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İMKB'DE İŞLEM GÖREN TURİZM İŞLETMELERİN VERİ ZARFLAMA ANALİZİ YÖNTEMİYLE MALİ PERFORMANSLARININ ÖLÇÜMÜ VE BENCHMARKING UYGULAMASI*

MEASUREMENT OF FINANCIAL PERFORMANCES OF TOURISM ESTABLISHMENTS TRADED IN THE ISTANBUL STOCK EXCHANGE (ISE) THROUGH DATA ENVELOPMENT ANALYSIS AND BENCHMARKING APPLICATION

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Abstract

Nowadays, survival chances of establishments are determined by their success levels among the competition. Therefore, establishments compare their performance with establishments producing similar products in order to obtain a competitive advantage. Benchmarking is accepted as a management technique used to increase the performance of an enterprise and it turns into a means for strong competition when implemented properly. Non-parametric performance measurements and comparisons based on this method allow us to compare the obtained results by taking the effective units as an example, and in this manner the strengths and weaknesses of enterprises against their competitors are determined.

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*Bu makale Crosscheck sistemi tarafından taranmış ve bu sistem sonuçlarına göre orijinal bir makale olduğu tespit edilmiştir.

In this study, relative financial performances of Tourism Establishments traded in the Istanbul Stock Exchange (ISE) were measured through mathematical programming based Data Envelopment Analysis. The study consisted of two parts, with one being theoretical and the other practical. In the first part, data envelopment analysis and benchmarking were explained theoretically. In the practical phase, financial data of the tourism establishments traded in the ISE was used, the inactive units were determined through data envelopment analysis and benchmarking was performed. Through benchmarking, changes to be made in the inactive units were specified in ratios and information was provided regarding the levels of these changes.

Data was evaluated through the EMS (Efficiency Measurement System) software intended for academic use. After the efficient and inefficient units were determined at the end of the analysis, inefficient units were set aside to be included in benchmarking. Data was obtained using the balance sheets and financial statements of tourism establishments traded in the ISE.

Input and output variables used in the DEA method consist of ratios used in the financial analysis method. In this study, 3 input and 4 output variables were used 9 tourism companies. In terms of these input and outputs titles, data from 2010 was examined. In line with the results of the analysis, inactive tourism establishments were benchmarked with active firms. In this application, the changes to be made in the input/output combinations were specified in ratios.

Key Words: Data envelopment analysis, financial performance, benchmarking, the Istanbul Stock Exchange, ISE, tourism establishment.

JEL CLASS.: C14, H54, C58.

Öz

Günümüzde işletmelerinin hayatta kalma şanslarını, rekabetteki başarı düzeyleri belirlemektedir. Bu nedenle işletmeler rekabet avantajı elde etmek için genellikle benzer ürün üreten işletmelerle performanslarını kıyaslarlar. Kıyaslama (benchmarking), işletme performansını arttırmak için kullanılan bir yönetim tekniği olarak kabul edilmekte ve doğru uygulandığında, güçlü bir rekabet aracı haline gelmektedir. Parametrik olmayan performans ölçümü ve bu yönteme dayalı kıyaslama; elde edilen sonuçların etkin birimler örnek edinilerek karşılaştırılmasına imkân vermekte, işletmelerin rakipleri karşısında zayıf ve güçlü yönlerin belirlenmesi sağlanmaktadır.

Bu çalışmada; İMKB'de işlem gören Turizm İşletmelerinin görece mali performansları matematiksel programlama tabanlı Veri Zarflama Analizi yöntemiyle ölçülmüştür. Çalışma teorik ve uygulama olarak iki kısımdan oluşmaktadır. İlk bölümde veri zarflama analizi ve kıyaslama teorik olarak anlatıldıktan sonra uygulama aşamasında İMKB'de işlem gören turizm firmalarına ait finansal veriler kullanılarak veri zarflama analizi sonucu etkin olmayan birimler belirlenerek kıyaslama yapılmıştır. Veriler, akademik kullanıcılar için tasarlanmış EMS (Efficiency Measurement System) yazılımında değerlendirilmiştir. Analiz sonucunda elde edilen etkin ve etkin olmayan birimler belirlendikten sonra etkin

olmayan birimler benchmarking yapılacak birimler olarak belirlenmiştir. Etkin birimlerden oluşan referans kümeleri de potansiyel kıyaslama odaklarını oluşturmaktadır.

Veriler İMKB'de işlem gören turizm işletmelerine ait bilanço ve gelir tablosu kullanılarak elde edilmiştir. VZA yönteminde kullanılan girdi ve çıktı değişkenleri finansal analiz yönteminde kullanılan oranlardan oluşmaktadır Bu çalışmada 3 adet girdi ve 4 adet çıktı değişkeni kullanılmıştır. 9 firmaya ait saptanan girdi ve çıktı değişken başlıklarından hareketle 2010 yılı incelemeye alınmıştır. Analiz sonuçlarına göre etkin olmayan turizm firmaları etkin firmalar ile benchmarking yapılmıştır. Bu uygulamada girdi/çıktı bileşimlerinde yapılacak değişiklikler oransal olarak belirtilmiştir.

Anahtar Kelimeler: Veri zarflama analizi, mali performans, bencmarking, IMKB, turizm işletmeleri,

INTRODUCTION

Enterprises, which constitute an open system, have to display higher performances than their competitors in order to obtain a competitive advantage in the face of global developments and to maintain continuity. This fact has urged enterprises to use measurement and evaluation methods to measure their performances relatively in themselves and with their competitors so as to determine their strengths and weaknesses as well as to develop prospective plans.

Institutions should implement an effective performance measurement system that facilitates taking and applying conscious decisions so as to benefit from the results of the performance measurement. This is due to the fact that performance measurement systems evaluate the effectiveness and efficacy of the previous actions through collecting, comparing, grouping, analysing, interpreting and diffusing the appropriate data.[1]

The performance measurement of a firm is both a management method that is used in an increasingly common manner and one of the most important means in which the firm can account for its responsibility towards its shareholders. The importance of performance measurement has increased gradually, as the results of such measurements ensure a more effective management in the firm and facilitate the reporting made within the scope of the firm accounting for its responsibility to external shareholders.[2]

The main objective of the firm in benefiting from the performance measurement is to maximise total performance[3]. One of the methods that strengthens this objective is

[1] Neely, A.D., (1998), Performance Measurement: Why, What and How. Economist Books London. pp.5-6

[2] Turkish Court of Accounts, (2003), Preliminary Research Report of the Court of Accounts on the Performance Measurement, September

[3] Benligiray, S., (1999), Performance Management in Hotels in terms of Human Resources, Eskişehir, p.7

benchmarking. Benchmarking is accepted as a management method used to enhance the performance of the enterprise and when it is correctly implemented it becomes a strong competitive tool.[4] The performance levels of other enterprises are known as the "benchmarking reference" and an ideal benchmarking reference is "the performance level of the establishment accepted as the best of the relevant field". Performance benchmarking can include both financial criteria and nonfinancial criteria.[5]

Out of the methods used for determining and enhancing performance, Data Envelopment Analysis and benchmarking were used together to measure the relative efficiencies of the firms. Benchmarking is a process that enables us to detect the best among the evaluated units both within and outside of the enterprise, to analyse how they have become successful in their businesses and to compare the "most successful" to others that are similar. Conversely, Data Envelopment Analysis is a linear programming based method that is used to detect the units that use its processes effectively and those that do not, in the case that more than one input and output exists in the units operating in the same field.

The study consisted of two parts, with one being theoretical and the other practical. In the first part, data envelopment analysis and benchmarking were explained theoretically. In the practical phase, financial data of the tourism establishments traded in the ISE was used, the inactive units were determined through data envelopment analysis and benchmarking was performed. Through benchmarking, changes to be made in the inactive units were specified in ratios and information was provided regarding the levels of these changes.

1. Benchmarking

Benchmarking is a technique that was originally developed in the Japanese manufacturing sector and then adopted and popularised by the actors in the international business worlds.[6] Benchmarking is defined as a series of activities that use the performance indicators to evaluate and manage the performances of the enterprises. It is the process of determining and adapting the best or better practices of the criteria obtained through comparison. Benchmarking encourages managers and employees to think about the performance criteria and act to increase business profitability in line with a perfectionist mentality.[7]

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[4] Şimşek, M., (2002), Total Quality Management, İstanbul: Alfa Publishing., p.328

[5] Peršić, M. and Janković, S., (2011), Performance Benchmarking Tool in the Croatia Hotel Industry Advances in Food, Hospitality and Tourism, editors in chief: Brennan Charles & Knowles Tim Manchester Metropolitan University, UK (2043-8907) 1, 4; p.52-65.

[6] Jie W. And Haiyan S., (2011) Operationel Performance And Benchmarking: A Case Study Of International Tourist Hotels in Taipei African Journal of Business Management, Vol. 5(22) pp. 9455-9465. September.

[7] Wöber, K.W., (2001) Benchmarking for Tourism Organizations, An eGuide for Tourism Managers, National Laboratory for Tourism and eCommerce, University of Illinois at Urban Champaign, November.

Benchmarking is a management technique that was led by Xerox in the second half of the 1970s with the aim of getting ahead of the intensive competition posed by photocopy manufacturers. Principally, it is based on comparing the processes and principles of an enterprise to the processes and practice principles of another enterprise operating in another sector or country. In many cases, this technique provides new ways of increasing operational efficiency. As an effective management tool, benchmarking supports the implementing actors to find creative and innovative solutions by detecting the problems and formulating and implementing new strategies for performance improvement. It is not a very complex process. It simply requires the examination of the practices accepted as the best in a specific sector.[8] Benchmarking contains a continuous comparison of the products, services and activities to the examples setting the highest standard of the sector and these standards can be found in the same enterprise, other enterprises or different enterprises going through similar processes.[9]

[8] Bergeron, P. G., (2003) The ABCs of Financial Performance Measures and Benchmarks for Canada's Tourism Sector, Guıde 1, National Library of Canada Cataloguing in Publication Data, pp.1-7.

[9] Horngren, Ch. T., Sundem,G.L., Stratton,W.O., (2005) Introduction to Management Accounting, 14th Ed. Pearson Education, p.147.

Table 1. Different Types of Benchmarking Processes

Approach		Scope	Objectives	Advantages	Disadvantages
Internal benchmarking		Functions, departments, projects, businesses in the same company or group at the same or another location	• Improve competitiveness • Stimulate continuous improvement • Improve economic efficiency • Find effective employee rewarding systems.	• Similar language, culture, mechanisms and systems • Ease of access to data • Existing communications • Relatively quick returns possible	• Might inhibit external focus and foster complacency • Possibly results in returns that are merely adequate
External benchmarking	Best practice benchmarking	Any organization regardless of sector or location	• Identifying best management practices.	• Possibility of breakthroughs • Broaden corporate perspective • Stimulates challenge • Less sensitive to ethical and political reservations	• Relatively difficult to access data • Change ramifications are greater • Higher profile
	Competitive benchmarking	Competitors (e.g. companies operating in the same sector)	• Identifying performance, objectives, strategies and programs of competitors • Identify best practices.	• Similar structure and constraints • Relative ease of access to data • Relatively low threat • Helps to overcome complacency and arrogance	• Sector paradigms might restrain creativity • Legal, ethical and political considerations
	Sector benchmarking	Specific or similar sector or industry branch	• Identify sector strategies and programs • Disseminate information on best practices • Define training packages.	• Industry trends easier to assess • Relative ease of access to data	• More difficult to derive specific recommendations • Data also accessible to competitors

Source: Wöber, K.W. *Benchmarking for Tourism Organizations, An eGuide for Tourism Managers*, (Wöber, K.W. *Benchmarking for Tourism Organizations, An eGuide for Tourism Managers*, National Laboratory for Tourism and eCommerce, University of Illinois at Urban Champaign. 2001. November, p.5.

Despite this relatively clear definition, benchmarking has been defined differently by several authors and enterprises. While some think that benchmarking should be performed as an endless, continuous activity, others allege that benchmarking is a repeatable activity that should be implemented for a limited duration when the need arises. However, the generally accepted opinion is that benchmarking should continue unceasingly and use the best possible examples for comparison. It is based on performance comparison, difference detection and making

changes in the management processes, although results should be adapted to the target enterprise instead of directly imitating the processes.[10]

A model containing the processes of benchmarking is composed of such steps as "deciding on what to compare, examining our own processes in detail, determining the benchmarking partners, collecting information, analysing the collected information, implementing new processes to reach the predetermined activity targets and certain other steps if necessary". Successful benchmarking requires not only regularity and continuity, but also an application to the different layers of different departments of large-scale enterprises. This process should start with measurement and continue with benchmarking. The success of benchmarking also depends on continuous improvement and the implementation of systematic procedures.[11]

1. Non-parametric method DEA

DEA is a mathematical programming based method used in measuring the relative efficiencies of organisational units that have multiple inputs/outputs and perform similar activities. Especially in cases where multiple inputs or outputs cannot be transformed into weighted input or output set, DEA is accepted as an effective approach.[12]

Based on Farrell's (1957) theoretical approach in determining the performance efficiency, Data Envelopment Analysis is a linear programming based approach developed by Charnes et al. (1978).[13]

In the first DEA application made by Charnes et al. in 1978, efficiencies of state schools in the USA were measured. While the studies were continuing, Farrell's study; "The Measurement of Productive Efficiency" attracted the attention of Cooper. Accordingly, the study was expanded by Charnes et al. and DEA was applied successfully for efficiency measurement. The details of this study were completed by Charnes et al. in 1981.[14]

The most important characteristic of the method is that it can identify the amount of inefficiency and the sources in each of the decision-making units. Owing to this characteristic, the method can lead the managers as regards to reducing the input and/or increasing the output to a certain extent. The most important innovation is that it can take measurements without needing the prediction of the existence of any

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[10] Watson, G.H., (1993) Strategic Benchmarking: How to Rate Your Company's Performance against the World's Best,Wiley.

[11] Peršić, M. and Janković, S., (2011) works mentioned in p.55.

[12] Cooper W.W, L.M Seiford, and K. Tone., (1999) Data Envelopment Analysis. Kluwer Academic Publishers, p.21.

[13] Ulucan A., (2002) Data Envelopment Analysis Approach in Measuring the Efficiencies of ISO 500 Companies: Different Input Output Components and Evaluations with Returns to Scale Approaches, Ankara University, Journal of Political Sciences Faculty, Volume 57-2, 185-202 p.187.

[14] Banker, R. D. , Charnes A., and. Cooper W. W, (1984) Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis, Management Science, Vol. 30, No. 9, pp.1078-1092.

predetermined analytical production function in cases where numerous outputs are obtained using numerous inputs as in the parametric methods. In addition, inputs and outputs are independent from measurement units. Therefore, it is possible to measure the different dimensions of the enterprise at the same time.[15]

In the DEA technique, a blank input or output value should not be defined.[16] Differently from the classical efficiency analyses, DEA, which is based on the multiple input-multiple output principle, has also advanced rapidly in practice in addition to its theoretical development. Thousands of studies were carried out in several public service areas including hospitals, post offices, courts, banks, pharmacies, transport companies, police stations and education institutions. While DEA was principally used to measure comparative efficiency in non-profit public organisations, it was then used commonly to measure technical efficiency between enterprises in the non-profit production[17] and service sectors.[18]

Estimations in the Data Envelopment Analysis change depending on the DEA model used and the tendency of the model. There are two models that can be used to determine the efficiency frontier: these are "input-oriented models" and "output-oriented models". Input and output oriented DEA models are essentially similar. However, while input-oriented DEA models investigate the most suitable input combination to yield a certain output combination at the most efficient manner, output-oriented DEA models investigate the maximum number of output combinations that can be obtained with a certain input combination. These techniques are also used to determine to what extent the inputs of decision making units which cannot be effective for the data product level should be reduced. As to the output oriented efficiency measurement techniques, they try to determine the maximum output levels that can be produced with the data input level or to what extent the outputs should be increased to make an inefficient decision making unit efficient.[19]

2.1. Mathematical Structure of Data Envelopment Analysis

The first standard DEA model is the rational form, which is known as the CCR model and was developed by Charnes et al:[20]

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[15] Krsak, E., İşcan, E., F., (2000) Weight Restrictions of Relative Activity Performances in the Cement Sector and Their Evaluation Through the Data Envelopment Analysis by using Cross Efficiency, Journal of Industrial Engineering, Vol.: 11, N: 3. pp.2-3.

[16] Kuosmanen, T., (2003) Modeling Blank Data Entries in Data Envelopment Analysis, Wageningen University Department of Social Sciences, Wageningen, Netherlends, p.2.

[17] Gülcü, A., Tutar, H., Yeşilyurt C., (2004) The Relative Efficiency Analysis in Turkey Health Sector Using By Data Envelopment Analysis Method, Seçkin Press, Ankara, Turkey.

[18] Gülcü, A.(2001), Relative Efficiency Analysis of Cumhuriyet University Research Hospital Through Data Envelopment Analysis Method, Journal of Efficiency, No.4; pp.113-138.

[19] Bakırcı, F., (2006). Efficiency and Productivity Measurement in Production Data Envelopment Analysis Theory and Practice. Atlas Publishing No: 53.

[20] Charnes, A., Cooper, W W., and Rhodes, E., (1978) Measuring the efficiency of decision making units. European Journal of Operational Research, Vol. 2, pp.429-444.

Objective function:

$$maks.\left\{\theta_0 = \frac{\sum_i \mu_i y_{i0}}{\sum_j \nu_i x_{j0}}\right\} \qquad (1)$$

Restrictors:

$$\frac{\sum_i \mu_i y_{ik}}{\sum_j \nu_i x_{jk}} \leq 1 \qquad \text{For each DMU (decision making unit), k=1,2,3,…n} \qquad (2)$$

Positive restriction:

$\mu_i \geq 0$, $\nu_i \geq 0$

This model is the CCR-input oriented rational form. The parameters used in this model are as follows:

θ_0 : efficiency score of the 0th DMU that is analysed

n: number of the analysed DMU

i: output number

j: input number

$y_k = \{y_{1k}, y_{2k}, ..., y_{ik}, ..., y_{Ik}\}$, output vector of k *th* DMU whose i *th* output value for the k *th* DMU is y_{ik}

$X_k = \{x_{1k}, x_{2k}, ..., x_{jk}, ..., x_{Ik}\}$, input vector of k *th* DMU whose j *th* input value for the k *th* DMU is x_{jk}

μ and ν are product vectors on y_k and x_k , respectively.

μ_i and νj are the i *th* output and j *th* input weighting. When a DMU set is given in a j number, model determines the optimal-weighted input-output set which maximizes the e_0 efficiency score for each 0*th* DMU. Efficiency can be defined as follows in line with the abovementioned orientations: In an output-oriented model: if it is possible for an output to increase without any input increase or output reduction, this DMU is not efficient. In an output-oriented model: if an output decreases without any input increase or any output decrease, this DMU is not efficient.[21]

[21] Charnes, A., Cooper, W W., and Rhodes, E.(1978), works mentioned in, pp.429-444.

Neither (i) nor (ii) is essential and sufficient for characterising a DMU. An efficiency score of less than 1 means that the output vector can be obtained using a smaller input vector in linear combinations of other DMUs.

The weighted average of inputs of decision making units is equalised to 1. In addition, for each decision making unit, it is another condition that weighted output averages should be smaller than weighted input averages. In accordance with this condition, the weighted average of the outputs of decision making units whose efficiency values are to be calculated should correspond to 1 at the maximum. Therefore, the efficiency value becomes 1 for an effective decision making unit, while it becomes less than 1 for an ineffective decision making unit.

METHOD

In this study, Data Envelopment Analysis was used to evaluate the technical efficiencies of tourism establishments. This method is a "frontier" technique used in efficiency evaluation in many different sectors, as it has the characteristic of producing multiple inputs/multiple outputs.

Variable return to scale was preferred due to the characteristic of the data set to be used in the analysis. In addition, the additive model was used due to the difficulty of forming a focus point on the inputs/outputs as a result of the structural components of the addressed sector.[22]

The additive model was developed by Charnes, Cooper, Golany, Seiford and Stutz in 1985. Differently from CCR and BCC models, which conduct separate evaluations as input oriented and output oriented, the additive model evaluates these two orientations together. Although there are many versions of the additive model, the fundamental version is the one based on linear programming. The model is as follows:[23]

$$E_0 = max \sum_i s_i^- + \sum_r s_r^+$$

Subject to:

$$\sum_j \lambda_j x_{ij} + s_i^- = x_{i0}$$

$$\sum_j \lambda_j y_{rj} - s_r^+ = y_{r0}$$

$$\sum_j \lambda_j = 1$$

[22] Cook, Wade D. and Seiford, Larry M., (2009) "Data envelopment analysis (DEA) - Thirty years on," European Journal of Operational Research, Elsevier, Vol. 192(1), pp.1-17.

[23] Green, R.H. , W. Cook ve J. Doyle, (1997) A Note On The Additive Data Envelopment Analysis, Journal of the Operational Research Society, Vol 48, pp.446-448.

$$i = 1,2,3,\dots,m\,;\, j = 1,2,3,\dots,s; \lambda_j, s_i^-, s_r^+ \geq 0$$

Here, the main objective is to calculate the most distant point to the decision making unit that is inefficient on the efficiency frontier by evaluating the input surplus s+ and output loss s- together. Although the efficiency value cannot be obtained through this model, idle variable values reveal whether the decision making units are efficient and it is expressed as "no Pareto-Koopmans efficiency"[24]. If both idle variables are s+ = 0 and s= 0, this decision making unit is said to be efficient according to the additive model. If either of the idle variables is not zero or neither of them is zero, it is expressed that values of non-zero variables define sources and inefficient amounts in the appropriate inputs and outputs. If the value of the whole idle variable is zero (the score also corresponds to zero), that decision making unit is deemed efficient in this model. At the end of this model, an efficiency score is not obtained as in the other types of analysis. Efficiencies of decision making units are determined by considering the idle variable values. This is due to the fact that, if values of the idle variables correspond to zero, this means that no change will take place on the basis of input/output.

Data was evaluated through the EMS (Efficiency Measurement System) software intended for academic use. After the efficient and inefficient units were determined at the end of the analysis, inefficient units were set aside to be included in benchmarking. Conversely, reference sets composed of the effective units constituted the potential benchmarking foci.

1. Research Variables

Tourism establishments operate in a complicated sector due to their sectorial structures and divide into different, interrelated sub-sectors. These sub-sectors mainly comprise accommodation services (hotels, guest houses and resorts), transport services (car rental, travel agents and tour operators), refreshment services (restaurants, bars and fast food outlets) and the other peripheral service enterprises (gift shops) and leisure activities (sport competitions and fairs). Therefore, the financial statements of these firms are the consolidated form of financial statements of affiliated enterprises operating in various fields of activity. Therefore, the findings obtained in this study should be evaluated in light of this constraint.

Table 2. Firms Investigated in the Research Study (Decision Making Units)

1	AYCES	Altınyunus Çeşme Touristic Facilities Corp.
2	FVORİ	Favori Resorts Corp.
3	MAALT	Marmaris Altınyunus Touristic Facilities Corp.
4	MARTI	Martı Hotel Enterprises Corp.

[24] Kıran, Berna, (2008) "Evaluation of Economic Efficiencies of Priority Cities for Development through data envelopment analysis" Çukurova University Institute of Social Sciences Depart of Management Postgraduate Thesis, Adana, Turkey.

5	METUR	Metemtur Hotel Management and Tourism Enterprises Corp.
6	NTTUR	Net Tourism and Trade Industry Corp.
7	PKENT	Petrokent Tourism Corp.
8	TEKTU	Tek-Art Construction Trade Tourism Industry Corp.
9	UTYP	Utopya Tourism

2. Input and Output Variables Used in the Study

Data was obtained using the balance sheets and financial statements of tourism establishments traded in the ISE. Input and output variables used in the DEA method consist of ratios used in the financial analysis method. In this study, 3 input and 4 output variables were used. In terms of these input and outputs titles, data from 2010 was examined:

INPUTS	OUTPUTS
Current Rate (X1)	Capital Profit (Y1)
Total Debt/Total Asset (X2)	Return on Assets (Y2)
Real Assets/Constant Capital (X3)	Sales Profitability Activity expenses+Cost of goods sold/Sales (Y4) (Ae+cgs/Sales)

FINDINGS

Table 3. Distribution of Variables Used in the Measurement of Technical Efficiency

Inputs	**Average**	**Standard Deviation**
Current Rate	2.00	2.37
Total Debt/Total Asset	0.46	0.36
Real Asset/Constant Capital	0.89	0.46
Outputs		
Profit Capital	0.81	1.78
Returns on Asset	0.06	0.068
Sales Profitability	0.71	0.80
Activity expenses+Cgs/Sales	1.59	1.52

Table 4. Efficiency Scores of Tourism Establishments Traded in the ISE (0 Indicates an Efficient Score)

Units	Tourism Establishments	Variable Return to Scale (VRS) Additive Input Oriented	Variable Return to Scale (VRS) Additive Output Oriented
1	AYCES	0	0
2	FVORİ	0	0
3	MAALT	0	0
4	MARTI	0.4	2.05
5	METUR	1.24	8.16
6	NTTUR	0	0
7	PKENT	0	0
8	TEKTU	0	0
9	UTYP	0.58	3.51

Table 5. Some Statistical Indicators According to the Results of the Analysis

Indicators	VRS-INPUT	VRS-OUTPUT
Average efficiency score of the whole sample	0.25	1.52
Average efficiency score standard deviation for the whole sample	0.43	2.79
Maximum	1.24	8.16
Minimum	0.40	2.05
Number of efficient enterprises	6	6
Number of inefficient enterprises	3	3

As can be seen in Table 5, six firms were found to be efficient in the VRS Additive Input Oriented DEA model. The average efficient score of these firms was determined to be 0.25.

When the firms that were found to be inefficient in the VRS Additive Input Oriented DEA model are evaluated individually, the lowest efficient score belongs to the Martı Hotel Enterprises Corp. with a score of 0.4, while the highest efficient score belongs to the Metemtur Hotel Management and Tourism Enterprises Corp.

The same firms were also found to be efficient/inefficient according to the VRS Additive Output Oriented DEA model. The average efficiency score of these firms is 1.52. Out of the firms determined to be inefficient according to the VRS Additive Output Oriented Model, the lowest score also belongs to the Martı Hotel Enterprises Corp. with a score of 2.85, while the highest efficiency score belongs to the Metemtur Hotel Management and Tourism Enterprises Corp.

According to the results of Table 6, inefficient MARTI, METUR and UTYP companies should model and benchmark the 6 efficient companies to reach a 100% efficient in terms of potential improvement. It is recommended that inefficient companies should reduce their inefficient levels with the companies to which they compare themselves. Considering the results of the analysis, the following comments can be made for each of the inefficient companies:

The MARTI company resembles the companies of AYCES, MAALT, NTTUR and PKENT by 38%, 41%, 0.3% and 18%, respectively. However, out of these companies, MARTI should take MAALT as its reference, since it mostly resembles it with the rate of 41%. For MARTI to reach an efficiency of 100%, its indebt rate should be 38%, the Ae+cgs/Sales ratio should be 198%, its current rate should be 0.3%, while it should change the asset profitability to 0.10%.

The METUR company resembles AYCES by 79%, while it resembles MAALT by 21%. Therefore, the company that should be taken as reference by METUR is AYCES, to which it resembles by 79%. For the efficiency of METUR, it should regulate its current rate as 41%, the indebtedness rate as 83%, the Ae+cgs/Sales rate as 89%, profit capital as 540%, asset profitability as 8% and sales profitability as 74%.

Likewise, the UTYP company was found to be inefficient according due to the constant returns to scale additive input oriented DEA model resembles to FVORI and NTTUR companies by 48% and 16%. Therefore, the reference company for UTYP is FVORI as it has the highest resemblance rate. For UTYP to reach efficiency, it should change its current rate to be 10%, the indebtedness rate to 48%, the Ae+cgs/Sales ratio to 202%, profit capital to 7%, asset profitability to 2% and sales profitability to 112%.

When Table 7 is examined, the companies that the MARTI, METUR and UTYP companies, which were found inefficient in the variable returns to scale additive output oriented model, should model themselves on out of the 6 companies and the steps they should follow are explained below:

As an inefficient company, MARTI resembles AYCES, MAALT, NTTUR and PKENT companies by 36%, 43%, 2%, 19%, respectively. Therefore, the company that MARTI should take as its reference is MAALT by a ratio of resemblance of 43%. For the MARTI company to reach efficiency, its indebtedness rate should be regulated to 38%, the Ae+cgs/Sales ratio to 204%, profit capital to 0.1%, asset profitability to 0.01% and sales profitability to 1%.

Conversely, the METUR company resembles AYCES and MAALT by 57% and 43%, respectively. Therefore, the company that METUR should take as its reference is AYCES owing to their strong resemblance rate. For METUR to achieve the efficiency score, it should change its indebtedness rate to 85%, the MDV/SS rate to 15%, the Ae+cgs /Sales ratio to 183%, profit capital to 541%, asset profitability to 10% and sales profitability to 81%.

The third of the inefficient companies, UTYP, resembles the AYCES and MAALT companies by 50% and 50%, respectively. Therefore, UTYP can model itself on both companies. However, benchmarking was performed considering the data of the MAALT company. Accordingly, UTYP should change its indebtedness rate to 48%, the MDV/SS rate to 4%, the Fg+smm/Sales ratio to 226%, profit capital to 8%, asset profitability to 3% and sales profitability to 114% in order to become efficient.

CONCLUSION AND RECOMMENDATIONS

In this study, the relative efficiencies of nine tourism establishments traded in the ISE were measured through the method of DEA using the balance sheets and financial statements of companies for 2010 and benchmarking was carried out to determine what the companies found inefficient in the analysis should do in order to become efficient. Accordingly, the essential road map was drawn. Consequently, 6 firms (approximately 67%) namely AYCES, FVORİ, MAALT, NTTUR, PTKENT and TEKTU enterprises were found to be efficient, while 3 firms (approximately 33%) namely MARTI, METUR and UTYP were found to be inefficient in the variables returns to scale input oriented additive DEA model and the variable returns to the scale output oriented additive DEA model as of the balance sheet period.

Although the inefficiency score is an indicator on its own, inefficiency sources of firms subjected to the relative analysis were benchmarked (comparison, modelling) in this study and a detailed recommendation was made on how to eliminate their inefficiencies.

However, as stated previously, the constraint of this study is that the investigated companies operate in a complicated sector consisting of several interrelated but different sub-sectors. The future studies may be addressed to the companies operating in these tourism sub-sectors.

Another constraint of the research is the need to determine the input and output variables when it is considered that a difference in inputs and outputs selected to use the DEA method in determining the efficiency can affect the efficiency results of the firms. Another constraint influencing the determination of input and output numbers is that the ISE Tourism Index lists only 9 firms.

The fact that tourism establishments are fixed asset weighted establishments necessitates the use of long-term liabilities. Therefore, companies that were found to be relatively inefficient can achieve an efficient financial position by restructuring their cash management and debt management, in particular.

Table 6. Performance Analysis of Tourism Establishments Traded in ISE According to the VRS Additive Input Oriented DEA Model

	DMU	Score	X1	X2	X3	Y1	Y2	Y3	Y4	Benchmarking	X1	X2	X3	Y1	Y2	Y3	Y4
1	AYCES	0	0.49	1.65	2.85	0.22	-0.08	-0.23	-0.12	3							
2	FVORİ	0	0.79	1.83	2.68	5.45	-0.71	-0.38	-0.27	0							
3	MAALT	0	3.31	0.65	1.32	4.28	0.13	0.32	0.18	3							
4	MARTI	0.4	1.15	0.6	1	0	0.37	0	0.01	1 (0.38) 3 (0.41) 6 (0.03) 7 (0.18)	0.01371	0.38687	0	1.98012	0	0.01042	0
5	METUR	1.24	0.99	0.98	2.48	0	0	0	0	1 (0.79) 3 (0.21)	0.405	0.83286	0	0.88714	5.39714	0.08714	0.74071
6	NTTUR	0	7.2	0.53	0.44	0.23	0.59	2.27	4.9	1							
7	PKENT	0	1.93	1.23	2.7	0.26	0.4	1.31	0.14	1							
8	TEKTU	0	6.89	8	0.84	0	0.01	0.01	0.03	0							
9	UTYP	76.85 %	0.3	0	0.7	0	0	0	1	2 (0.48) 6 (0.16)	0.103	0.47657	0	2.01743	0.07543	0.02543	1.12614

Table 7. Performance Analysis of Tourism Establishments Traded in ISE According to the VRS Additive Output Oriented DEA Model

	DMU	Score	X1	X2	X3	Y1	Y2	Y3	Y4	Benchmarking	X1	X2	X3	Y1	Y2	Y3	Y4
1	AYCES	0	0.66	0.52	0.75	1.18	-0.08	-0.21	-0.31	3							
2	FVORİ	0	0.69	0	0.39	5.76	-1.37	-0.14	-1.65	0							
3	MAALT	0	0	0.04	0.34	12.83	0.13	0.4	0.35	3							
4	MARTI	2.05	4.89	0	0.99	0.9	0.03	0.01	0.57	1 (0.36) 3 (0.43) 6 (0.02) 7 (0.19)	0	0.3829	0	2.03605	0.00144	0.01139	0
5	METUR	8.16	2.57	0	0	1.16	-5.41	-0.1	-0.84	1 (0.57) 3 (0.43)	0	0.84571	0.15	1.83429	5.41429	0.10429	0.81143
6	NTTUR	0	1.92	0,09	0.05	0.93	0.53	0.49	5.58	1							
7	PKENT	0	1.47	0,11	0.18	0.89	0.25	0.23	0.13	1							
8	TEKTU	0	1.68	12,26	0.01	1.01	0.01	0.03	0.16	0							
9	UTYP	3.51	2.91	0	0	1.04	-0.07	-0.02	-1.15	1 (0.50) 3 (0.50)	0	0.47984	0.03815	2.25831	0.07979	0.02979	1.14413

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