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Regional efficiency in the tourism industry based on global development indicators using data envelopment analysis

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Abstract
The concept of efficiency in economic literature is the highest output with a certain amount of input and vice versa. Today, in order to measure the degree of efficiency, two categories of methods are used, which are parametric methods and non-parametric methods. In this paper, considering the non-parametric methods which are based on mathematical planning methods, the efficiency of Iran's tourism industry is evaluated in comparison with other countries in the region. It is worth mentioning that the main advantage of data envelopment analysis method over other existing methods for measuring performance is that it can be used to evaluate the performance of units that have multiple inputs and non-convertible multiple outputs.
In the present article, according to the inputs and outputs of the tourism industry in each of the countries in the region in 2018, their efficiency has been evaluated with the two assumptions of return to fixed scale and return to variable scale.

Keywords: Data Envelopment Analysis, Efficiency, Tourism Industry.

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1. Introduction

Organized tourism today is a very important part of the economic system of all countries in the world, so that the economies of some countries are heavily dependent on the interactions of the tourism industry. The tourism industry, as one of the most important industries in the development of cultures and comma 3- Data envelopment analysis.

Data envelopment analysis is a powerful mathematical method that uses linear programming to determine the relative efficiency of a set of homogeneous decision units or DMUs. An efficient DMU is considered when no other DMU can produce more efficient output that uses the same amount or less of inputs. The first known DEA models were originally proposed by Charents, Cooper, and Rhodes under the CCR model. The DEA makes no assumptions about the internal performance of a DMU. That is, the DEA treats each DMU as a "black box" that considers only the input and output consumed by each DMU. This view is often appropriate and sufficient. For example, if the purpose of the analysis is to identify inefficient DMUs and assess their degree of inefficiency, then the "black box" is a good approach. In this plan, the intention is to measure the efficiency of technology transfer methods. The evaluation of the performance of each organization's subset has always been and will be considered by senior managers. Traditional methods of performance appraisal that relied solely on financial metrics no longer have a place in modern management, and appraisal is no longer obsolete and acceptable only to senior executives or, in fact, the organization's strategic managers. In the meantime, performance appraisal has taken on a new definition and has an independent view of all sources. And moment-by-moment review puts it on the agenda at specific intervals. Of course, some of these functions are quantitative and some are qualitative, so how to measure these functions is very important. It is based on the results of these measurements that it can be determined how much resources the organization has wasted in order to achieve the goals. It is on this basis that researchers have defined performance appraisal as the measurement of activities performed in relation to a topic or perspective. In this design, data envelopment analysis or DEA is used to calculate the efficiency of decision-making units. Data envelopment analysis technique is used in evaluating relative performance. The basis and methodology of this technique are described parametrically below. Assume that each decision-making unit has multiple inputs and multiple outputs as shown below. nictations of nations, has a special role in establishing peace and tranquility in the world. International tourism has grown significantly in recent years and, according to economists, has reached the stage of mass production. The main origin of this industry is the developed industrial countries, so that the highest number of international tourists and income generated, belong to the member countries of the Organization of Industrial Cooperation (OECD) and especially the seven largest industrialized countries in the world. Statistics show that more than $ 620 billion is the annual turnover of the world tourism industry, of which Iran's share is less than one tenth of a percent (World Tourism Organization website). According to the World Tourism Organization, Iran ranks tenth in archeological and historical attractions and fifth in the world in terms of natural attractions and is one of the safest countries in the world for foreign tourists. And its talent in this industry is one of the top ten countries in the world in terms of international tourist arrivals (World Tourism Organization website). Therefore, it is clear that due to Iran's very small share of the world tourism industry,

this industry has not been able to play its role as a factor of economic development and the introduction of Iran as a tourist and cultural country. Therefore, in order to develop the country's tourism industry, the need to review policies and adopt an optimal investment model in this industry is necessary and inevitable. On the other hand, one of the most important inputs used in all economic activities is capital input, which can be crystallized in the form of facilities, credits and bank loans [1].

One of the useful and effective techniques that can help managers and experts in this field are mathematical programming models. The purpose of these techniques is to make mathematical models of existing natural conditions in order to determine the best structure for systems according to the objectives and the constraints facing them [2-3]. On the other hand, successful managers always try to get the maximum result with the least facilities and production factors, which can be called achieving maximum efficiency. An efficient firm is one that can achieve maximum production for a given set of inputs at the lowest possible cost. Because increasing efficiency leads to increasing productivity and this is the main goal of any business. Also, in order to enter the risk conditions and uncertainty and the problem of defects in statistics and the existence of inaccurate and uncertain data and information, the obtained results can be accurate by applying fuzzy logic and using it in multi-criteria decision models. Made wet and rely on the results with more confidence [2-3].

The principle of scarcity and optimal allocation of resources is an issue that has always occupied the human mind. They have no choice but to make the best use of the available facilities to access more production and higher quality. At present, what clearly answers this need is the category of efficiency, the concept of which will be examined and refined in the tourism industry.

2- Theoretical framework of the subject

Examining the tourist economy is like the process of exporting goods, so that the arrival of tourists increases exports. Tourism economy means the entry of foreign currencies into the economic arteries of the country and, consequently, improving the living standards of the lower economic deciles and a fairer distribution of income [4]. One of the characteristics of the tourism industry compared to other economic activities is that incomes from different sectors of the industry in the short term have a good effect on the prosperity of the economic situation of people, especially the poor, while the pace of this trend in oil revenues to This is not the limit [5]. Other features that distinguish this industry from other economic activities, no need for huge initial costs, high profitability and profitability, short-term return on investment, extensive job creation, no need for advanced technologies and technologies, abundant currency Utilizing natural and ancient talents, promoting culture and customs to other nations, prosperity of other industries and economic activities, preservation of natural and ancient monuments and dozens of other features that have led to the tourism industry today to be seriously considered by experts and economists [6]. For example, in a country like Spain, the value of the tourism industry and the resulting employment is as valuable as oil for Saudi Arabia, which is also expanding in East Asian countries such as China, Malaysia, Singapore, Thailand, and so on. Today, the tourism industry has played an important role in economic evaluations and related planning and is consistently one of the important factors in measuring

the development or underdevelopment of a country [7].

Some domestic and foreign studies conducted in the field of tourism industry or the model used in this study are: Fateh, in a study entitled Specifying and estimating the tourism demand function of Iran showed that the greatest impact on Tourism demand in the country is due to per capita income variables and relative prices of goods and services. Pourkazemi, in a study entitled "Study of the efficiency of the tourism industry using non-parametric methods in the Middle East," showed that the tourism industry in Bahrain, Turkey and Syria is the most efficient [7]. On the other hand, considering the role of Turkey as a model, based on the research findings, it can be said that inefficient countries in order to increase their efficiency in the tourism industry should use Turkey as their model. Hang examined some of the effects of the economic crisis on the tourism industry in the Western Balkans. The impact of the economic crisis on the exchange rates of foreign countries and the owner of capital in the region [8]. Abu Ali Kah, examined the role of the tourism industry on Jordan's economic development from 1990 to 2008. The results showed that the share of the tourism industry in this country increased from 12.3% to 14.6% during the research period, and this led to an increase in the share of the tourism industry in the total employment of Jordan during the research period of 2.5% [9]. Jahanshahlou, in articles entitled Ranking of Decision Units by Norm L1 for Interval Data, tried the data envelopment analysis method because ranking of decision units with interval numbers is difficult for inputs and outputs. Is to provide an innovative yet simple method that allows DMUs to be ranked based on interval numbers. They finally solved the model for a numerical example [10].

3- Data envelopment analysis

Data envelopment analysis is a powerful mathematical method that uses linear programming to determine the relative efficiency of a set of homogeneous decision units or DMUs. An efficient DMU is considered when no other DMU can produce more efficient output that uses the same amount or less of inputs. The first known DEA models were originally proposed by Charents, Cooper, and Rhodes under the CCR model. The DEA makes no assumptions about the internal performance of a DMU. That is, the DEA treats each DMU as a "black box" that considers only the input and output consumed by each DMU. This view is often appropriate and sufficient. For example, if the purpose of the analysis is to identify inefficient DMUs and assess their degree of inefficiency, then the "black box" is a good approach. In this plan, the intention is to measure the efficiency of technology transfer methods. The evaluation of the performance of each organization's subset has always been and will be considered by senior managers. Traditional methods of performance appraisal that relied solely on financial metrics no longer have a place in modern management, and appraisal is no longer obsolete and acceptable only to senior executives or, in fact, the organization's strategic managers. In the meantime, performance appraisal has taken on a new definition and has an independent view of all sources. And moment-by-moment review puts it on the agenda at specific intervals. Of course, some of these functions are quantitative and some are qualitative, so how to measure these functions is very important. It is based on the results of these measurements that it can be determined how much resources the organization has wasted in order to achieve the goals. It is on this basis that researchers have defined performance appraisal as the measurement of activities performed in relation to a topic or

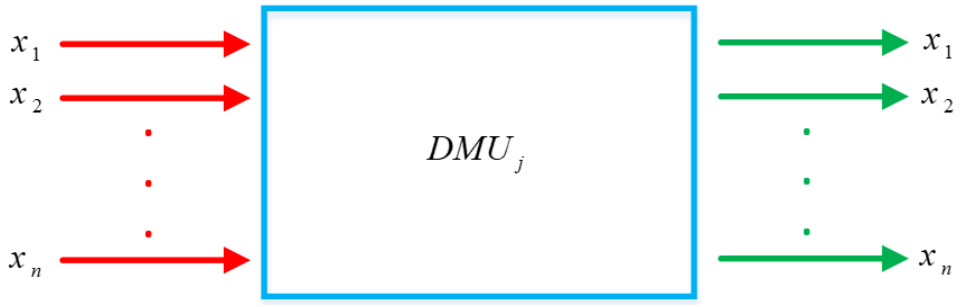

Figure 1- View of a decision maker

perspective. In this design, data envelopment analysis or DEA is used to calculate the efficiency of decision-making units. Data envelopment analysis technique is used in evaluating relative performance. The basis and methodology of this technique are described parametrically below. Assume that each decision-making unit has multiple inputs and multiple outputs as shown below.

The amount DMU_j of efficiency obtained by dividing the output by its input is not possible due to having more than one input and output of the above division, and therefore we need weights for inputs and weights

for unit outputs to be able to use the inputs and outputs with the help of these weights. Convert to an input and output.

For this purpose, suppose $V=(v_1,...,v_m), U=(u_1,...,u_S)$ are the output and input weight vectors, respectively. In this case, DMU_j it has used the input $\sum_{i=1}^{m} v_i x_{ij}$ and produced the output $\sum_{r=1}^{S} u_r y_{rj}$. Hence efficiency DMU_p is calculated from solving the following problem.

$$Max \quad \frac{\sum_{r=1}^{S} u_r y_{rp}}{\sum_{i=1}^{m} v_i x_{ip}}$$

$$s.t. \quad \frac{\sum_{r=1}^{S} u_r y_{rj}}{\sum_{i=1}^{m} v_i x_{ij}} \le 1, \qquad j=1,...,n$$

$$u_r,\ v_i \ge 0,\ r=1,...,s,\ i=1,...,m$$

So far, many methods have been proposed to measure efficiency in organizations. But compared to all DEA models, it is a better way to organize and analyze data because it allows performance to change over time and does not require any presuppositions about the performance frontier. Therefore, more than other perspectives have been used in performance appraisal and is a good technique for comparing units in performance measurement. This method has advantages compared to previous methods, which are mentioned below.

Unlike some numerical methods, DEA methods do not require weights to be specified in advance and assigned to inputs and outputs. Also, these methods do not require predetermined functional forms (such as statistical regression methods) or explicit form of the production function (such as some parametric methods).

- Data envelopment analysis provides facilities for studying units with

multiple inputs and multiple outputs. The data envelopment analysis method is based on linear algebra and its ability is mostly due to the use of linear programming. Linear programming enables data envelopment analysis to use linear programming problem-solving methods and binary theorems, thus determining the source and amount of inefficiencies for each input and output.

- DEA also creates many opportunities for collaboration between analyst and decision maker. These collaborations can be in order to select the input and output of the units under evaluation and how to operate and model the border.

Data envelopment analysis models can be categorized from different perspectives that in order to implement these models, the model must first be selected according to the problem conditions.

3-1 Classification from the point of view of nature

In this view, data envelopment analysis models are generally divided into two groups: input-driven and output-driven.

- Axis output model: In this approach, it is argued that to maximize the value of a fractional expression, it is sufficient that the denominator of the fraction is considered equal to a fixed number and the fraction form is maximized. These models are used when the goal of managers is only to increase the output in exchange for fixed values of inputs.
- Input-axis model: There are also models that reduce inputs by keeping the outputs constant, and in the same way in the output-axis output model, the opposite happens. Axis input models while maintaining the amount of outputs at a given level and reduce the amount of inputs proportionally and as much as possible.
- Additive model: Another model that is used to evaluate performance is called the "cumulative model". This model simultaneously considers the reduction of inputs and the increase of outputs and is used more than the other two models.

3-2 Classification from the perspective of efficiency to scale

Before evaluating decision-making units, we must first know the relationship between the ratio of changes in inputs and outputs of decision-making units. This ratio is called the return on scale. Determining the model for evaluating the decision-making units of a society depends on the returns to the scale of that society. Return to scale is the effect of changing the amount of factors of production on production. Three types of returns on a scale are defined as follows:

- Constant scale returns
- Return to scale reduction
- Return to increasing scale

In CCR models, return to fixed scale is considered and in BCC models, return to variable scale is considered.

3-3 Classification from a dual perspective

Data envelopment analysis models are generally presented in the form of the following two mathematical forms

- Coverage: which has more computational complexity but has more analytical ability while calculating unit performance and can help the decision maker in setting goals (target setting)
- Multiplication: It has less computational complexity and also calculates the importance (weight) of inputs and outputs.

3-4 Mathematical models of data envelopment analysis

The mathematical form of data envelopment analysis models in the framework of the classification is presented in the following tables. Considering that the efficiency obtained from the input-axis and output-axis CCR models are equal to each other, in this research, only the input-axis CCR model is used, but in relation to BCC models, both input-output and output-axis models are used. Will be taken.

Table 1- CCR input and output axis models in multiplicative and cover forms

مدل ورودی محور – مضربی CCR -	مدل ورودی محور – پوششی CCR -
$Max \quad \sum_r u_r y_{rp} = \theta_p$ $s.t. \quad \sum_i v_i x_{ip} = 1$ $\sum_r u_r y_{rj} - \sum_i v_i x_{ij} \le 0 \quad \forall j$ $u_r, v_i \ge \varepsilon$	$Min \quad \theta_p - \varepsilon \left[\sum_i s_i^- + \sum_i s_r^+ \right]$ $s.t. \quad \sum_i \lambda_j x_{ij} + s_i^- = \theta_p x_{ip} \quad \forall i$ $\sum_i \lambda_j y_{rj} - s_i^+ = y_{rp} \quad \forall r$ $\lambda_j, s_i^-, s_i^+, \ge 0, \theta_p \ free$
مدل خروجی محور – مضربی CCR -	مدل خروجی محور – پوششی CCR –
$Min \quad \sum_i v_i x_{ip} = \phi_p$ $s.t. \quad \sum_r u_r y_{rp} = 1$ $\sum_i v_i x_{ij} - \sum_r u_r y_{rj} \ge 0 \quad \forall j$ $u_r, v_i \ge \varepsilon$	$Max \quad \phi_p + \varepsilon \left[\sum_i s_i^- + \sum_i s_r^+ \right]$ $s.t. \quad \sum_i \lambda_j x_{ij} + s_i^- = x_{ip} \quad \forall i$ $\sum_i \lambda_j y_{rj} - s_i^+ = \phi_p y_{rp} \quad \forall r$ $\lambda_j, s_i^-, s_i^+, \ge 0, \phi_p \ free$

Table 2- BCC input and output axis models in multiplicative and cover forms

مدل ورودی محور – مضربی BCC -	مدل ورودی محور – پوششی BCC -
$Max \quad \sum_r u_r y_{rp} + u'_p = \theta_p$ $s.t. \quad \sum_i v_i x_{ip} = 1$ $\sum_r u_r y_{rj} - \sum_i v_i x_{ij} + u' \le 0 \quad \forall j$ $u_r, v_i \ge \varepsilon, u'_p \ free$	$Min \quad \theta_p - \varepsilon \left[\sum_i s_i^- + \sum_i s_r^+ \right]$ $s.t. \quad \sum_i \lambda_j x_{ij} + s_i^- = \theta_p x_{ip} \quad \forall i$ $\sum_i \lambda_j y_{rj} - s_i^+ = y_{rp} \quad \forall r$ $\sum_i \lambda_j = 1$ $\lambda_j, s_i^-, s_i^+, \ge 0, \theta_p \ free$

مدل خروجی محور – پوششی - BCC	مدل خروجی محور – مضربی - BCC
$Max \quad \phi_p + \varepsilon\left[\sum_i s_i^- + \sum_i s_r^+\right]$ $s.t. \quad \sum_i \lambda_j x_{ij} + s_i^- = x_{ip} \quad \forall i$ $\sum_i \lambda_j y_{rj} - s_i^+ = \phi_p y_{rp} \quad \forall r$ $\sum_i \lambda_j = 1$ $\lambda_j, s_i^-, s_i^+, \geq 0, \phi_p \ \ free$	$Min \quad \sum_i v_i x_{ip} + v'_p = \phi_p$ $s.t. \quad \sum_r u_r y_{rp} = 1$ $\sum_i v_i x_{ij} - \sum_r u_r y_{rj} + v'_p \geq 0 \quad \forall j$ $u_r, v_i \geq \varepsilon, v'_p \ \ free$

Table 3- Additive models in multiplicative and cover forms

مدل پوششی - Additive	مدل مضربی - Additive
$Min \quad Z_p = -\sum_i s_i^- - \sum_i s_r^+$ $s.t. \quad \sum_j \lambda_j x_{ij} + s_i^- = x_{ip} \quad \forall i$ $\sum_j \lambda_j y_{rj} - s_i^+ = y_{rp} \quad \forall r$ $\sum_i \lambda_j = 1$ $\lambda_j, s_i^-, s_i^+, \geq 0$	$Max \quad \sum_r u_r y_{rp} - \sum_i v_i x_{ip} + u'_p = w_p$ $s.t. \quad \sum_r u_r y_{rj} - \sum_i v_i x_{ij} + u'_p \leq 0 \quad \forall j$ $u_r, v_i \geq \varepsilon, u'_p \ \ free$

4- Analysis of results

After consulting and consulting with some experts, professors and experts in the tourism industry and studying some domestic and foreign research conducted on this industry, the most important inputs that can be used to evaluate and determine the efficiency of the tourism industry in the countries Use to be determined as follows. The information obtained in this research has been collected from the Global Development Indicators system.

The World Bank Development Data Group provides an annual report entitled Global Development Indicators. Global Development Indicators (WDI) is the most important annual collection of development information. This report is almost a comprehensive report on the statistics available in the economies of most countries in the world. This report consists of 6 sections and examines the different aspects of a country statistically. Sections in the report include Global Outlook, Population, Environment, Economy, Government and Market, and Global Communications. Each section has several tables and each table contains a number of variables that have been prepared for different countries.

The first part of the World Outlook has eight tables and is entitled New Estimates of Purchasing Power Parity from the 2005 International Comparative Plan, Size of the Economy, Millennium Development Goals-Eradicating Poverty and Improving Life, Millennium Development Goals-Environmental Protection, Countries The poor with heavy debts are the Millennium Development Goals-overcoming barriers, women's participation in growth and development, and ultimately key

indicators for other economies. This section can be considered as an abstract of the report, because the main important indicators are available in various sections.
The second part of the population includes variables related to population growth and number, employment, poverty and income distribution, education and population health and includes 22 tables. The tables are entitled: Population Dynamics, Labor Force Structure, Employment through Manufacturing Activities, Favorable Labor and Manufacturing Jobs, Unemployment, Working Children, Poverty, Income or Consumption Distribution, Vulnerability and Security Assessment, Educational Data , Participation in education, efficiency and effectiveness of education, completion of training and results, educational gaps and distances in terms of income and gender, health costs and its use, coverage and quality of disease prevention, reproductive health Nutrition, health risk factors and public health challenges, health gaps and gaps in terms of income, gender and mortality.
The third part of the environment is listed in 16 tables and has the following titles. Rural population and land use, agricultural resources, agricultural products and productivity, deforestation and biodiversity, fresh water, water pollution, energy production and exploitation, energy dependence and efficiency, and carbon dioxide emissions and production, current trends in Production and emission of greenhouse gases, electricity sources, urbanization, urban housing conditions, traffic and congestion, air pollution, government commitment and a wider range of savings.
The fourth section of the economy consists of 16 tables and the titles of the tables in this section are: Recent economic performance of developing countries, Production growth, Production structure, Factory production structure, Export structure, Import structure, Service export structure, Service import structure, demand structure, consumption and investment growth, central government assets, central government current expenditures, central government revenues, monetary indicators, exchange rates and prices, balance of payments and current account.
The fifth section of the government and the market has 12 tables. The titles of the tables in this section are: Private Sector in Economics, Workplace-Studies and Surveys of Institutions and Enterprises, Workplace-Performing Labor Indicators, Stock Markets, Financial Access and Sustainability and efficiency, tax policies, tax expenditures and arms transfers, public and institutional policies, transportation services, electricity and communications, the information age, and science and technology.
The sixth section of global communications has 17 tables, and the existing tables have such titles. Integration with the global economy, growth of commodity trade, direction and growth of commodity trade, trade of high-income economies with low- and middle-income economies, commodity prices, regional trade of blocks, tariff barriers, foreign debt, ratios for foreign debt, Global private financial inflows, net formal financial inflows, financial inflows from members of the Formal Development Committee, allocation of mutual assistance from members of the Development Committee, affiliation of aid, distribution of net aid by members of the Development Committee, relocation and travel and tourism.
In this research, 6 general indicators related to the tourism industry have been examined. And the goal is to compare the situation of our country Iran in this area with other countries in the region. Indicators include the following:

• Passenger Transportation Costs (Dollars)
• Passenger travel expenses (dollars)
• Number of entries
• Number of exits
• Receipt issued for passenger equipment (dollars)
• Receipt issued during the trip (dollars)

Given that data envelopment analysis models consider negative indicators as input and positive indicators as output, among the above indicators, the number of passengers leaving each country as input and other indicators as output in Is considered. The countries studied in the above indicators in this case include the following. The order of these countries is based only on the information contained in the WDI system, and this combination has no other reason.

1) Azerbaijan
2) Iran
3) Bahrain
4) Jordan
5) Pakistan
6) Turkey
7) Saudi Arabia
8) Kazakhstan
9) Qatar
10) Oman
11) Tajikistan
12) Kuwait
13) Armenia
14) Lebanon
15) Turkmenistan
16) United Arab Emirates

Table 4 provides information related to each index in the 16 countries mentioned above.

Four DEA models including CCR models, BCC input axis, BCC output axis and Additive model were implemented according to these six variables that constitute our input and output variables. By modeling, the most efficient countries in the tourism industry are introduced.

Now, based on the above data, each country is evaluated using four models of data envelopment analysis, and the performance obtained from each of these models is reported in Table 3. Also, the bar graph obtained from the efficiency of each country method using the four data envelopment analysis models is shown in Figure 2.

We now review, interpret and compare the results obtained from each of the models to evaluate the tourism industry in the countries. One of the challenging issues in using data envelopment analysis methods and other methods based on multi-criteria decisions is the resolution of these methods and their ability to rank decision units. Accordingly, researchers are always looking for methods and models that, while calculating the efficiency of decision-making units, can distinguish them well from each other. According to the obtained results, it is clear that the resolution of the CCR model is higher than other methods. This fact can be sought in the assumption of fixed-scale returns in this type of models. Based on this feature, the calculation of the efficiency of decision-making units is always more rigorous than the models that consider variable-scale returns. The important point here is that based on the higher resolution of CCR models, these models cannot always be considered preferable to models that work on a variable scale return, because the scale returns are constant or variable. One of the parameters of the problem is evaluating the performance of countries in the tourism industry. Accordingly, if in a particular case study, it is found that the returns are variable in scale, even if the BCC models have a lower resolution, these models should be used to evaluate the performance of countries. It should be noted that in data envelopment analysis, there are complementary models such as Anderson-Peterson that can re-rank the performance units obtained from the models discussed in this article and solve the problem of reparability to some extent.

Another issue discussed is the nature of the input or output axis of the tourism

industry. Regarding CCR models, we know that the efficiency obtained from input-output and output-driven models are the same, but as can be seen in Table 5, the efficiency obtained for different countries in BCC-input input models is different. It is based on output models. In the case of the studies considered in this study, the resolution of the additive model is slightly higher than the input-output and output-driven BCCs, but this challenge, like the resolution, still depends on the nature of the problem under study. In general, the evaluation of the performance of countries in the tourism industry is mainly in the hands of issues that have both input-output and output-oriented nature, so the use of additive models is recommended in terms of nature in this field.

Table 4: Status of 16 countries in indicators

Country	Passenger Transportation Costs (Dollars)	Passenger travel expenses (dollars)	Number of entries	Number of exits	Receipt issued for passenger equipment (dollars)	Receipt issued during the trip (dollars)
Azerbaijan	169000	2284000	2633	3919	196000	2634000
Iran	628000	11300000	7295	7243	230000	4402000
Bahrain	1306000	2717000	12045	2868	145000	3689000
Jordan	106000	1387000	4150	1501	972000	5249000
Pakistan	1106000	1793000	966	1263	428000	390000
Turkey	398000	4595000	45768	8383	1192000	25220000
Saudi Arabia	1288000	16644000	15334	21866	3184000	13791000
Kazakhstan	165000	2687000	8789	10230	396000	2255000
Qatar	2482000	9272000	1819	1729	9674000	5565000
Oman	668000	2542000	2301	3350	1217000	1758000
Tajikistan	14000	10200	1035	31	162000	8900
Kuwait	1174000	14318000	8508	7504	461000	458000
Armenia	53000	1405000	1652	1623	29000	1208000
Lebanon	141000	6254000	1964	1923	294000	8400000
Turkmenistan	15000	11300	8	38	173000	9800
United Arab Emirates	2592000	9382000	21286	18904	9785000	5676000

Table 5: Efficiency of each country in the tourism industry based on different DEA models

	Country	CCR	Input Oriented BCC	Output Oriented BCC	Additive
1	Azerbaijan	0.1752	0.2480	0.2651	0.1652
2	Iran	0.3108	0.6575	0.9082	0.8452
3	Bahrain	0.4744	0.9909	1	0.6851
4	Jordan	0.9155	1	1	0.8908
5	Pakistan	1	1	1	0.1894
6	Turkey	0.8489	1	1	1
7	Saudi Arabia	0.1752	1	1	1
8	Kazakhstan	0.0813	0.2164	0.6840	0.1307
9	Qatar	1	1	1	1
10	Oman	0.3115	0.3265	0.4193	0.2016
11	Tajikistan	1	1	1	1
12	Kuwait	0.5504	1	1	1
13	Armenia	0.2206	0.2391	0.3136	0.1056
14	Lebanon	1	1	1	1
15	Turkmenistan	0.8139	0.8675	0.8598	0.6821

16	United Arab Emirates	0.1106	1	1	1

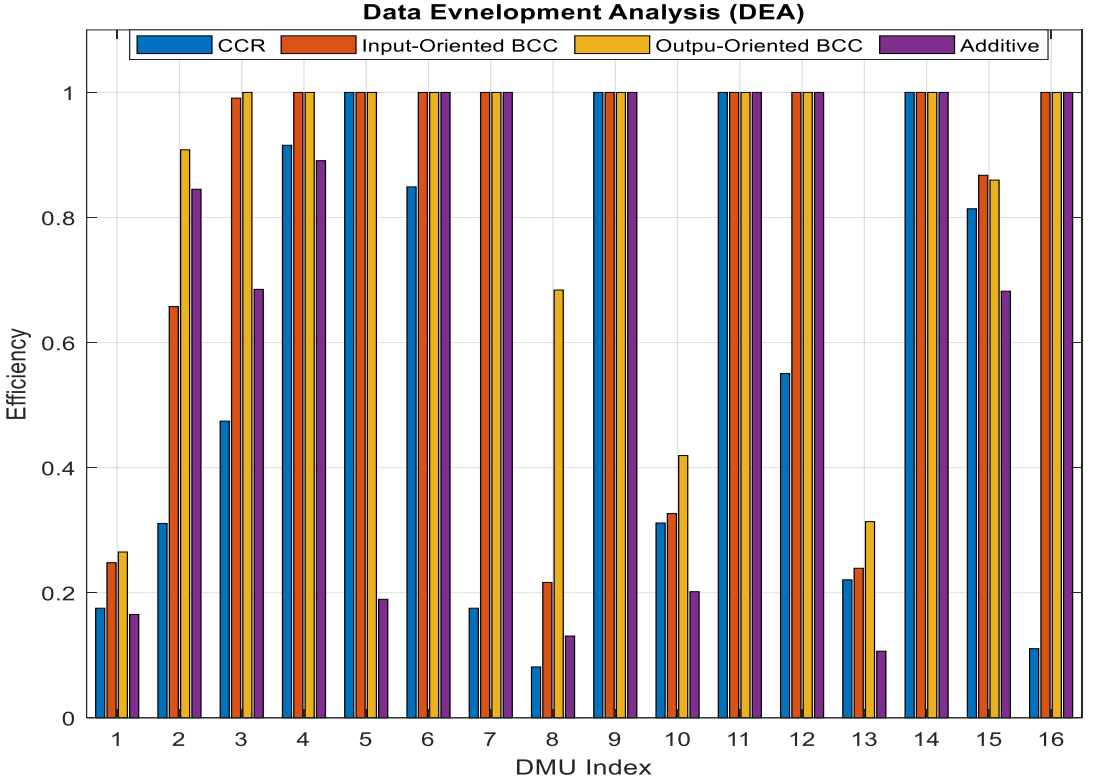

Figure 2 - Bar chart of the efficiency of each country based on different DEA models

5. Conclusion

Since the data envelopment analysis method has the ability to provide results with two natures of input and output, so it has more power in providing solutions to increase the efficiency of the tourism industry of countries. In this research, focusing on tourism industry indicators, different models of data envelopment analysis were used to evaluate and calculate efficiency. The models used in this research include CCR model, output axis BCC model, input axis BCC model and additive model. The results obtained to calculate the efficiency of countries based on each of these models are reported and the results obtained from each of them are compared with each other. Given the nature of the issue of evaluating the performance of countries in the tourism industry, it can be inferred that these types of issues are mainly in the category of issues in which decision-making units are both input-oriented and output-oriented. Therefore, the use of additive models to calculate performance in this area is recommended. Also, if the return on a fixed or variable scale is not a problem of one of the predetermined assumptions, the high resolution and ranking power of CCR models can be used to rank countries.

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