

Factoring Sector in Türkiye: General Overview and Evaluation of Factoring Companies' Financial Performance by Multi-Criteria Decision-Making Techniques

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Abstract: The factoring sector, which plays a key role in the sustainability of cash flows for businesses, particularly small and medium-sized enterprises (SMEs), offers a range of financial services, most notably the conversion of receivables into cash before their due dates. Today, this sector is regarded as one of the most significant components of the non-bank financial segment. Thus, the condition and performance of the factoring industry are crucial for the sector's future and the overall functioning of the financial system. The purpose of this study; to evaluate the general situation of the factoring sector in Türkiye, its position within the global factoring sector, and the financial performance of companies operating in this sector. In line with this objective, initially, a general assessment of the sector's overall situation was made based on cumulative data related to the sector. Subsequently, the financial performance of companies operating in the sector was evaluated for the 2021-2022 period using six criteria identified for examination, weighted both through the equal weighting method and the CRITIC method, and assessed using the MAIRCA and MABAC methods. According to the analyses conducted, the rankings of financial performance remain unchanged using the MABAC and MAIRCA methods. However, when the criteria weighting method varies, partial changes in the rankings of factoring companies' performance occur.

Keywords: Factoring Companies, MAIRCA, MABAC, CRITIC, Multi-Criteria Decision-Making Methods

Jel Codes: G2, G23, D81

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Türkiye'de Faktoring Sektörü: Genel Durumu ve Faktoring Şirketlerinin Finansal Performanslarının Çok Kriterli Karar Verme Yöntemleri ile Değerlendirilmesi

Öz: Özellikle küçük ve orta ölçekli olmak üzere firmaların nakit akışlarının sürdürülebilirliği noktasında kilit bir rol oynayan faktoring sektörü; firmalara başta alacakların vadesinden önce nakde dönüşmesini sağlamak üzere birçok finansal hizmet sunmaktadır. Günümüzde bu sektör, banka dışı finansal kesimin en önemli parçalarından biri olarak kabul edilmektedir. Dolayısıyla faktoring sektörünün durumu ve sergilemiş olduğu performans sektörün geleceği ve finansal sistemin genel işleyişi açısından önemlidir. Bu çalışmanın amacı; Türkiye'de faktoring sektörünün genel durumunun, dünya faktoring sektörü içerisindeki konumunun ve bu sektörde faaliyet gösteren şirketlerin finansal performanslarının değerlendirilmesidir. Bu amaç doğrultusunda öncelikle sektöre ilişkin kümülatif veriler ile sektörün genel durumuna ilişkin genel bir değerlendirme yapılmıştır. Daha sonra sektörde faaliyet gösteren şirketlerin 2021-2022 döneminde finansal performanslarının incelenmesi için belirlenen altı kriter hem eşit ağırlık yöntemi hem de CRITIC yöntemleriyle ağırlıklandırılarak MAIRCA ve MABAC yöntemleriyle performans değerlendirilmesi yapılmıştır. Yapılan analizlere göre, MABAC ve MAIRCA yöntemlerinin finansal performans sıralamaları değişmemektedir. Ancak kriter ağırlıklandırma yöntemi farklılaştığında faktoring şirketlerinin performans sıralamalarında kısmi değişimler yaşanmaktadır.

Anahtar Kelimeler: Faktoring Şirketleri, MAIRCA, MABAC, CRITIC, Çok Kriterli Karar Verme Yöntemleri

Jel Kodları: G2, G23, D81

1. Introduction

Factoring transactions is a process that includes financing, collection of receivables and warranty services because of the acquisition of term receivables by factors through assignment. Factoring companies, which stand out in terms of meeting short-term funding needs, are important alternative financing providers. Factoring, which enables the conversion of commercial receivables into cash before maturity, is an important liquidity provider and plays an important role in ensuring the production cycle of the real sector and the stability of the supply chain.

The importance of factoring companies, which are non-bank financial institutions, becomes evident, especially in times of economic crisis. Because in these periods, banks generally tend to shrink in lending and give fewer loans. This increases cash shortage and resource needs, especially in small and medium-sized enterprises with relatively low capital. In such cases, businesses resort to financing their receivables that have not yet matured to meet their cash needs. This situation is one of the issues that reveals the importance of factoring companies for businesses, especially SMEs.

Factoring transactions in Türkiye first started in 1988 in a sub-unit of İktisat Bank. According to the 2022 year-end data of FKB 2022, the factoring sector; has become a sector in which 49 companies, 18 of which can carry out international transactions, operate with 357 branches and 4008 personnel. However, the factoring sector has a very low share of less than 1% in terms of asset size in the Turkish financial sector in 2022.

A similar low share decrease is also found in the finance literature in Türkiye. While most of the studies in the literature examine banks, the number of studies examining non-bank institutions, especially factoring companies, are relatively low. The number of studies specifically examining the factoring sector is quite limited.

In this regard, the purpose of this study was determined to examine the general situation of the factoring sector in Türkiye comparatively with the world factoring sector and to evaluate the performance of the factoring sector in Türkiye for the 2021-2022 period. In the literature, only one study has been found that covers all companies in the factoring sector in Türkiye and analyzes the financial performance of the sector. This study was conducted with 2017-2019 data and a single method. The difference between our study and this study can be said to be the research of the 2021-2022 period and the comparative performance evaluation with different analysis techniques. In this regard, this study contributes to the literature by revealing the final situation of the factoring sector in Türkiye and analyzing the performances of the actors in the sector with different methods. Information about the design of the study is presented in Figure 1 below.

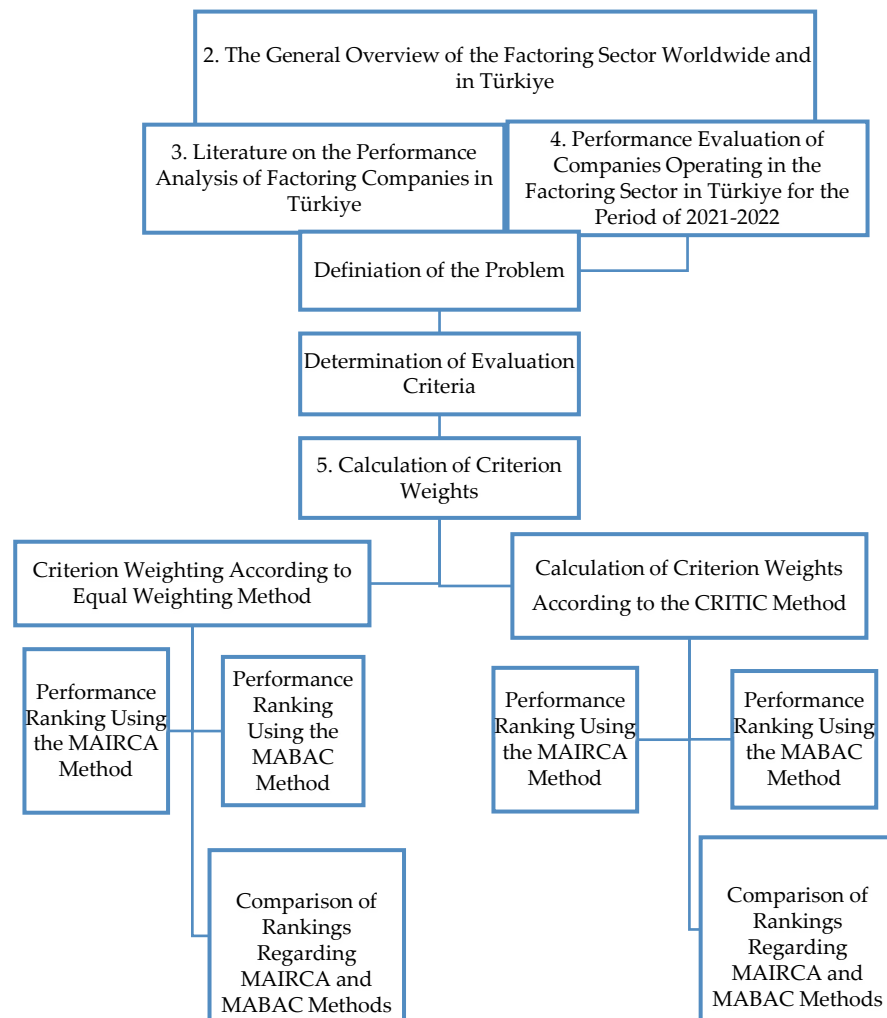
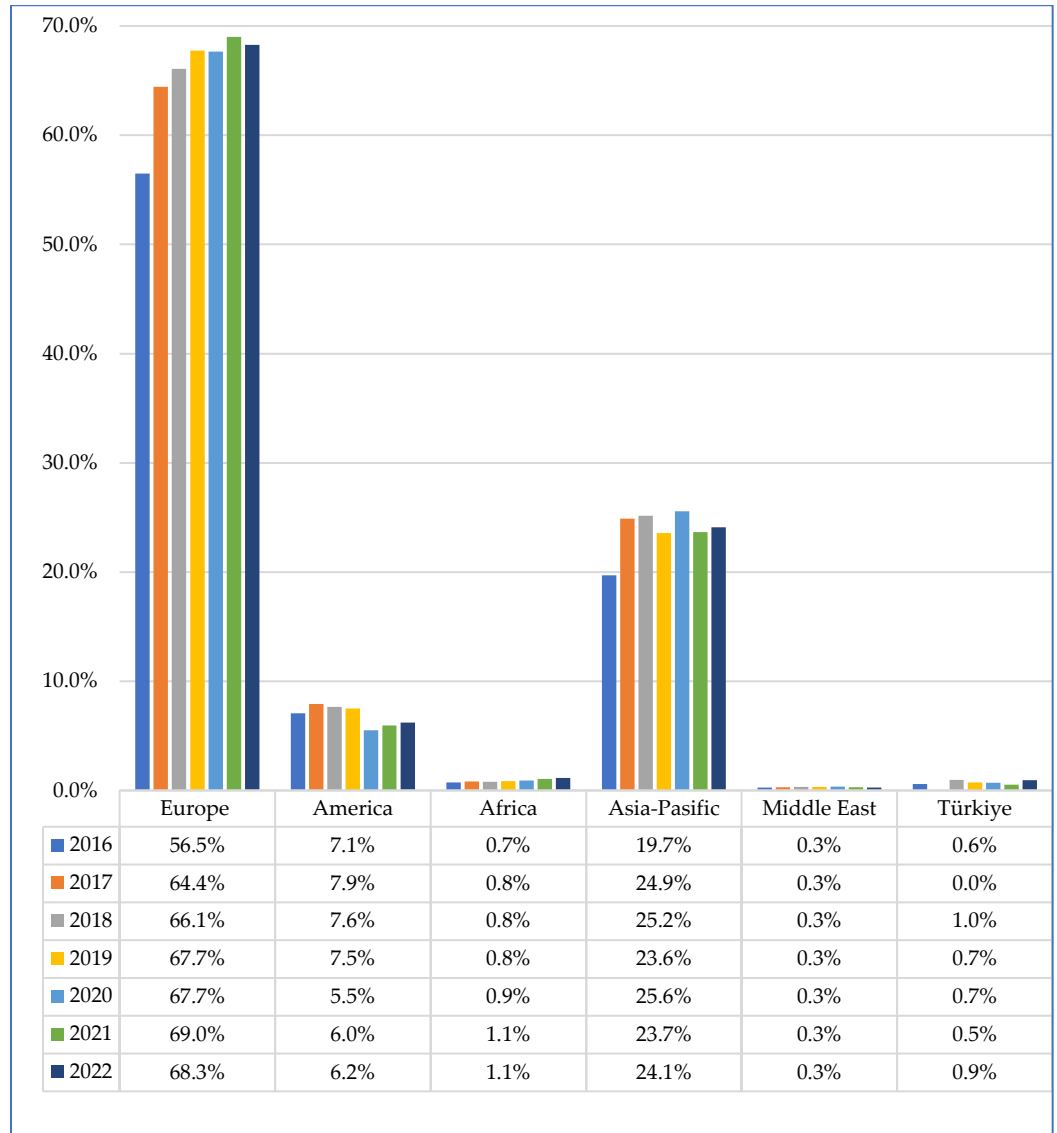


Figure 1. Design of the Study

2. The Factoring Sector in the World and Türkiye

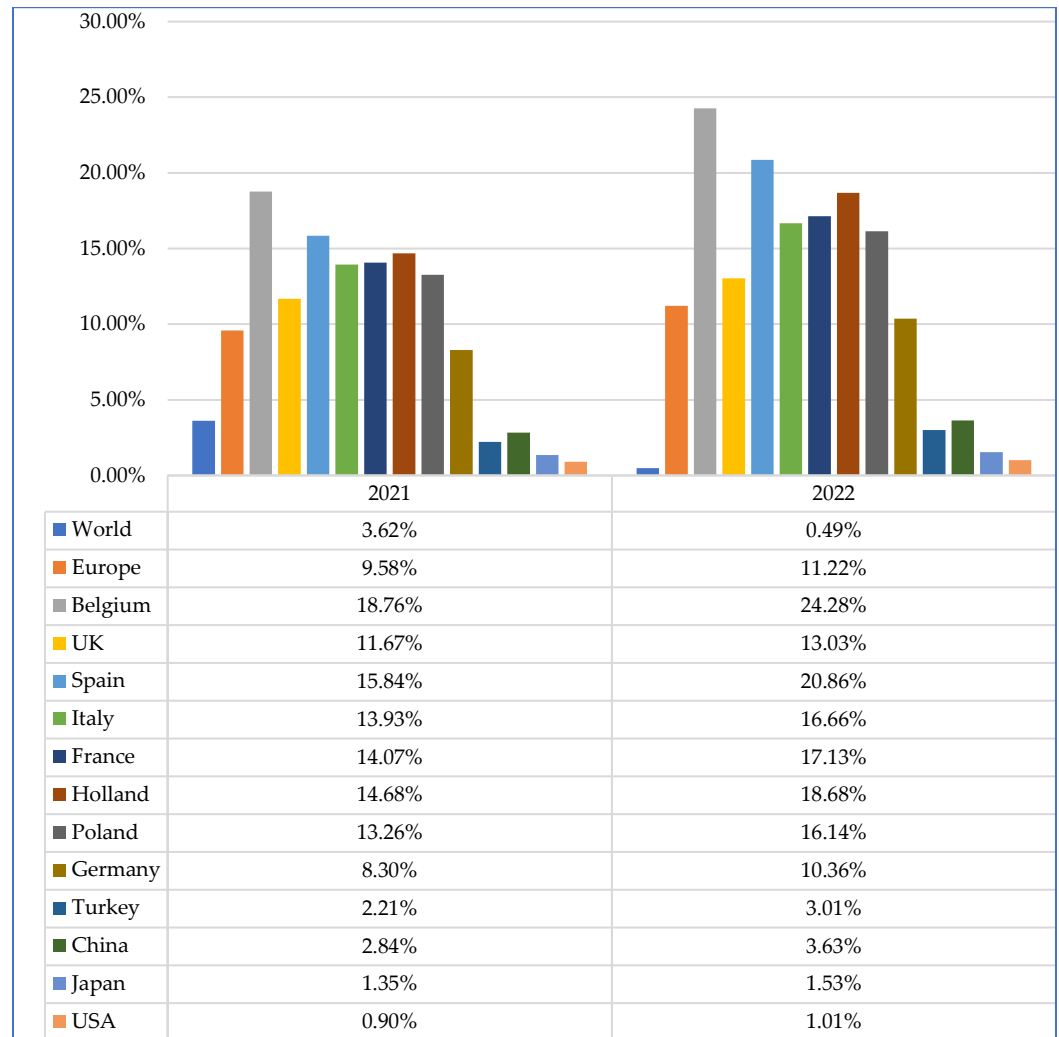
This part of the study provides an overview of the general situation of the factoring sector in Türkiye and worldwide, the position of the factoring sector in Türkiye within the global factoring sector, and leading indicators related to the factoring sector in Türkiye. Graph 1 presents information on the intercontinental volume distribution of the factoring sector.



Graph 1. Factoring Volume by Continents (%)

Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr.

In Graph 1, information about the continental distribution of factoring volume in recent years is presented. As seen in Graph 1, a significant portion of the world's factoring volume is generated in European countries. As of 2022, Europe constitutes 68.3% of the world factoring volume. It is followed by the Asia-Pacific, America, Africa, and the Middle East continents, respectively. It is observed that the factoring volume in Africa and the Middle East continents is quite low. Detailed information about Türkiye's factoring volume will be discussed in the upcoming sections. Graph 2 below contains information on the share of the factoring sector in GDP in the prominent countries in the factoring sector and Türkiye.



Graph 2. Share of Factoring Volume in GDP in the World and Selected Countries

Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr

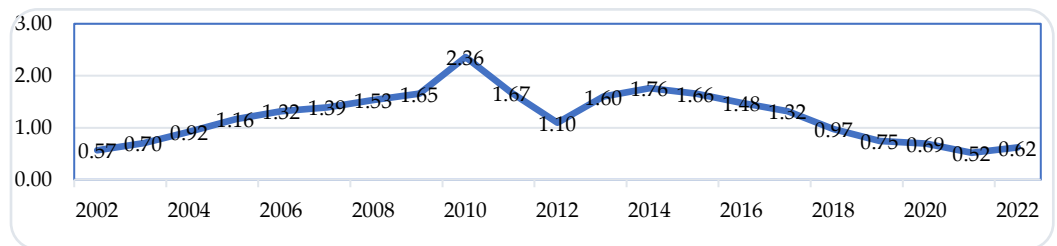
According to Graph 2, the share of the factoring sector within the World GDP, which stood at 3.6% in 2021, has contracted to approximately 0.49% in 2022. Examining single countries, the top five nations with the highest factoring volume in GDP include Belgium, Spain, the Netherlands, France, and Italy, in that order. As previously indicated, major economies influencing the global economy, such as the United States, China, and Japan, exhibit significantly lower proportions of the factoring sector within their GDP when compared to European nations. In Türkiye, the share of the factoring sector in GDP, which was 2.21% in 2021, has seen a marginal increase, reaching 3% by the end of 2022. Detailed insights regarding the volume of the factoring sector in the world and Türkiye over the years are presented in Table 1.

Table 1. Evaluation of Factoring Sector Volume Worldwide and in Türkiye over the Years

Years	World Factoring Sector Total Volume (Million \$)	Turkish Factoring Sector Total Volume (Million \$)	World Factoring Volume Growth (%)	Türkiye Factoring Volume Growth (%)
2003	950490	6663	20,74	48,86
2004	1161340	10733	22,18	61,08
2005	1199526	13959	3,29	30,06
2006	1497260	19701	24,82	41,13
2007	1896724	26405	26,68	34,03
2008	1869677	28677	-1,43	8,6
2009	1835488	30370	-1,83	5,9
2010	2186408	51594	19,12	69,88
2011	2610844	43699	19,41	-15,3
2012	2811346	30815	7,68	-29,48
2013	3078505	49300	9,5	59,99
2014	2847837	50152	-7,49	1,73
2015	2594729	42970	-8,89	-14,32
2016	2626490	38784	1,22	-9,74
2017	3117437	41140	18,69	6,07
2018	3168998	30815	1,65	-25,1
2019	3273284	24471	3,29	-20,59
2020	3353875	23274	2,46	-4,89
2021	3475791	18038	3,64	-22,5
2022	4139657	25688	19,1	42,41

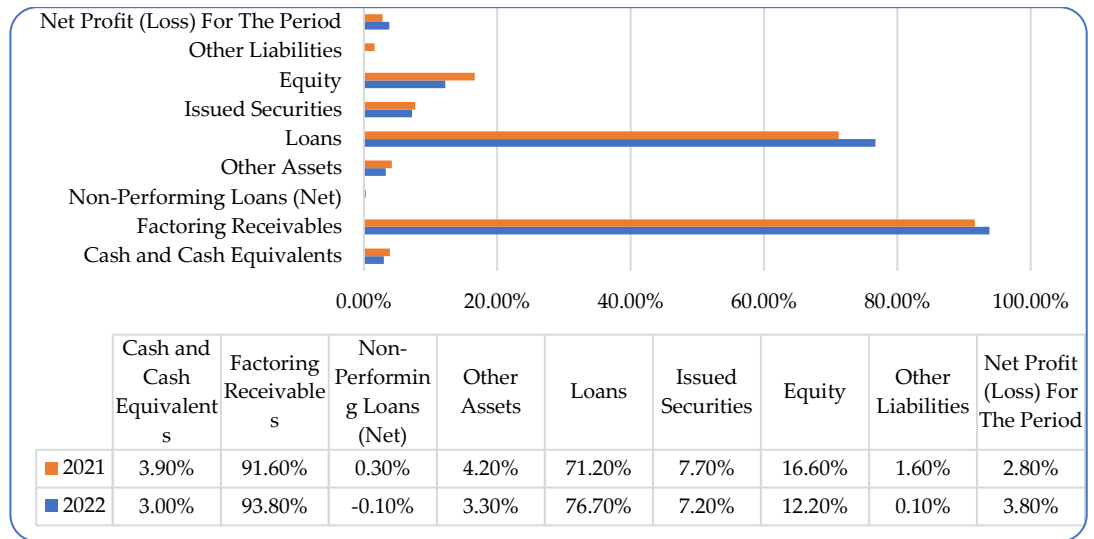
Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr

When examining the Table 1 data, it is observed that in 2003, the global volume of the factoring sector was \$950.490 billion, while in Türkiye; it was at the level of \$6.663. The factoring volume, along with negative and positive growth experienced over the years, has reached \$4,139.657 globally and \$25.688 in Türkiye according to the end-of-year figures for 2022. However, looking at the volume growth figures, globally, there was a contraction in the previous year's volume in 2008, 2009, 2014, and 2015, and growth in all other years. For Türkiye, the factoring volume reached levels of \$51.594 million in 2010, and generally, except for a few years, it has contracted to \$25.688 million. These figures indicate that while the factoring volume is steadily increasing worldwide, it is decreasing in Türkiye. This trend is more clearly illustrated in the Graph 3.

**Graph 3.** Share of Turkish Factoring Sector in the World Factoring Sector (%)

Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr

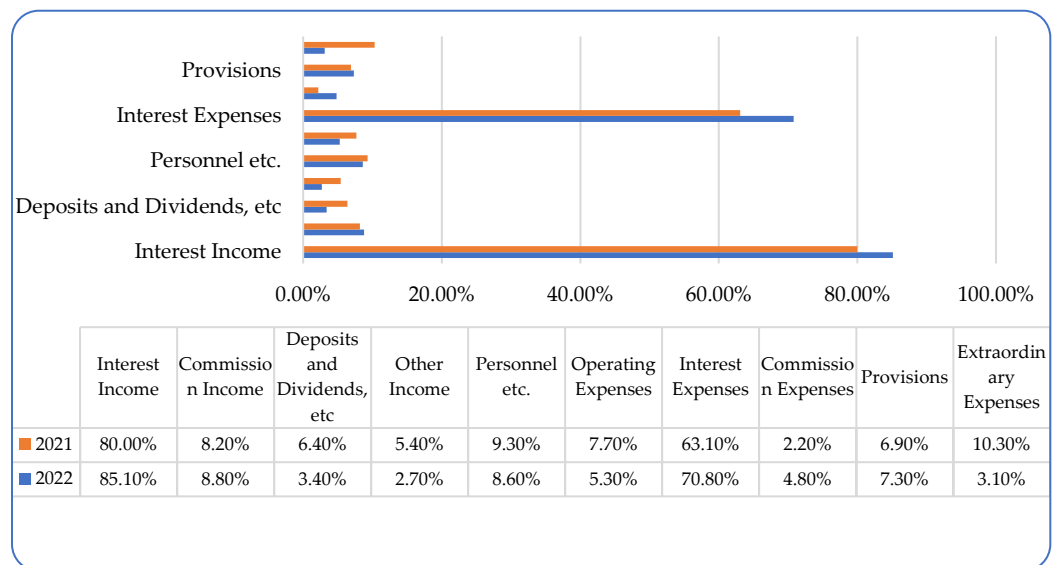
According to Graph 3, Türkiye's share in the world factoring sector is around 0.57% as of 2002. This figure increased continuously until 2010 and reached 2.39% in 2010. However, Türkiye's share, which entered a decreasing trend after 2010, has fallen to its level of 20 years ago by 2022. The Graph 4 below provides information about the factoring industry in Türkiye (financial structure, profitability, etc.).



Graph 4. Asset and Liability Distribution of the Factoring Sector in Türkiye for the Period of 2021-2022

Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr

According to the Graph 4, the share of factoring receivables within the assets increased by 2.2% to reach 93.8% in 2022 compared to 2021. The share of non-performing loans, which was at 0.3% in 2021, decreased to zero in 2022. From 2021 to 2022, there was a decrease in equity but an increase in loans. In terms of period profit/loss, while it was 2.80% in 2021, it increased by 1% to 3.80% in 2022.

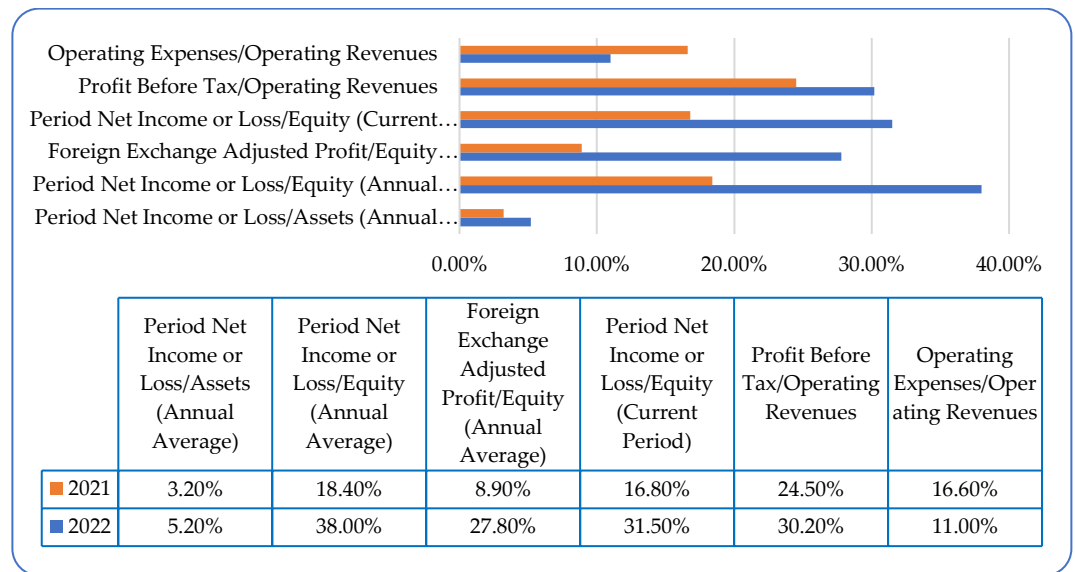


Graph 5. Income and Expense Distribution of the Factoring Sector in Türkiye for the Period of 2021-2022

Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr

According to Graph 5, in the sector, the share of interest income in total revenues increased by 5.1 percentage points to reach 85.1% compared to the year 2021. The share of commission income has also increased by 0.6%, reaching a level of 8.8%. Additionally, the share of personnel expenses has decreased by 0.6 percentage points to 8.6% compared to the year 2021. The share of interest expenses in total expenses has increased by 7.7 percentage points to reach 70.8% compared to the year 2021. There has been a 0.4

percentage point increase in the share of provision expenses in the total compared to the year 2021.



Graph 6. Efficiency Ratios of the Factoring Sector in Türkiye for the Period of 2021-2022

Source: Created by the author, compiled from the reports and data shared on www.fkb.org.tr

According to Graph 6, there have been increases in productivity ratios during this period. Compared to 2021, the return on equity ratio increased by 19.6%, and the return on assets ratio increased by 2%. The foreign exchange-adjusted return on equity ratio has also increased by 14.70%. The ratio of pre-tax profit to 'Operating Revenues' has increased by 5.6%. The ratio of operating expenses to Operating Revenues has decreased by 5.6 percentage points. In summary, the 2022 productivity indicators have shown significant positive changes compared to 2021.

3. Literature Review

In this part of the study, respectively, studies focusing on the factoring sector in the world and in Türkiye, and specifically studies evaluating the financial performance of the factoring sector in Türkiye, are included.

In the study conducted by Banerjee (2003), the operational and financial performance of Indian Factoring Companies was investigated using Ratio, Annual Average, Annual Average Growth Rate, Compound Growth Rate, and Mann-Whitney U tests. The analyses revealed that the operational and financial performance of factors in India has been increasing over time.

In Özdemir's (2005) study, an in-depth examination of the content, advantages, and disadvantages of factoring and forfaiting transactions is conducted, with a focus on exploring their impact on international trade. According to Özdemir, despite its relatively recent emergence, the factoring sector has exhibited rapid growth in Türkiye. The practice of transferring short-term receivables arising from the sale of goods and services to factoring companies is becoming increasingly prevalent. Factoring companies play a crucial role in meeting firms' short-term capital needs by offering various services, including the monitoring and collection of receivables, guaranteeing, providing financing, conducting market research, and offering credit intelligence.

Klapper (2006) examined the provision of factoring services in 48 countries during the period 1993-2003. According to the findings of the study, empirically, factoring services are becoming more widespread in economically developed countries. The increasing number of customers and accounts receivable in growing economies also

contributes to the growing demand for factoring services. Klapper further emphasized the asymmetric information problem, stating that low information asymmetry positively influences the provision of factoring services.

In her 2012 study, Janekova examined the global factoring sector. According to the findings of the study, awareness of the factoring sector is steadily increasing. Factoring stands out as a significant alternative funding source for companies. Despite some disadvantages (for example, cost, the impracticality of applying factoring in high-risk countries, etc.), small, medium, or multinational companies are turning to factoring transactions to enhance efficiency and simplify operations.

In their study, Kaur & Dhaliwal (2014) conducted research on the factoring sector in India, specifically focusing on Canbank Factors and SBI Global Factors for the period from 2005-06 to 2010-11. The performance criteria in the research comprised ratios reflecting profitability, expenditures, and similar indicators. According to the results of the analyses, Canbank Factors demonstrated better financial performance than SBI Global Factors in terms of operating income, net profit margin, return on equity, and return on assets criteria. Moreover, Canbank Factors outperformed SBI Global Factors in terms of earnings per share, equity dividend coverage ratio, and earnings per share dividend ratio. Additionally, during the study period, Canbank Factors exhibited higher operating income and profitability compared to SBI Global Factors.

In their study, Ece & Özdemir (2011) conducted a comparative analysis of the changes in stock prices, EVA (Economic Value Added), and TOPSIS scores for seven factoring and financial leasing companies listed on the Istanbul Stock Exchange (now known as Borsa Istanbul) for the period 2005-2010. In the TOPSIS method, criteria such as debt ratio, leverage ratio, current assets turnover ratio, fixed assets turnover ratio, net profit margin ratio, return on equity ratio, and current ratio were preferred. The criteria were weighted according to the subjective weighting method. According to the results of the analyses, the changes in stock prices moved in parallel with the EVA and TOPSIS performance criteria.

In their study, Bağcı & Esmer (2016) analyzed the financial performance of eight factoring companies listed on Borsa Istanbul for the period 2009-2015 using the PROMETHEE method. The selected criteria in the study included factoring receivables, factoring income, non-performing receivables, factoring debts, and net period profit/loss, with equal weighting for each criterion. According to the analysis results, the company exhibiting the top financial performance during the specified period was Lider Factoring Company.

Değer & Başdar (2017) analyzed the financial performance of six factoring companies listed on Borsa Istanbul in 2016 using the TOPSIS and ELECTRE techniques. In the research, the evaluation criteria chosen to represent financial performance encompassed metrics such as current ratio, leverage ratio, earnings per share, return on equity, asset profitability, and total assets turnover. The weights of these criteria were determined based on expert opinions in the industry and relevant literature. As a result of the evaluations conducted, it has been determined that YapıKredi Factoring Company exhibited the best financial performance in the year 2016.

In their study, Özbek & Erol (2017) analyzed the financial performance of seven factoring companies listed on Borsa Istanbul for the period 2013-2016 using the ARAS and COPRAS methods. The criterion weights were determined using the equal weighting method in the study. According to the analysis results, the most successful company was Garanti Factoring Company, while Sümer Factoring Company ranked last. Additionally, the findings obtained from both methods were nearly identical. The first three companies and the last two companies were ranked in the same order in both methods throughout all years.

In Gürol's study (2018), a financial performance analysis was conducted in the Factoring, Financial Leasing, and Financing Industries for the period 2014-2016 using the TOPSIS method. The criteria were weighted according to the equal weighting method.

According to the analyses conducted, the most successful year for the factoring and financial leasing sector was 2016, while for financing companies, it was 2015. Within these sectors, the financial leasing sector was identified as the most stable sector in terms of financial performance.

In their study, Özçelik & Küçükçakal (2019) examined the financial performance of seven financial leasing and factoring companies listed on Borsa Istanbul for the period 2016-2019 using the TOPSIS method. Criteria such as earnings per share, asset turnover ratio, leverage ratio, asset profitability, return on equity, and current ratio were preferred in the study. According to the results of the analysis, the companies that exhibited the most successful financial performance during the specified period were Creditwest Factoring, Şeker Financial Leasing, and Garanti Factoring Company.

In their study, Gör & Bilici (2021) examined the factoring sector in Türkiye for the period 2008-2020. The authors initially conducted a general assessment of the sector using profitability ratios, asset size, and various leading indicators. Subsequently, they evaluated the financial success of the factoring sector using the Diakomihalis Z Score Method. According to the Z score results, the factoring sector in Türkiye has been successful in terms of financial performance throughout the years 2008-2020.

In the study conducted by Gülcan (2022) for the period 2016-2020, the performance evaluation of 6 factoring and financial leasing companies listed on Borsa Istanbul was carried out using the VIKOR method. The importance weights of the criteria were determined as 20% for asset profitability and equity profitability and 10% for other criteria. According to the analyses, Lider Factoring exhibited the best financial performance in the years 2016-2019, while Creditwest Factoring Company demonstrated the highest financial performance in 2020.

In the study conducted by Ova (2022), the financial performances of factoring companies in Türkiye were examined using the TOPSIS method for the period 2017-2019. The criteria were equally weighted. According to the analysis results, among the top 10 factoring companies, the number of small firms is higher compared to large firms.

Karakaş & Gün (2023) conducted an analysis of the financial performance of eight companies in the financial leasing and factoring sector, covering the period from 2010 to 2019, by using their financial statements, which were continuously accessible. The financial performance criteria employed in the study included current ratio, asset turnover, leverage ratio, earnings per share, asset profitability ratio, and return on equity. The equal weighting method was preferred for determining the weights of the criteria in the study. According to the results of the analysis, the financial performance of factoring and financial leasing companies varies over time. However, it was generally observed that Creditwest Factoring Company, Yapı Kredi Financial Leasing Company, and Lider Factoring Company exhibited the best financial performance between 2010 and 2019.

When the literature review is generally evaluated, it is observed that the literature on the factoring sector is quite limited. A similar situation exists in Türkiye. However, there has been a slight increase in the number of studies on the factoring sector in Türkiye recently. In many of these studies, the focus has typically been on factoring companies traded on the stock exchange. In some studies, factoring companies have been examined together with financial leasing and financing companies. Additionally, in the conducted financial performance analyses, there has generally been a concentration on the same methods. Only one study (Ova, 2022) has been found that specifically addresses the entire sector by focusing solely on the factoring sector. Therefore, this study aims to evaluate the financial performance of all factoring companies operating in Türkiye for the 2021-2022 period using different and emerging methodologies with more up-to-date data.

4. Methodology

4.1 Data Set

In this part of the study, it's aims to investigate the financial performance of factoring companies operating in Türkiye in the 2021-2022 periods. As of the end of 2022, there are 49 companies operating in the factoring sector in Türkiye. To evaluate the financial performance of these companies, research criteria have been determined in the light of the relevant literature and are presented in Table 3. A data set was created with the data of 47 companies whose data regarding these determined criteria were accessible. These analyzed companies are included in Table 2. The data used in the study was compiled by examining the financial statements, audit and activity reports of each factoring company separately.

Table 2. Factoring Companies Examined within the Scope of the Study

Alternative	Factoring Companies	Alternative	Factoring Companies
A1	ABC	A25	İŞ
A2	ACAR	A26	KAPITAL
A3	AK	A27	KENT FINANS
A4	AKDENİZ	A28	LİDER
A5	AKIN	A29	MERT FINANS
A6	ANADOLU	A30	MNG
A7	ARENA FINANS	A31	OPTİMA
A8	ATILIM	A32	PARAFİNANS
A9	BAŞER	A33	QNB FINANS
A10	BAYRAMOĞLU	A34	SÜMER
A11	BİEN FINANS	A35	ŞEKER
A12	CREDITWEST	A36	ŞİRİNOĞLU
A13	ÇAĞDAŞ	A37	TAM FINANS
A14	DENİZ	A38	TEB
A15	DESTEK FINANS	A39	TRADEWING
A16	DORUK	A40	TUNA
A17	EKO	A41	ULUSAL
A18	EKSPO	A42	VAKIF
A19	FİBA	A43	VDF
A20	GARANTİ	A44	YAPI KREDİ
A21	GSD	A45	YAŞAR
A22	HALK	A46	YEDİTEPE
A23	HUZUR	A47	ZORLU
A24	İSTANBUL		

Table 3 includes the criteria and their explanations determined in the light of the relevant literature.

Table 3. Information Regarding the Criteria Used in the Analysis

Criteria	Calculation Method	Direction	Reference Studies
TAK	Non-Performing Receivables/ Total Factoring Receivables (Gross)	Minimum	Ova (2022)
KAL	Total Liabilities/Total Assets	Minimum	Ece & Özdemir (2011), Değer & Başdar (2017); Özçelik & Küçükçakal (2019), Gülcan (2022)
ROA	Net Income/Total Assets	Maximum	Kaur & Dhaliwal (2014), Değer & Başdar (2017); Selimler & Taş (2019), Ova (2022), Gülcan (2022)
ROE	Net Income/Equity	Maximum	Ece & Özdemir (2011), Kaur & Dhaliwal (2014); Değer & Başdar (2017), Selimler & Taş (2019), Özçelik & Küçükçakal (2019), Ova (2022), Gülcan (2022)
EGG	Operating Revenues/Operating Expenses	Maximum	Gülcan (2022)
FAÖ	Factoring Receivables/Equity	Maximum	Gülcan (2022)

4.2. Research Methods

Multi Attributive Ideal-Real Comparative Analysis (MAIRCA) and Multi-Attributive Border Approximation Area Comparison (MABAC) methods, which are among the most up-to-date Multi-Criteria Decision-Making Methods, were preferred to investigate the financial performance of factoring companies with the created data set. In the literature research, it was seen that there were differences in the criterion weighting point. Based on this, it is thought that the performance ranking may change if the importance weights of the criteria differ. To reveal the changes that may occur, the criteria are first weighted using the equal weighting method, and analyses are carried out using the MAIRCA and MABAC methods for 2021 and 2022. Then, the criteria are weighted with the Criteria Importance through Intercriteria Correlation (CRITIC) method, which is one of the objective decision-making techniques, and the analyses are carried out again with the MAIRCA and MABAC methods.

4.2.1. CRITIC Method

This method was developed by Diakoulaki et al. (1995) to objectively weigh the criteria in Multi-Criteria Decision Analysis (MCDA) methods where numerous criteria exist, ensuring objectivity in the weighting process. The method consists of five stages, as outlined below (Diakoulaki et al., 1995; Ayçin, 2020).

Step 1: Formation of the Decision Matrix

In the first stage, a decision matrix denoted by X and consisting of x_{ij} values is created, following Equation 1.1.

$$X = \begin{matrix} A_1 & \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \dots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \\ A_2 \\ \vdots \\ A_m \end{matrix} \tag{1.1}$$

Step 2: Normalization of the Decision Matrix

Benefit type criteria are normalized following Equation 1.2, and cost type criteria are normalized following equation 1.3.

$$R_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}} \quad \dots \quad j=1,2,\dots, n \tag{1.2}$$

$$R_{ij} = \frac{x_j^{max} - x_{ij}}{x_j^{max} - x_j^{min}} \quad \dots \quad j=1,2,\dots, n \tag{1.3}$$

Step 3: Formation of the Correlation Coefficient Matrix

Linear relationship coefficients (p_{jk}) are calculated following equation 1.4 to measure the degree of relationships between criteria, and a correlation coefficient matrix is formed.

$$P_{jk} = \frac{\sum_{i=1}^m (r_{ij} - \bar{r}_j) \cdot (r_{ik} - \bar{r}_k)}{\sqrt{\sum_{i=1}^m (r_{ij} - \bar{r}_j)^2 \cdot (r_{ik} - \bar{r}_k)^2}} \tag{1.4}$$

Step 4: Computation of C_j Values

In this method, the information in MCDA problems aims to be derived from the contrast intensity and conflicts present in the evaluation criteria. Therefore, values of C_j , which represent the total information in the j-th criterion by combining these features, are calculated following Equation 1.5 and Equation 1.6.

$$C_j = \sigma_j \cdot \sum_{k=1}^n (1 - p_{jk}) \quad j=1,2,\dots, n \tag{1.5}$$

$$\sigma_j = \sqrt{\frac{\sum_{i=1}^m (r_{ij} - \bar{r}_j)^2}{m-1}} \tag{1.6}$$

Step 5: Computation of Criterion Weights

In the fifth and final stage of the CRITIC method, criterion weights (W_j) are calculated following Equation 1.7.

$$W_j = \frac{c_j}{\sum_{k=1}^n c_k} \tag{1.7}$$

4.2.2. MAIRCA Method

The MAIRCA method, developed by Gigović et al., is a technique designed to characterize gaps between ideal and empirical rankings. In this method, the gaps for each criterion are aggregated, resulting in total gap values for decision alternatives. Following the application, the alternative with the lowest gap value is considered the best alternative. The stages of the method are as follows (Gigović et al., 2016; Pamucar et al.2018; Ayçin, 2020; Kahramani Koç, 2023);

Step 1: Creates a Decision Matrix

The criterion (C_j) values obtained from each alternative (A_i) are presented in Equation 2.1.

$$X = \begin{matrix} & C_1 & C_2 & \dots & C_n \\ \begin{matrix} A_1 \\ A_2 \\ \vdots \\ A_m \end{matrix} & \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \dots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix} \end{matrix} \tag{2.1}$$

Step 2: Determination of Preferences for Alternatives

There is no inherent preference among alternatives for the decision-maker. P_{Ai} is calculated following Equation 2.2 to indicate the preference of each alternative i, where m represents the total number of alternatives.

$$P_{Ai} = \frac{1}{m} ; \sum_{i=1}^m P_{Ai} = 1 \quad i = 1, 2, \dots, m \tag{2.2}$$

As seen in Equation 2.3, it is neutral for decision-makers concerning alternatives and equidistant from all alternatives.

$$P_{A1} = P_{A2} = \dots = P_{Am} \tag{2.3}$$

Step 3: The Calculations of Theoretical Evaluation Matrix Elements

As demonstrated in Equation 2.4, the elements of the matrix (tpij) are obtained by multiplying the weights of criteria with the priorities of alternatives (P_{Ai}).

$$T_p = \begin{bmatrix} P_{A1} \cdot W_1 & P_{A1} \cdot W_2 & \dots & P_{A1} \cdot W_n \\ P_{A2} \cdot W_1 & P_{A2} \cdot W_2 & \dots & P_{A2} \cdot W_n \\ \vdots & \vdots & \ddots & \vdots \\ P_{Am} \cdot W_1 & P_{Am} \cdot W_2 & \dots & P_{Am} \cdot W_n \end{bmatrix} \tag{2.4}$$

Step 4: Creates a Real Evaluation Matrix

In this stage, the real evaluation matrix (Tr) is calculated using the initial decision matrix, following Equation 2.5 (for benefit type criteria) and Equation 2.6 (for cost type criteria).

$$T_{rij} = t_{pij} \cdot \left(\frac{x_{ij} - x_{ij}^-}{x_{ij}^+ - x_{ij}^-} \right) \tag{2.5}$$

$$T_{rij} = T_{pij} \cdot \left(\frac{x_{ij} - x_{ij}^+}{x_{ij}^- - x_{ij}^+} \right) \tag{2.6}$$

Where, x_{ij}^+ denotes the maximum value that the criterion receives from the alternatives, while x_{ij}^- denotes the minimum value that the criterion takes. The calculated decision matrix is shown in Equation 2.7 as a result of the computations

$$Tr = \begin{bmatrix} Tr_{11} & Tr_{12} & \dots & Tr_{1n} \\ Tr_{21} & Tr_{22} & \dots & Tr_{2n} \\ \vdots & \vdots & \dots & \vdots \\ Tr_{m1} & Tr_{m2} & \dots & Tr_{mn} \end{bmatrix} \tag{2.7}$$

Step 5: Creates a Total Gap Matrix

The Total Gap Matrix (G) is obtained, as shown in Equation 2.9, by taking the difference between the theoretical evaluation matrix (Tp) and the real evaluation matrix (Tr) with the help of Equation 2.8.

$$G_{ij} = t_{pij} - t_{rij} \quad g_{ij} \in [0, \infty) \tag{2.8}$$

$$G = Tp - Tr = \begin{bmatrix} G_{11} & G_{12} & \dots & G_{1n} \\ G_{21} & G_{22} & \dots & G_{2n} \\ \vdots & \vdots & \dots & \vdots \\ G_{m1} & G_{m2} & \dots & G_{mn} \end{bmatrix} \tag{2.9}$$

Step 6: Identification of Total Gap with Alternatives

As a result of the computations, if the theoretical ranking (tpij) of an alternative for a criterion (Cj) is equal or different from zero, the gap is zero (Gij=0). In such a case, when the theoretical ranking for a criterion (Cj) and an alternative (Ai) is equal, it is emphasized that the relevant criterion (Cj) designates the alternative (Ai) as the ideal alternative (Ai+). However, if the theoretical ranking (tpij) and the actual ranking (trij) are both zero for a criterion (Cj) and an alternative (Ai), the gap degree will also be zero (tpij = trij = gij = 0). In the presence of such a situation, it is emphasized that the relevant criterion (Cj) designates the alternative (Ai) as the worst (anti-ideal) alternative (Ai-) (Ayçin, 2020; Kahramani Koç, 2023).

Step 7: The Calculation of the Final Values of the Criteria Functions (Qi) for the Alternatives

As seen in Equation 2.10, the final values of criterion functions (Qi) are obtained by summing the gaps (gij) with alternatives.

$$Q_i = \sum_{j=1}^n g_{ij} , i = 1, 2, \dots ,m \tag{2.10}$$

4.2.3. MABAC Method

This method, developed by Pamučar and Ćirović, evaluates decision alternatives by taking into account the distances of the decision alternatives to the boundary approach area of criterion functions. The process consists of a total of 7 stages, as outlined below (Pamučar & Ćirović, 2015; Ulutaş, 2019; KahramaniKoç, 2023).

Step 1: Creates a Decision Matrix

In the first stage of this method, a decision matrix is created, consisting of m alternatives and n criteria, following Equation 3.1.

$$X = \begin{bmatrix} x_{11} & x_{12} & \dots & x_{1n} \\ x_{21} & x_{22} & \dots & x_{2n} \\ \vdots & \vdots & \dots & \vdots \\ x_{m1} & x_{m2} & \dots & x_{mn} \end{bmatrix}; 1, \dots, m \text{ and } j = 1, \dots, n \tag{3.1}$$

Step 2: Normalization of the Decision Matrix

In this stage, criteria are normalized following Equation 3.2 for benefit type criteria and Equation 3.3 for cost type criteria.

$$D_{ij} = \frac{x_{ij} - x_j^{min}}{x_j^{max} - x_j^{min}} \tag{3.2}$$

$$D_{ij} = \frac{x_{ij} - x_j^{\max}}{x_j^{\min} - x_j^{\max}} \quad (3.3)$$

Step 3: Weighting of the Decision Matrix

In this stage, a weighted decision matrix is formed following Equation 3.4.

$$B_{ij} = W_j * (1 + D_{ij}) \quad (3.4)$$

Step 4: Determining the Border Approximation Area Matrix

The border approximation area for each criterion is determined according to the Equation 3.5.

$$G_{ij} = \left(\prod_{i=1}^m B_{ij} \right)^{1/m} \quad (3.5)$$

After calculating the g_i value for each criterion, a border approximation matrix is created in the format of $n \times 1$.

$$G: [g_i] 1 \times n \quad (3.6)$$

Step 5: Calculation of the Distance of the Alternative from the Border Approximation Area for the Matrix

In this stage, distances from the border approximation areas for all criteria are determined, and the Q matrix is formed following Equation 3.7.

$$Q = B - G = \begin{bmatrix} B_{11} - g_1 & B_{12} - g_2 & \dots & B_{1n} - g_n \\ B_{21} - g_1 & B_{22} - g_2 & \dots & B_{2n} - g_n \\ \dots & \dots & \dots & \dots \\ B_{m1} - g_1 & B_{m2} - g_2 & \dots & B_{mn} - g_n \end{bmatrix} = \begin{bmatrix} q_{11} & q_{12} & \dots & q_{1n} \\ q_{21} & q_{22} & \dots & q_{2n} \\ \dots & \dots & \dots & \dots \\ q_{m1} & q_{m2} & \dots & q_{mn} \end{bmatrix} \quad (3.7)$$

Step 6: Determination of Positions of Decision Alternatives According to the Border Approximation Area

In this stage, positions of decision alternatives according to the border approximation area are determined following Equation 3.8

$$A_i \in \begin{cases} G^+ \text{ if } q_{ij} > 0 \\ G \text{ if } q_{ij} = 0 \\ G^- \text{ if } q_{ij} < 0 \end{cases} \quad (3.8)$$

To identify the best alternative, it is necessary to have the values of criteria in the upper approximate area.

Step 6: Ranking of Decision Alternatives

In this stage, S_i values are obtained for each alternative by summing the distances (q_{ij}) to the approximate area following Equation 3.9. The alternative with the highest S_i value is determined as the best alternative.

$$S_i = \sum_{j=1}^n q_{ij} \quad (3.9)$$

5. Application and Analysis

In this section of the study, the financial performances of companies in the Turkish factoring sector are analyzed using MCDA methods for the years 2021-2022. As outlined in the study design, the weights of study criteria for the years 2021 and 2022 were initially calculated using the CRITIC method. Upon completion of the criterion weighting process, the performance ranking was first conducted for the years 2021 and 2022 using the MAIRCA method. Subsequently, the same process was replicated with the MABAC method to check whether methodological differences led to a change in the performance ranking. Following this, the criterion weighting method was altered, and the analyses were revisited by weighting the criteria using the equal weighting method. Altering both

the weighting and ranking methods in the analyses allows testing the consistency of the findings and facilitates a comparison of the results.

5.1. Determination of Criterion Weights Using the CRITIC Method

The first step of the CRITIC method involves creating the decision matrix, following Equation 1.1. In this context, the decision matrices established for the years 2021 and 2022 are presented in Table 4.

Table 4. Initial Decision Matrix¹

		2021				
Criteria	TAK	KAL	ROA	ROE	EGG	FAÖ
A/Direct.	Min.	Min.	Max.	Max.	Max.	Max.
A1	0.036	0.586	0.104	0.251	3.362	2.201
A2	0.433	0.049	0.018	0.019	1.402	0.596
A3	0.112	0.829	0.009	0.055	11.418	5.023
A4	0.106	0.726	0.042	0.152	10.844	2.606
A5	0.133	0.662	0.046	0.137	8.104	2.812
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.002	0.548	0.019	0.042	6.826	2.099
		2022				
Criteria	TAK	KAL	ROA	ROE	EGG	FAÖ
A/Direct.	Min.	Min.	Max.	Max.	Max.	Max.
A1	0.058	0.585	0.161	0.388	3.847	2.238
A2	0.220	0.091	0.071	0.078	1.458	0.633
A3	0.008	0.877	0.040	0.330	14.484	7.067
A4	0.106	0.717	0.090	0.318	12.370	2.491
A5	0.068	0.710	0.088	0.303	9.319	3.351
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.002	0.517	0.051	0.105	6.127	1.834

The second step involves creating a normalized decision matrix, emphasizing the benefit-cost orientation of the criteria, following Equations 1.2 and 1.3. The normalized decision matrix for the years 2021 and 2022 is presented in Table 5.

Table 5. Normalized Decision Matrix

		2021				
Criteria	TAK	KAL	ROA	ROE	EGG	FAÖ
A/Direction	Min.	Min.	Max.	Max.	Max.	Max.
A1	0.986	0.388	0.586	0.423	0.128	0.108
A2	0.825	0.964	0.076	0.000	0.043	0.022
A3	0.955	0.128	0.025	0.067	0.481	0.261
A4	0.957	0.239	0.218	0.244	0.456	0.130
A5	0.946	0.307	0.246	0.216	0.336	0.141
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.999	0.429	0.082	0.042	0.280	0.103
		2022				
Criteria	TAK	KAL	ROA	ROE	EGG	FAÖ
A/Direction	Min.	Min.	Max.	Max.	Max.	Max.
A1	0.987	0.425	0.794	0.706	0.073	0.112
A2	0.952	1.000	0.315	0.107	0.014	0.030
A3	0.998	0.084	0.153	0.595	0.338	0.359
A4	0.977	0.271	0.417	0.572	0.285	0.125
A5	0.985	0.280	0.407	0.543	0.209	0.169
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	1.000	0.504	0.207	0.159	0.130	0.091

¹The analysis covers a total of 47 alternatives and calculations are made for all alternatives. However, this table and all subsequent tables include a portion of this data to prevent the tables from becoming excessively long.

In the third step, the relationship coefficient matrix, consisting of linear relationship coefficients (q_{jk}), is created following Equation 1.4. The relationship coefficient matrices for the criteria in 2021 and 2022 are presented in Table 6.

Table 6. Correlation Matrix of Criteria

		2021					
	TAK	KAL	ROA	ROE	EGG	FAÖ	
TAK	1.0000	-0.3917	-0.3947	0.0060	0.1513	0.2225	
KAL	-0.3917	1.0000	0.6589	-0.2430	-0.4725	-0.7215	
ROA	-0.3947	0.6589	1.0000	0.3724	-0.2820	-0.5159	
ROE	0.0060	-0.2430	0.3724	1.0000	0.1784	0.2863	
EGG	0.1513	-0.4725	-0.2820	0.1784	1.0000	0.4852	
FAÖ	0.2225	-0.7215	-0.5159	0.2863	0.4852	1.0000	
		2022					
	TAK	KAL	ROA	ROE	EGG	FAÖ	
TAK	1.0000	-0.4575	0.0824	0.2710	0.1499	0.2025	
KAL	-0.4575	1.0000	0.5089	-0.5772	-0.3205	-0.7387	
ROA	0.0824	0.5089	1.0000	0.1709	-0.0667	-0.4343	
ROE	0.2710	-0.5772	0.1709	1.0000	0.4298	0.6701	
EGG	0.1499	-0.3205	-0.0667	0.4298	1.0000	0.5512	
FAÖ	0.2025	-0.7387	-0.4343	0.6701	0.5512	1.0000	

In the fourth step, values for C_j are calculated for each criterion following Equations 1.5 and 1.6. The C_j values for the years 2021 and 2022 are presented in Table 7.

Table 7. C_j Values

		2021					
	TAK	KAL	ROA	ROE	EGG	FAÖ	
C_j	0.7891	1.6040	1.3270	0.8113	1.0217	1.1024	
		2022					
	TAK	KAL	ROA	ROE	EGG	FAÖ	
C_j	0.6904	1.6078	1.0973	1.1375	0.7872	1.1742	

In the final step of the CRITIC method, the importance weight of each criterion is calculated following Equation 1.7. The importance weights (W_j) for the respective criteria for the years 2021 and 2022 are presented in Table 8.

Table 8. Importance Weights of Criteria

		2021					
	TAK	KAL	ROA	ROE	EGG	FAÖ	
W_j	0.1186	0.241	0.1994	0.1219	0.1535	0.1656	
		2022					
	TAK	KAL	ROA	ROE	EGG	FAÖ	
W_j	0.1063	0.2476	0.169	0.1752	0.1212	0.1808	

5.2. Performance Evaluation of Factoring Companies Using the MAIRCA Method Based on the CRITIC Weighting Method

In this section of the study, the financial performances of factoring companies operating in Türkiye in 2021 and 2022 are analyzed using the MAIRCA method with the criterion weights calculated by the CRITIC method, and a performance ranking is established in the factoring sector.

As shown in Equation 2.1, the first step of the MAIRCA method involves creating the initial decision matrix. The decision matrix is presented in Table 4. In the second step, the preferences of alternatives are calculated using Equation 2.2 to determine the PAI. Since the decision-maker is neutral towards all alternatives, P_{Ai} is calculated as $\frac{1}{47} = 0.0212766$.

In the third step, following Equation 2.4, the theoretical ranking matrix is created. This matrix is presented in Table 9.

Table 9. Theoretical Evaluation Matrix

2021						
Direct.	Min.	Min.	Max.	Max.	Max.	Max.
W	0.1186	0.2410	0.1994	0.1219	0.1535	0.1656
	TAK	KAL	ROA	ROE	EGG	FAO
A1	0.0025	0.0051	0.0042	0.0026	0.0033	0.0035
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.0025	0.0051	0.0042	0.0026	0.0033	0.0035
2022						
Direct.	Min.	Min.	Max.	Max.	Max.	Max.
W	0.1063	0.2476	0.1690	0.1752	0.1212	0.1808
	TAK	KAL	ROA	ROE	EGG	FAO
A1	0.0023	0.0053	0.0036	0.0037	0.0026	0.0038
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.0023	0.0053	0.0036	0.0037	0.0026	0.0038

In the fourth step, considering the benefit-cost directions of the criteria and following Equations 2.5 and 2.6, the real evaluation matrix is created. This matrix is presented in Table 10.

Table 10. Real Evaluation Matrix

2021						
	TAK	KAL	ROA	ROE	EGG	FAO
A1	0.00249	0.00199	0.00249	0.00110	0.00042	0.00038
A2	0.00208	0.00494	0.00032	0.00000	0.00014	0.00008
A3	0.00241	0.00066	0.00011	0.00017	0.00157	0.00092
A4	0.00242	0.00122	0.00092	0.00063	0.00149	0.00046
A5	0.00239	0.00158	0.00104	0.00056	0.00110	0.00050
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.00252	0.00220	0.00035	0.00011	0.00091	0.00036
2022						
	TAK	KAL	ROA	ROE	EGG	FAO
A1	0.00223	0.00224	0.00285	0.00263	0.00019	0.00043
A2	0.00215	0.00527	0.00113	0.00040	0.00004	0.00011
A3	0.00226	0.00044	0.00055	0.00222	0.00087	0.00138
A4	0.00221	0.00143	0.00150	0.00213	0.00074	0.00048
A5	0.00223	0.00147	0.00146	0.00202	0.00054	0.00065
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.00226	0.00266	0.00075	0.00059	0.00034	0.00035

In the fifth step, following Equations 2.8 and 2.9, the total gap matrix is calculated. This matrix is created by taking the difference between the theoretical and real evaluation matrices and is presented in Table 11.

Table 11. Total Gap Matrix

2021						
	TAK	KAL	ROA	ROE	EGG	FAO
A1	0.00004	0.00314	0.00175	0.00150	0.00285	0.00314
A2	0.00044	0.00018	0.00392	0.00259	0.00313	0.00345
A3	0.00011	0.00447	0.00413	0.00242	0.00169	0.00260
A4	0.00011	0.00390	0.00332	0.00196	0.00178	0.00306
A5	0.00014	0.00355	0.00320	0.00203	0.00217	0.00303
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.00000	0.00293	0.00389	0.00248	0.00235	0.00316
2022						
	TAK	KAL	ROA	ROE	EGG	FAO
A1	0.00003	0.00303	0.00074	0.00109	0.00239	0.00342
A2	0.00011	0.00000	0.00246	0.00333	0.00254	0.00373
A3	0.00000	0.00482	0.00304	0.00151	0.00171	0.00247
A4	0.00005	0.00384	0.00210	0.00159	0.00184	0.00337
A5	0.00003	0.00379	0.00213	0.00170	0.00204	0.00320
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.00000	0.00261	0.00285	0.00313	0.00224	0.00350

In the seventh and final step of the MAIRCA method, following Equation 2.10, the function values (Q) of the criteria are calculated. These values are then ranked from small to large, determining the ranking of alternatives. The function values and rankings of the criteria are presented in Table 12.

Table 12. Alternative Ranking According to MAIRCA.

2021			2022		
Alternative	Q	Rank	Alternative	Q	Rank
A36	0.009787	1	A29	0.009079	1
A39	0.010148	2	A42	0.009105	2
A29	0.010783	3	A24	0.009253	3
A26	0.010798	4	A36	0.009756	4
A11	0.011073	5	A33	0.010691	5
⋮	⋮	⋮	⋮	⋮	⋮
A23	0.016286	47	A35	0.016644	47

5.3. Performance Evaluation of Factoring Companies Using the MABAC Method Based on the CRITIC Weighting Method

In this section of the study, the financial performances of factoring companies operating in Türkiye in 2021 and 2022 are analyzed using the MAIRCA method with the criterion weights calculated by the CRITIC method, and a performance ranking is established in the factoring sector.

As seen in Equation 2.1, the first step of the MAIRCA method involves creating the initial decision matrix. The decision matrix is presented in Table 4 above. In the second step, considering the benefit-cost directions of the criteria and following Equations 3.2 and 3.3, the normalized decision matrix is created. This normalized decision matrix is presented in Table 13.

Table 13. Normalized Decision Matrix

2021						
Xij+	2.475	0.948	0.173	0.567	23.269	18.689
Xij-	-2.475	-0.933	-0.168	-0.548	-22.840	-18.492
Direct.	Min.	Min.	Max.	Max.	Max.	Max.
W	0.119	0.241	0.199	0.122	0.154	0.166
	TAK	KAL	ROA	ROE	EGG	FAÖ
A1	0.986	0.388	0.586	0.423	0.128	0.108
A2	0.825	0.964	0.076	0.000	0.043	0.022
A3	0.955	0.128	0.025	0.067	0.481	0.261
A4	0.957	0.239	0.218	0.244	0.456	0.130
A5	0.946	0.307	0.246	0.216	0.336	0.141
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.999	0.429	0.082	0.042	0.280	0.103
2022						
Xij+	4.559	0.950	0.200	0.539	41.058	19.589
Xij-	0.000	0.091	0.012	0.023	0.911	0.057
Direct.	Min.	Min.	Max.	Max.	Max.	Max.
W	0.106	0.248	0.169	0.175	0.121	0.181
	TAK	KAL	ROA	ROE	EGG	FAÖ
A1	0.987	0.425	0.794	0.706	0.073	0.112
A2	0.952	1.000	0.315	0.107	0.014	0.030
A3	0.998	0.084	0.153	0.595	0.338	0.359
A4	0.977	0.271	0.417	0.572	0.285	0.125
A5	0.985	0.280	0.407	0.543	0.209	0.169
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	1.000	0.504	0.207	0.159	0.130	0.091

In the third step, following Equation 3.4, the criterion weights calculated in the CRITIC method are multiplied by the values of the normalized decision matrix, resulting

in a weighted normalized decision matrix. The weighted normalized decision matrix is presented in Table 14.

Table 14. Weighted Normalized Decision Matrix

		2021				
W	0.1186	0.2410	0.1994	0.1219	0.1535	0.1656
	TAK	KAL	ROA	ROE	EGG	FAÖ
A1	0.2354	0.3345	0.3163	0.1735	0.1732	0.1836
A2	0.2164	0.4733	0.2145	0.1219	0.1601	0.1692
A3	0.2318	0.2718	0.2044	0.1300	0.2274	0.2089
A4	0.2321	0.2985	0.2428	0.1516	0.2235	0.1872
A5	0.2308	0.3151	0.2483	0.1482	0.2051	0.1891
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.2370	0.3445	0.2158	0.1271	0.1965	0.1827
		2022				
W	0.1063	0.2476	0.1690	0.1752	0.1212	0.1808
	TAK	KAL	ROA	ROE	EGG	FAÖ
A1	0.2113	0.3527	0.3030	0.2989	0.1301	0.2010
A2	0.2075	0.4951	0.2222	0.1938	0.1229	0.1861
A3	0.2124	0.2685	0.1949	0.2794	0.1622	0.2457
A4	0.2101	0.3147	0.2394	0.2754	0.1558	0.2033
A5	0.2110	0.3169	0.2377	0.2703	0.1466	0.2113
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.2126	0.3724	0.2040	0.2030	0.1370	0.1973

In the next step, following Equations 3.5 border approximation area matrix is created. The border approximation area matrix is presented in Table 15.

Table 15. Border Approximation Area Matrix

2021	<i>Gi</i>	2.75E-32	1.23E-12	5.77E-31	1.45E-40	3.86E-36	6.38E-35
2022	<i>Gi</i>	2.21E-34	1.48E-26	1.38E-34	2.98E-30	5.06E-42	2.22E-32

In the next step, Equation 3.7 is followed to calculate the difference between the elements of the weighted decision matrix and the border approximation area matrix. This calculation results in the distances of each criterion from the border approximation area. Distances to the border approximation area are presented in Table 16.

Table 16. Distances to the Border Approximation Area

		2021				
	TAK	KAL	ROA	ROE	EGG	FAÖ
A1	0.23543	0.33451	0.31630	0.17347	0.17323	0.18359
A2	0.21637	0.47331	0.21448	0.12190	0.16005	0.16921
A3	0.23178	0.27183	0.20445	0.13001	0.22738	0.20886
A4	0.23207	0.29850	0.24285	0.15162	0.22352	0.18721
A5	0.23077	0.31505	0.24835	0.14825	0.20510	0.18906
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.23703	0.34445	0.21575	0.12705	0.19651	0.18267
		2022				
	TAK	KAL	ROA	ROE	EGG	FAÖ
A1	0.21128	0.35271	0.30305	0.29890	0.13007	0.20099
A2	0.20750	0.49514	0.22221	0.19385	0.12286	0.18614
A3	0.21245	0.26845	0.19485	0.27944	0.16218	0.24570
A4	0.21014	0.31465	0.23941	0.27539	0.15580	0.20334
A5	0.21103	0.31686	0.23770	0.27032	0.14659	0.21129
⋮	⋮	⋮	⋮	⋮	⋮	⋮
A47	0.21257	0.37236	0.20400	0.20297	0.13695	0.19726

In the final step of the MABAC method, Equation 3.9 is followed to calculate the final values (Si) for each evaluation criterion. These values are then ranked from highest to lowest, and the details of the performance ranking using the MABAC method are presented in Table 17.

Table 17. Rank of the Alternatives Using the MABAC Method.

2021			2022		
Alternative	Si	Rank	Alternative	Si	Rank
A36	154.001	1	A29	157.328	1
A39	152.303	2	A42	157.209	2
A29	149.321	3	A24	156.510	3
A26	149.251	4	A36	154.146	4
A11	147.955	5	A33	149.754	5
⋮	⋮	⋮	⋮	⋮	⋮
A23	123.454	47	A35	121.773	47

5.4. Performance Evaluation of Factoring Companies Using the MAIRCA and MABAC Method Based on the Equal Weighting Method

In the previous sections of the study, the importance weights of the criteria are determined sequentially using the CRITIC method, and then the performance evaluation is conducted using the MAIRCA and MABAC methods. In this section, another criterion weighting method, Equal Weighting Method, is used to renew the analyses with MAIRCA and MABAC methods. In this way, the potential impact of changes in criterion weights on performance ranking is examined, and the stability of the analysis findings is tested. In this regard, initially, the criteria of the study were evenly weighted ($1/6 = 0.1666$). Then, the steps of the MAIRCA method are followed sequentially to conduct the performance evaluation. The findings related to the MAIRCA method are presented in Table 18.

Table 18. Ranking of Alternatives Using the MAIRCA Method Based on Equal Weighting.

2021			2022		
Alternative	Q	Rank	Alternative	Q	Rank
A26	0.009992	1	A42	0.007315	1
A36	0.010089	2	A29	0.008541	2
A39	0.010403	3	A24	0.00934	3
A42	0.010461	4	A33	0.009508	4
A35	0.010953	5	A36	0.009894	5
⋮	⋮	⋮	⋮	⋮	⋮
A45	0.015943	47	A10	0.017683	47

After the performance evaluation using the MAIRCA method, the steps of the MABAC method are then followed sequentially to conduct the performance evaluation. The findings related to the MABAC method are presented in Table 19.

Table 19. Ranking of Alternatives Using the MABAC Method Based on Equal Weighting.

2021			2022		
Alternative	Si	Rank	Alternative	Si	Rank
A26	153.036	1	A42	165.618	1
A36	152.582	2	A29	159.855	2
A39	151.107	3	A24	156.104	3
A42	150.834	4	A33	155.313	4
A35	148.522	5	A36	153.498	5
⋮	⋮	⋮	⋮	⋮	⋮
A45	125.068	47	A10	116.888	47

5.5. Comparative Examination of Evaluation Results of the Methods

As previously mentioned, this study conducts a performance evaluation of factoring companies operating in the Turkish factoring sector for the 2021-2022 period. For this purpose, performance analyses were carried out using the Equal Weighting, CRITIC, MAIRCA, and MABAC methods with the created dataset. In the study, a total of 47 factoring companies were evaluated for their financial performance. However, interpreting the performance of all companies separately is quite challenging. Therefore, the research findings are interpreted based on the top-performing five companies. Detailed results for all examined companies (alternatives) within the scope of the study are available in Annex 1². Analysis results containing information about the top five companies for the years 2021 and 2022 are presented comparatively in Table 20.

Table 20. Final Performance Ranking of Factoring Companies

MAIRCA METHOD				
		2021	2022	
	Equal Weighting	CRITIC	Equal Weighting	CRITIC
1	Kapital	Şirinoğlu	Vakıf	Mert Finans
2	Şirinoğlu	Tradewing	Mert Finans	Vakıf
3	Tradewing	Mert Finans	İstanbul	İstanbul
4	Vakıf	Kapital	QNB Finans	Şirinoğlu
5	Şeker	BIEN Finans	Şirinoğlu	QNB Finans
MABAC METHOD				
		2021	2022	
	Equal Weighting	CRITIC	Equal Weighting	CRITIC
1	Kapital	Şirinoğlu	Vakıf	Mert Finans
2	Şirinoğlu	Tradewing	Mert Finans	Vakıf
3	Tradewing	Mert Finans	İstanbul	İstanbul
4	Vakıf	Kapital	QNB Finans	Şirinoğlu
5	Şeker	BIEN Finans	Şirinoğlu	QNB Finans

When examining Table 20, which presents findings related to the top five companies in the factoring sector for the years 2021-2022, the first striking observation is that the performance rankings obtained through the MAIRCA and MABAC methods remain unchanged even when weighting methods are altered. The fact that rankings did not change over both years, despite not experimenting with different evaluation methods, supports the robustness of the analysis findings. However, it is also observed that there are partial changes in performance rankings when criterion weighting methods are altered.

6. Conclusion and Evaluation

The factoring sector is a significant alternative financing method in the financial industry with its ability to convert trade receivables into cash, thereby alleviating liquidity constraints. When global factoring data are examined, the total volume of the sector worldwide is approximately 41,396,522 million dollars as of 2022. In Türkiye, this figure is around 25,688 million dollars. Türkiye's share in the global factoring sector volume increased from 0.57% in 2002 to 2.36% in 2010. However, since then, a significant decreasing trend has been observed, reaching 0.62% by the end of 2022. In the main development of the factoring sector in Türkiye, there was a period of negative growth from 2018 to 2021, but growth was achieved in 2022. During this period, the growth figures in the global factoring volume were also low, though not negative.

According to the year-end data for 2022, compared to the previous year, the profitability of the factoring sector in Türkiye has increased, with higher interest income, while non-performing loans and operating expenses have decreased. Therefore, it can be

²Detailed results for all companies (alternatives) examined within the scope of the study are included in Annex-1.

said that, in terms of efficiency, the sector had a more successful year compared to the previous one. However, when all the data is evaluated together, it can be argued that the factoring sector in Türkiye has deviated from the development trend it had achieved before 2010. Especially in developing countries like Türkiye, policymakers are recommended to make the necessary regulations to enable the sector to capture the development trend it had achieved in the past, considering its importance in meeting liquidity needs, particularly in sectors such as the industrial sector.

In terms of performance evaluation, according to the analysis results based on the CRITIC weighting method for the year 2021, the companies demonstrating the best financial performance are, respectively, Şirinoğlu, Tradewing Mert Finans, Kapital, and BIEN Finans Factoring companies. In analyses conducted through the Equal Weighting method, there is a variation in the ranking of the top five companies, replacing Mert Finans and Bien Finans with Vakıf and Şeker Factoring companies.

For the year 2022, according to the results of the performance evaluation based on the CRITIC weighting method, the companies demonstrating the best financial performance are, respectively, Mert Finans, Vakıf, İstanbul, and Şirinoğlu factoring companies. In analyses conducted through the Equal Weighting method, there are partial changes in the ranking of the top five companies; however, the top five companies with the best financial performance remain unchanged.

In the relevant period, Vakıf Factoring, being the largest company in terms of total assets, has successfully positioned itself among the most successful companies in both years. When the analysis findings are collectively evaluated, one of the significant observations is the success of factoring companies with lower total assets compared to bank-affiliated factoring companies in terms of financial performance. According to the analyses, except for Vakıf, Şeker, and QNB Finans, there are no bank-affiliated companies among the top five companies. This result is consistent with the findings reached by Bağcı & Esmer, 2016; Değer & Başdar, 2017; Gülcan, 2022, and Karakaş & Gün, 2023. In these studies, evidence has been obtained indicating that non-bank-affiliated and relatively small-scale factoring companies exhibit high financial performance compared to their counterparts. Based on the findings, it is recommended, especially for bank-affiliated and large-scale factoring companies, to take measures to enhance their performance. Researchers interested in the subject can investigate the factoring sector in Türkiye in the future using different criterion and different methods, considering scale distributions.

References

- Ayçin, E. (2020). Personel seçim sürecinde CRITIC ve MAIRCA yöntemlerinin kullanılması. *İşletme*, 1(1), 1-12.
- Bağcı, H. & Esmer, Y. (2016). PROMETHEE yöntemi ile faktoring şirketi seçimi. *Beykent Üniversitesi Sosyal Bilimler Dergisi*, 9(2), 116-129. <http://dx.doi.org/10.18221/bujss.14955>
- Banerjee, P. K. (2003). Performance evaluation of Indian factoring business: A study of SBI Factors and commercial services limited, and Canbank Factors Limited. *Vision: The Journal of Business Perspective*, 7(1), 55-68.
- Değer, A. & Başdar, C. (2017). A comparison of TOPSIS and ELECTRE methods: An application on the factoring industry. *Business and Economics Research Journal*, 8(3), 627-646. Doi: 10.20409/berj.2017.70.
- Diakoulaki, D., Mavrotas, G., & Papayannakis, L. (1995). Determining objective weights in multiple criteria problems: The Critic method. *Computers & Operations Research*, 22(7), 763-770.
- Ece, N. & Özdemir, F. (2011). Halka açık finansal kiralama ve faktoring şirketlerinin performans ölçümü ve analizinde kullanılan EVA ve TOPSİS yöntemlerinin hisse senedi değerleri ile karşılaştırmalı analizi. *Finans Politik & Ekonomik Yorumlar*, 48(561), 83-95.
- Gigović, L., Pamučar, D., Bajić, Z. & Milićević, M. (2016). The combination of expert judgment and GIS-MAIRCA analysis for the selection of sites for ammunition depots. *Sustainability*, 8(4), 1-30. <https://doi.org/10.3390/su8040372>
- Gör, Y. & Bilici, F. M. (2021). 2008-2020 yıllarını kapsayan süreçte faktoring sektörünün durumu üzerine bir değerlendirme. *Finans Ekonomik Sosyal Araştırmalar Dergisi*, 6(4), 709-718. <https://doi.org/10.29106/fesa.991133>

- Gülcan, N. (2022). Finansal kiralama ve faktoring şirketlerinin finansal performans değerlendirmesinde VIKOR yönteminin uygulanması. *Ekonomi, Politika & Finans Araştırmaları Dergisi*, 7(ÖzelSayı), 235-247. <https://doi.org/10.30784/epfad.1148935>
- Gürol, B. (2018). Faktoring, finansal kiralama ve leasing sektörlerinin performanslarının TOPSIS, yöntemi ile ölçülmesi: Türkiye karşılaştırması, *Ticari Bilimler Fakültesi Dergisi*, 2(2), 61-73.
- <https://www.fkb.org.tr/raporlar-ve-yayinlar/raporlar/factoring-sektor-raporlari/> (Accessed on 15 December 2023).
- Janekova, J. (2012). Faktoring-alternative source of a company financing. *Annals of the Faculty of Engineering Hunedoara. International Journal of Engineering*, 10(3), 303-306.
- Kahramani Koç, A. (2023). Ulaştırma ve depolama sektöründeki şirketlerin finansal performanslarının Çok Kriterli Karar Verme Teknikleri ile analizi, Unpublished doctoral dissertation, Kafkas University.
- Karakaş, Y. S. & Gün, M. (2023). *Borsa İstanbul'da işlem gören finansal kiralama ve faktoring işletmelerinin TOPSIS yöntemiyle performans analizi*. 1st edition, İKSAD Publishing House, Ankara, Türkiye. <https://dx.doi.org/10.5281/zenodo.10145338>
- Kaur, H., & Dhaliwal, N. K. (2014). Financial analysis of factoring companies in India: A study of SBI Global Factors and Canbank Factors. *International Journal of Research in Management, Science & Technology*, 2(1), 30-34. https://www.researchgate.net/publication/351350880_Financial_Analysis_of_Factoring_Companies_in_India_A_Study_of_SBI_Global_Factors_and_Canbank_Factors
- Klapper, L. (2006). The role of factoring for financing small and medium enterprises. *Journal of Banking & Finance*, 30(11), 3111-3130. <http://dx.doi.org/10.1016/j.jbankfin.2006.05.001>
- Ova, A. (2022). Evaluation of Turkish factoring company performances using TOPSIS method, *Yönetim Bilimleri Dergisi*, 20(43), 29-47. <https://doi.org/10.35408/comuybd.836726>
- Özbek, A. & Erol, E. (2017). Ranking of factoring companies in accordance with ARAS and COPRAS. *International Journal of Academic Research in Accounting, Finance and Management Sciences*, 7(2), 105-116. <http://dx.doi.org/10.6007/IJARAFMS/v7-i2/2876>
- Özçelik, H. & Küçükçakal, Z. (2019). BIST'de işlem gören finansal kiralama ve faktoring şirketlerinin finansal performanslarının TOPSIS yöntemi ile analizi. *Muhasebe ve Finansman Dergisi*, 81, 249- 270. <https://doi.org/10.25095/mufad.510675>
- Özdemir, Z. (2005). Dış ticaret finansman tekniklerinden faktoring ve forfaiting işlemleri. *Kocaeli Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 10(2), 194-224.
- Pamučar, D. & Ćirović, G. (2015). The selection of transport and handling resources in logistics centers using Multi-Attributive Border Approximation Area Comparison (MABAC). *Expert Systems with Applications*, 42(6), 3016-3028. <https://doi.org/10.1016/j.eswa.2014.11.057>
- Pamucar, D. S., Tarle, S. P. & Parezanovic, T. (2018). New hybrid Multi-Criteria Decision-Making DEMATEL-MAIRCA Model: Sustainable selection of a location for the development of multimodal logistics centre. *Economic Research-Ekonomska Istraživanja*, 31(1), 1641-1665.
- Selimler H. & Taş, C. (2019). Finansman, faktoring ve leasing şirketlerinin kredi yönetim performansının TOPSIS yöntemi ile değerlendirilmesi: (2015-2018). *Finans Ekonomi ve Sosyal Araştırmalar Dergisi*, 4(3), 286-306. <https://doi.org/10.29106/fesa.595430>
- Ulutaş, A. (2019). Entropi ve MABAC yöntemleri ile personel seçimi. *OPUS Uluslararası Toplum Araştırmaları Dergisi*, 13(19), 1152-1573. <https://doi.org/10.26466/opus.580456>

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Annex 1. Performance Ranking of All Factoring Companies for the Period of 2021-2022

	EQUAL W.				CRITIC			
	MAIRCA		MABAC		MAIRCA		MABAC	
	2021	2022	2021	2022	2021	2022	2021	2022
1	Kapital	Vakıf	Kapital	Vakıf	Şirinoğlu	Mert Finans	Şirinoğlu	Mert Finans
2	Şirinoğlu	Mert Finans	Şirinoğlu	Mert Finans	Tradewing	Vakıf	Tradewing	Vakıf
3	Tradewing	İstanbul	Tradewing	İstanbul	Mert Finans	İstanbul	Mert Finans	İstanbul
4	Vakıf	QNB Finans	Vakıf	QNB Finans	Kapital	Şirinoğlu	Kapital	Şirinoğlu
5	Şeker	Şirinoğlu	Şeker	Şirinoğlu	BİEN Finans	QNB Finans	BİEN Finans	QNB Finans
6	Garanti	Garanti	Garanti	Garanti	İstanbul	ABC	İstanbul	ABC
7	VDF	ABC	VDF	ABC	Bayramoğlu	Garanti	Bayramoğlu	Garanti
8	TEB	Deniz	TEB	Deniz	Vakıf	Deniz	Vakıf	Deniz
9	Mert Finans	VDF	Mert Finans	VDF	VDF	TEB	VDF	TEB
10	İstanbul	TEB	İstanbul	TEB	Ekspo	VDF	Ekspo	VDF
11	BİEN Finans	Çağdaş	BİEN Finans	Çağdaş	ABC	Çağdaş	ABC	Çağdaş
12	İş	İş	İş	İş	Şeker	Acar	Şeker	Acar
13	ABC	TAM Finans	ABC	TAM Finans	Garanti	TAM Finans	Garanti	TAM Finans
14	QNB Finans	Anadolu	QNB Finans	Anadolu	Anadolu	Lider	Anadolu	Lider
15	Anadolu	Akdeniz	Anadolu	Akdeniz	TEB	Anadolu	TEB	Anadolu
16	Ekspo	Lider	Ekspo	Lider	İş	Akdeniz	İş	Akdeniz
17	Yapı Kredi	Yapı Kredi	Yapı Kredi	Yapı Kredi	QNB Finans	Akın	QNB Finans	Akın
18	Halk	Akın	Halk	Akın	Destek Finans	İş	Destek Finans	İş
19	Destek Finans	Kent Finans	Destek Finans	Kent Finans	Acar	Yapı Kredi	Acar	Yapı Kredi
20	Başer	AK	Başer	AK	Halk	Ekspo	Halk	Ekspo
21	Bayramoğlu	GSD	Bayramoğlu	GSD	Başer	Kent Finans	Başer	Kent Finans
22	Deniz	Halk	Deniz	Halk	Yapı Kredi	GSD	Yapı Kredi	GSD
23	Akdeniz	Ekspo	Akdeniz	Ekspo	Tuna	AK	Tuna	AK
24	Çağdaş	Acar	Çağdaş	Acar	Akın	Doruk	Akın	Doruk
25	TAM Finans	Doruk	TAM Finans	Doruk	Akdeniz	Halk	Akdeniz	Halk
26	Akın	Huzur	Akın	Huzur	Optima	Huzur	Optima	Huzur
27	Optima	Arena Finans	Optima	Arena Finans	Deniz	Optima	Deniz	Optima
28	Doruk	Fiba	Doruk	Fiba	Doruk	Fiba	Doruk	Fiba
29	Tuna	Destek Finans	Tuna	Destek Finans	Çağdaş	Arena Finans	Çağdaş	Arena Finans
30	Atılım	Optima	Atılım	Optima	TAM Finans	Destek Finans	TAM Finans	Destek Finans
31	Kent Finans	Kapital	Kent Finans	Kapital	Atılım	Kapital	Atılım	Kapital
32	Lider	Ulusal	Lider	Ulusal	Zorlu	Zorlu	Zorlu	Zorlu
33	GSD	Parafinans	GSD	Parafinans	Kent Finans	Ulusal	Kent Finans	Ulusal
34	Zorlu	Atılım	Zorlu	Atılım	GSD	Parafinans	GSD	Parafinans
35	Acar	Zorlu	Acar	Zorlu	Creditwest	BİEN Finans	Creditwest	BİEN Finans
36	AK	Tuna	AK	Tuna	Lider	Atılım	Lider	Atılım
37	Parafinans	BİEN Finans	Parafinans	BİEN Finans	AK	Tuna	AK	Tuna
38	Creditwest	Başer	Creditwest	Başer	Sümer	Creditwest	Sümer	Creditwest
39	Sümer	Eko	Sümer	Eko	Parafinans	Başer	Parafinans	Başer
40	Fiba	Creditwest	Fiba	Creditwest	Fiba	Eko	Fiba	Eko

41	MNG	MNG	MNG	MNG	MNG	MNG	MNG	MNG
42	Ulusal	Sümer	Ulusal	Sümer	Yeditepe	Bayramođlu	Yeditepe	Bayramođlu
43	Arena Finans	Yeditepe	Arena Finans	Yeditepe	Eko	Sümer	Eko	Sümer
44	Yeditepe	Yaşar	Yeditepe	Yaşar	Ulusal	Yaşar	Ulusal	Yaşar
45	Huzur	Şeker	Huzur	Şeker	Yaşar	Tradewing	Yaşar	Tradewing
46	Eko	Tradewing	Eko	Tradewing	Arena Finans	Yeditepe	Arena Finans	Yeditepe
47	Yaşar	Bayramođlu	Yaşar	Bayramođlu	Huzur	Şeker	Huzur	Şeker