of liquidity sub-indexes

Main indexes	Sub-indexes				
	Liquidity (C_1)	**Leverage (C_2)**	**Activity (C_3)**	**Profitability (C_4)**	**Growth (C_5)**
0.07408	0.0755	0.0543	0.01144	0.0741	0.005

Schematic diagram of research (FAHP-TOPSIS, FAHP-DEA):



Financial ratios: Accounting reports are important sources of information for managers, investors, and financial analysts. Financial ratios are common tools to extract

These information that must remove the effect of size of organization from accounting variables; and emphasize on important and remarkable firm characteristics such as profitability and liquidity (Tringueiros, 1994, P.149). Financial statements which include reports of managerial performance (which is an evidence for success or failure of management and a warning about signs of problems) are drawing tools for the company's commercial status (Feng & Wang, 2000, P.134). Financial ratios are the most useful indicators of firms' performance and financial status (Ertugrual & Karakasoglu, 2006). Financial ratios create useful financial quantitative information both for investors and analysts so that they can assess the company's operations and analyze its conditions. Also these ratios provide suitable quantitative data for basic statistical operations such as regression analysis (Gallizo & Salvador, 2003, P.267).

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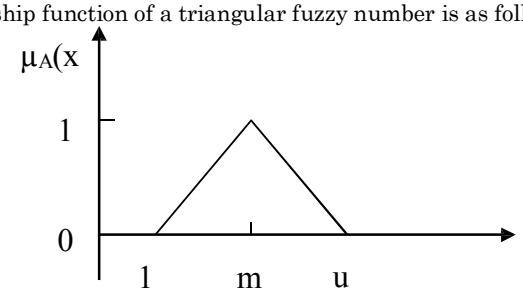
Fuzzy logic: Fuzzy numbers are a group of numbers that widely used in modern mathematics. Depending on situation, different fuzzy numbers can be used. Usually triangular and trapezoidal fuzzy numbers are used in practice. Because of their calculation easiness, triangular fuzzy numbers (T.F.N) is widely applied. Triangular fuzzy number is shown by three points (l, m, and u). Membership function of a triangular fuzzy number is as following equation:

$$\mu_M(X) = \begin{cases} \dfrac{x-1}{m-1}, 1 \le x \le m \\ \dfrac{u-x}{u-m}, m \le x \le u \\ 0, Otherwise \end{cases}$$

Mathematical operators on fuzzy numbers are as follows:
M1 = (l1, m1, u1), M2 = (l2, m2, u2), M1 + M2 = (l1 + l2, m1 + m2, u1 + u2)
M1 - M2 = (l1 - l2, m1 - m2, u1 - u2), M1M2 = (l1l2, m1m2, u1u2)
M1 / M2 = (l1/u2, m1/m2, u1/l2)

And the membership function of a triangular fuzzy number is as follows:



4 DATA ENVELOPMENT ANALYSIS (DEA):

Data envelopment analysis is one of the most popular methods that have been considered by many experts and analysts in recent years. DEA method is a new approach for evaluating a set of peer institutions and groups' performance (decision- making units such as universities, cities, courts, companies, countries and regions that convert multiple inputs to multiple outputs). This method is based on optimizing using linear programming. In this method, the efficient frontier curve which is formed by a series of points determined in turn by linear programming, according to relevant economic theories determine the organization efficiency using nonparametric method. For this reason, it has fewer constraints. DEA estimate the production frontier. It's a method that examines and solves a set of fractional reverse planning to determine relative efficiency of multicriteria systems in conversion of multiple inputs to multiple outputs. Since DEA doesn't induce analysts to know the complex relationships between multiple inputs and outputs, it outspread in wide application areas. DEA experimental trends and lack of previous assumptions, have led to its widespread use in studies (Ceyhan, 2010, P.2). The original DEA models divided into two categories including CCR and BBC. Each of these models can be examined with two approaches of input-oriented and output-oriented. CCR and BCC models differ in assumption of constant or variable returns to scale. The CCR model assumes constant returns to scale, and the BCC model assumes variable returns to scale. "Constant returns to scale" means that outputs change with the same ratio as inputs change. In the method of constant returns to scale (CCR) based on available data,

efficiency of each decision maker unit individually as well as of each unit between all n-units (DMUJ), estimated and calculated.

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS):

Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) had developed in 1981 by Hovang & uone. According to this method, most desirable solution has minimum distance from positive ideal solution and maximum distance from negative solution. Positive ideal solution is the solution that has maximum benefit and minimum loss and negative ideal solution is the solution that has minimum benefit and maximum loss (KianiMavi, et al.1390). Main fault in TOPSIS method is not specifying weights and not surveying judgment compatibilities. So, this method need to effective procedure that determines relative importance of different parameters. AHP method complies these faults (Rao & Davim, 2008). Also, use of hierarchical analyze had limited because of human's limitation in data processing and maximum number of pair matching had considered 7±2 (Kandakoglu et al., 2009). TOPSIS method can comply pair matching requests and consequently, human's limitations had eliminated (Shih et. al., 2007).

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5 Data Analyses:

Determining the weight of each indicators and sub-indicators based on Fuzzy AHP:

After determining indexes by experts, the hierarchical analysis questionnaire was developed in order to determining priorities or weights of indicators and sub-indicators. Thirteen AHP questionnaires were distributed among experts (Tehran University financial professors) and stock investors in order to determining them through Group Fuzzy AHP. At first we compute group paired comparison matrix; group fuzzy paired comparisons matrix can be combined by following algorithm (Meixner, 2009, P.5).

$$l_{ij} = \min(l_{ijk}), m_{ij} = \left(\prod_{k=1}^{k} m_{ijk}\right)^{\frac{1}{k}}, u_{ij} = \max(u_{ijk})$$

Where (Lijk, Mijk, Uijk) are involved in fuzzy calculations and K answerers are existed. Anyway calculating the minimum and maximum of fuzzy numbers are not symmetric if the responses of the individual have a great distance from each other. In other words, ratings and calculations will be incongruent. In this case, we have to consider one or a few numbers of respondents. Because of the operations of multiplication and division of fuzzy numbers, group fuzzy weights which are obtained in this case are not reliable and dependable; and this is not desirable. Typically, geometric mean is used in the arithmetic operations of group AHP. So we decided to use geometric mean in calculating Lij and Uij in order to getting reliable and dependable weights (ibid, p.5).

$$l_{ij} = \left(\prod_{k=1}^{k} l_{ijk}\right)^{\frac{1}{k}}, m_{ij} = \left(\prod_{k=1}^{k} m_{ijk}\right)^{\frac{1}{k}}, u_{ij} = \left(\prod_{k=1}^{k} u_{ijk}\right)^{\frac{1}{k}}$$

So integrated fuzzy comparison matrices by experts (professors and investors) are as follow:

Table 2) integrated fuzzy comparison matrices of main indexes

	(C_1)	(C_2)	(C_3)	(C_4)	(C_5)
(C_1)	(1 , 1 , 1)	(.4 , .63 , 1.084)	(0.55 , .89 , 1.49)	(0.20 ,0 .30 ,0 .58)	(0.36 , 0.60 , 1.01)
(C_2)	(0.91 , 1.57 , 2.49)	(1 , 1 , 1)	(0.51, 0.88, 1.48)	(0.22, 0.37, 0.67)	(0.46 , 0.84 , 1.68)
(C_3)	(0.65 , 1.22 , 1.7)	(0.67 , 1.12, 1.95)	(1 , 1 , 1)	(0.23 , 0.30 , 0.6)	(0.39 , 0.62 , 1.18)
(C_4)	(1.71 , 3.11 , 4.9)	(1.47 , 2.64 , 4.34)	(1.5 , 3.22 , 4.51)	(1 , 1 , 1)	(1.47 , 3.37, 5.43)
(C_5)	(0.96 , 1.64 , 2.69)	(0.59 , 1.17 , 2.1)	(0.84 , 1.6 , 2.53)	(0.18 , 0.29 , 0.67)	(1 , 1 , 1)

Table 3) integrated fuzzy comparison matrices of liquidity sub-indexes

	(C_{11})	(C_{12})	(C_{13})
(C_{11})	(1 , 1 , 1)	(0.18 , 0.31 , 0.68)	(0.16 , 0.22 , 0.37)
(C_{12})	(1.75 , 3.18 , 5.27)	(1 , 1 , 1)	(0.30 , 0.53 , 1.04)
(C_{13})	(2.32 , 4.08 , 5.71)	(1.08 , 2.00 , 3.28)	(1 , 1 , 1)

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Table 4) integrated fuzzy comparison matrices of leverage sub-indexes

	(C_{21})	(C_{22})	(C_{23})
(C_{21})	(1 , 1 , 1)	(1.288 , 2.76 , 3.15)	(2.00 , 3.19 , 5.00)
(C_{22})	(0.3 , 0.37 , 0.76)	(1 , 1 , 1)	(1.08 , 2.00 , 3.19)
(C_{23})	(0.20 , 0.29 , 0.49)	(0.31 , 0.49 , 0.91)	(1 , 1 , 1)

Table 5) integrated fuzzy comparison matrices of activity sub-indexes

	(C_{31})	(C_{32})	(C_{33})	(C_{34})
(C_{31})	(1 , 1 , 1)	(0.12 , 0.16 , 0.36)	(0.16 ,0 .25 , 0.62)	(0.244 , 0.41 , 1.1)
(C_{32})	(3.77 , 5.85 , 7.76)	(1 , 1 , 1)	(1 , 2.03 , 3.85)	(1.51 , 3.6 , 5.54)
(C_{33})	(1.88 , 3.82 , 6.15)	(0.25 , 0.49 , 0.99)	(1 , 1 , 1)	(1.05 , 2.2 , 4.27)
(C_{34})	(1.79 , 2.38 , 4.08)	(.18 , .32 , .66)	(0.23 , 0.44 , 0.94)	(1 , 1 , 1)

Table 6) integrated fuzzy comparison matrices of profitability sub-indexes

	(C_{41})	(C_{42})	(C_{43})
(C_{41})	(1 , 1 , 1)	(.15 , .23 , .43)	(.19 , .33 , .68)
(C_{42})	(2.20 , 4.32 , 6.31)	(1 , 1 , 1)	(1 , 1.60 , 2.40)
(C_{43})	(1.40 , 2.92 , 5.11)	(.41 , .61 , 1)	(1 , 1 , 1)

Table 7) integrated fuzzy comparison matrices of growth sub-indexes

	(C_{51})	(C_{52})	(C_{53})
(C_{51})	(1 , 1 , 1)	(.15 , .21 , .39)	(0.19 , 0.29 , 0.706)
(C_{52})	(2.53 , 4.56 , 6.57)	(1 , 1 , 1)	(0.88 , 1.57 , 2.70)
(C_{53})	(1.41 , 3.35 , 5.26)	(0.37 , 0.63 , 1.13)	(1 , 1 , 1)

Now, we calculate the weight of main index and sub-indexes by FAHP:

Sk=∑_(i=1)^5▒Ci = (19.3275 , 31.4322 , 48. 0885)
S1 = (2.517/48.0885 , 3.429/31.4322 , 5.098/19.3275) , S1 = (.0523,.109,.2638)
S2 = (3.1199/48.0885,4.6732/31.4322,7.3445/19.3275) , S2 = (.0649 ,.1486,.38)
S3 = (2.943/48.0885,4.276/31.4322,6.436/19.3275) , S3 = (.0612 ,.136 ,.333)
S4 = (7.164/48.0885,13.342/31.4322,20.214/19.3275) , S4 = (.149,.4245,1.0459)
S5 = (3.5832/48.0885,5.711/31.4322,8.996/19.3275) , S5 = (.074,.1817,.4654)
V (S1≥S2) = (.2638- .0649)/((.2638- .0649)+ (.1486- .109)) = .834 , V (S1≥S3) =
(.2638- .0612)/((.2638-.0612)+(.136- .109)) = .8824
V (S1≥S4) = (.2638 - .149)/((.2638 - .149) + (.4245 - .109)) = .2667,V (S1≥S5) =
(.2638 - .074)/((.2638 - .074) + (.1817 - .109)) = .723
V (S3 ≥S2) = (.333 - .0649)/((.333 - .0649) + (.1468 - .136)) = .9551V (S2 ≥S4) =
(.38 - .149)/((.38 - .149) + (.4245 - .1486)) = .4557
V (S2 ≥S5) = (.38 - .074)/((.38 - .074) + (.1817 - .1476)) = .8997,V (S3 ≥S4) =
(.333 - .149)/((.333 - .149) +(.4245 - .136)) = .3894
V (S3 ≥S5) = (.333 - .074)/((.333 - .074) + (.1817 - .136)) =.85,V (S5 ≥S4) =
(.4654 - .149)/((.4654 - .149) + (.4245 - .1817)) = .5651
V (S2 ≥S1) = 1 , V (S3 ≥S1) = 1 , V (S4 ≥S1) = 1 ,V (S5 ≥S1) = 1 , V (S2 ≥S3) = 1 ,
V (S5 ≥S2) = 1 V (S4 ≥S2) = 1 , V (S4 ≥S3) = 1 , V (S5 ≥S3) = 1 , V (S4 ≥S5) = 1
V (S1 ≥S2 , S3 , S4 , S5) = Min [.834 , .8824 , .2667 , .723] = .2667
V (S2 ≥ S1 , S3 , S4 , S5) = Min [1 , 1 , .4557 , .8997] = .4557
V (S3 ≥ S1 , S2 , S4 , S5) = Min [1 , .9551 , .3894 , .85] = .3894
V (S4 ≥ S1 , S2 , S3 , S4) = Min [1 , 1 , 1 , 1] = 1
V (S5 ≥ S1 , S2 , S3 , S4) = Min [1 , 1 , 1 , .5651] = .5651
W (Liquidity) = (.2667)/(.2667+ .4557+ .3894 + 1 + .5651) = .1, W (Leverage) = (.4557)/(2.6769) = .17
W (Activity) = (.3894)/(2.6769) = .15, W (Profitability) = 1/(2.6769) = .37, W(Growth) =
(.5651)/(2.6769) = .21

The weights of sub-indexes are calculated as the same.

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Table 9: the weight of indexes

Main indexes	Weight	Sub-indexes	Weight
Liquidity (C_1)	0/1	Current ratio (c11)	0/01
		Quick Ratio (c12)	0/234
		Current liabilities by Current assets (c13)	0/555
Leverage (C_2)	0/11	Liability ratio (c21)	0/24
		Liability by equity capital (c22)	0/33
		Fix assets by equity capital (c_{23})	0/05
Activity (C_3)	0/15	Accounts Receivable turnover (c31)	0/01
		Current assets turnover (c32)	0/23
		Total assets turnover (c33)	0/34
		Inventory turnover (c34)	0/15
Profitability (C_4)	0/31	Net profit margin (c41)	0/03
		Return on equity (c42)	0/55
		Return on assets (c43)	0/24
Growth (C_5)	0/41	Operating profit growth (c51)	0/03
		Equity growth (c52)	0/52

The rating of companies by using TOPSIS:

The result of rating for companies in two industries including automotive and petrochemical are as follow:

Table 9) Rating of companies in petrochemical industry

Company	Liquidity	Leverage	Activity	Profitability	Growth	C_i	Rate
Marun	1/02	0/272	3/297	0/601	0/469	0/6491	1
Khalij fars	4/74	0/398	0/063	0/061	4/320	0/6452	2
Khark	1/48	0/353	1/786	0/712	0/302	0/6444	3
Pardis	0/45	0/278	2/224	0/631	0/609	0/6378	4
Zagros	0/59	0/626	3/168	0/434	0/168	0/5938	5
Isfahan	0/86	1/03	1/051	0/374	0/44	0/5843	6
Iran	0/72	0/433	2/677	0/346	0/229	0/5744	7
Abadan	0/56	1/128	2/841	0/298	0/08	0/5520	8
Fanavaran	0/62	0/89	1/992	0/31	-0/005	0/5454	9
Shazand	0/52	0/95	2/531	0/275	0/126	0/5433	10
Farabi	0/72	2/68	3/493	0/168	0/253	0/5263	11
Jahrom	5/40	0/049	0	0/015	0/388	0/5118	12
Kermansha	0/37	2/637	1/268	0/156	0/305	0/5089	13
Shiraz	1/35	0/424	1/077	0/074	0/123	0/5004	14
Bisotun	0/26	21/71	8/035	0/586	-4/85	0/3325	15

As shown in the above table; Marun petrochemical, Khalije Fars petrochemical and Khark petrochemical allocated first to third place. So, these companies have better financial performance than other companies in the petrochemical industry.

Table 10) Rating of companies in automotive industry

Company	Liquidity	Leverage	Activity	Profitability	Growth	C_i	Rate
Saze pooyesh	0/609	1/485	2/875	0/359	0/33	0/7276	1
Ghata'at automo-bil	1/30	0/34	0/326	0/317	0/24	0/6877	2
Bahman group	0/643	0/724	1/215	0/229	0/22	0/6577	3
Charkheshgar	0/617	1/353	1/77	0/221	0/17	0/6462	4
Niroo mohareke	0/621	1/084	2/842	0/146	0/22	0/6282	5
Kapart sanat	0/668	1/157	1/974	0/187	0/12	0/6252	6
Nasir mashin	0/710	0/613	2/862	0/165	0/12	/0/6227	7
Zamiad	0/668	1/246	1/318	0/183	0/14	0/6225	8
Lent tormoz	0/681	0/560	1/915	0/180	0/08	0/6178	9
Iran khodro	0/715	3/466	2/69	0/184	0/16	0/6166	10
Saipa	0/607	1/60	2/667	0/164	0/10	0/6126	11
Ring sazi	0/650	1/412	3/704	0/144	0/10	0/6103	12
Fanar sazi	0/731	0/409	1/50	0/129	0/18	0/6073	13
Saipa dizel	0/771	0/001	1/308	0/386	-0/47	0/6040	14
Mehvarsazan	0/54	1/70	7/37	0/090	0/1	0/5935	15
Electric shargh	0/691	1/256	1/845	0/118	0/072	0/5797	16
Motorsazan terac-tor	0/488	0/956	1/42	0/105	0/046	0/5693	17
Mehvar khodro	0/60	1/067	1/07	0/090	0/06	0/5606	18
Iran radiator	0/684	0/93	1/64	0/083	0/05	0/5604	19
Saipa azin	0/746	3/27	2/35	0/046	0/133	0/5392	20
Fanarsazi zar	0/744	1/241	1/36	0/051	-0/02	0/5285	21
Mehrkam	0/676	1/617	3/25	0/007	0/105	0/5278	22
Pars khodro	0/602	1/393	3/33	0/003	0/082	0/5234	23
Ahangari teraktor	0/654	2/723	1/51	-0/270	1/25	0/5012	24
Iran khdoro dizel	0/660	3/371	0/99	-0/012	0/11	0/4931	25
Rikhtegari iran	0/753	2/178	1/35	-0/17	0/65	0/4797	26
Rikhtegari teraktor	0/657	1/084	1/48	-0/016	-0/45	0/4386	27
indimin	0/620	2/878	2/63	-0/60	0/34	0/2241	28

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Among of companies in the automotive industry; Saze pooyesh, Ghata'at automobile Iran and Bahman group allocated first to third place and these companies have better financial performance than other companies in the automotive industry. So the answer to the first question is yes and we have rating for the financial performance of companies in Tehran Stock Exchange.

Separating efficient and inefficient petrochemical companies by output-based BCC method:

The outputs of DEA Master calculated by output-based BCC for petrochemical industry are shown as follow:

Table 11): The output of DEA Master of petrochemical industry (BCC method)

Company	Effi-ciency	Company	Efficiency
Bisotoon	100	Zagros	93/83
Jahrom	100	Marun	100
Khalij fars	100	Shiraz	50/92
Kermanshah	40/95	Khark	100
Shazand	73/43	Farabi	99/62
Abadan	81/47	Iran	80/25
Isfahan	66/29	Fanavaran	58/89
Pardis	99/51	Zagros	93/83

As shown in the above table, Bisotoon petrochemical, jahrom petrochemical, Khalije Fars, Maroon and Khark are efficient.

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Separating efficient and inefficient automobile companies by output-based BCC method:

The outputs of DEA Master calculated by output-based BCC for automobile industry are shown as follow:

Table 12): the output of DEA Master of automobile industry (BCC method)

Company	Efficiency	Company	Efficiency
Iran khodro	79/03	Rikhtegari Iran	84/72
Iran khodro diesel	57/64	Fanarsazikhavar	100
Pars khodro	71/97	Fanarsazi zar	66/73
Saipa	71/37	Saipa Azin	74/88
Zamyad	64/49	Rikhtegari Teraktor	61/22
Saze pouyesh	100	Iran radiator	64/48
Ring making of mashhad	79/40	Charkheshgar	71/68
Pars Mehrkam	76/92	Irka part	70/76
Niro Mohareke	85/20	Motor sazan teraktor	48/09
Nasir mashin	100	Saipa diesel	100
Mehvarsazan	100	Bahman group	82/30
Mehvar khodro	57/83	Ahangari teraktor	100
Lent tormoz	81/55	Shargh electric khodro	66/65
Automobile parts	100	Endamin komak-fanar	75/47

Among of companies in the automotive industry, Saze pooyesh, Nasir machine, Mehvarsazan, Ghata'at automobile Iran, Fanarsazi khavar, Saipa dizel and Ahangari teraktor are efficient. So the answer to the second question is yes and we have Separate efficient and inefficient companies in Tehran Stock Exchange.

6 Conclusion

Stock exchange is one of the most important channels in the world and the world's main commodity and stock exchanges are critical for all markets. Also, this market is a way to collection of people's small and large capitals to promote the country's economy and using in production and services. Furthermore, exchange market prepares the way for economic and industrial growth and development, and by promoting new jobs and engaging young people fight with unemployment. As a result, many of social pathologies of unemployment such as theft, crime, etc., will reduce. In order to fulfill this important task by capital market; it must supply both investors and corporate executives with clear information. Performance evaluation and rating based on quantitative indicators help to achieve this important aim, so that investors can invest more certain and the companies' directors can maximize the shareholders wealth in the best way. This is not possible without information about the company's and its stock's situation. Accordingly, this study seeks to provide a mechanism to better investment and performance evaluation. Since the AHP is not able to consider the qualitative judgments, a combined approach of fuzzy AHP - DEA (BCC) and fuzzy AHP-TOPSIS are used in this study. Five main criteria including liquidity, leverage, activity, profitability and growth and 16 sub-criteria were determined and refined in consultation with experts. A 6-year period (1385-1390) was appointed. Experts assigned maximum weight to profitability indicator (0.37) and minimum weight to liquidity indicator (0.1). Among liquidity sub- criteria, "current liabilities to total assets" and "quick" ratios have the most weights according to experts. In leverage sub-criteria, "debt ratio" received a high weight. In activity sub-criteria, "current asset turnover" and total asset turnover" supposed to be important. In profitability sub-criteria, "return on equity" and "return on investment" supposed to be more important than "net profit margin". Experts believe that "growth of equity" is more important than other growth sub-criteria. According to fuzzy AHP-TOPSIS approach in petrochemical industry; Marun petrochemical, Khalije Fars petrochemical and Khark petrochemical allocated first to third place. So, these companies have better financial performance than other companies in the petrochemical industry. Also among of companies in the automotive industry; Saze pooyesh, Ghata'at automobile Iran and Bahman group allocated first to third place and these companies have better financial performance than other companies in the automotive industry. On the other hand, according to fuzzy AHP - DEA (BCC) in petrochemical industry, Bisotoon, jahrom, Khalije Fars, Maroon and Khark are efficient, thus these companies have a better financial situation and may be offered to investors for investment and to other firms as good patterns. In the automotive industry, Saze pooyesh, Nasir machine, Mehvarsazan, Ghata'at automobile Iran, Fanarsazi khavar, Saipa dizel and Ahangari teraktor are efficient and may be models for other

companies in this industry.

The remarkable point is that Companies that have achieved higher rate in the fuzzy AHP-TOPSIS approach, in the fuzzy AHP - DEA (BCC) approach is also in line with the company were ineffective. Therefore, the results obtained from the two approaches are compatible.

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