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Efficiency Ranking of Journals in Turkey with DEA and DR/DEA Methods

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Abstract

Today, all countries publish many scientific studies in order to make progress in a scientific sense and plan for the future. Many criteria, such as impact factor, citation count, and article impact score, have been developed to measure, compare, and rank the quality of journals in which these studies are published. These criteria are used for purposes such as academic promotion, hiring, publication support, project support, and scholarships. It is extremely important to evaluate the quality standards of journals published in any field objectively in order to determine their quality and improve their standards. In this study, effective analysis was performed on certain journals published in Turkey using suitable input and output variables selected from these criteria. The efficiency scores of the journals were calculated using the Data Envelopment Analysis method and Discriminant Ratio Data Envelopment Analysis was applied. The journals were ranked according to the efficiency scores obtained. The efficiency scores obtained using Discriminant Ratio Data Envelopment Analysis were found to give better results in evaluating the performance of journals. In addition, the obtained efficiency scores were compared with the journal rankings given by Journal Citation Reports. As a result of this study, the importance of evaluating the performance of journals using objective criteria has once again been emphasized.

Keywords: Data Envelopment Analysis, Discriminant Ratio, Discriminant Ratio/Data Envelopment Analysis.

VZA ve DO/VZA Yöntemleri ile Türkiye'deki Dergilerin Etkinlik Sıralaması

Öz

Günümüzde tüm ülkeler, bilimsel anlamda ilerleme kaydetmek ve geleceğe yönelik planlamalar yapmak amacıyla birçok bilimsel çalışma yayınlamaktadır. Bu çalışmaların yer aldığı dergilerin niteliğini ölçmek, karşılaştırmak ve sıralamak amacıyla geliştirilen etki faktörü, atıf sayısı, makale etki puanı gibi birçok kriter geliştirilmiştir. Bu kriterler akademik yükseltme, işe alma, yayın destekleme, proje destekleri, burslar gibi amaçlar için kullanılmaktadır. Hangi alanda olursa olsun yayınlanan dergilerin kalite standartlarının belirlenip, niteliklerinin artması için objektif kriterlerle değerlendirilmesi son derece önemlidir. Bu çalışmada, Türkiye'de yayınlanan belirli dergiler ele alınarak, kriterlerden seçilen uygun girdi ve çıktı değişkenleriyle etkinlik analizi yapılmıştır. Veri zarflama analizi yöntemi ve diskriminant oranı veri zarflama analizi uygulanarak, dergilerin etkinlik skorları hesaplanmıştır. Elde edilen etkinlik skorlarına göre dergiler sıralanmıştır. Diskriminant oranı veri zarflama analizi yöntemi, dergilerin performansının değerlendirilmesinde daha iyi sonuçlar vermiştir. Ayrıca, elde edilen etkinlik skorları, Journal Citation Reports tarafından verilen dergi sıralamaları ile de karşılaştırılmıştır. Bu çalışma sonucunda, dergilerin performanslarının objektif kriterler kullanılarak değerlendirilmesinin önemi bir kez daha vurgulanmıştır.

Anahtar Kelimeler: Veri Zarflama Analizi, Diskriminant Oranı, Diskriminant Oranı/Veri Zarflama Analizi.

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1. Introduction

In today's academic world, there is a significant emphasis on the publication of scientific research in academic journals. With the aim of increasing their publication records, researchers often submit their studies to journals that prioritize speed over quality. This trend, unfortunately, raises concerns about the overall quality of scientific research despite the increasing quantity. It is important to remember that the quality, accuracy, and reliability of scientific studies should be the top priority, as these are the factors that contribute to the advancement of knowledge in a particular field. Therefore, it is essential to utilize effective methods to evaluate the efficiency of scientific journals and their published research, enabling researchers, universities, and funding agencies to make informed decisions regarding academic promotion, hiring, publication support, project support, and scholarships.

There are many criteria for comparing the performance of academic journals. These criteria are impact factor, five-year impact factor, urgency index, self-factor score, number of articles, and article impact score. Impact Factor is a quantitative tool used to rank and compare journals. It shows the average frequency of articles referenced in a journal within a given year or period (Tamilselven and Balasubramanian, 2012). The five-year impact factor refers to the number of citations to the journal's articles published within five years to determine the longer-term impact of a journal (Sevinç and Zeren, 2015). The Immediacy index indicates the average number of citations in the year of publication of a journal. The self-factor score is a scoring system that shows the importance of a scientific publication. The self-factor score of a journal is a criterion that shows its contribution to the scientific world. The article impact score refers to the average impact score of a journal article within the scope of Journal Citation Reports (JCR) in the first five years after publication.

Determining the effectiveness of journals has been the subject of numerous studies in the literature. Mingers et al. (2012) proposed the use of the h-index as a measure of research quality for a journal. Tüselmann et al. (2015) employed DEA and Random Forests method to combine journal rankings, while Petković et al. (2015), Tüselmann et al. (2016), and Rosenthal and Weiss (2017) utilized DEA to rank journals. Vana et al. (2016) used paired comparisons and adaptive lasso estimators to rank journals, and Chen et al. (2021) used integer DEA for the same purpose. Liu (2020) evaluated journals using h-type indices and journal impact factor, and Dias and Kadziński (2022) derived Composite Indicators of Benefit of Doubt (BoD) from DEA for comprehensive rankings of journals.

Considering the criteria individually may be misleading in evaluating the performance of journals. Therefore, when evaluating the performance of journals, considering all the criteria at the same time allows us to obtain more reliable results. In this study, the Data Envelopment Analysis

(DEA) method was applied to the appropriate input and output variables selected from the criteria and the relative effectiveness scores of the journals were calculated. Then, new efficiency scores were obtained by Discriminant Ratio Data Envelopment Analysis (DR/DEA) method. The journals were ranked according to the efficiency scores obtained from DEA and DR/DEA. The obtained efficiency rankings were compared with the rankings in the JCR and the correlations between them were examined.

By combining various criteria and using robust evaluation methods, this study provides a more comprehensive and reliable assessment of the performance of academic journals. This can assist academics in selecting the appropriate journals to publish their research and help improve the overall quality of scientific publications.

2. Materials and Methods

2.1. Data Envelopment Analysis

DEA is a nonparametric efficiency measurement technique developed to measure the relative efficiency of Decision-Making Units (DMU) responsible for converting input to output (Ramanathan, 2003). This technique allows for determining how to effectively use the available resources to create the outputs of the DMUs (Yolalan, 1993).

In cases where it is difficult to convert a large number of inputs and a large number of outputs into a weighted input or output set, DEA is a mathematical programming-based technique that produces quite valid and meaningful results (Ulucan, 2000; Thanassoulis et al., 2004).

Suppose that n decision-making units ($j = 1, \dots, n$) use different amounts of m inputs ($i = 1, \dots, m$) to produce different s outputs ($r = 1, \dots, s$). Let's assume that the DMU ($j = 1, \dots, n$) uses different amounts of m inputs ($i = 1, \dots, m$). Especially j-th DMU (DMU_j), r-th when generating the y_{rj} amount of the output i-th consumes x_{ij} amount of the input. Suppose that $x_{ij} \geq 0$, $y_{rj} \geq 0$, and also that each DMU has at least one positive input and positive output value. The DEA handles the observed inputs and outputs and selects the values of the input and output effects for a special DMU. In other words, efficiency DEA defines the ratio of the total effect of outputs to the total input effect (Luptacik, 2010).

In an observation set consisting of n number of DMUs using m number of inputs, producing s number of outputs, the ratio model for the input is expressed as follows.

$$\max \qquad h_0(u, v) = \frac{\sum_{r=1}^{s} y_{r0} u_r}{\sum_{i=1}^{m} x_{i0} v_i}$$

constraints $\frac{\sum_{r=1}^{s} y_{rj}u_r}{\sum_{i=1}^{m} x_{ij}v_i} \leq 1 \quad j = (1, \dots, n)$

$u_r \geq \varepsilon \quad r = (1, \dots, s)$

$v_i \geq \varepsilon \quad i = (1, \dots, m)$ (**1**)

In the model, u_r represents the weight of the r-th output, and v_i represents the weight of the i-th input.

Where $x_{ij} > 0$, j-th used by DMU in production i-th represents the amount of input. If $y_{rj} > 0$, r-th obtained as a result of production shows the amount of output (Charnes et al., 1978).

When the (1) model is considered as a whole, it is seen that the ratio desired to be maximized in the objective function is also included in the constraints. Therefore, the value of the objective function should be $0 < h_0 \leq 1$ (Lorcu, 2008). If $h_0 = 1$ DMU is efficient, if $h_0 < 1$ DMU is not efficient. Inefficient DMUs show lower performance compared to efficient ones, so the scores here are relative efficiency values.

2.2. Two Groups Discriminant Ratio Analysis

Classical two-group discriminant analysis (Morrison, 1976) does not distinguish between input and output variables. It determines a ratio function between the linear combination of the outputs and the linear combination of the inputs, rather than the linear combination of inputs and outputs expressed by an equation as in classical linear discriminant analysis. This ratio function may be similar to the efficiency ratio in DEA. However, while the weights given to inputs and outputs in DEA vary from unit to unit, common weights are used in the discriminant analysis of ratios. This means that discriminant analysis of ratios determines weights such that the ratio score function optimally discriminates between two groups of observations on a one-dimensional scale (efficiency and inefficiency units predicted by DEA (Sinuany and Friedman, 1998).

Instead of the classical linear discriminant score, the ratio expressed below is used.

$T_j = \sum_{r=1}^{s} u_r y_{rj} / \sum_{i=1}^{m} v_i x_{ij} \qquad j = (1, \dots, n)$ (**2**)

The average of the ratio score of the efficiency and inefficiency groups is expressed as follows.

$\bar{T_1} = \sum_{j=1}^{n_1} T_j / n_1$ (**3**)

$\bar{T_2} = \sum_{j=n_1+1}^{n} T_j / n_2$ (**4**)

n_1 and n_2 are the number of efficiency and inefficiency units in the DEA model, respectively, and the weighted average of all units ($n = n_1 + n_2$) is expressed as $\overline{T} = (n_1\overline{T_1} + n_2\overline{T_2})/n$.

Common weights $v_i\,(i = 1, \dots, m)$ and $u_r(r = 1, \dots, s)$, the between-group variance of T $SS_B(T)$,and within-group variance of T $SS_W(T)$ ratio is found with the help of the following equations as maximum.

$$max_{u_r v_i}\lambda = max_{u_r v_i}\frac{SS_B(T)}{SS_W(T)} \quad (\mathbf{5})$$

$$SS_B(T) = \frac{n_1 n_2}{n_1+n_2}(\overline{T_1} - \overline{T_2})^2 \quad (\mathbf{6})$$

$$SS_W(T) = \sum_{j=1}^{n_1}(T_j - \overline{T_1})^2 + \sum_{j=n_1+1}^{n}(T_j - \overline{T_2})^2 \quad (\mathbf{7})$$

The objective function $SS_B(D)/SS_W(D)$ is the well-known discriminant criterion and D is the linear combination of variables in classical discriminant analysis, where D is the ratio between two linear combinations (T).

2.3 Discriminant Ratio Data Envelopment Analysis (DR/DEA)

In the DR/DEA method, which has a multi-stage process, firstly, the classical DEA method is used to separate the units as efficient and inefficient. In the second stage, two-group discriminant analysis of the combined ratios of inputs and outputs is applied to the two groups obtained from the previous stage. Then, based on the combined input and output weights, new efficiency scores $j = (1, \dots, n)$ are obtained for each unit.

$$T_j = \sum_{r=1}^{s} u_r y_{rj} / \sum_{i=1}^{m} v_i x_{ij} \qquad j = (1, \dots, n) \quad (\mathbf{8})$$

Thus, when scaling units, the rank of the highest scoring unit is 1, for example, $R_{T(1)} = 1$, and the rank of the lowest scoring unit is n, for example, $R_{T(n)} = n$ (Sinuany-Stern and Friedman, 1998).

3. Findings and Discussion

The aim of this study was to evaluate the academic performance of 57 scientific journals published in Turkey within the Science Citation Index (SCI) and Emerging Sources Citation Index (ESCI) using objective criteria. To achieve this, the study utilized the DEA and DR/DEA methods, based on data from the Journal Citation Reports 2018. Output variables such as impact factor, five-year impact factor, urgency index, self-factor score, and article impact score were considered, while the number of articles was used as the input variable (Rosenthal and Weiss, 2017).

First, the efficiency scores of the journals were calculated by using the DEA method with the determined input-output variables. The weights given to the inputs and outputs obtained from DEA are as in Table 1.

Table 1. Weights given to inputs and outputs in DEA

Journals	u	v_1	v_2	v_3	v_4	v_5
Atmospheric Pollution Research	0,0019	0	0,2175	0	128,93	0
Journal of Sports Science and Medicine	0,0020	0	0	0	238,09	0
Annals of Hepatology	0,0018	0	0	0,1859	203,74	0
Diagnostic and Interventional Radiology	0,0024	0	0,2736	0	162,20	0
Journal of Clinical Research in Pediatric Endocrinology	0,0030	0	0,3438	0	203,75	0
International Journal of Hematology and Oncology	0,0059	0	0,6818	0	381,67	0
Turkish Journal of Agriculture and Forestry	0,0022	0,1308	0	0	235,08	0
Turkish Journal of Earth Sciences	0,0055	0	0,9097	0	0	3,36
Turkish Journal of Botany	0,0021	0	0	0,2153	235,84	0
Balkan Medical Journal	0,0028	0	0	0,2725	298,56	0
Records of Natural Products	0,0027	0	0	0,3176	280,03	0
Turkish Journal of Chemistry	0,0021	0	0	0,2120	232,28	0
Turkish Journal of Gastroenterology	0,0021	0	0	0,2032	222,68	0
Anatolian Journal of Cardiology	0,0015	0	0	0,1504	164,80	0
Turkish Journal of Fisheries and Aquatic Sciences	0,0017	0	0	0,1699	186,15	0
New Perspectives on Turkey	0,0192	0	0	0	0	2,81
Turkish Journal of Biology	0,0018	0	0	0	212,50	0
Acta Orthopaedica et Traumatologica Turcica	0,0019	0	0	0	209,73	0
Turkish Neurosurgery	0,0012	0	0	0,1243	136,25	0
Joint Diseases and Related Surgery	0,0057	0,6135	0	1,7114	0	0
Turkish Journal of Hematology	0,0039	0	0	0,4583	404,12	0
Experimental and Clinical Transplantation	0,0012	0	0	0,1198	131,28	0
Turkish Journal of Zoology	0,0016	0	0	0	185,54	0
Turkish Journal of Field Crops	0,0053	0	0	0	605,51	0
Archives of Neuropsychiatry	0,0028	0	0	0	326,45	0
Hacettepe Journal of Mathematics and Statistics	0,0019	0	0	0,1914	209,69	0
Turkish Journal of Trauma & Emergency Surgery	0,0020	0	0	0	227,98	0
Turkish Journal of Electrical Engineering and Computer Sciences	0,0008	0	0	0	93,0026	0
Turkish Journal of Psychiatry	0,0056	0	0	0	636,30	0
Turkish Journal of Medical Sciences	0,0008	0	0	0	100,55	0
Journal of International Advanced Otology	0,0029	0	0	0	328,35	0
Bulletin of Mikrobiyology	0,0030	0	0	0	341,29	0
Journal of the Faculty of Engineering and Architecture of Gazi University	0,0020	0	0	0,2445	215,59	0
Ecology	0,0082	0	0	0	0	0
Turkish Journal of Entomology	0,0049	0	0	0	554,80	0

Turkish Journal of Veterinary & Animal Sciences	0,0016	0	0	0	189,92	0
Turkish Journal of Mathematics	0,0019	0	0	0,1870	204,90	0
Education and Science	0,0017	0	0	0,1717	188,09	0
Turkish Journal of Pediatrics	0,0016	0	0	0	184,63	0
Psychiatry and Clinical Psychopharmacology	0,0158	0	0	0,7155	0	0
Journal of the Faculty of Veterinary Medicine, Kafkas University	0,0012	0	0	0,1202	131,76	0
Journal of Agricultural Sciences	0,0040	0	0	0	459,69	0
Anatolian Journal of Psychiatry	0,0024	0	0	0,2850	251,34	0
Veterinary Journal of Ankara University	0,0036	0	0	0	409,55	0
Turkish Journal of Biochemistry	0,0026	0	0	0	300,33	0
Journal of Thermal Science and Technology	0,0064	0	0	0	0	0
Turkish Journal of Psychology	0,0151	0	0	0	0	0
Archives of Rheumatology	0,0043	0	0	0,1968	0	0
Journal of Textile and Apparel	0,0036	0	0	0	0	0
Turkish Journal of Physical Medicine and Rehabilitation	0,0030	0	0	0	339,23	0
Journal of The Entomological Research Society	0,0060	0	0	0	0	0
Turkish Journal of Civil Engineering	0,0102	0	0	0,4600	0	0
International Relations	0,0074	0	0	0	0	0
Turkish Journal of Geriatrics	0,0035	0	0	0	0	0
TODAIE's Review of Public Administration	0,0082	0	0	0	0	0
Bilig	0,0038	0	0	0	0	0
Turkish Journal of Thoracic and Cardiovascular Surgery	0,0013	0	0	0	0	0

By considering the weights given to the inputs and outputs obtained from the first stage, the combined ratios of output and input variables, ratios based on the DR/DEA method, were calculated. Thus, effectiveness scores were obtained for each journal. Efficiency scores obtained from DEA and DR/DEA are as in Table 2.

Table 2. Efficiency scores from DEA and DR/DEA

Journals	DEA	DR/DEA
Atmospheric Pollution Research	**1**	0,5063
Journal of Sports Science and Medicine	**1**	0,5155
Annals of Hepatology	0,8393	0,4146
Diagnostic and Interventional Radiology	0,7595	0,3964
Journal of Clinical Research in Pediatric Endocrinology	0,79432	0,4182
International Journal of Hematology and Oncology	**1**	0,4044
Turkish Journal of Agriculture and Forestry	0,5867	0,2751
Turkish Journal of Earth Sciences	0,9948	0,4637
Turkish Journal of Botany	0,5291	0,2563
Balkan Medical Journal	0,4800	0,2433
Records of Natural Products	0,4687	0,2276
Turkish Journal of Chemistry	0,3106	0,1559
Turkish Journal of Gastroenterology	0,4245	0,2076
Anatolian Journal of Cardiology	0,3790	0,1741
Turkish Journal of Fisheries and Aquatic Sciences	0,3583	0,1664
New Perspectives on Turkey	**1**	0,7046

Turkish Journal of Biology	0,2851	0,1334
Acta Orthopaedica et Traumatologica Turcica	0,3925	0,1868
Turkish Neurosurgery	0,3283	0,1486
Joint Diseases and Related Surgery	0,3823	0,1810
Turkish Journal of Hematology	0,4968	0,2224
Experimental and Clinical Transplantation	0,3209	0,1459
Turkish Journal of Zoology	0,3732	0,1726
Turkish Journal of Field Crops	0,3219	0,1587
Archives of Neuropsychiatry	0,3139	0,1465
Hacettepe Journal of Mathematics and Statistics	0,3103	0,1420
Turkish Journal of Trauma & Emergency Surgery	0,2602	0,1202
Turkish Journal of Electrical Engineering and Computer Sciences	0,1489	0,0657
Turkish Journal of Psychiatry	0,3065	0,1498
Turkish Journal of Medical Sciences	0,2304	0,1004
Journal of International Advanced Otology	0,3223	0,1535
Bulletin of Mikrobiyology	0,2326	0,1037
Journal of the Faculty of Engineering and Architecture of Gazi University	0,1293	0,0545
Ecology	0,4297	0,1444
Turkish Journal of Entomology	0,3005	0,1414
Turkish Journal of Veterinary & Animal Sciences	0,2187	0,0927
Turkish Journal of Mathematics	0,2853	0,1293
Education and Science	0,1398	0,0612
Turkish Journal of Pediatrics	0,2458	0,1020
Psychiatry and Clinical Psychopharmacology	**1**	0,3489
Journal of the Faculty of Veterinary Medicine, Kafkas University	0,1646	0,0702
Journal of Agricultural Sciences	0,2352	0,0963
Anatolian Journal of Psychiatry	0,1317	0,0483
Veterinary Journal of Ankara University	0,2177	0,0829
Turkish Journal of Biochemistry	0,1416	0,0537
Journal of Thermal Science and Technology	0,3333	0,0788
Turkish Journal of Psychology	0,7878	0,0860
Archives of Rheumatology	0,2392	0,0758
Journal of Textile and Apparel	0,1884	0,0527
Turkish Journal of Physical Medicine and Rehabilitation	0,1634	0,0606
Journal of The Entomological Research Society	0,3170	0,0978
Turkish Journal of Civil Engineering	0,5398	0,1078
International Relations	0,3851	0,0388
Turkish Journal of Geriatrics	0,1843	0,0277
TODAIE's Review of Public Administration	0,4297	0,0394
Bilig	0,1984	0,0301
Turkish Journal of Thoracic and Cardiovascular Surgery	0,0687	0,0143

The efficiency analysis involved the use of input-oriented CCR model to calculate the efficiency in DEA, which resulted in an efficiency value of 1 for Atmospheric Pollution Research, Journal of Sports Science and Medicine, International Journal of Hematology-Oncology, New Perspectives on Turkey, Psychiatry, and Clinical Psychopharmacology journals, indicating their effectiveness. However, to obtain a more comprehensive evaluation, the DEA and DR/DEA efficiency rankings were calculated. In the DEA efficiency ranking, journals with the same efficiency score were given the same sequence number, based on their effectiveness. On the other hand, the efficiency ranking with DR/DEA was based on the score of the unit with the highest rank being taken as 1, while the unit with the lowest score was ranked 57. The event rankings obtained and the journal rankings obtained from JCR are as in Table 3.

Table 3. DEA, DR/DEA and JCR rankings

Journals	DEA	DR/DEA	JCR
Atmospheric Pollution Research	1	3	1
Journal of Sports Science and Medicine	1	2	2
Annals of Hepatology	3	6	3
Diagnostic and Interventional Radiology	6	8	4
Journal of Clinical Research in Pediatric Endocrinology	4	5	5
International Journal of Hematology and Oncology	1	7	6
Turkish Journal of Agriculture and Forestry	7	10	7
Turkish Journal of Earth Sciences	2	4	8
Turkish Journal of Botany	9	11	9
Balkan Medical Journal	11	12	10
Records of Natural Products	12	13	11
Turkish Journal of Chemistry	29	22	12
Turkish Journal of Gastroenterology	15	15	13
Anatolian Journal of Cardiology	19	18	14
Turkish Journal of Fisheries and Aquatic Sciences	21	20	15
New Perspectives on Turkey	1	1	16
Turkish Journal of Biology	34	31	17
Acta Orthopaedica et Traumatologica Turcica	16	16	18
Turkish Neurosurgery	23	25	19
Joint Diseases and Related Surgery	18	17	20
Turkish Journal of Hematology	10	14	21
Experimental and Clinical Transplantation	26	27	22
Turkish Journal of Zoology	20	19	23
Turkish Journal of Field Crops	25	21	24
Archives of Neuropsychiatry	28	26	25
Hacettepe Journal of Mathematics and Statistics	30	29	26
Turkish Journal of Trauma & Emergency Surgery	35	33	27
Turkish Journal of Electrical Engineering and Computer Sciences	48	46	28
Turkish Journal of Psychiatry	31	24	29
Turkish Journal of Medical Sciences	40	37	30
Journal of International Advanced Otology	24	23	31
Bulletin of Mikrobiyology	39	35	32
Journal of the Faculty of Engineering and Architecture of Gazi University	52	49	33
Ecology	14	28	34
Turkish Journal of Entomology	32	30	35
Turkish Journal of Veterinary & Animal Sciences	41	40	36
Turkish Journal of Mathematics	33	32	37
Education and Science	50	47	38
Turkish Journal of Pediatrics	36	36	39
Psychiatry and Clinical Psychopharmacology	1	9	40
Journal of the Faculty of Veterinary Medicine, Kafkas University	46	45	41
Journal of Agricultural Sciences	38	39	42
Anatolian Journal of Psychiatry	51	52	43
Veterinary Journal of Ankara University	42	42	44
Turkish Journal of Biochemistry	49	50	45
Journal of Thermal Science and Technology	22	43	46
Turkish Journal of Psychology	5	41	47
Archives of Rheumatology	37	44	48
Journal of Textile and Apparel	44	51	49
Turkish Journal of Physical Medicine and Rehabilitation	47	48	50
Journal of The Entomological Research Society	27	38	51
Turkish Journal of Civil Engineering	8	34	52
International Relations	17	54	53
Turkish Journal of Geriatrics	45	56	54
TODAIE's Review of Public Administration	13	53	55
Bilig	43	55	56
Turkish Journal of Thoracic and Cardiovascular Surgery	53	57	57

4. Conclusions and Recommendations

The study findings reveal the significance of employing various techniques to assess the efficiency of scientific journals, given that different methods can result in varying rankings. The DEA and DR/DEA approaches allow for a comprehensive and holistic evaluation of criteria, leading to more realistic outcomes. Looking at the order of scientific journals included in the study, Atmospheric Pollution Research is effective in DEA, while it is in third place in DR/DEA. While the Journal of Sports Science and Medicine is effective in DEA, it ranks second in the DR/DEA ranking. While the International Journal of Hematology-Oncology is effective in DEA, it is in seventh place in the DR/DEA ranking. While New Perspectives on Turkey is effective in DEA, it also ranks first in the DR/DEA ranking. While Psychiatry and Clinical Psychopharmacology is effective in DEA, it ranks ninth in the DR/DEA ranking.

DEA and DR/DEA methods, which are used in determining the efficiency rankings of scientific journals, allow the criteria to be handled and evaluated holistically and enable us to reach more realistic results.

The correlation value between the efficiency rankings obtained by DEA and DR/DEA method was obtained as 0.8156. The correlation value between JCR journal rankings and DEA effective rankings was 0.6053, and the correlation value between JCR journal rankings and DR/DEA efficiency rankings was 0.8885. Therefore, the relationship between efficiency rankings in DR/DEA method and JCR journal rankings is higher than the DEA efficiency ranking and better represents the journal ranking.

In conclusion, the study highlights the importance of using multiple methods to evaluate the efficiency of scientific journals, as different methods can lead to different rankings. By employing DEA, DR/DEA, and JCR journal rankings, a more comprehensive understanding of the efficiency of scientific journals can be achieved.

Authors' Contributions

All authors contributed equally to the study.

Statement of Conflicts of Interest

There is no conflict of interest between the authors.

Statement of Research and Publication Ethics

The author declares that this study complies with Research and Publication Ethics.

References

Charnes, A., Cooper, W.W., and Rhodes, E. (1978). Measuring the efficiency of decision making units. European Journal of Operational Research, 2(6), 429-444.

Chen, K., Ren, X. T., and Yang, G. L. (2021). A novel approach for assessing academic journals: Application of integer DEA model for management science and operations research field. *Journal of Informetrics*, *15*(3), 101176.

Dias, L. C., and Kadziński, M. (2022). Meta-Rankings of Journals Publishing Multiple Criteria Decision Aiding Research: Benefit-of-Doubt Composite Indicators for Heterogeneous Qualitative Scales. In *Intelligent Decision Support Systems: Combining Operations Research and Artificial Intelligence-Essays in Honor of Roman Słowiński* (pp. 245-268). Cham: Springer International Publishing.

Liu, Z. (2020). Evaluating Special Education Journals with H-type Indices and Journal Impact Factors. *Library Philosophy and Practice*, 1-14.

Lorcu, F. (2008). Veri zarflama analizi ile Türkiye ve Avrupa Birliği ülkelerinin sağlık alanındaki etkinliklerinin değerlendirilmesi. (Doctoral dissertation, İstanbul Üniversitesi Sosyal Bilimler Enstitüsü İşletme Anabilim Dalı). İstanbul.

Luptacik, M. (2010). Mathematical optimization and economic analysis. Springer, New York.

Mingers, J., Macri, F., and Petrovici, D. (2012). Using the h-index to measure the quality of journals in the field of business and management. *Information Processing & Management*, *48*(2), 234-241.

Morrison, D. F. (1976). Multivariate Statistical Methods (2nd edition). McGraw-Hill, New York.

Petković, J., Jovanović, M., Jakšić, M. L., Marinković, S., and Djordjević, M. (2015). Ranking technology forecasting journals by using data envelopment analysis. *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies*, *20*(76), 49-61.

Ramanathan, R. (2003). An introduction to data envelopment analysis: A tool for Performance Measurement. Sage Publications, New Delhi.

Rosenthal, E. C., and Weiss, H. J. (2017). A data envelopment analysis approach for ranking journals. *Omega*, *70*, 135-147.

Sevinç, E. B., and Zeren, E. (2015). SSCI Kapsamındaki Dergilerin Kamu Yönetimi Alanına Katkısı Üzerine Bir Değerlendirme. Optimum: Journal of Economics & Management Sciences/Ekonomi ve Yönetim Bilimleri Dergisi, 2(2).

Sinuany-Stern, Z., and Friedman, L. (1998). DEA and the discriminant analysis of ratios for ranking units. European Journal of Operational Research, 111(3), 470-478.

Tamilselven, N., and Balasubramanian, S. (2012). Journal impact factor (JIF) in digital era. International Journal of Library and Information Science, 1(1), 1-14.

Thanassoulis, E., Portela, M. C., and Allen, R. (2004). Incorporating value judgment in DEA. In Handbook on Data Envelopment Analysis (pp. 119-147). Kluwer Academic Publisher, New York.

Tüselmann, H., Sinkovics, R. R., and Pishchulov, G. (2015). Towards a consolidation of worldwide journal rankings–a classification using random forests and aggregate rating via data envelopment analysis. *Omega*, *51*, 11-23.

Tüselmann, H., Sinkovics, R. R., and Pishchulov, G. (2016). Revisiting the standing of international business journals in the competitive landscape. *Journal of World Business*, *51*(4), 487-498.

Ulucan, A. (2000). Şirket performanslarının ölçülmesinde veri zarflama analizi yaklaşımı: Genel ve sektörel bazda değerlendirmeler. Hacettepe Üniversitesi İİBF Dergisi, 18, 405-418.

Vana, L., Hochreiter, R., and Hornik, K. (2016). Computing a journal meta-ranking using paired comparisons and adaptive lasso estimators. *Scientometrics*, *106*, 229-251.

Yolalan, R. (1993). İşletmeler Arası Göreli Etkinlik Ölçümü. MPM Yayınları, Ankara.