Available online at http://ijdea.srbiau.ac.ir

Int. J. Data Envelopment Analysis (ISSN 2345-458X)

Vol. 10, No. 1, Year 2022 Article ID IJDEA-00422, pages 1-24
Research Article

International Journal of Data Envelopment Analysis

Science and Research Branch (IAU)

Benchmarking Automotive and Parts Manufacturing Companies Based on Intellectual Capital Using Data Envelopment Analysis

Mohsen Mirzaei, Moen Zareian*
Department of Mathematics, Astaneh Ashrafiyeh Branch, Islamic Azad University, Astaneh Ashrafiyeh, Iran

Received 7 November 2021, Accepted 20 January 2022

Abstract
Benchmarking is a systematic way by which organizations can measure and modify their activities based on the best industry or organization. The purpose of this study is to rank and evaluate the performance of automotive and parts manufacturing companies presented in the Tehran Stock Exchange using data envelopment analysis and also to benchmark inefficient companies-years. Practical results are also provided based on mathematical models to find the position of automotive and parts manufacturing companies compared to each other and to maximize their performance. The components of companies' intellectual capital, including human capital, structural capital, capital employed and innovative capital are considered as inputs. Also, return on assets, return on equity, return on sales and net profit per share are deemed as outputs which are extracted from the financial statements of the sample companies during the ten years 2010-2019. The performance of the units is evaluated using the output-oriented CCR model. 26 out of 280 member-year sample companies were determined as efficient. Then, the Anderson-Peterson model is used to rank them. Also, benchmarking for inefficient units are done applying the envelopment form and GAMS software, which can be used to observe the behavior of inefficient companies, in order to target to improve organizational performance.

Keywords: Benchmarking, Efficiency, Ranking, Intellectual capital, Data envelopment analysis.

* Corresponding author: Email: Moeinzareian@gmail.com

1. Introduction

In knowledge-based economy, intellectual capital is considered as a factor of higher importance than visible assets to improve the competitiveness of the company and value production [1]. On the other hand, this intangible resource has been introduced as one of the most valuable resources of companies and a key capital in the growth of entrepreneurship. Nowadays, the necessity of development and management of intellectual capital has become a serious requirement at the national macro level and in the field of business, and by moving towards knowledge-based economy has led to a change in the prevailing paradigm of the industrial economy [2].

Intellectual capital is born in the field of science and knowledge. Although the term was in its formative era, the concept was first introduced in 1991, when the large Swedish company Scandia began implementing a series of innovative scientific methods to pay special attention to its intangible assets. If we consider the growth of hardware power as an important indicator, we should say that soon, computers will achieve a capacity equivalent to the capacity of the human brain. At that time, how can the value of corporate assets be measured? Might the most important assets be the most intangible of assets? This is worth further investigation [2].

Despite the increasing importance of intangible assets and intellectual capital, most accounting systems still operate traditionally and are unable to fully calculate and take into account intellectual capital. However, the importance of disclosure of non-spam items and intangible assets in annual reports, especially in the annual and midterm reports of large and medium-sized enterprises, is increasing sharply. Russians and others of 1994 believed that intellectual capital could be linked to other topics such as the company's strategy and provided measurement tools [3].

Many researchers have traditionally considered the issue of their performance, suitability based on accounting standards to explain the actual performance of the company. Pulic (2000) states that traditional measures are not a suitable way to measure the performance of companies in the knowledge-based economy. He claims that measuring the economy by industrial method is unable to determine the real value created [4]. Many efforts have been made in recent decades to measure the company's performance in non-traditional ways, some of which have been related to shareholder value analysis and include various criteria such as investment returns or economic value added (EVA) or other market-based criteria such as Tobin's q.

Traditional analysis techniques of financial statements use ratio analysis to compare the performance of companies with similar companies and with the performance of previous years of the same company. Based on this comparison, the analyst can conclude whether a company has a favorable performance or its performance has degraded compared to similar companies and previous years. Although the analysis of financial ratios for financial evaluation of companies has a long history, but due to the mentioned limitations, it cannot be a good guide for investors, creditors and managers of commercial units. The data envelopment analysis (DEA) technique can fix this problem, in fact, this approach, taking into account a number of ratios as inputs and some as outputs, converts all ratios to a criterion called 'efficiency'. Consequently, the comparison and evaluation of the performance of commercial units can be better done. It is also a robust and flexible method for measuring financial performance. Because of this fact that the DEA technique, simultaneously considers several variables as input and output

measures to evaluate the relative efficiency of the company.

In this study, the components of intellectual capital, as inputs and financial ratios as outputs have been used to evaluate the performance of companies. The purpose of this research is to investigate the performance of automobile and parts manufacturing companies based on intellectual capital in order to rank them and model their performance. It also provides practical results based on mathematical models to identify the position of automobile and parts manufacturing companies compared to each other and to maximize their efficiency.

2. Literature review

Nowadays, innovation in the present technological space is mandatory for organizations and most organizations are looking to create new ideas. In this regard, the organization's experts are trying to use the knowledge to provide the new products or services that customers want, and create an infrastructure that makes innovation the same as continuous process learning because the goal of knowledge management and the secret of the survival of these organizations today lies in innovation [5]. By entering the third millennium A.D., what happens most is the development of knowledge and the process of organizations towards knowledge-based. Currently, developed countries make a fortune from knowledge production and are transferring hardware activities to developing countries. The development of human resources is considered as one of the most important competitive advantages of this period, which creates new business and entrepreneurship ideas and ultimately sustainable development [6].

The theoretical foundations of this research are rooted in signaling theory. According to this theory, information and non-financial data, such as disclosure of information about the company's performance in using intellectual capital in creating competitive advantage and value, can reduce information asymmetry between company managers, investors and creditors. This, in turn, will reduce investment risk for investors. According to this theory, intellectual capital as one of the most intangible assets of the commercial unit can help the company to create value and a sustainable competitive advantage and also leads to improved performance [7].

Hussi (2004) insists that research and development should be conducted in order to be innovative. In order to do this, two factors of intellectual capital and financial resources are needed. He believes that the intellectual capital, due to innovation, reduces the cost of production, good reputation of the company's products in the market, better relations with the customer and ultimately increases the company's market share. This will ultimately increase profitability and increase the value of the company [8].

According to the authors of this paper, this issue can have a good scientific achievement. Since accounting researchers are less familiar with the DEA technique, this research can make them more familiar with the application of DEA in financial and accounting analysis and expand the use of this technique in accounting and financial research.

The conceptual framework of this paper is based on the classifications proposed by Chang (2011) and Pulic (2000). These classifications divide intellectual capital into four subsets: human capital, structural capital, capital employed, and innovative capital.

2.1. Human Capital: Human capital represents the inventory of the knowledge

of an organization. In experimental literature, it is usually assumed that human capital has a positive effect on the company's performance. Bontis (2001) argues the importance of human capital as a source of innovation and strategic renewal [9].

Chen et al. (2005) showed that human capital has a positive effect on market value and the profitability of Taiwan's stock exchange companies. Kamath et al. (2008) also showed that human capital may have a positive effect on commercial performance, which can be done directly or indirectly [10].

2.2. Structural Capital: Structural capital includes all inhumane reserves of knowledge in the organization. On the other hand, structural capital acts as a support infrastructure for human resources: A person may have a high level of intelligence, but if the organization has a weak system and method of tracking activities related to a person, the sum of intellectual capital will not reach the quorum of its ability [9]. Unlike human capital, structural capital components can be owned or traded by an organization [11]. Structural capital depends on human capital, as it is the second main factor in capital development.

2.3. Capital Employed: Capital employed indicates how much of the company's added value is created by physical and financial assets [12]. That is, in exchange for a multi-value asset, multi-value-added assets are created and are derived from the division of value added into the capital employed.

2.4. Innovative Capital: Innovative capital is the ability of the organization to innovate and develop new products, services and solutions. And its main component has been proposed with the activities of research and development [13].

Sun et al. (2020) in a study in China examined the impact of education, the age of managers, and the length of time it took over the company's innovation. The results of this research show that human capital with higher education and sufficient experience is an important factor in the company's innovation. According to these researchers, human capital plays an important role in the company's performance.

Safari et al. (2017) examined the impact of intellectual capital on organizational performance. The results of a study of their research hypotheses showed that intellectual capital directly had a positive effect on organizational performance and it makes sense. Competitive advantage and organizational agility have also played a mediating role in the relationship between intellectual capital and organizational performance [14].

3. Performance Evaluation

In a competitive environment, organizations expect to be ranked top in their segment and able to compete in international markets. This ranking is usually based on an assessment of companies' financial performance. The financial performance appraisal process is based on the financial ratios calculated from the financial statements to analyze the company's financial situation. Financial ratio analysis is an efficient tool that can expose the financial strength and weakness of companies. In addition, it helps managers achieve the appropriate strategies that the company must pursue to achieve specific goals [15].

Continuous improvement of the performance of organizations creates a huge synergistic force that can support the growth and development program and create opportunities for organizational excellence. Governments, organizations, and institutions are making a win-win effort. Without reviewing and gaining awareness of the level of progress and

achieving goals and without identifying the challenges facing the organization and gaining feedback and knowing the implementation of the policies developed and identifying cases that requires serious improvement, continuous performance improvement will not be possible. Not all of these are possible without measurement and evaluation [18].

Performance appraisal refers to a set of measures and information that are intended to increase the level of optimal use of facilities and resources to achieve economic goals and practices in line with efficiency and effectiveness. So performance appraisal in the "organizational dimension" is usually the effectiveness of activities. Effectiveness is the ability to achieve goals and programs with the characteristics of efficiency of activities and operations [19].

4. Efficiency

Efficiency is one of the most important indicators of optimal performance evaluation of economic units. Although several definitions of efficiency are offered, their commonality is that it is an efficient unit that gains the most output from the specific data combination [18]. In general, it can be said that efficiency represents the ratio of outputs to inputs compared to a certain standard [19]. Performance measurement has always been of interest to researchers because of its importance in evaluating the performance of organizations. In recent years, different applications of DEA have been seen in most countries of the world to evaluate the performance of institutions and other common activities in different fields. The reason for the widespread acceptability of this method in other methods is the possibility of investigating the complex and often uncertain relationships between several outputs that exist in these activities. The DEA has made it possible for a new attitude to activities that have already been evaluated in other ways [20]. In general, the advantages of DEA compared to other parametric methods are:

- Focusing on each observation versus the average of the community
- Simultaneous use of multiple inputs and outputs
- Adapting to exogenous variables
- No need to know the shape of the distribution function
- Possibility to use inputs and outputs with different measurement scales [19].

5. Research Methodology

The present research is applied in terms of purpose and it is a post-event in terms of the research plan. The method of collecting information is to document through the financial statements of automotive and parts building companies of the Tehran Stock Exchange. The statistical community of this research is a member of automotive and parts building companies of the Tehran Stock Exchange, among which the sample companies have been selected by the method of systematic elimination. Their information is available over a ten-year period of 2010-2019, and their fiscal year has been in March, and they have not been a capital-based company. According to the above, the number of samples includes 28 companies during the 10 financial years (280 observations).

6. Research Model and Variable

6.1. Input variables

The input variables of this research are considered components of intellectual capital, which are calculated by the modified value added intellectual coefficient method. The value-added method of intellectual capital is one of the ways in which capital is measured by Pulic

and is an analytical tool for measuring the company's performance. The value-added model of intellectual capital is based on the assumption that the size of the company's value-added and development may affect the company's market value [4]. Chang (2011) considered the cost of R&D and intellectual assets to improve the power of his research. The results led to the proposed adjustment of the modified value added intellectual coefficient, which includes a new variable for calculating intellectual capital, entitled Innovative Capital.

To calculate the added value of a company, we subtract the company's outputs minus its inputs

VA = GM – Sga EXP + LEXP = Operating Income + LEXP

The value added= Gross profit- The cost of administrative, general and sales expenses

Cost of human resources that Pulic calls human capital is equal to the cost of salary

HC = LEXP

and structural capital is equal to the value added of the company minus human capital:

SC = VA – HC

Pulic (2000) states that human capital and structural capital are reversed. The lower the share of human capital, the more structural capital involved. And based on Pulic's intellectual value added coefficient, the capital employed is equal to the book value of the company's net assets [4].

Capital employed = Book Value of Net Assets

Also a new variable that Chang added (heuristic capital) is equal to R&D costs.

Innovation Capital = R&D Expenditure.

In order to calculate the efficiency of each component of intellectual capital (the above 4 indicators), the following relationships are used:

Human Capital Efficiency = VA/ HC

Structural Capital Efficiency = SC/VA

Capital employed Efficiency = VA/CE

Innovation Capital Efficiency= R&D expenditure/ Book value of common stock

6.2. Output variables

The output variables of this study are 4 financial ratios which are considered as:

Return on assets (ROA): It is obtained from the company's annual dividend to all assets.

Return on equity (ROE): It is derived from the company's annual dividend to equity.

Return on sales (ROS): It is derived from the company's annual dividend to the company's sales.

Net profit per share: It is calculated from the division of operating profit, after the deduction of company tax, by the total number of shares.

6.3. Data Envelopment Analysis

In general, efficiency indicates how a firm or organization has used its available resources in line with the best possible production at some point in time. Considering that there are several factors involved in increasing efficiency, so by determining and estimating them, the performance of systems and the importance of each factor in determining the output can be evaluated.

In DEA models, the solution for improving inefficient units is to reach the efficiency frontier. The efficiency frontier consists of units with the efficiency value equal to one. Generally, there are two types of strategies for improving inefficient units and reaching the efficiency frontier:

a- Reducing inputs without reducing outputs until they reach a unit on the frontier (this attitude is called improving performance or measuring efficiency with the input orientation).

b- Increasing the outputs until reaching a unit on the efficiency frontier without absorbing more inputs. This attitude is called the performance improvement or performance measurement with the output orientation [21].

In this study, output-oriented multiple CCR model (Model (1)) has been used to find the relative efficiency of DMUs.

$$P: Z^* = \min \sum_{i=1}^{m} v_i x_{io}$$

$$s.t.$$

$$\sum_{r=1}^{s} u_r y_{ro} = 1 \qquad (1)$$

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

$$u_r, v_i \ge \varepsilon.$$

6.4. Ranking efficient units

In basic DEA models, due to lack of the complete ranking among efficient units, the possibility of comparing efficient units with each other does not provide. In other words, these models divide the studied units into two groups of "efficient units" and "inefficient units". Inefficient units can be ranked obtaining efficient points, but efficient units cannot be ranked because they have an equal efficiency score (i.e. unity). Therefore, some researchers have suggested methods for ranking these efficient units, the most famous of which is the Anderson Peterson (AP) model. In AP model, the constraint corresponding to the unit under investigation is removed from the evaluation. This constraint causes the maximum value of the objective function to be one. By eliminating this constraint, the efficiency of the unit under consideration can be more than 1 and thus efficient units such as inefficient units can be ranked. The method works as decision-making unit that is DMU_p is removed from the production possibility set and the model is implemented for other DMUs. The larger the unit coefficient, the more efficient unit is [22].

Before benchmarking companies with the appropriate performance, companies with optimal performance should be identified. Therefore, a valid method with appropriate criteria is needed to identify high performance companies. In this study, Anderson-Peterson model (model (2)) has been used and the results of ranking the top 50 companies in Appendix A as well as Figure 1 have been presented.

$$D: \theta_{AP}^{*} = \max \theta^{AP} - \varepsilon(\sum_{r=1}^{s} s_r^{+} + \sum_{i=1}^{m} s_i^{-})$$

$$st. \sum_{\substack{j=1 \\ j\neq 0}}^{n} \lambda_j x_{ij} + s_i^{-} = x_{io}, i = 1,...,m \quad (2)$$

$$\sum_{\substack{j=1 \\ j\neq 0}}^{n} \lambda_j y_{rj} - s_r^{+} = \theta^{AP} y_{ro}, r = 1,...,s$$

$$\lambda_j \ge 0, \theta^{AP}: urs, s_i^{-} \ge 0, s_r^{+} \ge 0,\ j = 1,...,n; \forall i; \forall r$$

6.5. Benchmarking inefficient DMUs

In today's world and in competitive market conditions, product quality and productivity as two basic and important factors in maintaining and survival of institutions have the first letter and those who have higher productivity and quality and will be present in the market will be persistent. Therefore, continuous knowledge of the market condition and quality of competitors' products as well as systems and methods of doing the work are essential and inevitable for any competing institution and company to model the advantages and superior characteristics of competitors, to get themselves to a better situation than them. Thus, the only way that organizations can lead themselves to the best and progress and development is to keep their eyes open to competitors and the best global experiences in all required fields [23]. Accordingly, modeling is a systematic method by which organizations

can measure and modify their activities based on the best industry or organization. This method shows how to fill existing gaps by providing a framework for organizations by which the activities of the best organization have been identified and determining the aspects of differentiation of the existing organization with the best organization.

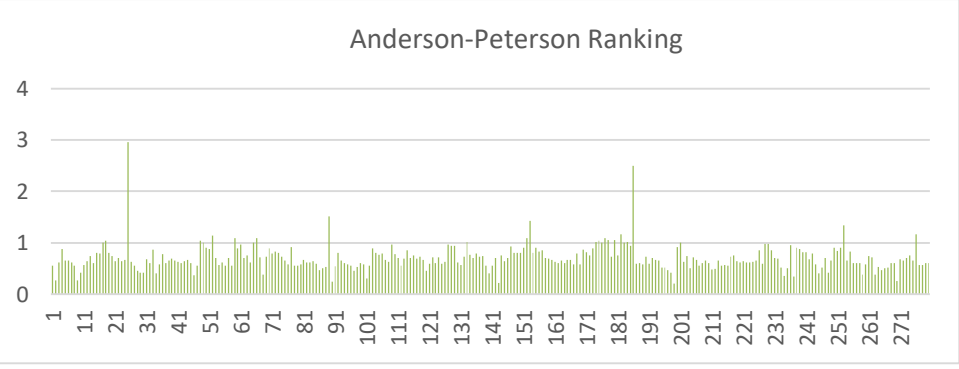

Figure 1- Efficiency results of the company- Sample member years

Performance Modeling: One of the modeling methods is comparing the performance criteria of an organization's production compared to the direct competitors of the company. In this study, to calculate the improvement points in the outputs and patterning of units, the envelopment model (model (3)) has been used. Inefficient companies can put the performance of reference companies 1 to 4 as their benchmarking, which it can be seen in Appendix 2.

$$D:\theta^{*}=\max\theta-\varepsilon(\sum_{r=1}^{s}s_r^{+}+\sum_{i=1}^{m}s_i^{-})$$

$$s.t.\sum_{j=1}^{n}\lambda_j x_{ij}+s_i^{-}=x_{io},i=1,...,m$$

$$\sum_{j=1}^{n}\lambda_j y_{rj}-s_r^{+}=\theta y_{ro},r=1,...,s \quad (3)$$

$$\lambda_j\geq 0,\theta:urs,s_i^{-}\geq 0,s_r^{+}\geq 0,\ j=1,...,n;\forall i;\forall r$$

7. Conclusion

The results of descriptive statistics of research variables in Table 1 are as follows. As mentioned in this study, the efficiency and ranking of automobile and parts manufacturing companies of the country according to their intellectual capital were investigated using DEA. The results obtained using multiplier model and Anderson-Peterson model show that 26 companies are efficient from 280 samples were used (28 companies during fiscal year 2010-2019), including Automotive company, 2010, 2011 and 2017, Vehicle Axle company, 2010, 2011, 2013 and 2019, Mehvarsazan company in 2016, Mashhad wheel Company in 2012 and 2013, Zamyad Company in 2011, Charkheshgar company in 2012, Electric Khodro Shargh company in 2012, 2018 and 2019, and Part Ayrka industry company in 2014, 2015, and 2018, Sazeh Puyesh in 2012, 2013, 2014, 2015, 2016 and 2017, Radiator Iran company in 2015 and Bahman Group in 2015. This represents the optimal performance of these companies in the mentioned years in the field of intellectual capital components (human capital, structural, applied and innovative) which means that the mentioned companies were able to create outputs proportional to the amount of input spent and therefore properly use their capacity which can lead to more growth and profitability in them.

Table 1. The results of descriptive statistics

EPS	Profit to sales	ROE	ROA	Innovative capital	Social capital	Structural capital	Human capital	
221.501	13.484	2.436	3.239	0.006	0.858	0.266	1.962	Average
166.523	4.096	14.617	3.415	0.004	0.814	0.277	1.371	Mediam
2.891	2.087	2.915	1.895	0.019	0.913	0.626	1.686	Standard deviation
-15.885	-10.563	-72.560	-25.541	-0.041	-9.421	-3.214	-10.815	Minimum
2977.210	835.990	135.434	514.686	27.697	19.542	5.909	22.751	Maximum

The finding of this paper can be used for the company-years of the sample member who have a non-efficient performance to benchmark and observe the behavior of efficient companies in order to improve organizational performance. Also, according to the desired outputs (output target values) obtained using the envelopment model, it can be concluded that inefficient company-years in the fiscal year have not used some of the resources properly. In fact, some of the resources have been wasted.

Also, unfortunately, although many advances have been achieved in terms of technology in the present era, it is still observed in developing countries, including Iran, that in many industries, intellectual capital is viewed with a view to cost, and among them the most deprived part of it is the R&D sector, which is also known as the industry's propulsive engine. According to the results of the research, it is suggested that DEA be used continuously in evaluating the performance of firms in order to evaluate the capacity of inputs and outputs of each firm by modeling efficient companies and also determining the desired level of efficiency. Also, further investment in R&D expenditures or Chang's term "innovative capital" has been put on its agenda so that they can surpass others in the field of competition and achieve an optimal level of efficiency and productivity.

References:

[1] Xu, J., & Liu, F. The Impact of Intellectual Capital on Firm Performance: A Modified and Extended VAIC Model. *Journal of Competitiveness.2020;* 12(1): 161–176.

[2] Marr, B., Gray, D. and Neely, A. Why do firms measure their intellectual capital? Journal of Intellectual Capital. 2003; 4(4): 441-464

[3] Khajavi, S., A. Ghayomi, and M. Jafari, *Data Envelopment Analysis Technique: A complementary Method for Traditional Analysis of Financial Ratios.* Accounting and Auditing Review, 2010. 17(2): p. 41-56.

[4] Pulic, A."VAICT - an accounting tool for IC management", International Journal of Technology Management. 2000; 20(8): 702-714.

[5] Rudsaz, H., m.a. seyed naghavi, and F. Abdoli Masinan, *The Effect of Open Innovation on Competitive Advantage Considering the Mediation Role of Knowledge Management.* Industrial Management Studies, 2020. 18(59): p. 117-150.

[6] Amini Milani, M. and N. Jalili, *The Impacts of Knowledge-Based Economy' Components on Economic Growth in Iran (1975-2012).* Economic Development Policy, 2015. 3(4): p. 73-116.

[7] Yeh, C., Lin, F., Wang, T., Wu, c. Does corporate social responsibility affect cost of capital in China, Asia Pacific Management Review. 2020; 25(3): 1-12.

[8] Hussi, T. "Reconfiguring knowledge management.Combining intellectual capital, intangible assets and knowledge creation". Journal of Knowledge Management issue.2004;8(2): 36– 52.

[9] Bontis, N. "Assessing knowledge assets: a review of the models used to measure intellectual capital", International Journal of Management Reviews. 2001; 3(1): 41-60.

[10] Kamath, G. "Intellectual capital and corporate performance in Indian pharmaceutical industry", Journal of Intellectual Capital. 2008; 9(4): 684-704.

[11] Olander, H., Hurmelinna-Laukkanen, P. and Heilmann, P. "Human resources – strength and weakness in protection of intellectual capital", Journal of Intellectual Capital. 2015; 16(4): 742-762.

[12] Bnimahd, Bahman., Ghanbariha, Zohreh., Relation Between the Intellectual Capital and firm's leverage in the selected firms on Tehran Stock Exchange. Financial Knowledge of Securities Analysis, 2011. 4(11), 3: p. 163-186.

[13] Lu, Wen-Min. Wang, Wei-Kang. Long Kweh, Qian. Intellectual capital and performance in the Chinese life insurance industry. The international journal of management science, Omega. 2013;42(2): 65–74.

[14] Safari, A., M.H. Moshref Javadi, and M. Mirzaiefar, *The Effect of Intellectual Capital on Organizational Performance:The mediation Role of*

Organizational Agility and Competitive Advantage. Journal of Executive Management, 2017. 9(17): p. 149-168.

[15] Abdel-Basset, Mohamed. Ding, Weiping. Mohamed, Rehab. Metawa, Noura. An integrated plithogenic MCDM approach for financial performance evaluation of manufacturing industries. Journal of Risk Management. 2020; 22(3) 192–218.

[16] *Seyed Javadain, Seyed Reza. Human resource management and personnel affairs, Tehran: Negah Danesh, 2015*.

[17] Banifatemi Kashi, Mohamadreza. performance evaluation, Hesabdar journal,2007; 185.p.41-53.

[18] Askari A, Charkhkar M. The Determination and Assessment of the Relational Efficiency Indicators of Tehran City's and Province's Tax Affairs General Directorates with Data Envelope Analysis Approach (DEA). J Tax Res. 2015; 23 (27): p.35-62.

[19] Alem Tabriz, Akbar., Emanipour, Mahdiyeh. Measuring the relative efficiency of hospital health services using data envelopment analysis method(DEA). Journal of Business Management perspective. 2009; 8(31): p.139-157.

[20] Bahiraie A, Hamedi R, Alinia H, Sanayei Y. Modeling the efficiency of banks by cover data method and Genetic programming. mieaoi. 2020; 9 (31): p.69-98.

[21] Mehrabian, Saeid., eyni, Mahdi., Karimi, Balal. Changing the level of inputs and evaluating the outputs in the DEA when a number of outputs are undesirable. Journal of Operational Research in Its Applications. 2011; 9(2); p. 121-130.

[22] Abzari, Mahdi., Baloei jam khaneh, Hadi., khazaei pol, Lavad., Pour mostafa khoshkrodi, Mahdi.Evaluate the performance of public university departments using DEA and SWOT models and structural equations and provide strategic strategies to improve efficiency. Journal of Operational Research in Its Applications. 2012; 1(36): p. 19-41.

[23] Abbasi, f., *Virtual Benchmarking for R&D Projects.* Journal of Science and Tec

[24] hnology Policy, 2008; 1(2): p. 17-28.

Appendix A. The results of Anderson Peterson ranking

Efficiency	Firm-Year	Rank	Efficiency	Firm-Year	Rank
1	Sazeh Puyesh2014	26	2.96	automotive2017	1
0.98	Pars Khodro2018	27	2.5	Vehicle Axle2013	2
0.98	Pars Khodro2019	28	1.51	Mehvarsazan2016	3
0.97	Part Ayrka industry2010	29	1.43	Mashhad wheel2013	4
0.96	Nasir Machine2014	30	1.34	Zamyad2011	5
0.96	Radiator Iran2019	31	1.17	Charkheshgar 2012	6
0.95	Pars Khodro2016	32	1.16	Vehicle Axle2019	7
0.94	Radiator Iran2010	33	1.14	Electric Khodro Shargh2012	8
0.94	Radiator Iran2011	34	1.09	Part Ayrka industry2018	9
0.94	Vehicle Axle2012	35	1.09	Part Ayrka industry2015	10
0.93	Iran Casting Industries 2017	36	1.09	Mashhad wheel2012	11
0.92	Lent Tormoz2015	37	1.09	Sazeh Puyesh2015	12
0.92	SAIPA AZIN2016	38	1.05	Sazeh Puyesh2016	13
0.91	Pars Khodro2017	39	1.05	Sazeh Puyesh2017	14
0.91	Zamyad2010	40	1.04	automotive2011	15
0.91	Mashhad wheel2011	41	1.04	Sazeh Puyesh2013	16
0.9	Zamyad2018	42	1.04	Electric Khodro Shargh2018	17
0.9	Electric Khodro Shargh2010	43	1.02	Radiator Iran2015	18
0.9	Mashhad wheel2015	44	1.01	Sazeh Puyesh2012	19
0.89	Part Ayrka industry2019	45	1.01	Vehicle Axle2011	20
0.89	Lent Tormoz2018	46	1	Bahman Group2015	21
0.89	Nasir Machine2018	47	1	Electric Khodro Shargh2019	22
0.89	Sazeh Puyesh2011	48	1	automotive2010	23
0.88	SAIPA2018	49	1	Part Ayrka industry2014	24
0.88	Zar Spring2018	50	1	Vehicle Axle2010	25

Appendix B. The benchmarking results for inefficient DMUs

The fourth pattern	The third pattern	The second pattern	The first pattern	Firm-year
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	SAIPA DIESEL2010
Part Ayrka industry2015	Mehvarsazan2016	Part Ayrka industry2018	Sazeh Puyesh2015	SAIPA DIESEL2011
Part Ayrka industry2015	Sazeh Puyesh2015	Radiator Iran2015	Sazeh Puyesh2015	SAIPA DIESEL2012
Mehvarsazan2016	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	SAIPA DIESEL2013
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	SAIPA DIESEL2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	SAIPA DIESEL2015
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	SAIPA DIESEL2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	SAIPA DIESEL2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	SAIPA DIESEL2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	SAIPA DIESEL2019
Mehvarsazan2016	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Iran Khodro Diesel2010
Part Ayrka industry2015	Mehvarsazan2016	Part Ayrka industry2015	Sazeh Puyesh2015	Iran Khodro Diesel2011
Sazeh Puyesh2016	Mehvarsazan2016	Part Ayrka industry2015	Sazeh Puyesh2015	Iran Khodro Diesel2012
Part Ayrka industry2015	Mehvarsazan2016	Part Ayrka industry2015	Mashhad wheel2013	Iran Khodro Diesel2013
Mashhad wheel2013	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Iran Khodro Diesel2014
Sazeh Puyesh2016	Mehvarsazan2016	Part Ayrka industry2015	Mashhad wheel2013	Iran Khodro Diesel2015
Part Ayrka industry2015	Mehvarsazan2016	Part Ayrka industry2015	Mashhad wheel2013	Iran Khodro Diesel2016
Part Ayrka industry2015	Mehvarsazan2016	Part Ayrka industry2015	Mashhad wheel2013	Iran Khodro Diesel2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Iran Khodro Diesel2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	Iran Khodro Diesel2019
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Mashhad wheel2013	Bahman Group2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Bahman Group2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Bahman Group2012

Radiator Iran2015	Part Ayrka industry2015	automotive2017	Mashhad wheel2013	Bahman Group2013
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Bahman Group2014
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Mehvarsazan2016	Bahman Group2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Bahman Group2017
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Mashhad wheel2013	Bahman Group2018
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Mashhad wheel2013	Bahman Group2019
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2010
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Iran Khodro2012
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Iran Khodro2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2015
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Iran Khodro2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Iran Khodro2019
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Motorsazan2010
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Motorsazan2011
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Motorsazan2012
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Motorsazan2013
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Motorsazan2014
Mehvarsazan2016	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Motorsazan2015
Mehvarsazan2016	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Motorsazan2016
Mehvarsazan2016	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Motorsazan2017
Sazeh Puyesh2016	Mehvarsazan2016	Part Ayrka industry2015	Sazeh Puyesh2015	Motorsazan2018
Sazeh Puyesh2016	Part Ayrka industry2015	Part Ayrka industry2015	Sazeh Puyesh2015	Motorsazan2019

Vehicle Axle2019	Part Ayrka industry2015	Part Ayrka industry2018	Mehvarsazan2016	Pars Khodro2010
Mehvarsazan2016	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Pars Khodro2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Pars Khodro2012
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Pars Khodro2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Pars Khodro2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Pars Khodro2015
Mashhad wheel2013	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Pars Khodro2016
automotive2017	Charkheshgar 2012	automotive2017	Mehvarsazan2016	Pars Khodro2017
Vehicle Axle2019	Vehicle Axle2019	Part Ayrka industry2015	Mehvarsazan2016	Pars Khodro2018
Vehicle Axle2019	Vehicle Axle2019	Part Ayrka industry2015	Mehvarsazan2016	Pars Khodro2019
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Part Ayrka industry2018	SAIPA2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Part Ayrka industry2018	SAIPA2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Part Ayrka industry2018	SAIPA2012
Mehvarsazan2016	automotive2017	automotive2017	Part Ayrka industry2018	SAIPA2013
Mehvarsazan2016	Part Ayrka industry2015	automotive2017	Charkheshgar 2012	SAIPA2014
Mehvarsazan2016	Part Ayrka industry2015	automotive2017	Charkheshgar 2012	SAIPA2015
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Charkheshgar 2012	SAIPA2016
Part Ayrka industry2015	Part Ayrka industry2015	automotive2017	Charkheshgar 2012	SAIPA2017
automotive2017	Part Ayrka industry2015	Part Ayrka industry2015	Part Ayrka industry2018	SAIPA2018
Sazeh Puyesh2016	Mehvarsazan2016	Part Ayrka industry2015	Part Ayrka industry2018	SAIPA2019
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Zamyad2011	Zamyad2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Zamyad2011	Zamyad2012
Mashhad wheel2013	Mashhad wheel2012	Part Ayrka industry2018	automotive2017	Zamyad2013
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Zamyad2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Zamyad2015

Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Zamyad2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Zamyad2017
Mehvarsazan2016	Part Ayrka industry2015	Vehicle Axle2019	Part Ayrka industry2015	Zamyad2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Zamyad2019
automotive2017	Charkheshgar 2012	Charkheshgar 2012	Vehicle Axle2013	Tractor Manufacturing2010
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Manufacturing2011
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Tractor Manufacturing2012
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Tractor Manufacturing2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Tractor Manufacturing2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Tractor Manufacturing2015
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Tractor Manufacturing2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Tractor Manufacturing2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Manufacturing2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Manufacturing2019
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2012	Charkheshgar 2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2012	Charkheshgar 2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2015
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2012	Charkheshgar 2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Charkheshgar 2012	Charkheshgar 2019
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Zar Spring2010
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Zar Spring2012

Part Ayrka industry2018	Part Ayrka industry2015	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2013
Part Ayrka industry2018	Charkheshgar 2012	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2014
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2015
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2016
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Zar Spring2019
Sazeh Puyesh2013	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	automotive2012
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	automotive2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	automotive2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	automotive2015
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	automotive2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	automotive2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	automotive2019
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Indamin 2010
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Indamin 2011
Sazeh Puyesh2016	Mehvarsazan2016	automotive2017	Vehicle Axle2013	Indamin 2012
Mehvarsazan2016	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Indamin 2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Indamin 2014
Mashhad wheel2013	Mashhad wheel2012	Charkheshgar 2012	Vehicle Axle2013	Indamin 2015
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Indamin 2016
Mashhad wheel2013	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Indamin 2017
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Indamin 2018
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Indamin 2019
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Fanar Sazi Khavar2010

Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2012
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2013
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2015
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2016
Part Ayrka industry2015	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Fanar Sazi Khavar2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Fanar Sazi Khavar2019
Mashhad wheel2013	Mehvarsazan2016	Part Ayrka industry2018	Part Ayrka industry2015	Electric Khodro Shargh2010
Part Ayrka industry2018	Electric Khodro Shargh2012	automotive2017	Part Ayrka industry2015	Electric Khodro Shargh2011
Mehvarsazan2016	Part Ayrka industry2018	automotive2017	Part Ayrka industry2015	Electric Khodro Shargh2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Electric Khodro Shargh2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Electric Khodro Shargh2015
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Electric Khodro Shargh2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Electric Khodro Shargh2017
Part Ayrka industry2018	Zamyad2011	Zamyad2011	Part Ayrka industry2015	Part Ayrka industry2010
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Part Ayrka industry2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Part Ayrka industry2012
Part Ayrka industry2018		automotive2017	Part Ayrka industry2015	Part Ayrka industry2013
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Part Ayrka industry2015	Part Ayrka industry2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Part Ayrka industry2015	Part Ayrka industry2017
Part Ayrka industry2018	automotive2017	Zamyad2011	Part Ayrka industry2015	Part Ayrka industry2019
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2012

Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2013
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2015
automotive2017	Charkheshgar 2012	automotive2017	Mehvarsazan2016	Lent Tormoz2016
Part Ayrka industry2015	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Lent Tormoz2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Lent Tormoz2019
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2010
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2012
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2013
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2014
Mashhad wheel2013	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2015
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Mehvarsazan2019
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Mehrcampars2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Mehrcampars2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Mehrcampars2012
automotive2017	Charkheshgar 2012	Charkheshgar 2012	Vehicle Axle2013	Mehrcampars2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Mehrcampars2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Mehrcampars2015
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Mehrcampars2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Mehrcampars2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Mehrcampars2018

Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Mehrcampars2019
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Nasir Machine2012
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mehvarsazan2016	Nasir Machine2013
Mehvarsazan2016	Part Ayrka industry2015	Part Ayrka industry2018	Mehvarsazan2016	Nasir Machine2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2015
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Mehvarsazan2016	Nasir Machine2019
Sazeh Puyesh2015	Radiator Iran2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2010
Sazeh Puyesh2015	Radiator Iran2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2011
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2012
Sazeh Puyesh2015	Sazeh Puyesh2013	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2013
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2014
Radiator Iran2015	Vehicle Axle2019	Part Ayrka industry2015	Vehicle Axle2013	Nirou Moharrkeh 2015
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2016
Radiator Iran2015	Part Ayrka industry2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2017
Sazeh Puyesh2015	Radiator Iran2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2018
Sazeh Puyesh2015	Radiator Iran2015	automotive2017	Vehicle Axle2013	Nirou Moharrkeh 2019
Vehicle Axle2019	Mashhad wheel2012	automotive2017	Radiator Iran2015	Radiator Iran2010
Vehicle Axle2019	Mashhad wheel2012	automotive2017	Radiator Iran2015	Radiator Iran2011
Part Ayrka industry2015	Mashhad wheel2012	automotive2017	Radiator Iran2015	Radiator Iran2012
Part Ayrka industry2015	Mashhad wheel2012	automotive2017	Radiator Iran2015	Radiator Iran2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Radiator Iran2015	Radiator Iran2014

Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Radiator Iran2015	Radiator Iran2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Radiator Iran2015	Radiator Iran2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Radiator Iran2015	Radiator Iran2018
Vehicle Axle2019	Mashhad wheel2012	automotive2017	Radiator Iran2015	Radiator Iran2019
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2010
automotive2017	Charkheshgar 2012	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2011
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2012
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2013
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Iran Casting Industries 2015
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2016
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	Iran Casting Industries 2019
automotive2017	Mehvarsazan2016	Part Ayrka industry2018	Mashhad wheel2013	Mashhad wheel2010
Mehvarsazan2016	automotive2017	Mashhad wheel2012	Mashhad wheel2013	Mashhad wheel2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Mashhad wheel2014
Part Ayrka industry2018	Electric Khodro Shargh2012	Mashhad wheel2012	Mashhad wheel2013	Mashhad wheel2015
Part Ayrka industry2018	Mashhad wheel2012	Mashhad wheel2012	Mashhad wheel2013	Mashhad wheel2016
Part Ayrka industry2018	Part Ayrka industry2018	automotive2017	Mashhad wheel2013	Mashhad wheel2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Mashhad wheel2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Mashhad wheel2013	Mashhad wheel2019
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Tractor Foundry2010
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Tractor Foundry2011
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Foundry2012

Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Foundry2013
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Foundry2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Foundry2015
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Foundry2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Vehicle Axle2013	Tractor Foundry2017
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Tractor Foundry2018
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Tractor Foundry2019
Mehvarsazan2016	Part Ayrka industry2015	automotive2017	Sazeh Puyesh2015	Sazeh Puyesh2010
Sazeh Puyesh2016	Mehvarsazan2016	Part Ayrka industry2015	Sazeh Puyesh2015	Sazeh Puyesh2011
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Sazeh Puyesh2015	Sazeh Puyesh2018
Sazeh Puyesh2016	Mehvarsazan2016	Part Ayrka industry2015	Sazeh Puyesh2015	Sazeh Puyesh2019
Part Ayrka industry2018	automotive2017	Zamyad2011	Vehicle Axle2013	Vehicle Axle2012
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Vehicle Axle2014
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Vehicle Axle2015
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Vehicle Axle2016
Part Ayrka industry2015	Part Ayrka industry2018	automotive2017	Vehicle Axle2013	Vehicle Axle2017
Part Ayrka industry2018	Vehicle Axle2019	Part Ayrka industry2015	Vehicle Axle2013	Vehicle Axle2018
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2010
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2011
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2012
Sazeh Puyesh2016	Mehvarsazan2016	automotive2017	Part Ayrka industry2015	SAIPA AZIN2013
Mehvarsazan2016	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2014
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2015
Mashhad wheel2013	Mashhad wheel2012	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2016
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2017
Part Ayrka industry2018	automotive2017	Charkheshgar 2012	Part Ayrka industry2015	SAIPA AZIN2018

Mehvarsazan2016	Part Ayrka industry2015	automotive2017	Part Ayrka industry2015	SAIPA AZIN2019