

MEASUREMENT OF THE EFFICIENCY OF AZERBAIJAN REGION HOTEL ORGANIZATION: WINDOW ANALYSIS AND MALMQUIST INDEX

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ABSTRACT:

In recent years, policies to develop tourism in the Republic of Azerbaijan have been followed, and governmental level programs have been implemented to increase competitive power in the tourism sector. The aim of study is to investigate the efficiency changes of hotels and hotel-type accommodation organizations of 9 regions of Republic of Azerbaijan with the data of 2006 to 2018 by using Window Analysis and Malmquist Total Factor Productivity Index methods. Efficiency change measurements made through Window Analysis method were made by using output oriented constant and variable return models. In this study, average annual number of employees, total number of rooms and total annual expenditures were used as input variable and number of people placed, number of overnight stays and total amount of annual income were used as output variable. According to the results of fixed and variable scale window analysis, Nakhchivan A.R. was the only efficient region in all of the years of 2012-2018. In addition, according to the results of both analyses, no region was efficient in 2010. When examining the averages of all periods, it was observed a 1,1% decline in the TFP. It could be said that this decline is due to the decrease in technical efficiency and technological change. It is seen in the strategic planning for the socio-economic development of the regions that there is a need to implement policies towards the development of tourism and increasing the efficiency of hotel organizations.

Keywords: Tourism, Hotel Enterprises, Data Envelopment Analysis, Window Analysis, Malmquist Index

JEL classification: L83, Z32, D61

INTRODUCTION

“The development of the tourism sector is among the priorities. State Tourism Agency was established with the decision of the President of Azerbaijan, and for this purpose, more government support was provided in this field. The number of tourists in Azerbaijan increased by 22% in 2016, 20% in 2017 and 10% in the first half of 2018”

These were spoken by Ilham Aliyev, the President, in the meeting of the Council of Ministers related to the results of socioeconomic development and future tasks in the first half of 2018 (Azertag, 2018).

Azerbaijan hosted the First European Games in 2015, the 4th Baku Islamic Solidarity Games in 2017 and the international sports competitions such as Formula 1 in 2018 and 2019, with the realization of the first one held in 2017 and in addition to this, it becomes a continuously developing tourism center, as a result of the policies implemented for the development of nature tourism. Since hotel and hotel-type accommodation organizations are one of the indispensable factors of the tourism sector, as a result of abovementioned activities, many employees, both seasonal and permanent staff, are employed in the hotel and hotel type accommodation organizations and competition among these organizations is increasing each passing day.

Efficiency measurement is based on the ground of the analysis of product and service production and cost minimization functions. Debreu (1951), Koopmans (1951) and Farrell (1957), who were one of the leading names in efficiency analysis, defined the technical efficiency as the maximum reduction of all inputs with the assumption of producing existing outputs. The first empirical studies were performed by Debreu and Koopmans (Murillo-Zamorano et al., 2000). Farrell's approach, that was a milestone for the development of subsequent approaches, was made with single-output production technology and some restrictive assumptions and ignored the structural inefficiency. This interpretation can also be expressed as the boundary approach and this means that the production function and the production set consisting of the entire input combination and output combinations are adopted as the upper bound (Kutlar et al., 2011: 85).

In the literature, there are many studies carried out by Data Envelopment Analysis (DEA) method for measuring the efficiency of service sector, especially accommodation organizations. In international literature, it is seen that DEA method was applied for the calculation of Ru and Ruonan (2013)) efficiencies on three-star hotels in the UK (Sigala (2004)), tourism centers in Italy (Bosetti et al. (2006)) branches of a travel agency in Austria (Wöber (2007)), hotels in Taiwan (Shang et al. (2010)), in various tourism centers in the Indian province of Uttar Pradesh (Siddiqui and Tripathi (2010)), in the tourism centers in the provincial, municipal and autonomous regions of China (Bi et al. (2011)).

When the literature related to the studies carried out by using DEA method in the tourism sector is examined, it is seen that Azizova's study (2002), in which the place of the tourism sector in the Azerbaijani economy was examined and the proposals

for tourism training were offered, can be described as the first study of the new millennium. In her study, Azizova first introduced the country and then by presenting general information about the economy, the development plans of the country tourism and the vocational training level within these plans, the problems encountered and solution proposals were mentioned. Seferov and Hesenov (2006) evaluated the analysis of tourism potential and tourism efficiencies of Azerbaijan for the period between 1996-2003. Novresli (2010) made an analysis by using the time series econometrics based on tourism revenue and GDP variables between 1996 and 2008, and his hypothesis that the tourism sector increased economic growth within the context of the Azerbaijani economy was studied by Zivot-Andrews and Gregory-Hansen tests. As a result of the study, it was concluded that tourism sector affected Azerbaijan's economic growth after 2003, especially at a higher rate since 2006. Amanova (2019) measured the relationship between tourism revenues and the main macroeconomic indicators of the Azerbaijani economy between 1995 and 2017 and concluded, within the context of the Azerbaijani economy, that tourism revenues had inverse and weak correlation with inflation and a positive and strong correlation with GDP and budget revenues as well as the increasing effect of this on the GDP variable tended to increase in the long term as a percentage.

In this study, the efficiency changes of hotel organizations, one of the most important factors of tourism sector, were measured. For this purpose, Window Analysis and Malmquist Index Total Factor Productivity analysis were performed with fixed scale and variable scale methods of Nonparametric DEA. The target population of the study was selected as the years of 2006 to 2018 obtained from the State Statistics Committee of the Republic of Azerbaijan, and nine regions of the Republic of Azerbaijan were selected as the scope of research. Average annual number of employees, total number of rooms, total capacity of hotel and total annual expenditures were used as input variable and number of people placed, number of overnight stays of guests and total amount of annual income were used as output variable.

METHOD

The CCR model proposed by Charnes, Cooper and Rhodes (CCR) in 1978 is the first step that contributed to the development of DEA approach. Variable weight is used in DEA method. Especially, weights are directly derived from data obtained as a result of multiple assumptions and it is avoided from constant weight selected calculations.

In the literature, these weight values are named as “virtual input-output” or “virtual weights” and are formulated as follows (Cooper et al., 2011: 13).

$$\frac{\text{virtual outputs}}{\text{virtual inputs}} = \frac{u_1 y_{1o} + u_2 y_{2o} + \dots + u_s y_{so}}{v_1 x_{1o} + v_2 x_{2o} + \dots + v_m x_{mo}} \quad (1)$$

Where; u_s – s. expresses the weight of output, y_{so} – “o” expresses s. output obtained from “o” unit, v_m – m. weight of input, x_{mo} – “o” expresses m. input used by “o” unit .

Supposing that a DMU produces outputs y_r , $r=1, 2, \dots, s$ from inputs x_i , $i=1, 2, \dots, m$, equation can be written as follows with the help of the appropriate weights on the variables ($u_r=1, 2, \dots, s$; $v_i=1, 2, \dots, m$) (Charnes et al., 1978: 431):

$$\theta = \frac{\sum_{r=1}^s u_r y_{ro}}{\sum_{i=1}^m v_i x_{io}} \quad (2)$$

As it can be seen from the formula, DEA should be considered as a conceptual model in a sense, because the fractional program uses the ratio of total factor efficiency.

The linear program for DMU_o is made by equalizing the denominator of the objective function in the fractional function to 1 (Charnes et al., 1978: 431).

$$\text{Max } \theta = \sum_{r=1}^s u_r y_{ro} ; \quad \sum_{i=1}^m v_i x_{io} = 1 \quad (3)$$

$$\text{Constraints: } \frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1 \quad (j = 1, 2, \dots, n); \quad \sum_{i=1}^m v_i x_{ij} = 1; \quad u_r > 0 ; \quad v_i > 0$$

Equation (3) is a linear equation and restricts the weighted sum of inputs to 1 and maximizes the weighted output sum of “o” DMU by selecting appropriate values for u_r v_i . At the same time, the efficiency value cannot exceed 1.

When Banker, Charnes and Cooper created the BCC model, they defined the set of production possibilities as follows (Cooper et al., 2011: 88);

$$P_B = \{(x, y) | x \geq X\lambda, y \geq Y\lambda, e\lambda = 1, \lambda \geq 0\} \quad (4)$$

$X=(x_j) \in R^{m \times n}$, $Y=(y_j) \in R^{s \times n}$, $\lambda \in R^n$ e is a sequence vector whose all elements equal to 1. According to the above definition, the only difference that distinguishes the BCC model from the CCR model is that the constraint is added to the model.

$$e\lambda = \sum_{j=1}^n \lambda_j = 1 \quad (5)$$

This constraint, together with the condition $\lambda_j \geq 0$, enables the realization of different combinations of n piece of DMU only within a concave efficiency upper boundary line (Banker et.al, 1984: 1086).

In this case, the input-oriented BCC model is calculated by solving the efficiency of ($= 1, \dots, n$) of DMU_0 by solving the following linear programming model,

$$(BCC_0) \min \theta_B \tag{6}$$

Constraints are $\theta_B x_0 - X \lambda \geq 0$; $y \lambda \geq y_0$; $e \lambda = 1$; $\lambda \geq 0$ where θ_B is a numeric value. The dual multiplier form of this linear program (BCC_0) is as follows;

$$\max z = y_0 - u_0 \tag{7}$$

Constraints are $v x_0 = 1$; $-v X + u Y - u_0 e \leq 0$; $v \geq 0, u \geq 0$; where; u_0 is a free signal variable (positive, negative or zero), and z and u_0 are numerical values.

In DEA, panel data is collected and used in Window Analysis to overcome problems experienced when the number of the decision-making units (DMU)s is limited to the number of input and output variables. The mean efficiency of DMU can be monitored by Window Analysis (Charnes et al. 1984). Thus, performance comparisons of the DMUs within a fixed time can be made with the same DMU and another DMU within the same period of time. This analysis evaluates the performance of DMU in time by supposing that there is a different unit in each period (Kutlar, Kabasakal and Babacan, 2015: 78).

DEA is a nonparametric measurement approach for Window Analysis. Let the number of DMUs is represented by N ($n = 1, 2, \dots, N$) supposing that m is used to produce output in the period T ($t = 1, 2, \dots, T$) s. In this case, there are as many observations as $N \times T$, in the period t , r dimensional input vector of n DMU_n^t is $x_t^n = (x_{1t}^n, x_{2t}^n, \dots, x_{rt}^n)$ and s -dimensional output vector $y_t^n = (y_{1t}^n, y_{2t}^n, \dots, y_{st}^n)$. At the width of w ($1 \leq w \leq T$), k is indicated by k_w in the window starting at time t and observed up to $N \times W$ (Asmild et al., 2004: 70).

The matrix for the inputs and outputs of this Window Analysis can be formed as follows:

$$X_{k_w} = \begin{pmatrix} x_k^1 & x_k^2 & \dots & x_k^N \\ x_{k+1}^1 & x_{k+1}^2 & \dots & x_{k+1}^N \\ \vdots & \vdots & \vdots & \vdots \\ x_{k+w}^1 & x_{k+w}^2 & \dots & x_{k+w}^N \end{pmatrix}; Y_{k_w} = \begin{pmatrix} y_k^1 & y_k^2 & \dots & y_k^N \\ y_{k+1}^1 & y_{k+1}^2 & \dots & y_{k+1}^N \\ \vdots & \vdots & \vdots & \vdots \\ y_{k+w}^1 & y_{k+w}^2 & \dots & y_{k+w}^N \end{pmatrix} \tag{8}$$

The input-oriented DEA window analysis formula can be written for DMU_t^1 under the assumption of constant returns to scale as follows (Charnes et al. 1984):

$$\theta_{kwt} = \min_{\theta, \lambda} \theta \tag{9}$$

By using a priori knowledge about the relative values of inputs and outputs for DEA window model, the model including multiplier constraints to obtain definitive and more realistic productivity estimates is suggested by Asmild et al. (2004). Here, the dimensions $s \times L$ and $r \times L$ are included in the model, being used through the C^i input and C^o output constraint matrices respectively. In this case, the formula (9) takes the following form:

$$\Theta_{kwt} = \min_{\theta, \lambda, z} \theta \quad (10)$$

The effect of adding these multiplier constraints to the DEA model is to eliminate them by the constraints, although there are some old (or unconstrained) reference points. This is done by adding flexibility to z 's. As a result, while the calculation of the greater efficiency and Malmquist index for observations within the bounds, the results of the small input activity scores, lower super-efficiency scores are obtained for the observations out of bounds.

"Malmquist Index Total Factor Productivity" (TFP) was developed by Malmquist (1953) to determine how the efficiency changes over time in the evaluation process of efficiencies. This index measures the change in TFP between two data points by calculating the differences ratios of each data point by using common technology. This measurement is performed with the distance function which is used to define production technologies having multiple inputs and outputs without specifying targets such as cost minimization or profit maximization (Griffel-Tatje & Lovell: 1995: 171).

When a technology is discussed as the reference technology for the period t , the output-oriented Malmquist TFP change index can be written for the s (base period) and t periods as follows (Coelli, et al., 1998: 291);

$$m_0^t(y_s, x_s, y_t, x_t) = \frac{d_0^t(y_t, x_t)}{d_0^t(y_s, x_s)} \quad (11)$$

Alternatively, when discussing the period s as reference, the calculation changes as follows:

$$m_0^s(y_s, x_s, y_t, x_t) = \frac{d_0^s(y_t, x_t)}{d_0^s(y_s, x_s)} \quad (12)$$

As it can be seen from the equations above, $d_0^s(y_t, x_t)$ notation shows the production element from period t to period s . Malmquist TFP Index can be shown as the geometric mean of different functions as follows (Kutlar, Yuksel and Bakirci, 2011: 139);

$$d_0^s(y_0^t, x_0^t) = [top. \{ \varphi = (\varphi y_0^t, x_0^t) \in S(s) \}]^{-1} \quad (13)$$

It gives the output in the period t (inputs are constant). The distance of this production to the technology boundary in the period s reaches the form:

$$S(p) = \{y_h^s, x_h^s\}; x_h^s \geq 0, y_h^s \geq 0, \forall h = 1 \dots n \quad (14)$$

If the period s and t are greater than one (small), then the TFV representation generated in this way is positive (negative) Malmquist Index. Distance functions in this productivity index can be rearranged in order to show that they are equivalent to the product of technical efficiency change index and technological change index (Coelli, et al., 1998: 292).

$$m_0^t(y_s, x_s, y_t, x_t) = \frac{d_0^t(y_t, x_t)}{d_0^s(y_s, x_s)} \times \left[\frac{d_0^s(y_t, x_t)}{d_0^t(y_t, x_t)} \times \frac{d_0^s(y_s, x_s)}{d_0^t(y_s, x_s)} \right]^{1/2} \quad (15)$$

The equation (1,42) consists of the multiplication of "Efficiency Change" and "Technological Change", which measure changes in output-oriented technical efficiency in period's s and t and changes in technology between the two periods. The change in efficiency refers to the ratio of the technical efficiency in the period t to the technical efficiency in the period s (Candemir & Deliktaş, 2006: 4).

$$\text{Efficiency change (EC)} = \frac{d_0^t(y_t, x_t)}{d_0^s(y_s, x_s)} \quad (16)$$

$$\text{Technological Change (TC)} = \left[\frac{d_0^s(y_t, x_t)}{d_0^t(y_t, x_t)} \times \frac{d_0^s(y_s, x_s)}{d_0^t(y_s, x_s)} \right]^{1/2} \quad (17)$$

Where, Change in Efficiency is the change index in technical efficiency under constant return to scale. While this index is the best effect of capturing the production limit for each observation between periods s and t, the Technological Change index is the change in the technical efficiency limit. TFP change is expressed as the product of the change in technical efficiency and technological change (Candemir & Deliktaş, 2006: 4).

While this index is expressed as the effect of capturing best production limit for each observation between period's s and t, Technological Change Index is expressed as the change in the boundary of technical efficiency. TFP change is expressed as the multiplication of the change in technical efficiency and technological change (Candemir & Deliktaş, 2006: 4).

$$M_{TFV}^{s,t} = EC \times TC \quad (18)$$

If the change index in Malmquist TFP is greater than 1, it indicates that TFP increases or improves from period s to period t and d and if this value is less than 1, it indicates that decreases.

VARIABLES

Data used in the study Data were obtained from the official website of the State Statistics Committee of the Republic of Azerbaijan. Within the scope of study, 10 regions of the Republic of Azerbaijan were included by using data of 2006-2018. In the efficiency analysis performed, Staff (average annual number of employees), Room (total number of rooms), Capacity (total capacity) and Expenditure (total annual expenditure, thousand manats) were used as input variables and Guest (number of people placed), Overnight (overnight stay of guests) and income (total annual income, one thousand Manats) were used as output variables. According to the statistical data obtained, the highest amount in input and output variables was in Baku and the least amount was in the region of Upper Karabakh. Because the other parts of the Upper Karabakh region are occupied by Armenia except for Tartar, only the data of Tartar city in 2006-2017 and Fuzuli city in 2018 are presented on the website of the Statistical Committee. Therefore, the Nagorno-Karabakh Region was not included in the scope of the study.

FINDINGS

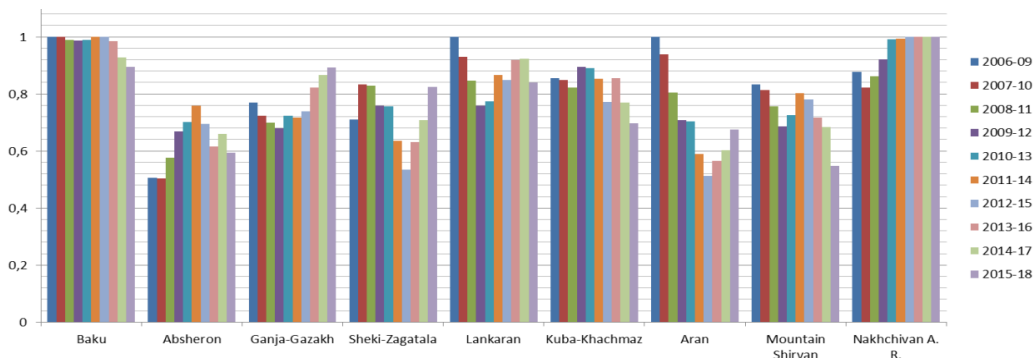
Window analysis is a time dependent DEA technique and it was used in this study to measure how efficiency values of regions of Azerbaijan Republic changed during years of 2006 and 2018. Since it is more important to maximize the existing inputs and outputs in the tourism sector, especially in hotel organizations, as in all production and service sectors, efficiency measurements have been performed by using output-oriented, constant-scale and variable-scale window analyses. The mean efficiency of the window analysis was measured by quadruple windows. In the first window, the efficiency average of the regions for the years 2006-2007-2008-2009 is represented. In the second window analysis, the efficiency scores of 2006 are reduced and the efficiency scores of 2010 are added. With this method, the last window reflects the mean efficiency scores of the years 2015-2016-2017-2018. If the result of Window Analysis is taken as 1, it means that the region is efficient in four years.

Results of efficiency scores obtained by output-oriented, constant-scale window analysis are presented in Table 1. According to the results of the analysis, Baku, Lenkeran and Aran in the first window, Baku in the second and sixth windows, Baku and Nakhchivan Autonomous Republic in the seventh window, and Nakhchivan Autonomous Republic in the eight, nine and tenth windows were fully efficient. It was found in the third, fourth and fifth windows that there was no region with full efficiency score.

Table 1: Average Through Window (Win-O-C)

Regions	Win1 2006-09	Win2 2007-10	Win3 2008-11	Win4 2009-12	Win5 2010-13
Baku	1	1	0,989	0,987	0,989
Absheron	0,507	0,503	0,577	0,668	0,701
Ganja-Gazakh	0,770	0,722	0,698	0,680	0,724
Sheki-Zagatala	0,711	0,833	0,828	0,760	0,757
Lankaran	1	0,929	0,846	0,760	0,774
Kuba-Khachmaz	0,855	0,849	0,822	0,896	0,890
Aran	1	0,939	0,804	0,707	0,704
Mountain Shirvan	0,834	0,813	0,757	0,685	0,726
Nakhchivan A. R.	0,878	0,822	0,861	0,921	0,992
Regions	Win6 2011-14	Win7 2012-15	Win8 2013-16	Win9 2014-17	Win10 2015-18
Baku	1	1	0,985	0,929	0,896
Absheron	0,758	0,695	0,616	0,660	0,593
Ganja-Gazakh	0,718	0,738	0,822	0,866	0,893
Sheki-Zagatala	0,636	0,534	0,630	0,709	0,824
Lankaran	0,866	0,849	0,919	0,922	0,840
Kuba-Khachmaz	0,854	0,773	0,855	0,770	0,697
Aran	0,588	0,512	0,565	0,602	0,676
Mountain Shirvan	0,803	0,780	0,716	0,683	0,549
Nakhchivan A. R.	0,994	1	1	1	1

As it can be seen from Table 1, the region with the lowest mean efficiency score in the first five windows was Absheron, in the sixth, seventh, eighth and ninth windows, it was found to be Aran and in the tenth window, it was found to be Mountainous Shirvan. Baku was fully efficient in four windows including 2006-2009, 2007-2010, 2011-2014 and 2012-2015, Nakhchivan Autonomous Republic was fully efficient in four windows including 2012-2015, 2013-2016, 2014-2017 and 2015-2018 and each of Lankaran and Aran regions were fully efficient in one window including the 2006-2009.

Figure 1: Mean Scores (CCR) of Regions in Window Analysis

As it can be seen from Figure 1, Baku has the closest scores to 1 in the windows where it is not efficient, according to the results of the window analysis. When examining the mean efficiency scores of the regions from the Figure, it is observed that the Baku region has values close to the full efficiency score in seven windows, and the efficiency scores decreased in the last three windows, that is, 2013-2018.

Although the increasing direction of the Absheron region's mean efficiency score shows a trend up to the sixth window, it declined, after the seventh window. The Ganja-Kazah, Sheki-Zakatala, Lankaran and Aran regions first had a decreasing trend and then an increasing trend of efficiency. The mean efficiency scores of Kuba-Khachmaz and mountainous Aran regions decreased in the last windows.

The efficiency scores for the regions according to the estimated years as a result of the constant scale window analysis are presented in Table 2. Baku region was fully efficient in 2006-2009, 2011-2013 ve 2018, Absheron region in 2012, Ganja-Gazakh region in 2017, Sheki-Zakatala in 2016 and 2018, Lankaran in 2006-2009 and 2014, Kuba-Khachmaz in 2011 and 2012, Aran region in 2006-2008 and Nakhchivan A.R. in 2012-2018. Another point that attracts attention is that Mountainous Shirvan region is not effective in any year.

It is also seen that in 2010 no region was efficient, the highest efficiency score was 99,8% (Sheki Zakatala) and the lowest efficiency score was 46,2% (Absheron). From Table 2, it was found that mean efficiency of regions according to years was below 80% in 2010, 2013-2016 and above 80% in 2006-2009, 2012, 2017 and 2018.

Efficiency score results obtained by output-oriented, variable-scale window analysis are presented in Table 3. According to the results of the analysis, it was found that Baku, Lenkeran, Aran and Mountainous Shirvan were fully efficient in the first window, Baku in the second and sixth windows, Baku, Absheron and Nakhchivan A.R. in the seventh window and regions of Nakhchivan Autonomous Republic in the eight, nine and tenth Windows.

It was found that no region obtained efficiency score in the third and fourth windows, but in the third and fourth windows, Baku (99,1% in both windows) and in the fifth window, Nakhchivan A.R. (99,3%) regions had the highest efficiency scores, and in the third window, Absheron (65,1%), in the fourth window, Ganja-Gazakh (73,8%) and in the fifth window, Aran (74%) had the lowest efficiency scores.

Table 2: Average by Term (Win-O- C)

Regions	2006	2007	2008	2009	2010	2011	2012
Baku	1	1	1	1	0,965	1	1
Absheron	0,507	0,537	0,568	0,437	0,462	0,842	1
Ganja-Gazakh	0,946	0,976	0,613	0,578	0,729	0,865	0,659
Sheki-Zagatala	0,600	0,746	0,865	0,680	0,998	0,830	0,629
Lankaran	1	1	1	1	0,678	0,743	0,781
Kuba-Khachmaz	0,884	0,992	0,706	0,782	0,856	1	1
Aran	1	1	1	0,991	0,807	0,667	0,504
Mountain Shirvan	0,795	0,821	0,834	0,973	0,619	0,657	0,719
Nakhchivan A. R.	0,912	0,793	0,717	0,849	0,977	0,979	1
Average	0,849	0,874	0,811	0,810	0,788	0,843	0,810
Regions	2013	2014	2015	2016	2017	2018	
Baku	1	0,987	0,893	0,920	0,977	1	
Absheron	0,537	0,570	0,632	0,651	0,645	0,666	
Ganja-Gazakh	0,583	0,727	0,955	0,840	1	0,884	
Sheki-Zagatala	0,537	0,465	0,475	1	0,870	1	
Lankaran	0,882	1	0,704	0,986	0,959	0,788	
Kuba-Khachmaz	0,781	0,781	0,793	0,667	0,719	0,644	
Aran	0,599	0,358	0,598	0,618	0,884	0,672	
Mountain Shirvan	0,820	0,850	0,643	0,457	0,663	0,621	
Nakhchivan A. R.	1	1	1	1	1	1	
Average	0,749	0,749	0,744	0,793	0,857	0,808	

As it can be seen from Table 3, it was found that Absheron (63,4% and 65,2%) had the lowest efficiency score average in the first two windows, Ganja-Gazakh (73,9%) in the sixth window, Aran (73,6%, 72,5%, 69,3%), in the seven, eight and ninth windows, and Mountainous Sh irvan (62,1%) the tenth window. Baku had been efficient in the four windows including Win1, Win2, Win6 and Win7, Nakhchivan A. R. in the four windows including Win7, Win8, Win9 and Win10 windows and Lankaran, Aran and Mountainous Shirvan regions in the one window including Win1 and Absheron in one region including Win7 respectively.

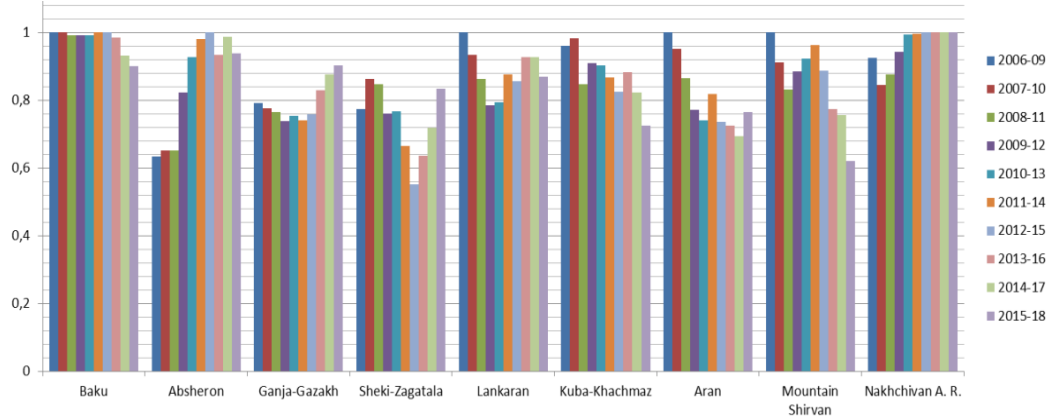
As it can be seen from Figure 2, according to the results of the window analysis, it was found that Baku and Nakhchivan regions had the closest scores to 1 in the windows where they were not effecient. When the mean efficiency scores of the regions are examined, it is observed that the Baku region obtained values close to the full efficiency score of seven window and the mean efficiency scores have decreased in the last three windows. Although the increasing direction of the Absheron region's mean efficiency score shows a trend up to the seven window, it declined after the seventh window. The Ganja-Kazah, Sheki-Zakatala, Lankaran and Aran regions first had a decreasing trend and then an increasing trend of efficiency. The mean efficiency scores of Kuba-Khachmaz and mountainous Aran regions decreased in the last windows.

Table 3: Average Through Window (Win-O-V)

Regions	Win1 2006-09	Win2 2007-10	Win3 2008-11	Win4 2009-12	Win5 2010-13
Baku	1	1	0,991	0,991	0,991
Absheron	0,634	0,652	0,651	0,823	0,928
Ganja-Gazakh	0,791	0,776	0,764	0,738	0,754
Sheki-Zagatala	0,772	0,862	0,846	0,760	0,767
Lankaran	1	0,934	0,862	0,785	0,795
Kuba-Khachmaz	0,961	0,982	0,847	0,908	0,903
Aran	1	0,952	0,864	0,771	0,740
Mountain Shirvan	1	0,911	0,831	0,884	0,923
Nakhchivan A. R.	0,926	0,846	0,875	0,943	0,993
Regions	Win6 2011-14	Win7 2012-15	Win8 2013-16	Win9 2014-17	Win10 2015-18
Baku	1	1	0,985	0,932	0,901
Absheron	0,979	1	0,934	0,986	0,937
Ganja-Gazakh	0,739	0,757	0,829	0,876	0,902
Sheki-Zagatala	0,665	0,551	0,637	0,718	0,835
Lankaran	0,876	0,856	0,928	0,928	0,870
Kuba-Khachmaz	0,867	0,825	0,882	0,823	0,725
Aran	0,819	0,736	0,725	0,693	0,765
Mountain Shirvan	0,963	0,887	0,774	0,756	0,621
Nakhchivan A. R.	0,995	1	1	1	1

The efficiency scores for the regions according to the estimated years as a result of the constant scale window analysis are presented in Table 4. Baku region was fully efficient in 2006-2009, 2011-2013 and 2018, Absheron region in 2012 and 2014-2016, Ganja-Gazakh region in 2007 and 2017, Sheki-Zakatala in 2016 and 2018, Lankaran in 2006-2009, 2014 and 2016, Kuba-Khachmaz in 2006, 2007, 2011 and 2012, Aran region in 2006-2009 and 2017, Mountainous Shirvan in 2006-2009 and 2013 and Nakhchivan A.R. in 2006 and 2012-2018.

Figure 2: Mean Scores of Regions in Window Analysis (BCC)



It is also seen that in 2010 no region was efficient, the highest efficiency score was 99,8% (Sheki Zakatala) and the lowest efficiency score was 46,2% (Absheron). 2006 was the year in which six of the nine regions were efficient. From Table 4, it was found that mean efficiency of regions according to years was below 90% in 2006, 2007, 2017 and 2018 and between 80% and 90% in other years.

Table 4: Average by Term (Win-O-V)

Regions	2006	2007	2008	2009	2010	2011	2012
Baku	1	1	1	1	0,974	1	1
Absheron	0,648	0,781	0,719	0,485	0,768	0,856	1
Ganja-Gazakh	0,950	1	0,693	0,589	0,857	0,871	0,668
Sheki-Zagatala	0,720	0,811	0,895	0,692	0,998	0,859	0,642
Lankaran	1	1	1	1	0,731	0,755	0,789
Kuba-Khachmaz	1	1	0,868	0,859	0,912	1	1
Aran	1	1	1	1	0,930	0,702	0,702
Mountain Shirvan	1	1	1	1	0,821	0,843	0,854
Nakhchivan A. R.	1	0,844	0,741	0,871	0,990	0,988	1
Mean	0,924	0,937	0,880	0,833	0,887	0,875	0,850
Regions	2013	2014	2015	2016	2017	2018	
Baku	1	0,988	0,898	0,922	0,982	1	
Absheron	0,902	1	1	1	0,918	0,855	
Ganja-Gazakh	0,611	0,751	0,967	0,847	1	0,889	
Sheki-Zagatala	0,548	0,486	0,486	1	0,892	1	
Lankaran	0,895	1	0,734	1	0,964	0,798	
Kuba-Khachmaz	0,786	0,860	0,832	0,679	0,800	0,650	
Aran	0,885	0,404	0,731	0,718	1	0,700	
Mountain Shirvan	1	0,935	0,725	0,477	0,714	0,628	
Nakhchivan A. R.	1	1	1	1	1	1	
Mean	0,847	0,825	0,819	0,849	0,919	0,836	

Averages technical efficiency change (effch), technological change (techch), pure efficiency change (pech), scale efficiency change (sech) and TFP change (tfpch) of the hotel organizations of Azerbaijan regions is presented in Table 5. As it can be seen in Table 5, TFP occurred in 2008-2009, 2010-2011, 2014-2015, 2015-2016 and 2016-2017. The highest tfpch score was 1,128 in 2016-2017 and the lowest tfpch score was 0,882 in 2009-2010. It can be said that the tppch score decreased by 3% in 2017-2018 as 0,997. Although the overall average of the efficiency changes of all regions according to years did not take value above 1, effch decreased by 0,7%, techch and pech by 0,4%, sech by 0,3% and tfpch by 1,1%.

When examining the tfpch of 2006-2007 and 2009-2010 periods, it is remarkable that there is a high rate of loss. In this period, the positive development of the input-output compositions of the regions, that is, the increase in technical efficiency did not prevent the decrease in tfpch. In this and other years, the negative signals of the technical change indicate that the input-output combinations in the production processes of the companies have changed negatively. Hotel organizations in the regions have moved their efficiency limits down. With the negative effect of Techch, the efficient production limit could not be up risen. While the positive contribution to the increase in technical efficiency change that has the positive contribution to TFP comes from sech in 2006-2007 period and while positive contribution comes from pech during the period 2009-2010 in which decrease in pech contributed negatively, it should be emphasized that the decreases in sech contributed negatively.

Table 5: Annual Means

year	effch	techch	pech	sech	tfpch
2006-2007	1,113	0,882	0,995	1,119	0,982
2007-2008	0,981	0,993	1,001	0,980	0,974
2008-2009	0,863	1,185	0,954	0,904	1,023
2009-2010	1,044	0,844	1,048	0,997	0,882
2010-2011	1,095	0,973	1,010	1,085	1,066
2011-2012	0,860	1,039	0,945	0,910	0,894
2012-2013	0,977	0,931	0,986	0,991	0,910
2013-2014	0,936	0,979	0,974	0,962	0,916
2014-2015	1,062	0,976	1,034	1,027	1,036
2015-2016	1,028	1,065	0,974	1,055	1,095
2016-2017	1,079	1,046	1,088	0,991	1,128
2017-2018	0,923	1,081	0,957	0,964	0,997
mean	0,993	0,996	0,996	0,997	0,989
[Note that all Malmquist index averages are geometric means]					

When examining the mean efficiency change of the regions presented in Table 6, it is determined that the tfpch scores of Baku, Absheron, Ganja-Gazakh, Sheki-Zagatala and Nakhchivan A.R regions are over one and the lowest tfpch score is 0,899 in Aran region. It was seen that the technical efficiency change of the hotel organizations of Baku region increased by 3,3% and no change was seen in other efficiencies.

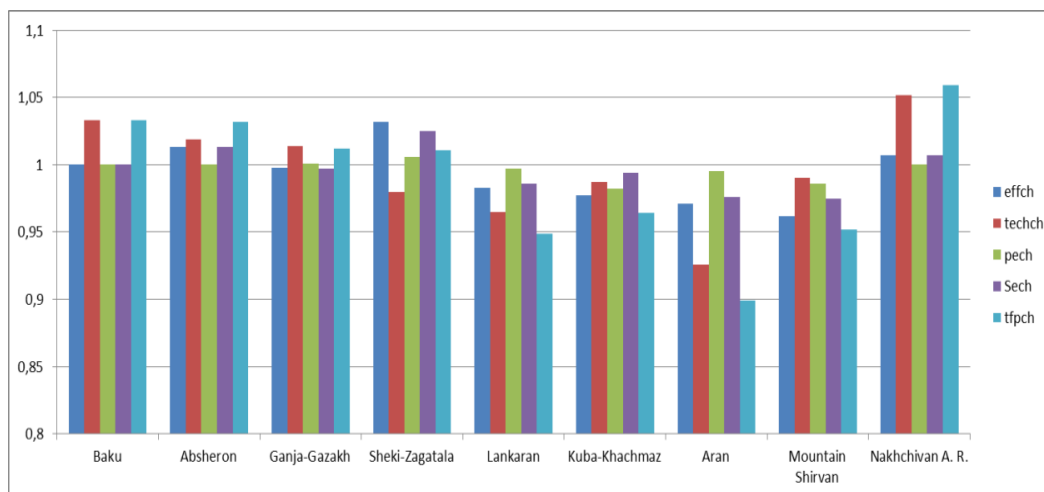
Table 6: Region Means

Regions	effch	techch	pech	sech	tfpch
Baku	1,000	1,033	1,000	1,000	1,033
Absheron	1,013	1,019	1,000	1,013	1,032
Ganja-Gazakh	0,998	1,014	1,001	0,997	1,012
Sheki-Zagatala	1,032	0,980	1,006	1,025	1,011
Lankaran	0,983	0,965	0,997	0,986	0,949
Kuba-Khachmaz	0,977	0,987	0,982	0,994	0,964
Aran	0,971	0,926	0,995	0,976	0,899
Mountain Shirvan	0,962	0,990	0,986	0,975	0,952
Nakhchivan A. R.	1,007	1,052	1,000	1,007	1,059
Mean	0,993	0,996	0,996	0,997	0,989

[Note that all Malmquist index averages are geometric means]

The regions, whose efficiency change was above one, were Absheron (1,3%), Sheki-Zagatala (3,2%) and Nakhchivan A.R. (0,7%) and the regions with technical efficiency change above one are Baku (3,3%), Absheron (1,9%), Ganja-Gazakh (1,4%) and Nakhchivan A.R. (5,2%). These changes can also be seen in Figure 3.

Figure 3: Region Means



In Table 7, the estimated MI (tfpch) scores of the regions according to years are presented. The tppch score of the Baku region was above one in 2007-08, 2010-11, 2011-12, 2015-16, 2016-17 and 2017-18, and the highest score was achieved in 2016-2017 with 21%. MI score for the years 2012-13 was 99,9%.

The Sheki-Zakatala region, which made a breakthrough in the tourism sector in recent years, became the region with a tppch score above one in 2006-07, 2007-08, 2009-10, 2014-15, 2015-16 and 2017-18. The MI score of the Sheki-Zagatala region in 2015 and 2016 was 2,218, which means that efficiency in the region increased by 121,8% in a year.

Table 7: Malmquist Index TFP Summary of Regions

Regions	2006-2007	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Baku	0,881	1,166	0,979	0,910	1,113	1,015
Absheron	1,327	0,979	0,771	1,034	1,667	1,066
Ganja-Gazakh	1,064	0,909	0,931	1,135	1,081	0,727
Sheki-Zagatala	1,053	1,046	0,863	1,248	0,820	0,689
Lankaran	0,798	0,929	1,269	0,552	1,136	1,017
Kuba-Khachmaz	1,081	0,832	1,161	0,979	1,400	0,995
Aran	0,919	0,898	0,820	0,663	0,657	0,606
Mountain Shirvan	0,903	1,010	1,405	0,535	0,885	1,037
Nakhchivan A. R.	0,902	1,037	1,192	1,260	1,169	1,059
Regions	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018
Baku	0,999	0,964	0,969	1,120	1,210	1,125
Absheron	0,547	1,031	1,157	1,042	1,018	1,142
Ganja-Gazakh	0,890	1,186	1,302	0,923	1,266	0,897
Sheki-Zagatala	0,831	0,870	1,007	2,218	0,842	1,259
Lankaran	1,126	1,076	0,648	1,418	0,960	0,830
Kuba-Khachmaz	0,663	0,793	1,005	0,862	1,079	0,922
Aran	1,244	0,555	1,829	1,060	1,475	0,788
Mountain Shirvan	1,094	0,956	0,790	0,720	1,465	1,011
Nakhchivan A. R.	1,044	0,982	0,991	1,015	1,008	1,100

The tppch score of the Nakhchivan A.R. region was above one in other years except 2006-07 (90,2%), 2013-14 (98,2%) and 2014-15 (99,1%). The highest efficiency score of the Nakhchivan A. R. region increased by 26% in 2010-11.

CONCLUSION

The importance of the tourism sector in the globalizing world is increasing every passing day. It is travelled to countries for economic, cultural, historical, religious, sporting, health and other purposes. Although the Republic of Azerbaijan, which has seven of the nine climates in the world, is already fighting against Armenia, it attracts the attention of tourists with its natural beauty, cultural-historical infrastructure and international organizations. It is crucial for the purpose of

examining the results of the policies implemented in the tourism sector in order to measure the tourist performance of the regions, to evaluate the current situation of the hotel and hotel type organizations and to take future decisions. The fact that no similar studies have been encountered in Azerbaijan so far demonstrates the importance of the study.

In this study, the efficiency changes of hotel and hotel type accommodation organizations of 9 regions of Republic of Azerbaijan were investigated by using Window Analysis and Malmquist Total Factor Productivity Index (TFP) methods. Efficiency change measurements performed by Window Analysis method were made by using output oriented constant and variable return models. As a result of the study, the following findings were obtained: According to the results of constant and variable scale window analysis, Nakhchivan A.R. was the only region efficient in all the years of 2012 - 2018. The Baku region has been efficient in 2006-2009, 2011-2013 and 2018. In addition, according to the results of both analyses, no region was efficient in 2010. The region with the lowest efficiency score was the Aran region.

According to the results of TFP, it was observed that there were no significant losses in the average TFP of the other regions except the Aran region, but there was remarkable development in the productivity increases during the application period of the analysis, The highest increase in TFP occurred in 2016-2017 with 12,8%. Although the average technical efficiency changes of the regions obtained the highest values, it was observed a decrease in the scale efficiency change. In 2011-2012 periods, in which technical efficiency change values gave negative signals, the decrease in TFP reached 10,6%. The largest loss (11,8%) in the TFP was experienced during the period 2009–2010. In this period, it was seen decreases only in technical change and pure efficiency change values, and increases in technical efficiency change and pure technical efficiency changes were not sufficient to eliminate the losses. The highest decrease in pure efficiency was 5,5% during the period of 2011-2012 and the highest decrease in scale efficiency was 9,6% during the period of 2008-2009. Finally, when the averages of all periods are analyzed, it was observed a 1,1% decline in TFP. It can be said that this decline was caused by the decrease in technical efficiency and technical change. Increasing the technical efficiency of the tourism sector, the positive use of technology, and providing the full administrative efficiency will not only increase the economic efficiency and productivity in the regions, but will also bring along high competitive power. In the strategic planning for socio-economic development of the regions, it is seen that there is a need for policies to improve tourism and increase the efficiency of hotel organizations.

It should be noted that increasing productivity and efficiency not only shows the economic growth of the country, it is also considered as an indicator of the welfare level and the level of competition experienced in the sector. Efficiency analysis, which provides information, albeit partial, about the policies implemented in the field studied, is one of the important tools for policy making in sectoral performance and economic development. The results of the analysis performed are limited with the selected variables and the determined period in the direction of data which could be obtained. Inclusion and exclusion of selected decision-making units with the use of different variables will result in changes in the results.

REFERENCES

- Akkaya. G.C. & Uzar. C. (2012). Financial Efficiency Test of the ISE Tourism Companies: Data Envelopment Analysis Application. *International Journal of Economics and Finance Studies*. 4(1). 95-100.
- Aksu. A. A. & Köksal C. D. (2005). Comparing the Efficiency of the Independent Hotels and Chain Hotels Using Data Envelopment Analysis: A study in the Antalya Region. *IIF*. 20(235). 97-107.
- Amanova. N. (2019). Azərbaycan Turizm Gelirlerinin Makroekonomik Göstergelere Etkisi; 1995-2016 yılı Analizi. *İstanbul Üniversitesi Sosyal Bilimler Enstitüsü*. Yayınlanmamış yüksek lisans tezi.
- Asmild. M., Paradi. J. C., Aggarwall. V. & Schaffnit. C. (2004). Combining DEA Window Analysis with the Malmquist Index Approach in a Study of the Canadian Banking Industry. *Journal of Productivity Analysis*. 21. 67–89.
- Azertag (2018). *President İlham Aliyev: The Development of the Tourism Sector is Among the priorities*.
https://azertag.az/xeber/Prezident_Ilham_Aliyev_Turizm_sektorunun_inkisafi_prioritetler_sirasindadir-1178291 (12.10.2019)
- Azizova. M. (2002). Azərbaycan Turizminin Değerlendirilmesi ve Turizm Eğitime Yönelik Öneriler. *Gazi Üniversitesi Eğitim Bilimleri Enstitüsü*. yayınlanmamış yüksek lisans tezi.
- Babacan. A. & Özcan. S. (2009). Alanya Bölgesi Otellerinin Görelî Etkinliğinin Belirlenmesi: Bir Veri Zarflama Analizi Tekniğı Uygulaması. *Mustafa Kemal Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*. 6(12). 176-189.
- Banker. R. D., Charnes A. & Cooper. W.W. (1984). Some Models For Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*. 30(9). 1078-1092.
- Bi. G., Luo. Y. & Liang. L. (2011). Efficiency Evaluation of Tourism Industry with Data Envelopment Analysis (DEA): A Case Study in China. *Journal of China Tourism Research*. 7(1). 104-116.

- Bosetti. V. Cassinelli. M. & Lanza. A. (2006). Benchmarking in Tourism Destination. Keeping in Mind the Sustainable Paradigm. *The Fondazione Eni Enrico Mattei Note di Lavoro Series Index*. 1-28.
- Candemir. M. & Deliktaş. E. (2006). *TİGEM İşletmelerinde Teknik Etkinlik. Ölçek Etkinliği. Teknik İlerleme. Etkinlikteki Değişme ve Verimlilik Analizi: 1999-2003*. Ankara: TİGEM
- Charnes. A.. Clark. C. T.. Cooper. W. W. & Golany B. (1984). A Developmental Study of Data Envelopment Analysis in Measuring the Efficiency of Maintenance Units in the U.S. Air Forces. *Annals of Operations Research*. 2(1). 95-112
- Charnes. A.. Cooper. W.W. & Rhodes. E. (1978). Measuring the Efficiency of Decision Making Units. *North-Holland Publishing Company European Journal of Operational Research*. 2. 429-444.
- Coelli. T. J. et. al. (1998). *An Introduction to Efficiency and Productivity Analysis*. Second Edition. New York: Springer Science
- Cooper. W. W.. Seiford. L. M. & Zhu. J. (2011). *Handbook on Data Envelopment Analysis*. Second Edition. New York: Springer.
- Debreu. G. (1951). The Coefficient of Resource Utilization. *Econometrica*. 19(3). 273-292
- Devlet İstatistik Komitesi. <https://www.stat.gov.az/source/tourism/> (10.09.2019)
- Doğan. N. Ö & Ersoy. Y. (2018). Veri Zarflama Analizi ile Konaklama İşletmelerinde Etkinlik Ölçümü: Yozgat ili Örneği. *Mukaddime*. 9(2). 119-134.
- Doğan. N. Ö & Tanç. A. (2008). Konaklama İşletmelerinde Veri Zarflama Analizi Yöntemiyle Faaliyet Denetimi: Kapadokya örneği. *Journal of Economics and Administrative Sciences*. 22(1). 239-259.
- Doğan. N. Ö. (2014). Efficiency Measurement Using Super Efficiency DEA Models: A Case Study on the Balloon Firms in Cappadocia. *Journal of Economics and Administrative Sciences*. 29 (1). 187-203.
- Emir. O. & Özgür. E. (2008). Influence Analysis of Accommodation Establishments. *Afyon Kocatepe University Journal of Social Science*. 10(1). 163-174.
- Farrel M. J. (1957). The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society. Series A (General)*. 120(3). 253-290.
- Griffel-Tatje. E. & Lovell. C.A. (1995). A Note on the Malmquist Productivity Index. *Economics Letters*. 47. 169-175.

- Keskin Benli. Y. (2012). Data Envelopment Analysis (DEA) and Malmquist Total Factor Productivity (TFP): An Empirical Evidence in Accomodation Businesses. *Ege Akademik Bakış*. 12(3). 369-382.
- Koopmans. T. C. (1951). *Activity Analysis of Production and Allocation*. New York: John Wiley and Sons Inc.
- Kutlar. A., Kabasakal. A. & Babacan. A. (2015). Dynamic Efficiency Analysis of Turkish Banks: A DEA-Window and Malmquist Index Analysis for the 2003-2012 Period. *Sosyoekonomi*. 24. 71-97.
- Kutlar. A., Yüksel. F. & Bakırcı F. (2011). *Türkiye’de Belediyelerin Ekonomik Etkinliği ve Etkinliğe Etki Eden Faktörler Üzerine bir Araştırma*. Ankara: Korza Yayıncılık..
- Malmquist. S. (1953). Index Numbers and Indifference Curves. *Trabajos de Estatistica*. 4(1). 209-242.
- Murillo-Zamorano. L. R. & Vega-Cervera. J. (2000). The use of Parametric and Non Parametric Frontier Methods to Measure the Productive Efficiency in the Industrial Sector. A Comparative Study. *Department of Economics and Related Studies University of York. Discussion Papers in Economics*. 17.
- Novresli. T. (2010). Azerbaycan Turizm potansiyelinin Kalkınma Amaçlı Değerlendirilmesi. *Dokuz Eylül Üniversitesi. Sosyal Bilimler Enstitüsü*. yayınlanmamış doktora tezi.
- Ru. Q. & Ruonan. X. (2013). The Study on the Efficiency Evaluation of Urban Tourism Based on the Method of DEA. *25th Chinese Control and Decision Conference (CCDC)*. 1616-1619.
- Seferov R. & Hesenov. T. (2006). An Assessment Of Azerbaijan’s Tourism Potential And Activities. *Selçuk Üniversitesi Türkiyat Araştırmaları Dergisi*. 20. 255 – 272.
- Shang. J.-K., Wang. F.-C. & Hung. W.-T. (2010). A Stochastic DEA Study of Hotel Efficiency. *Applied Economics*. 42(19). 2505-2518.
- Siddiqui. M. H. & Tripathi. S. N. (2010). Performance of Tourist Centres in Uttar Pradesh: an Evaluation Using Data Envelopment Analysis. *ASCI Journal of Management*. 40(1). 31-51.
- Sigala. M. (2004). Using Data Envelopment Analysis for Measuring and Benchmarking Productivity in the Hotel Sector. *Journal of Travel & Tourism Marketing*. 16(2). 39-60.
- Uyar. S. & Alış. M. (2014). Konaklama İşletmelerinde Veri Zarflama Analizi Yöntemiyle Faaliyet Denetimi Uygulaması. *Dokuz Eylül University Faculty of Economics And Administrative Sciences Journal*. 29(2). 107-136.
- Wöber. K.W. (2007). Data Envelopment Analysis. *Journal of Travel & Tourism Marketing*. 21(4). 91-108.