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The Ranking of Corporate Social Responsibility by Using of DEA Cross Efficiency

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ABSTRACT

Social responsibility provides a framework for ethical monitoring on the business enterprises activities whereby business enterprises must responsible to society and environment. This study based on financial variables and using the data envelopment analysis technique, ranks automotive companies in terms of social responsibility. Data and theoretical frameworks of the research are based on library studies and data analysis is also based on the data envelopment analysis model. Results of this research indicate that big companies in the automotive industry are less socially responsible than other companies. This suggests that big companies in the automotive industry do not have a proper social behavior toward the stakeholders, and pay less attention to social and environmental issues. Given to the outcomes of this study is suggested that regulators and policymakers in automotive industry could develop executive instructions to match social goals with businesses performance and coordinate the firm activities and responsibilities with society policies.

Keywords:

Social Responsibility, Data Envelopment Analysis, Corporate Social Responsibility, Ranking.

1. Introduction

Corporate Social Responsibility means obligations and duties which businesses assume toward society. These obligations include the duties which the businesses assume toward economy, society, environment, life improvement and health of citizens and other stakeholders. Some subjects such as environmental pollution control, safety and health of workplace, creation of equal job opportunities for minorities and women, quality promotion of the products of the company, observing human and worker rights are among the expectations which have been considered by the legal authorities and stakeholders in recent decades as social responsibility of the companies against society. Failure to observe duties and obligations greatly affects continuity of corporate activities (Hasas Yeganeh and Barzegar, 2014). Emergence of concept of corporate social responsibility in economic, scientific and political circles of the world in recent decades can result from more complexity of business space, globalization of economy and creation of multinational companies, demand for transparency of business, political pressures of the states, creation of social and environmental crises, etc. In today's world, companies particularly those who act in the global markets are obliged to create balance between social, economic and environmental elements of their activity while maximizing share value of the investors. They should apply their socially, ethically, legally and environmentally responsible standards in their businesses (Lindgreen et al. 2007). Despite different studies which have been conducted on the subject of corporate social responsibility and also contrary to the awareness level of the senior managers of the state industries with corporate social responsibility , there are no clear borders and scope of reporting and disclosing corporate social responsibility . Some researchers in corporate social responsibility believe that there is no generally accepted theory or approach for the corporate social responsibility. They regard corporate social responsibility as a widespread, complex and continually evolving concept which includes different attitudes and ideas (Godfrey and Hatch, 2007).

Ranking of corporate social responsibility is one of the important subjects for analysis of corporate social performance. This paper aims to rank social responsibility of automotive companies based on the financial indicators and using data envelopment analysis (DEA) approach. Data envelopment analysis (DEA) approach is a powerful and flexible approach for measurement of financial performance because this technique concurrently considers different variables as input and output variables for assessment of corporate efficiency . This approach is also a decision-making tool and can provide more information compared with the traditional analysis methods (for example financial ratios). Data envelopment analysis (DEA) approach compares any company with other companies with the same industry in terms of efficiency. Such comparison is a suitable one because in traditional analyses, efficiency of each company is compared with mean or median of the sample companies of the research. Since concept of social responsibility based on economic development plans of the state and general policies of the vision plan 2025 is of special importance for economy of the country, for this reason, the present research seeks to determine and rank corporate social responsibility rank considering the financial indicators using Data envelopment analysis (DEA) approach. The contributions of this research can be described as follows:

Firstly, results of this research can expand theoretical frameworks of the previous researches on corporate social responsibility in social accounting. Secondly, this research indicates how corporate social responsibility is ranked for interpretation of social behavior. This issue can give useful information to the policymakers in accounting and social fields. Therefore, this research can give its readers better understanding of the theories of social accounting.

2. Literature Review

2.1. Social responsibility

Concept of corporate social responsibility was raised in 1950s. Social responsibility means tendency of a business enterprises to respond to consequences of its activities on society and environment. Social responsibility is first a framework for ethical monitoring of the business enterprises on which basis business enterprises should perform the activities which improve conditions of the society not perform the activities which harm the society. Social responsibility seeks to include environmental and social factors in commercial decisions of companies so

that firm economic performance can be coordinated with the social and environmental performance to be useful for business enterprises and also for society and environment. In fact activity of the business enterprises should create balance between profitability resulting from economic activities, social justice in society and environmental protection. In other words, firm profitability should not be harmful to people of society and environment. It means that companies should report a profit to their shareholders where social justice and environmental protection have been observed. Observing human rights including not using labor children , not forcing workers to work overtime , observing rights and protecting health of customers , performing humanitarian activities for people in society , observing environmental regulations such as non contamination of water , air and environmental (Hasas Yeganeh and Barzegar, 2013).

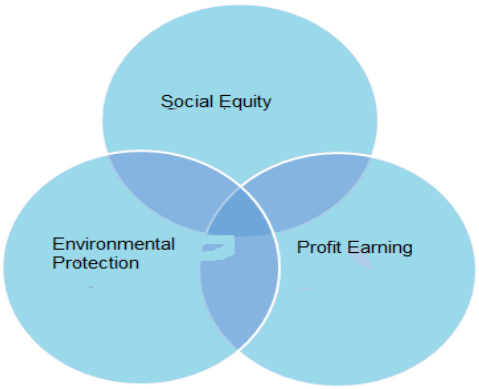

Diagram 1. Balance between economic, social and environmental activities

Banimahd et al. (2009) studied the relationship between environmental performance and financial performance of the companies listed in Tehran stock exchange. Results of the research indicate that the environmental performance has no significant relationship with the financial performance but corporate size, ratio of advertising expenses to total sales, ratio of export sales to total sales, ratio of financial leverage and ratio of sales to total assets have significant relationship with the financial performance. Industry type is effective on the relationship between environmental performance and financial performance. Bahar Moghadam et al. (2013) in a research concluded that disclosure of corporate social responsibility was affected by corporate governance mechanisms. It means that the better the corporate governance mechanisms are applied and executed, the more disclosure of corporate social responsibility reports will be improved and these mechanisms will act as infrastructure of corporate social responsibility disclosure. Arab Salehi et al. (2013) indicated that financial performance had no significant relationship with corporate social responsibility toward personnel and environment. They believe that businesses managers should develop the effective policies relating to corporate social responsibility for achieving better financial performance.

Results of research by Abdoli et al.(2014) indicate that there is significant relationship between corporate social responsibility and ratio of the members of the board of directors and ownership concentration had the highest effect on the corporate social responsibility compared with other variables. Based on the obtained results, it was specified that there was no significant relationship between dual role of the chairman of the board of directors , ratio of the board of directors changes and ownership type and corporate social responsibility. Omidi et al. (2016) in a study entitled "effect of corporate social responsibility on social performance and consumer's reactions in food industries" concluded that social responsibility had direct effect and mediating effect of social performance and consumer reactions on the financial performance. Dianati Deilami and Khodakarami (2017)studied effect of corporate social responsibility news publication on shares price and concluded that shares purchase rate of these companies increased after publication of positive news about corporate social responsibility leading to increase of share price of the company. More findings of this research indicate that publication of bad news about social and environmental responsibility doesn't have effect on share price of the companies. Zandi and Faghani Makrani(2018) based on content analysis of the existing articles about social responsibility found that corporate social responsibility had significant relationship with the financial performance. Davoudi Nasr et al. (2018) explained auditing of corporate social responsibility from the viewpoint of human rights and social values found that dimensions of social responsibility auditing from the viewpoint of human rights and social values include social base , use of mass media, attendance in public area , attitude

toward citizenship rights , responsibility and accountability , contributing to civil partnership, information and clarity , quality and quantity of services and social mission obligation. Allahyari et al. (2018) studied effectiveness of dimensions of corporate governance in relationship between social responsibilities and tax equity. They found that corporate governance had positive and significant relationship with relationship between social responsibilities and tax equity. They believe that observing rights of all stakeholders , the presence of non-obliged members in the board of directors , auditing committee independence, salary disclosure of the members of the board of directors led to more monitoring on companies and it led to increase of tax equity. Brammer and Millington(2008) showed that there was positive relationship between corporate responsibility and corporate financial performance. In the companies which there are high social responsibility, financial performance in capital market is higher than that of the companies which have low social responsibility. Belu(2009) in his research showed that the companies which had weaker financial performance had lower social performance. Evidence of his research also showed that the companies which are active in financial section have weaker performance than other industries in terms of social and environmental performance.

Crisóstomo et al. (2011) in a research in Brazil showed that there was negative relationship between corporate social responsibility and corporate value. They also found that there was no significant relationship between variables of financial performance and social performance. Scholtens & Kang(2013) studied relationship between earnings management and corporate social responsibility and investors support. Results of their research indicated that the companies with good social responsibility are highly interested in reduction of earnings management. They also found that there was negative relationship between investors support and earnings management and corporate social responsibility causes companies to less manage earnings. Lee & Farzipoor Saen (2012) presented a model for measurement of corporate social responsibility based on data envelopment analysis (DEA) approach. They believe that data envelopment analysis can measure corporate social responsibility as useful tool better than traditional techniques.

Soliman et al.(2012) in a research entitled "ownership structure and corporate social responsibility in Egypt " divided ownership structure into three different groups of institutional , managerial and foreign ownership. Results of their research show that there is positive and significant relationship between foreign investors and institutional investors but there is negative and significant relationship between foreign ownership and social responsibility .

Kim et al. (2014) in a research studied the relationship between social responsibility reporting and share price reduction risk. Results of this research indicate that firm performance in social responsibility has a negative relationship with share price reduction risk in future. In addition, effect of social responsibility reduction on reduction risk will be more distinctive when firms have weak corporate governance or they have lower level than the institutional ownership has. Jianwen(2017) in his research studied relationship between CEO power and corporate social responsibility. He showed that CEO power had negative and significant relationship with firm performance in social and environmental responsibility but Yuan et al.(2017) achieved the opposite result. Their research results indicated that corporate social responsibility had negative relationship with management ability.

Sharbati(2018) in a study on relationship between corporate social responsibility and performance in pharmaceutical industry in Jordan showed that there was positive and significant relationship between corporate performance and social responsibility particularly environmental responsibility. Wu & Lin(2018) using data envelopment analysis (DEA) approach showed that CEO debt to company has positive and significant relationship with corporate social responsibility. Wang et al. (2018) using data envelopment analysis (DEA) approach studied the effect of social responsibility on corporate financial performance in telecommunication industry. Their research results showed that financial performance was higher in the companies which observed social responsibility than other companies.

2.2. Cross Efficiency Model in Data Envelopment Analysis (DEA)

Data envelopment analysis (DEA) is a mathematical planning model for assessment of

efficiency of the decision-making units (DMUs) which have several inputs and outputs. This model is one of the suitable and efficient tools for productivity which is used as a non-parametric method to calculate efficiency of the decision-making units. One of the methods of ranking efficient decision-making units (DMUs) in data envelopment analysis (DEA) is use of "cross efficiency" model. Efficiency in data envelopment analysis (DEA) is calculated with ratio of weighted sum of outputs on weighted sum of inputs. Weights were selected in Data envelopment analysis (DEA) such that the studied unit is allowed to maximize its efficiency size compared with other units. Two main advantages of the cross efficiency assessment are as follows:

A- Cross efficiency gives an efficiency ranking among all decision-making units (DMUs) for distinguishing between the best and the worst performance.

B- Cross efficiency can exclude need for weight limitation for all types of applications and therefore, violate unreal weighting method of Data envelopment analysis (DEA)(Liang et al. , 2008).

In Data envelopment analysis (DEA), we have the following classic signs:

Assume that there is a set of *DMU*s . Every DMU_j has *m* distinctive input of x_{ij}) *i=1,..,m*(and *s* distinctive output of y_{rj}) *r=1,…,s*(.

Cross efficiency of *DEA* is a traditional development in two-phased process. More precisely, self assessment efficiencies of each *DMU* will be calculated in phase 1 based on Constant return to scale(*CRS*) developed by Charnes , Cooper and Rhodes (1978)(CCR from here on) . In phase 2, the obtained weights of phase 1 will be applied for all other *DMU*s to obtain a score which is hereinafter called cross efficiency assessment score. Then, the mathematical model for two-phased process expressed above is given.

Phase 1: self-assessment efficiency of DMU_d is shown with *CCR* model in *DEA* is shown as follows:

Relation 1

$$max\ E_{dd} = \sum_{r=1}^{s} u_{rd} y_{rd}$$

$$S.t$$

$$\sum_{r=1}^{s} u_{rd} y_{rj} - \sum_{i=1}^{m} v_{id} x_{ij} \leq 0 \quad j = 1, \dots, n$$

$$\sum_{i=1}^{m} v_{id} x_{id} = 1$$

$$v_{id} \geq 0 \qquad i = 1, .., m$$

$$u_{rd} \geq 0 \qquad r = 1, \dots s$$

Where u_{rd} and v_{id} are representation of r^{th} output weights and *i*th input weights of DMU_d. For each DMU_d, we obtain a set of optimal weights of v_{1d}^* ، v_{2d}^* ، .... ، v_{md}^* ، u_{1d}^* ، u_{2d}^* ، .... ، u_{sd}^* by solving the model in phase 1.

Phase 2: cross efficiency of every DMU_j can be calculated using optimal weights of DMU_d i.e. E_{dj} as follows:

Relation 2

$$E_{dj} = \frac{\sum_{r=1}^{s} u^*_{rd} y_{rj}}{\sum_{i=1}^{m} v^*_{id} x_{ij}} \qquad d, j = 1, \dots, n$$

Therefore, cross efficiency matrix (*CEM*) is formed using the above Relation.

For every DMU_j) *j=1,…,n*(, mean of all E_{dj}) *d=1,…,n*(is expressed as cross efficiency score for DMU_j.

$$\bar{E}_j = \frac{1}{n} \sum_{d=1}^{n} E_{dj}$$

Cross efficiency score can be named cumulative score with equal weight of $1/n$. At the end, we rank the decision-making units using cross efficiency score.

Recently, the researchers presented secondary target model using conceptual definition as satisfaction rate. They solved the secondary model and obtained a unique answer for it with two algorithms.

In this research, a new concept was introduced as satisfaction ratio with which a secondary target model is presented for cross efficiency.

The following model will calculate an ideal value of efficiency for DMU_j) j=1,..,n ; j≠ *d*(considering weights of DMU_d:

$$\overline{E_{dj}} = \max \sum_{r=1}^{s} u_{rd} y_{rj}$$

Relation 3

$$S.t$$

$$\sum_{i=1}^{m} v_{id} x_{ij} = 1$$

$$\sum_{r=1}^{s} u_{rd} y_{rd} - E_{dd}^{*} \sum_{i=1}^{m} v_{id} x_{id} = 0$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0, \qquad j = 1,\dots,n$$

$$u_r \ge 0, \quad v_i \ge 0, \qquad \forall r, i$$

Where E_{dd}^{*} is efficiency value of DMU_d using Relation 1. In this way, anti-ideal value of efficiency can be calculated for DMU_j) j=1,..,n ; $j \neq d$(considering weights of DMU_d as follows:

Relation 4

$$\underline{E}_{dj} = \min \sum_{r=1}^{s} u_{rd} y_{rj}$$

$$S.t$$

$$\sum_{i=1}^{m} v_{id} x_{ij} = 1$$

$$\sum_{r=1}^{s} u_{rd} y_{rd} - E_{dd}^{*} \sum_{i=1}^{m} v_{id} x_{id} = 0$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0, \qquad j = 1,\dots,n$$

$$u_r \ge 0, \quad v_i \ge 0, \qquad \forall r, i$$

DMU_j) j=1,..,n ; $j \neq d$(always tries to obtain efficiency value of $\overline{E_{dj}}$ but it is impossible to reach this value for all DMU_j) j=1,..,n ; $j \neq d$(. DMU_j) j=1,..,n ; $j \neq d$(tries to avoid efficiency value of $\underline{E}_{dj}$. Therefore, for DMU_j) j=1,..,n ; $j \neq d$(, satisfaction ratio is defined as follows given weights of DMU_d as follows:

$$\varphi_j = \frac{1}{\overline{E}_{dj} - \underline{E}_{dj}} \left(w_1 \left(E_{dj} - \underline{E}_{dj} \right) - w_1 \left(\overline{E}_{dj} - E_{dj} \right) \right)$$

Here, we call φ_j as satisfaction ratio and the more its value, the more satisfaction it will have. w_1 and w_2 are the weights which are determined by the decision maker to consider importance of efficiency distance from its ideal or anti-ideal value. $w_1 + w_2 = 1$. E_{dj} is the efficiency value calculated for DMU_j given weights of DMU_d with the model. Here, considering satisfaction ratio defined above, we give the following secondary model to obtain optimal weights of DMU_d.

$$\underset{\substack{1 \le j \le n \\ d \neq j}}{\text{Max}} \varphi_j = \frac{1}{\overline{E}_{dj} - \underline{E}_{dj}} (w_1 \left(E_{dj} - \underline{E}_{dj} \right) - w_1 \left(\overline{E}_{dj} - E_{dj} \right))$$

$$S.t$$

$$\sum_{i=1}^{m} \sum_{j=1}^{n} v_{id} x_{ij} = 1$$

$$\sum_{r=1}^{s} u_{rd} y_{rd} - E_{dd}^{*} \sum_{i=1}^{m} v_{id} x_{id} = 0$$

Relation 5

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0, \qquad j = 1,\dots,n$$

$$u_r \ge 0, \quad v_i \ge 0, \qquad \forall r, i$$

Here, the aim is to obtain Maximum satisfaction ratio for DMU_j) j=1,..,n; $j \neq d$(so that efficiency of DMU_d remains fixed. Relation 5 is a multi-objective relation but it can be converted into a single-objective planning model and then solved with multi-objective methods. One of the methods which we use in this article has been weighted. Therefore, using the weighted method, Relation 5 is converted into the following single-objective model:

$$\max \sum_{\substack{j=1 \\ j \neq d}}^{n} w_j \varphi_j$$

$S.t$

$$\varphi_j = \frac{1}{\overline{E}_{dj} - \underline{E}_{dj}}\Big(w_1\big(E_{dj} - \underline{E}_{dj}\big) - w_1\big(\overline{E}_{dj} - E_{dj}\big)\Big), \quad 1 \le j \le n;\ d \neq j$$

$$\sum_{i=1}^{m}\sum_{j=1}^{n} v_{id}x_{ij} = 1$$

Relation 6

$$\sum_{r=1}^{s} u_{rd}y_{rd} - E^{*}_{dd}\sum_{i=1}^{m} v_{id}x_{id} = 0$$

$$\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \le 0, \qquad j = 1,\ldots,n$$

$$\sum_{\substack{j=1 \\ j\neq d}}^{n} w_j = 1$$

$$u_r \ge 0, \quad v_i \ge 0, \qquad \forall r,i$$

Pay attention that if $\overline{E}_{dj} = \underline{E}_{dj}$(for d=1,…,n; j=1,…,n), we place 1 in satisfaction ratio fraction . Output of this model is satisfaction ratio φ_j and efficiency value E_{dj}) j=1,…,n , j≠ d(which can be placed in dth line o the new cross efficiency matrix. In this regard, cross efficiency matrix is formed by solving the above model for n time and cross efficiency indicator is calculated as follows:

Relation 7

$$E_d = \frac{\sum_{j=1} E_{dj}}{n}$$

Considering above materials, the following stages will be executed for ranking DMUs considering the satisfaction ratio:

- We first calculate values of efficiency E_{dd} for (d=1,…,n) using Relation 1.
- We calculate ideal values of $\overline{E_{dj}}$ and anti-ideal values of $\underline{E_{dj}}$) j=1,..,n ; j≠ d و d=1,…,n(using Relations 3 and 4.
- Using Relation 6, we calculate values of E_{dj})j=1,…,n , j≠ d(and form cross efficacy matrix.
- Using Relation 7, we calculate cross efficiency score .
- We rank the decision-making units based on the cross efficiency score.

3. Methodology

3.1. Research Method

The studied companies in this research include the companies acting in automotive industry and parts manufacturers in 2016 which are listed in Tehran stock exchange market. These companies are 25 in number. Names of the companies are given in Table 1.

Table 1. Names of companies

Company name	Company No.	Company name	Company No.
Saipa	14	Ahangari Tractor	1
Saipa Azin	15	Electric Khodro Shargh	2
Saipa Diesel	16	Iran Khodro	3
Iran Casting Industries	17	Iran Khodro Diesel	4
Mehvarsazan	18	Pars Khodro	5
Niroo Moharekeh	19	Mehvar Khodro	6
Fanarsazi Khavar	20	Lent Tormoz	7
Fanarsazi Zar	21	Charkheshgar	8
Irka Part Sanaat	22	Radiator Iran	9
Mehrkam Pars	23	Rikhtehgari tractor	10
Nasir Machine	24	Ringsazi Mashhad	11
Motorsazan Tractor	25	Zamiad	12
		Sazeh	13

To assess and measure efficiency of companies to be studied, suitable criteria which can be included in the model are needed considering the cross efficiency model with satisfaction ratio to accurately measure firm performance. Therefore, considering previous studies which have been conducted in this field and review of articles and theses and also the past researches and field studies and surveying on the experts of this industry , variables of the cost of goods sold , total assets , total debts , controlling shareholder ownership percent and social responsibility score were selected for measurement. Given to these five variables, the said variables were divided into two classes of input and output variables as follows:

Input variables : cost of goods sold (I_1), total assets (I_2) , total debts (I_3), controlling shareholders ownership percent(I_4)

Output variables: social responsibility score(O_1)

In the present research, to measure variable of firm performance in the social responsibility, a checklist provided by Yuhan et al. (2017) has been used. The above checklist includes a set of components each including some indices in corporate social and environmental responsibility and score of each index is equal to 1. After investigating the above checklist relating to the studied companies, the number of indicators disclosed by company is divided by total number of indicators in the checklist and finally corporate performance in social responsibility is obtained. Other research variables have been obtained based on information of the financial statements of companies to be investigated in the research.

4. Results

Data relating to inputs and outputs of the studied companies is shown in Table 2.

Since the aim of this research is to calculate efficiency using cross efficiency model based on satisfaction ratio for the automotive industry and parts manufacturers in Tehran Stock Exchange. Work procedure is given as follows:

In the first stage , we calculate value of E_{dd}^{*} (d=1,…,n) for companies . Results of Relation 1 are given in Table 3.

E_{dd}^{*} can be a criterion for ranking of units. But considering Table 3, it is observed that companies 7, 12, 18, 22 and 25 are efficient because their efficiency value is 1. Therefore, they have equal rank. To solve this problem, cross efficiency model is used. Relations 3 and 4 will be first executed. After executing the relations, the cross efficiency of companies is given in Table 4.

As shown in Table 4, all 25 companies have been ranked without any interference. Results of this Table indicate that Irka Part Sanaat(22), Lent Tormoz(7) and Radiator Iran(9) are ranked 1 to 3 and Saipa (14), Iran Khodro(3) and Pars Khodro(5) are ranked 23, 24 and 25. Other companies in automotive industry and part manufacturers are between these ranks.

Table 2. Data relating to inputs and outputs of the studied companies in automotive industry and part manufacturers

Companies	I_1	I_2	I_3	I_4	O_1
1	955884	1947141	699146	61.68	0.6452
2	1927202	2130917	1748461	68.46	0.6452
3	234173756	190731126	170560088	51.05	0.7742
4	7182544	17935697	29558833	57.00	0.6774
5	38958568	43553499	30279834	67.83	0.5806
6	955089	1313670	855095	82.40	0.5806
7	131163	217020	123965	68.54	0.4516
8	864429	2172658	1104778	75.42	0.6774
9	1301502	1234265	526165	62.00	0.6452
10	1415429	1195727	893978	79.70	0.6452
11	3115026	1046649	773601	52.23	0.5484
12	6170178	14874069	9573287	38.60	0.6452
13	2767975	2364052	1708131	66.00	0.2903
14	71049936	187754786	138428167	46.00	0.7097

Companies	I_1	I_2	I_3	I_4	O_1
15	2235289	2049906	1319810	54.10	0.5161
16	4832495	10360325	18521898	56.70	0.7097
17	275301	571860	461817	67.31	0.4839
18	3062007	741193	527695	68.33	0.6452
19	6260452	2963984	1725830	80.74	0.6129
20	202051	309279	179632	85.00	0.2903
21	289543	804856	410136	80.79	0.5161
22	350077	700354	166034	18.08	0.2903
23	6405483	2939385	2359104	71.16	0.5161
24	288976	279295	91251	42.90	0.2581
25	1185052	930590	736437	86.72	0.7419

Table 3: Efficiency of E_{dd}^{*} obtained from Relation 1 for the companies in automotive industry and part manufacturers

Efficiency score E_{dd}^{*}	Company No.
0.74	1
0.66	2
0.9	3
0.71	4
0.51	5
0.7	6
1	7
0.76	8
0.92	9
0.81	10
0.9	11
1	12
0.28	13
0.92	14
0.6	15
0.76	16
0.92	17
1	18
0.48	19
0.5	20
0.85	21
1	22
0.45	23
0.85	24
1	25

Table 4. Cross efficiency score and ranking of companies

Ranking of companies	Cross efficiency score of companies	Companies
8	0.6964	1
13	0.592	2
24	0.2308	3
21	0.2916	4

25	0.1672	5
14	0.586	6
2	0.8	7
12	0.6292	8
3	0.7864	9
9	0.6636	10
7	0.718	11
18	0.3888	12
22	0.2532	13
23	0.234	14
15	0.5384	15
20	0.3696	16
6	0.7364	17
4	0.784	18
16	0.416	19
17	0.4008	20
10	0.6424	21
1	0.9928	22
19	0.3708	23
11	0.6404	24
5	0.776	25

5. Discussion and Conclusions

In this paper, companies were ranked in terms of social responsibility using data and variables of 25 companies from automotive industry based on the financial indicators and using data envelopment analysis (DEA) approach. Data envelopment analysis (DEA) approach is a strong and flexible method for measurement of performance to analyze corporate social performance because this technique concurrently considers different variables as input and output variables for assessment of corporate efficiency. This method is also a decision-making tool and can provide more information in comparison with traditional analysis methods (for example, financial ratios). Data envelopment analysis (DEA) approach compares any company with other companies with the same industry in terms of efficiency. This comparison is a suitable one because in traditional analyses, efficiency of each company is compared with mean or median of the sample companies of the research. Results of this research indicate that large companies in the automotive industry are less socially responsible than other companies. This suggests that large companies in the automotive industry do not have a proper social behavior toward the stakeholders, and pay less attention to social and environmental issues. This issue is contrary to views and theories in accounting regarding response of the business enterprises to the social issues. Based on the accounting theories , the business enterprises should identify and perceive gaps between expectations of society and its performance and have response to compensate them. In other words, social goals should be integrated with activities and performance of the business enterprises. In other words, companies should perform their activities and responsibilities toward persons and different groups of society based on the policies of society. Results of this research can be matched with research conducted by Belu(2009). He suggested in his research that the companies which had weaker financial performance had lower social performance. Evidence and findings of his research also can give useful information to the policymakers in automotive industry in order to improve the corporate social responsibility. Regulators and policymakers in automotive industry could develop executive instructions to match social goals with businesses performance and coordinate the firm activities and responsibilities with society policies. Since concept of social responsibility based on economic development plans of the state and general policies of the vision plan 2025 is of special importance for economy of the

country, for this reason, the Tehran stock exchange are suggested to determine and rank the corporate social responsibility rank using Data envelopment analysis (DEA) approach. The policymakers in automotive industry are also suggested to coordinate activities and responsibilities of firms with the policies of society by formulating executive instructions in order to align social goals with corporate performance.

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