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Analysis of The Financial Performance of Companies Listed in The ISE Financial Leasing and Factoring Index by Using the ENTROPY-Based ARAS Method

BIST Finansal Kiralama ve Faktöring Endeksine Kayıtlı Şirketlerin ENTROPI Tabanlı ARAS Yöntemi ile Finansal Performans Analizi

ÖZET

Bu çalışmanın amacı BIST Finansal Kiralama ve Faktöring Endeksi'ne kayıtlı şirketlerin finansal performanslarının incelenmesidir. Bu çerçevede söz konusu 7 şirketin 2020-2024 dönemine ilişin finansal tablo verileri üzerinden elde edilen esas faaliyet gelirleri/esas faaliyet giderleri, diğer esas faaliyet gelirleri/diğer esas faaliyet giderleri, net kar/aktif toplamı, net kar/özkaynak toplamı, toplam borçlar/aktif toplamı, takipteki alacaklar/aktif toplamı, finansal kiralama veya faktöring alacakları/özkaynak toplamı, finansman giderleri/toplam borçlar oranları ENTROPI ve ARAS yöntemleri ile analize tabi tutulmuştur. ENTROPI yöntemi sonucunda elde edilen bulgular 2020-2024 döneminde finansal kiralama ve faktöring şirketleri açısından en önemli kriterin diğer esas faaliyet gelirleri/diğer esas faaliyet giderleri oranının olduğunu göstermektedir. ARAS yöntemi sonucunda 2020 yılında Ulusal Faktöring A.Ş., 2021 yılında Creditwest Faktöring A. Ş., 2022, 2023 ve 2024 yıllarında ise Lider Faktöring A.Ş.'nin performans açısından en başarılı şirketler olduğu yönünde bulgular elde edilmiştir. Bununla birlikte ARAS yöntemi sonuçları 2020 yılında Lider Faktöring A.Ş, 2021 yılında Garanti Faktöring A.Ş., 2022 ve 2023 yıllarında Creditwest Faktöring A. Ş., 2024 yılında ise Şeker Finansal Kiralama A.Ş.'nin performans sıralamasında son sıralarda yer aldığını ortaya koymaktadır.
Anahtar Kelimeler: Finansal Kiralama, Faktöring, ENTROPI, ARAS, Finansal Performans

ABSTRACT

This study aims to analyze companies listed in the ISE Financial Leasing and Factoring Index. In this context, the financial performances of seven companies were analyzed for the 2020-2024 period using financial statement data. The key financial ratios considered include operating income/operating expenses, other operating income/other operating expenses, net profit/total assets, net profit/total equity, total liabilities/total assets, non-performing loans/total assets, leasing or factoring receivables/total equity, and financing expenses/total liabilities. These ratios were analyzed using the ENTROPY and ARAS methods. The findings derived from the ENTROPY method indicate that the most critical criterion for leasing and factoring companies during the 2020-2024 period was the ratio of other operating income to other operating expenses. Given the results achieved from the ARAS method, the highest-performing companies were found to be Ulusal Factoring in 2020, Creditwest Factoring in 2021, and Lider Factoring in 2022, 2023, and 2024. Furthermore, the ARAS method results revealed that Lider Factoring ranked lowest in 2020, Garanti Factoring in 2021, Creditwest Factoring in 2022 and 2023, and Şeker Leasing in 2024
Keywords: Financial Leasing, Factoring, ENTROPY, ARAS, Financial Performance

1. INTRODUCTION

One of the most critical functions of financial institutions operating within the financial system is ensuring that businesses can access the necessary funds at low costs and on time. Institutions fulfilling this function include banks, capital market institutions, factoring companies, companies, and financing companies. Leasing and factoring are particularly important financing sources for businesses that face difficulties in obtaining bank loans and firms with high debt levels.

Financial leasing is the process by which an asset selected by the lessee and purchased by the lessor is leased to the lessee, granting them the right to use the asset for the duration of the lease period (Bölükbaş & Sümer, 2023, p.2). As specified in the Financial Leasing, Factoring, and Financing Companies Law No. 6361, a transaction qualifies as financial leasing if it meets any of the following criteria: the ownership of

the asset is transferred to the lessee at the end of the lease term, the lessee has the right to purchase the asset at a price below its fair market value at the end of the lease term, the lease term exceeds 80% of the asset's economic life, or the present value of lease payments is higher than 90% of the asset's fair market value. Law No. 6361 stipulates that leasing transactions shall be conducted by leasing companies, development and investment banks, and participation banks (Financial Leasing, Factoring, and Financing Companies Law, 2012).

Businesses utilizing the leasing option benefit from improved cash flow since they can make investments in small installments. Moreover, financial leasing agreements are exempt from stamp tax, duties, and other charges, thus reducing operational expenses. Moreover, Decree No. 32 states that those leasing agreements involving machinery and equipment subject to a 1% VAT rate can be executed in foreign currency. In this context, small firms with low export revenues can invest in machinery through leasing and thereby incur foreign currency-denominated debt (Bölükbaş & Sümer, 2023, p.2).

Factoring is defined as the transfer of receivables originating from the sale of goods and services to a factoring company, which provides financing, guarantee, and collection services to manage these receivables. A factoring transaction involves three parties: the seller (supplier of goods or services), the buyer (debtor), and the factoring company. Factoring facilitates cash flow for the seller by collecting receivables before maturity, enhances the seller's competitive power, promotes market expansion, optimizes resource utilization, and saves time and costs ("Factoring," n.d.).

As outlined above, leasing and factoring transactions offer many advantages, particularly in terms of creating alternative financial resources for firms operating in the real sector. Therefore, the performance of leasing and factoring companies plays a very important role in ensuring efficient processes in these financial transactions. Moreover, the performance of these companies can affect firms' selection of these companies for their financing needs. In this regard, this study examines the financial performance of these companies. The analysis is conducted using eight financial ratios derived from financial statement data of companies listed in the Istanbul Stock Exchange (ISE) Financial Leasing and Factoring Index for the 2020-2024 period. This financial performance assessment employs the ENTROPY and ARAS methods. Differing from the other studies on the same subject, the present study contributes to the literature by utilizing novel methods not previously employed and by evaluating the most recent five-year period.

This study consists of six sections. Following the introduction, a literature review on the subject is provided in the second section. The third section introduces the data sources and variables used. The fourth section details the methodology, while the fifth section discusses the analysis findings. Finally, the sixth section evaluates the results and provides a conclusion.

2. LITERATURE

There are many studies evaluating the financial performances of various financial institutions. This section presents an overview of selected studies that examine the financial performance of leasing and factoring companies.

Ergül and Akel (2010) analyzed the financial performances of 7 leasing companies traded on ISE for the period 2005-2008. Their study employed the TOPSIS method, considering the following criteria: current ratio, period income/assets, non-performing receivables/assets, period income/equity, short- and long-term financial leasing receivables/equity, financing expenses/liabilities, operating revenues/operating expenses, and other operating revenues/other operating expenses. The results indicated that the best-performing companies were Yapı Kredi for 2005 and 2006, Vakıf for 2007, and Finans Leasing for 2008.

Alper and Başdar (2017) examined the performances of 6 factoring companies traded on ISE for the year 2016 by making use of the TOPSIS and ELECTRE techniques. The authors assessed financial performance by considering the current ratio, leverage ratio, earnings per share, return on equity, return on assets, and asset turnover ratio. The results indicated that Yapı Kredi Factoring Company had the highest performance.

Bağcı and Kaharaman (2017) conducted a performance analysis of 6 leasing companies registered with the Public Disclosure Platform (KAP) for the period 2009-2015 using the ELECTRE method. Their study employed leasing transactions, receivables from leasing transactions, leasing revenues, and net income/loss as evaluation criteria. The results achieved in their study revealed that Yapı Kredi Financial Leasing Company demonstrated the best performance in all years except for 2015. In 2015, Yapı Kredi Leasing shared the top ranking with Garanti Leasing, whereas Şeker Leasing consistently ranked last in performance across all years.

In a previous study, Ceyhan and Demirci (2017) evaluated the financial performances of 6 leasing companies traded on ISE using the MULTIMOORA method. Their study considered several financial ratios as evaluation criteria, including the current ratio, investment profitability, non-performing receivables/total assets, return on equity, short- and long-term financial leasing receivables/equity, financing expenses/total liabilities, other operating revenues/other operating expenses, and operating revenues/operating expenses. The results indicated that Yapı Kredi Financial Leasing Company had the highest performance, whereas Şeker Financial Leasing Company had the lowest performance.

Çetineli et al. (2018) evaluated the performances of financing, leasing, and factoring companies affiliated with the Association of Financial Institutions. They analyzed companies' transaction volume, loans received, total assets, net profit, receivables, non-performing receivables, and the number of customers for the period 2015-2016 using Modified Digital Logic and Grey Relational Analysis methods. The findings suggested that the leasing sector held a more advantageous position in terms of receivables, loans received, non-performing receivables, and net profit, whereas the financing sector excelled in terms of the number of customers. Additionally, the factoring sector demonstrated significant growth.

Gürol (2018) examined the performances of factoring, leasing, and financing companies for the period 2014-2016 by utilizing the TOPSIS method to evaluate financial performance based on sector-wide financial statements and considering the parameters period net income/transaction volume, period net income/number of employees, receivables/assets, period net income/number of customers, non-performing loans, net income/number of companies, return on equity, and return on assets. The results indicated that the best-performing year for the factoring and leasing sectors was 2016, whereas the financing sector performed best in 2015. Furthermore, the leasing sector was found to be the most stable in terms of performance improvement.

Özbek (2018) assessed the performances of 7 factoring companies traded on ISE for the 2013-2016 period utilizing the SWARA, ARAS, MOORA, and TOPSIS methods. The study considered various criteria, including fixed assets, factoring revenues, intangible assets, factoring liabilities, total assets, other liabilities, equity, other receivables, factoring receivables, borrowed funds, non-performing loans, and net profit/loss. The findings revealed that, across all methods, Yapı Kredi Factoring and Garanti Factoring ranked highest in terms of performance, while Sümer Factoring ranked the lowest.

In a study carried out by Özçelik and Küçükçakal (2019), the financial performances of 7 leasing and factoring companies traded on ISE were evaluated for the 2009-2016 period. The analysis, performed using the TOPSIS method, employed criteria of the current ratio, financial leverage ratio, asset turnover ratio, earnings per share, return on assets, and return on equity. The results indicated that the top three companies in terms of performance were Creditwest Factoring, Garanti Factoring, and Şeker Financial Leasing.

Selimler and Taş (2019) examined the credit management performances of finance, factoring, and leasing companies. Their study analyzed the credit-related data and ratios, including loans, special provisions, total assets, income, non-performing loans, and profit, using the TOPSIS method. The findings highlighted that the credit management performance of these companies varied over time. Additionally, the results indicated that 2018 was the worst-performing year for finance, leasing, and factoring companies, whereas 2017 was the best-performing year.

Ova (2022) analyzed the performances of 56 factoring companies operating in Türkiye for the 2017-2019 period using the TOPSIS method. The study incorporated financial ratios such as non-performing loans to equity, non-performing loans to factoring receivables, net income to equity, return on equity, net income to total assets, and factoring receivables to total assets. The results revealed that a larger number of small firms were among the top 10 highest-performing factoring companies. Moreover, among the top 10 highest-performing large factoring companies, there was an increase in the number of bank-owned factoring firms.

In a study carried out by Gülcan (2022), the financial performances of leasing and factoring companies traded on ISE were examined for the years between 2016 and 2020. The study utilized the VIKOR technique to analyze the financial ratios of these firms, including leasing or factoring receivables to equity, financial leverage, non-performing loans to total assets, other operating income to other operating expenses, operating income to operating expenses, financial expenses to liabilities, return on equity, and return on assets. The findings showed that Lider Factoring was the most successful company in terms of performance from 2016 to 2019, whereas Creditwest Factoring achieved the highest performance in 2020.

Bektaş (2023) evaluated the financial performances of leasing and factoring companies traded on ISE for the 2020-2021 period by employing the ENTROPY, GRI-ENTROPY, and TOPSIS methods. The study incorporated financial indicators such as amortized financial assets, total assets, operating income, net profit, equity, liabilities from leasing transactions, other liabilities, and non-performing loans. The findings revealed that, according to the ENTROPY and GRI-ENTROPY methods, equity was the most significant criterion for the 2020–2021 period. Additionally, the TOPSIS analysis showed that the top three highest-performing companies in 2020-2021 were Creditwest Factoring, Garanti Factoring, and Ulusal Factoring.

In their study, Karakaş and Gün (2023) analyzed 8 leasing and factoring companies traded on ISE for the 2010-2019 period. The analysis was conducted using the TOPSIS method, incorporating financial parameters including the current ratio, asset turnover ratio, earnings per share, leverage ratio, return on equity, and return on assets. The findings provided evidence that, during the 2010-2019 period, the highest-performing companies were Creditwest Factoring, Lider Factoring, and Yapı Kredi Financial Leasing.

In the study carried out by Sönmez (2023), the financial performances of financial leasing and factoring companies operating in ISE were examined using the MAIRCA method using data from the 2018-2021 period. The study used the criteria of financial expenses/total debts, net debt/EBITDA, earnings per share, asset turnover, return on equity, return on assets ratio and period profit/total assets. As a result of the study, it was found that the most important ratios for companies were net debt/EBITDA and return on equity. However, the companies with the best performance were CRDFA (2018-2019), SEKFK (2020) and GARFA (2021), while SEKFK (2018), GARFA (2019), LIDFA (2020) and QNBFL (2021) companies were in the last places in the performance ranking.

Yıldırım (2024) examined the financial performances of 47 companies operating in the Turkish factoring sector for the 2021-2022 period by making use of the CRITIC, MAIRCA, and MABAC methods. The study considered financial ratios such as non-performing loans to total factoring receivables, total liabilities to total assets, net income to total assets, net income to equity, operating income to operating expenses, and factoring receivables to equity. The results of the CRITIC method indicated that the most significant ratio in the 2021-2022 period was total liabilities to total assets. Furthermore, the results obtained from the MAIRCA and MABAC methods showed that, under equal weighting, Kapital Factoring and Vakıf Factoring had the highest performance in 2021 and 2022, respectively. Meanwhile, when weighting was applied using the CRITIC method, Şirinoğlu Factoring and Mert Finans Factoring emerged as the top-performing companies.

3. DATA

This study evaluates the performance of 7 companies listed in the ISE Leasing and Factoring Index for the 2020-2024 period. The performance analysis employs eight financial ratios that are frequently used in the literature as evaluation criteria. These financial ratios were calculated using the financial statements of leasing and factoring companies obtained from the Public Disclosure Platform. Information regarding the companies and criteria included in this study is presented in Table 1.

Tablo 1. Information on Companies and Criteria Included in This Study

Company	CODE	Criteria	Abbrev.	Criterion Direction	Literature
Creditwest Faktöring A.Ş.	CRDFA	Operating Income / Operating Expenses	OPI	Utility	
Garanti Faktöring A.Ş.	GARFA	Other Operating Income / Other Operating Expenses	OTH	Utility	
İş Finansal Kiralama A.Ş.	ISFIN	Return on Equity (Net Profit / Total Equity)	ROE	Utility	Ergül & Akel (2010); Ceyhan & Demirci (2017); Özçelik & Küçükçakal (2019); Gülcan (2022); Yıldırım (2024)
Lider Faktöring A.Ş.	LIDFA	Return on Assets (Net Profit / Total Assets)	ROA	Utility	
Şeker Finansal Kiralama A.Ş.	SEKFK	Leverage Ratio (Total Liabilities / Total Assets)	LR	Cost	
Ulusal Faktöring A.Ş.	ULUFA	Non-Performing Loans / Total Assets	NPL	Cost	
Vakıf Finansal Kiralama A.Ş.	VAKFN	Leasing or Factoring Receivables / Total Equity	LFR	Cost	
		Financing Expenses / Total Liabilities	FEX	Cost	

4. METHOD

Multi-criteria decision-making (MCDM) methods were used in analyses. MCDM provides an effective framework for comparing multiple criteria simultaneously. It is one of the fastest-growing research fields and is regarded as one of the most effective decision-making methods (Wang & Lee, 2009, p. 8980). This study employs the ENTROPY method to determine the criteria weights and the ARAS method for performance evaluation.

4.1. ENTROPY Method

Determining the weight of criteria in MCDM methods is crucial for the decision-making process (Wang & Lee, 2009, p. 8981). Criteria weights can be determined either subjectively based on expert opinions and individual experience or objectively using statistical measurement data. In this study, the ENTROPY method, an objective measurement approach, is utilized to obtain criteria weights. The concept of entropy is widely used in physics, information theory, mathematics, and engineering. Initially introduced by Rudolph Clausius in 1865, entropy in thermodynamics measures a system's inability to perform work. Information entropy, first conceptualized by Claude E. Shannon (1948), quantifies the uncertainty related with a random variable (Zhang et al., 2011, p. 444).

Entropy is an appropriate concept for measuring the relative contrast intensities of criteria, which represent the information conveyed to the decision-maker. As such, it is frequently used in criteria weighting (Shemshadi et al., 2011, p. 12162).

The application steps of the ENTROPY method are as follows (Shemshadi et al., 2011, p. 12162; Lihong et al., 2008, p. 130; Özdağoğlu et al., 2011, p. 346):

Step 1: The decision matrix is established, where m represents the number of alternatives (companies), and n represents the number of criteria (financial ratios), as shown in Equation (1):

$$D = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

Step 2: The decision matrix is normalized using Equation (2), where x_{ij} refers to the value of the i^{th} alternative for the j^{th} criterion:

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^{m} x_{ij}} \quad (2)$$

Step 3: The entropy value is calculated using Equation (3):

$$e_{ij} = -k \sum_{j=1}^{n} P_{ij} ln P_{ij} \;\; k = 1/\ln(m) \quad (3)$$

Step 4: The degree of differentiation is formulated as shown in Equation (4):

$$d_j = 1 - e_j \quad (4)$$

Step 5: The criterion weight is computed using Equation (5):

$$w_j = \frac{d_j}{\sum_{j=1}^{n} d_j} \quad (5)$$

The entropy weight serves as a parameter indicating how similar different alternatives are concerning a specific criterion. A lower entropy weight for a criterion suggests that it provides less information and is of lesser importance in the decision-making process (Wang & Lee, 2009, p. 8982).

4.2. ARAS Method

The ARAS (Additive Ratio Assessment) method, developed by Zavadskas and Turskis (2010), has gained attention among MCDM methods in recent years (Dahooie et al., 2019, p. 1096). In this method, the utility function value, which represents the relative efficiency of a feasible alternative, is directly proportional to the relative impact of the weights and values of the primary criteria within a project (Zavadskas & Turskis, 2010, p. 163). In this approach, the utility function values of alternatives are compared to the utility function value of the optimal alternative. This characteristic differentiates ARAS. The higher the utility value obtained through ARAS, the more similar the alternative is to the optimal alternative and the higher its ranking (Karadağ et al., 2022, p. 9).

The steps for implementing this method are as follows (Zavadskas & Turskis, 2010, p. 163; Dahooie et al., 2019, p. 109; Ecer, 2016, p. 90; Işık, 2019, p. 4):

Step 1: The decision matrix is established as follows in Equation (6):

$$X = \begin{bmatrix} x_{01} & \cdots & x_{0j} & \cdots & x_{0n} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{i1} & \cdots & x_{ij} & \cdots & x_{in} \\ \vdots & \ddots & \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mj} & \cdots & x_{mn} \end{bmatrix} \quad (6)$$

In Equation (6), m refers to the number of alternatives, n to the number of criteria, x_{ij} to the value of the i^{th} alternative concerning the j^{th} criterion, and x_{0j} to the optimal value for the j^{th} criterion. If the optimal value of the j^{th} criterion is unknown, it can be determined using Equations (7) and (8):

$$\begin{cases} For\ utility\ (maximization)\ x_{0j}\ ;\ max_i\ x_{ij}, & i = 0,1,\dots,m\ ve\ j = 0,1,\dots,n \quad (7) \\ For\ cost\ (minimization)\ x_{0j}\ ;\ min_i\ x_{ij}, & i = 0,1,\dots,m\ ve\ j = 0,1,\dots,n \quad (8) \end{cases}$$

Step 2: The decision matrix is normalized utilizing the formulations in Equations (9) and (10) for utility-oriented and cost-oriented criteria, respectively:

$$\overline{x_{ij}} = \frac{x_{ij}}{\sum_{i=0}^{m} x_{ij}} \quad (9)$$

$$\overline{x_{ij}} = \frac{1/x_{ij}}{\sum_{i=0}^{m} 1/x_{ij}} \quad (10)$$

Step 3: The criteria weights obtained through the ENTROPY method are applied to construct the weighted normalized decision matrix, as seen in Equation (11):

$$x_{ij} = \overline{x_{ij}} * w_j \quad (11)$$

Step 4: The optimality function is calculated using Equation (12):

$$S_i = \sum_{i=1}^{n} x_{ij} \quad (12)$$

Step 5: The utility degree is determined using Equation (13):

$$K_i = \frac{S_i}{S_0} \quad (13)$$

Where S_0 refers to the optimality function value of the best alternative.

5. FINDINGS

Within the context of this study, the weight of each criterion was first determined using the ENTROPY method, followed by an evaluation of the leasing and factoring companies' performance for the 2020–2024 period using the ARAS method.

5.1. Application of the ENTROPY Method

The decision matrix is first established to determine the criteria weights for the companies. The 2020 data is used as an example to illustrate the implementation of the method. The decision matrix for 2020 is shown in Table 2.

Table 2. Decision Matrix for 2020

Company	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
CRDFA	5.07431	1.15023	0.09079	0.03845	0.57653	0.07379	1.84396	0.14553
GARFA	6.27520	2.54212	0.23480	0.01722	0.92667	0.04540	13.08268	0.07021
ISFIN	9.79366	3.31225	0.12204	0.01643	0.86539	0.04316	4.81346	0.04576
LIDFA	2.83684	1.20895	0.03577	0.00668	0.81317	0.03045	4.17857	0.16168
SEKFK	1.87908	1.62193	0.14486	0.01856	0.87186	0.10941	6.20289	0.11425
ULUFA	2.58679	67.80690	0.01551	0.00227	0.85382	0.03550	6.39725	0.11729
VAKFN	9.16149	10.08170	0.16984	0.01625	0.90433	0.05805	10.22852	0.04013

The decision matrix (Table 2) consists of alternative companies in rows and various financial ratios as criteria in columns. After constructing the decision matrix, the normalization process is applied to achieve the normalized decision matrix, presented in Table 3.

Table 3. Normalized Decision Matrix for 2020

	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
CRDFA	0.1349	0.0131	0.1116	0.3318	0.0992	0.1865	0.0394	0.2094
GARFA	0.1669	0.0290	0.2886	0.1486	0.1594	0.1147	0.2799	0.1010
ISFIN	0.2604	0.0378	0.1500	0.1418	0.1489	0.1091	0.1030	0.0659
LIDFA	0.0754	0.0138	0.0440	0.0577	0.1399	0.0769	0.0894	0.2327
SEKFK	0.0500	0.0185	0.1780	0.1602	0.1500	0.2765	0.1327	0.1644
ULUFA	0.0688	0.7730	0.0191	0.0196	0.1469	0.0897	0.1368	0.1688
VAKFN	0.2436	0.1149	0.2088	0.1403	0.1556	0.1467	0.2188	0.0578

Following the normalization process, Equations (3), (4), and (5) are used to determine ENTROPY values, divergence values, and weight values, which are shown in Table 4.

Table 4. ENTROPY (e_j), Differentiation (d_j), and Weight (w_j) Values for The Year 2020

	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
e_j	0.9210	0.4438	0.8916	0.8925	0.9952	0.9527	0.9284	0.9452
d_j	0.0790	0.5562	0.1084	0.1075	0.0048	0.0473	0.0716	0.0548
w_j	0.0767	0.5402	0.1052	0.1044	0.0047	0.0460	0.0696	0.0532

An examination of the weight values for 2020 (Table 4) indicates that the highest weight, at 54.02%, belongs to the ratio of other main operating income to other main operating expenses. This criterion is followed by the return on equity ratio (10.52%) and the return on assets ratio (10.44%).

As part of the ENTROPY analysis, the necessary calculations have also been performed for other years within the analysis period, and the results are presented in Table 5.

Table 5. ENTROPY (e_j), Differentiation (d_j), and Weight (w_j) Values for The Criteria

Year	Value	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
2020	e_j	0.9210	0.4438	0.8916	0.8925	0.9952	0.9527	0.9284	0.9452
	d_j	0.0790	0.5562	0.1084	0.1075	0.0048	0.0473	0.0716	0.0548
	w_j	0.0767	**0.5402**	0.1052	0.1044	0.0047	0.0460	0.0696	0.0532
2021	e_j	0.9189	0.8944	0.9192	0.9613	0.9971	0.9687	0.9433	0.9447
	d_j	0.0811	0.1056	0.0808	0.0387	0.0029	0.0313	0.0567	0.0553
	w_j	0.1792	**0.2335**	0.1786	0.0855	0.0064	0.0693	0.1253	0.1222
2022	e_j	0.9144	0.1449	0.9632	0.9547	0.9965	0.9165	0.9140	0.9563
	d_j	0.0856	0.8551	0.0368	0.0453	0.0035	0.0835	0.0860	0.0437
	w_j	0.0690	**0.6899**	0.0297	0.0365	0.0028	0.0674	0.0694	0.0353
2023	e_j	0.8796	0.0431	0.9673	0.9693	0.9965	0.8714	0.9395	0.9569
	d_j	0.1204	0.9569	0.0327	0.0307	0.0035	0.1286	0.0605	0.0431
	w_j	0.0874	**0.6952**	0.0238	0.0223	0.0026	0.0934	0.0439	0.0313
2024	e_j	0.8956	0.1090	0.9570	0.9516	0.9973	0.8571	0.9676	0.9753
	d_j	0.1044	0.8910	0.0430	0.0484	0.0027	0.1429	0.0324	0.0247
	w_j	0.0810	**0.6909**	0.0333	0.0376	0.0021	0.1108	0.0251	0.0192

Examining Table 5, it can be seen that in 2020 and 2021, the criteria with the highest weights were the ratio of other operating income to other operating expenses and the return on equity ratio. In 2022, the criteria with the highest weights were the ratio of other operating income to other operating expenses and the ratio of financial leasing or factoring receivables to total equity. In 2023, the criteria with the highest weights were the ratio of other operating income to other operating expenses and the ratio of non-performing loans to total assets. Finally, in 2024, the criteria with the highest weights were the ratio of other operating income to other operating expenses and the ratio of core operating income to core operating expenses.

5.2. Application of the ARAS Method

After determining the weight coefficients, the financial performances of leasing and factoring companies were evaluated using the ARAS (Additive Ratio Assessment) method. The first stage of the ARAS method involves constructing the decision matrix. The decision matrix, formulated within the framework of the sample application for the year 2020, is shown in Table 6.

Table 6. Construction of The Decision Matrix for The Year 2020

	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
Criterion Direction	Max	Max	Max	Max	Min	Min	Min	Min
w_j	0.0767	0.5402	0.1052	0.1044	0.0047	0.0460	0.0696	0.0532
Optimum Value	9.7937	67.8069	0.2348	0.0384	0.5765	0.0304	1.8440	0.0401
CRDFA	5.0743	1.1502	0.0908	0.0384	0.5765	0.0738	1.8440	0.1455
GARFA	6.2752	2.5421	0.2348	0.0172	0.9267	0.0454	13.0827	0.0702
ISFIN	9.7937	3.3122	0.1220	0.0164	0.8654	0.0432	4.8135	0.0458
LIDFA	2.8368	1.2090	0.0358	0.0067	0.8132	0.0304	4.1786	0.1617
SEKFK	1.8791	1.6219	0.1449	0.0186	0.8719	0.1094	6.2029	0.1143
ULUFA	2.5868	67.8069	0.0155	0.0023	0.8538	0.0355	6.3972	0.1173
VAKFN	9.1615	10.0817	0.1698	0.0162	0.9043	0.0580	10.2285	0.0401

In Table 6, alongside the decision matrix derived from the ENTROPY method, the utility direction of the criteria, their weight values (wi), and their optimum values are also displayed. The utility direction of the criteria can be interpreted as the direction in which they impact financial performance. The criteria OPI, OTH, ROE, and ROA are considered maximization criteria, whereas the criteria LR, NPL, LFR, and FEX are treated as minimization criteria. The criterion weights are derived from the values computed by making use of the ENTROPY method. The optimum value for maximization criteria is determined by selecting the maximum value in the column, while for minimization criteria, it is obtained by selecting the minimum value in the column. Following the construction of the decision matrix, cost-oriented (minimization) criteria were converted into utility-oriented (maximization) criteria, as shown in Table 7.

Table 7. Conversion of Cost-Oriented Criteria into Utility-Oriented Criteria for 2020

	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
Criterion Direction	Max	Max	Max	Max	Min	Min	Min	Min
Optimum	9.7937	67.8069	0.2348	0.0384	1.7345	32.8443	0.5423	24.9199
CRDFA	5.0743	1.1502	0.0908	0.0384	1.7345	13.5516	0.5423	6.8714
GARFA	6.2752	2.5421	0.2348	0.0172	1.0791	22.0248	0.0764	14.2422
ISFIN	9.7937	3.3122	0.1220	0.0164	1.1555	23.1701	0.2078	21.8546
LIDFA	2.8368	1.2090	0.0358	0.0067	1.2298	32.8443	0.2393	6.1852
SEKFK	1.8791	1.6219	0.1449	0.0186	1.1470	9.1400	0.1612	8.7527
ULUFA	2.5868	67.8069	0.0155	0.0023	1.1712	28.1706	0.1563	8.5258
VAKFN	9.1615	10.0817	0.1698	0.0162	1.1058	17.2269	0.0978	24.9199

After transforming cost-oriented criteria into utility-oriented ones, a normalization process was applied to obtain the normalized decision matrix, which is presented in Table 8.

Table 8. Normalized Decision Matrix for The Year 2020

	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
Criterion Direction	Max	Max	Max	Max	Min	Min	Min	Min
Optimum	0.2066	0.4360	0.2240	0.2492	0.1675	0.1835	0.2680	0.2143
CRDFA	0.1071	0.0074	0.0866	0.2492	0.1675	0.0757	0.2680	0.0591
GARFA	0.1324	0.0163	0.2240	0.1116	0.1042	0.1231	0.0378	0.1225
ISFIN	0.2066	0.0213	0.1164	0.1065	0.1116	0.1295	0.1027	0.1880
LIDFA	0.0598	0.0078	0.0341	0.0433	0.1187	0.1835	0.1183	0.0532
SEKFK	0.0396	0.0104	0.1382	0.1203	0.1107	0.0511	0.0797	0.0753
ULUFA	0.0546	0.4360	0.0148	0.0147	0.1131	0.1574	0.0773	0.0733
VAKFN	0.1933	0.0648	0.1620	0.1053	0.1068	0.0963	0.0483	0.2143

Subsequent to the normalization process, the criterion weights obtained were used to establish the weighted normalized decision matrix, which is displayed in Table 9.

Table 9. Weighted Normalized Decision Matrix for The Year 2020

	OPI	OTH	ROE	ROA	LR	NPL	LFR	FEX
Criterion Direction	Max	Max	Max	Max	Min	Min	Min	Min
wj	0.0767	0.5402	0.1052	0.1044	0.0047	0.0460	0.0696	0.0532
Optimum	0.0158	0.2355	0.0236	0.0260	0.0008	0.0084	0.0187	0.0114
CRDFA	0.0082	0.0040	0.0091	0.0260	0.0008	0.0035	0.0187	0.0031
GARFA	0.0102	0.0088	0.0236	0.0116	0.0005	0.0057	0.0026	0.0065
ISFIN	0.0158	0.0115	0.0123	0.0111	0.0005	0.0060	0.0071	0.0100
LIDFA	0.0046	0.0042	0.0036	0.0045	0.0006	0.0084	0.0082	0.0028
SEKFK	0.0030	0.0056	0.0145	0.0126	0.0005	0.0023	0.0055	0.0040
ULUFA	0.0042	0.2355	0.0016	0.0015	0.0005	0.0072	0.0054	0.0039
VAKFN	0.0148	0.0350	0.0171	0.0110	0.0005	0.0044	0.0034	0.0114

Using the weighted normalized decision matrix, the optimality value (Si) and the utility degree (Ki) were calculated. The performance ranking of the companies was determined based on the utility degree. The optimality values, utility degrees, and rankings for the year 2020 are shown in Table 10.

Table 10. Optimality Values, Utility Degrees, and Rankings For 2020

Company	Si	Ki	Rank
CRDFA	0.0734	0.2157	4
GARFA	0.0695	0.2043	5
ISFIN	0.0743	0.2185	3
LIDFA	0.0370	0.1086	7
SEKFK	0.0482	0.1416	6
ULUFA	0.2598	0.7637	1
VAKFN	0.0976	0.2868	2

An examination of Table 10 reveals that Ulusal Factoring ranked as the highest-performing company in 2020, while Lider Factoring recorded the lowest performance. By following the stages of the ARAS method, the optimality degrees, utility degrees, and rankings for the 2020-2024 period were obtained and are presented in Table 11.

Table 11. Utility Degrees and Rankings for the 2020–2024 Period

Company	2020		2021		2022		2023		2024	
	Ki	Rank	Ki	Rank	Ki	Rank	Ki	Rank	Ki	Rank
CRDFA	0.2157	4	0.2375	**1**	0.0874	**7**	0.0875	**7**	0.1186	6
GARFA	0.2043	5	0.0582	**7**	0.2732	2	0.2625	3	0.2229	4
ISFIN	0.2185	3	0.1322	3	0.1899	5	0.2058	4	0.1507	5
LIDFA	0.1086	**7**	0.1248	4	3.5340	**1**	5.1113	**1**	4.5061	**1**
SEKFK	0.1416	6	0.0995	5	0.1204	6	0.0936	6	0.0660	**7**
ULUFA	0.7637	**1**	0.0868	6	0.2458	3	0.1712	5	0.4165	2
VAKFN	0.2868	2	0.1436	2	0.2315	4	0.3530	2	0.2431	3

Upon examining Table 11, the top-performing companies in the performance ranking were Ulusal Factoring and Vakıf Leasing in 2020, Creditwest Factoring and Vakıf Leasing in 2021, Lider Factoring and Garanti Factoring in 2022, Lider Factoring and Vakıf Leasing in 2023, and Lider Factoring and Ulusal Factoring in 2024. Conversely, the companies ranked at the lower end of the performance spectrum included Lider Factoring and Şeker Leasing in 2020, Garanti Factoring and Ulusal Factoring in 2021, Creditwest Factoring and Şeker Leasing in both 2022 and 2023, and Şeker Leasing and Creditwest Factoring in 2024. Furthermore, İş Leasing demonstrated a relatively stable performance trend throughout the 2020-2024 period.

6. CONCLUSION

This study examines the financial performance of companies listed in the ISE Financial Leasing and Factoring Index. In this context, eight financial ratio criteria derived from the financial statements of seven companies within the index for the period 2020-2024 were used as evaluation criteria, and analyses were conducted using the ENTROPY and ARAS methods.

Findings obtained through the ENTROPY method indicate that the most critical criterion for leasing and factoring companies during the 2020-2024 period is the ratio of other operating income to other operating expenses. However, it can be observed that the weight of this ratio was lower in 2021 compared to other years. Within the analysis period, the operating income to operating expenses ratio emerged as the second most important criterion for leasing and factoring companies, followed by the return on equity (ROE) as the third most significant criterion.

The analysis conducted using the ARAS method revealed the following performance rankings: In 2020, Ulusal Factoring ranked first, while Lider Factoring had the lowest performance. In 2021, Creditwest Factoring was the most successful company, whereas Garanti Factoring had the lowest performance. In 2022 and 2023, Lider Factoring exhibited the highest performance, while Creditwest Factoring recorded the lowest. In 2024, Lider Factoring maintained its leading position in terms of performance, while Şeker Leasing ranked last. Additionally, throughout the 2020-2024 period, Vakıf Leasing and İş Leasing demonstrated stable financial performance.

The study's findings, which highlight Ulusal Factoring, Creditwest Factoring, and Lider Factoring as the top-performing companies, align with the results of prior studies by Özçelik and Küçükçakal (2019), Gülcan (2022), Bektaş (2023), and Karakaş and Gün (2023). Similarly, the finding that Şeker Leasing ranked lowest in terms of performance is consistent with the studies of Bağcı and Kahraman (2017) and Ceyhan and Demirci (2017).

A general evaluation of the study results indicates that factoring companies predominantly ranked higher in financial performance during the 2020-2024 period. Furthermore, to enhance their financial performance, leasing, and factoring companies should focus on increasing revenues from core and other operating activities while reducing expenses to improve profitability. Additionally, businesses engaged in the trade of goods or services are advised to prefer financially strong leasing and factoring companies to optimize their financial operations.

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