

PERFORMANCE ANALYSIS WITH RATIO ANALYSIS AND TOPSIS METHOD: A RESEARCH ON THE FOOD PRODUCTS MANUFACTURING SECTOR IN TURKEY

Oran Analizi ve Topsis Yöntemiyle Performans Analizi: Türkiye Gıda Ürünleri İmalatı Sektörü Üzerine Bir Araştırma

Assist. Prof. Dr. Murat ÖZDEMİR¹

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ABSTRACT

The manufacturing sector of food products, which has a strategic importance, produces the essential goods indispensable for human life. Thanks to the developing technology, eating habits are altering, and the demand for packaged products is increasing due to health and other concerns. Such increasing demand causes the industry to grow constantly. This current study was conducted to determine the financial performance of the food products manufacturing sector in Turkey. For this purpose, the data obtained from the main financial statements of the companies from the industry covering the years 2009-2019. First, the ratio analysis was made on the selected indicators, and then the TOPSIS method was applied to the study data. According to the results of the study, it can be stated that the net working capital of the food products manufacturing sector in Turkey is insufficient, the liquidity ratios are low and there is a cash crunch. Moreover, while the sector showed the best financial performance in 2019, it showed the lowest performance in 2011.

Key Words: Financial Performance, Manufacturing of Food Products, Ratio Analysis, TOPSIS Method

JEL Codes: M40-M41

ÖZET

Stratejik bir öneme sahip olan gıda ürünleri imalatı sektörü, insan yaşamı için gerekli temel ürünleri üretmektedir. Gelişen teknoloji ile birlikte yeme alışkanlıkları değişmekte, sağlık ve diğer endişelerle paketli ürünlere talep artmaktadır. Bu artış ise sektörün sürekli büyümesine neden olmaktadır. Çalışma, Türkiye’de gıda ürünleri imalatı sektörünün finansal performansının belirlenmesine yönelik yapılmıştır. Bu amaçla sektörün 2009-2019 yıllarını kapsayan temel mali tablolardan elde edilen veriler kullanılmıştır. Çalışma verilerine seçilmiş göstergeler üzerinden önce oran analizi yapılmış, daha sonra TOPSIS yöntemi uygulanmıştır. Çalışmanın sonuçlarına göre, Türkiye’de gıda ürünleri imalatı sektörünün net işletme sermayesinin yetersiz, likidite oranlarının düşük, nakit sıkışıklığının mevcut olduğu ifade edilebilir. Bununla birlikte sektör en iyi finansal performansı 2019 yılında gösterirken, en düşük performansı ise 2011 yılında göstermiştir.

Anahtar Kelimeler: Finansal Performans, Gıda Ürünleri İmalatı, Oran Analizi, TOPSIS yöntemi

JEL Kodları: M40-M41

1. INTRODUCTION

Financial performance analysis is generally made by using the information produced in the accounting information system, or in other words, by using the main financial statements. Financial performance analysis allows the evaluation of the financial situation and operating results of a business or a sector. The importance of financial performance analysis emerges in the financial decisions, planning and activities of the enterprises. In short, it can be expressed as the type of analysis that is effective in making rational decisions that shape the future of businesses. In this context, in this study, the food products manufacturing sector in Turkey is discussed in order to evaluate its financial performance.

As it is known, the food products manufacturing sector is the sector where the products necessary for the nutritional needs that will ensure the continuation of human life are met. At the same time, the food sector is one of the most growing sectors with the increase in the human population, as it is one of the basic needs. Therefore, it can be said that it has strategic importance. In this study, conducted within the scope of this importance, ratio analysis and TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method were used to determine the financial performance of the food products manufacturing sector in Turkey. Analysis data were obtained from the sector balance sheets published by the Central Bank of the Republic of Turkey (CBRT).

¹ Giresun University, Faculty of Economics and Administrative Sciences, Department of Business Administration, mail: murat.ozdemir@giresun.edu.tr, Giresun/Turkey

2. LITERATURE REVIEW

Within the literature, there are many studies on the evaluation of financial performance. In this context, some of the national and international studies in which ratio analysis and TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method are applied together are listed below.

Feng and Wang (2000) tried to create a performance evaluation process over the financial ratios of Taiwan's five largest airline companies in their study in which the TOPSIS method was used. Based on the results, the researchers concluded that considering financial ratios makes the performance evaluation process more comprehensive.

Atmaca (2012) aimed to evaluate the financial performance of four sports services companies traded on the Istanbul Stock Exchange. In the study, the TOPSIS method was applied to the data obtained as a result of ratio analysis using financial indicators for the years between 2003-2010. When the results are interpreted, it can be determined that Fenerbahçe Sportif Services Industry and Trade Inc. has higher financial performance compared to its competitors.

Ömürbek and Mercan (2014) tried to evaluate the performances of manufacturing sub-sectors with TOPSIS and ELECTRE Methods, which are multi-criteria decision-making techniques. For this purpose, the liquidity, profitability, operational performance and financial leverage ratios of 22 sub-sectors of the industrial sector were used. According to the results of the study, the production of coke and refined petroleum products ranks first in both TOPSIS and ELECTRE methods.

In the study conducted by Wang (2014), the financial performance of 3 companies engaged in container transportation activities was evaluated with the TOPSIS method. Based on the results, it was emphasized that financial performance is simply and easily determined via the TOPSIS method, and this evaluation can be made from a variety of perspectives, including all proxy indices and partial categories.

Eyüboğlu&Bayraktar (2018) aimed to compare the financial performance of small, medium and large-sized companies in the manufacturing sector. In this context, the 2014-2016 periods of the companies in the study are analysed. In the study, 19 different financial ratios from liquidity, activity, profitability, and financial structure ratios were used. During the study, criterion weights were determined by the Analytical Hierarchy Process (AHP) method, and then the scales were listed with the TOPSIS method. According to the results of the study, it has been determined that although small and medium-sized companies have a significant volume in terms of quantity, their financial performances are weaker than large-scale companies.

Yıldırım, Altan&Gemici (2018), analysed the corporate governance factors and the firms' performances. For this purpose, the 2013-2016 period of 5 food & beverage companies traded in the Borsa Istanbul Corporate Governance Index were investigated. Study data were analyzed with the Entropy-weighted TOPSIS method. According to the results of the study, it has been determined that there is no continuous and significant relationship between the corporate governance ratings of the companies in question and their financial performance.

In his study, Açıkgöz (2021) deals with the manufacturing sector companies traded in Borsa Istanbul. The study aims to determine the cash flow profiles and financial performance of these companies between 2015-2019. According to the results of the study using the TOPSIS method, businesses in the manufacturing sector are clustered in successful, growing and young business profiles. In terms of cash flow, it has been determined that the most successful financial performance company profile is the growing business profile.

BellerDikmen (2021) aimed to determine the financial performance of the Turkish furniture manufacturing sector in his study. In the study, ratio analysis and the TOPSIS method were applied to the data obtained from the balance sheet and income statements of the firms that operate in the sector. According to the results of the study, it has been determined that the sector has a low profit in each year between the years 2009-2019. Again, the best year of the sector performance was determined as 2019 and the lowest year as 2016.

3. EVALUATION OF THE FINANCIAL PERFORMANCE OF THE MANUFACTURING SECTOR OF THE FOOD PRODUCTS

The purpose, scope, limitations, and method of the study conducted to evaluate the financial performance of the food products manufacturing sector are given in this section.

3.1. Purpose, Scope and Limitations of the Study

The study is aimed to evaluate the financial performance of the C-10-Food products manufacturing sub-sector, which is one of the sub-sectors of the manufacturing sector, by ratio analysis and the TOPSIS method. C-10-Food products manufacturing sector consists of nine sub-sectors and these include the following;

- C-101- Processing and storage of meat and manufacture of meat products,
- C-102- Processing and storage of fish, shellfish, and molluscs,
- C-103- Processing and storage of vegetables and fruits,
- C-104- Manufacture of vegetable and animal oils and fats,
- C-105- Manufacture of dairy products,
- C-106- Manufacture of milled grain products, starch and starchy products,
- C-107- Manufacture of bakery and bakery products,
- C-108- Manufacture of other foodstuffs,
- C-109- Manufacture of ready-made animal feeds.

For the purpose of the study, the financial data used for the sector were taken from the financial statements (Statement of Financial Position and Statement of Income) published by the Central Bank of the Republic of Turkey (CBRT). Financial statements are for 11 years between 2009 and 2019. The number of businesses in the consolidated financial statements ranges from approximately 10,000 to 13,000 and changes every year. For example, while the number of businesses was 9,829 in the first year of 2009, it was 12,924 in the last year of 2019.

The combined financial statements for 2020 could not be included in the study. This issue can be expressed as the limitations of the study.

3.2. Methodology of the Study

Ratio analysis and the TOPSIS method were used to evaluate the financial performance of the Turkish food products manufacturing sector. The financial data used in both ratio analysis and the TOPSIS method are obtained from the consolidated balance sheets and income statements of the companies operating in the sector. First of all, the performance indicators to be used for the sector were determined. In this determination, the most used ratios were taken into consideration and liquidity, profitability, financial structure, and asset utilization ratios were selected. Then, the TOPSIS method was applied to the calculated ratios with the help of the Microsoft Office Excel program.

3.3. Analysis and Findings of the Study

The analysis and findings of the study are given under two sub-headings as ratio analysis and the TOPSIS method. First, brief information about the financial ratios used in the study is given, and then the ratio analysis of the study, and the TOPSIS method and its application follows.

3.3.1. Ratio Analysis and Findings

Ratio analysis is one of the most preferred analysis methods due to the use of ratios from previous years (Çabuk and Lazol, 2010: 174). This method, which allows determining the relationships between the items in the financial statements, is generally grouped as liquidity ratios, financial structure ratios, profitability ratios and asset utilization ratios (Akdoğan and Tenker, 2010: 640). The ratios and calculation methods used in the study are given below.

Liquidity Ratios; These ratios are used to determine whether the working capital is sufficient and to measure the short-term solvency of the enterprise. Liquidity ratios are divided into three as current ratio, acid-test ratio (liquidity ratio) and cash ratio (Akgüç, 1998: 23; Ertuğrul and Karakaşoğlu, 2009: 703).

While the current ratio shows the ability of the enterprise to pay its short-term debts, it also gives information about the adequacy of the net working capital. The current ratio is usually desired to be 2. For developing countries, a value of 1.5 is considered sufficient. If the current ratio is too high, it is an undesirable situation and indicates that there are idle funds and that the resources of the enterprise are not used effectively (Çabuk and Lazol, 2010: 208). The current ratio calculation method is given below.

$$\text{Current Ratio} = \text{Current Assets} / \text{ShortTerm Liabilities}$$

The acid-test ratio, also known as the liquidity ratio, makes the current ratio more meaningful. The acid-test ratio shows the current assets corresponding to the short-term liabilities of the firm (Yenisu, 2019: 25). The acid-test ratio, which is found by deducting stocks from current assets and proportioning to short-term liabilities, is expected to be 1. In this case, it is accepted that the enterprise will not have difficulty in fulfilling its short-term obligations (BellerDikmen, 2021: 84). The acid-test ratio calculation method is given below.

$$\text{Acid - Test Ratio} = (\text{Current Assets} - \text{Inventories}) / \text{ShortTerm Liabilities}$$

The third of the liquidity ratios, the cash ratio, is known as the ratio that shows the money situation that the business can use at any time. Generally, it is desirable that the cash ratio be 0.20, or in other words, not be less than 0.20 or not too much. Because below this ratio, it indicates cash crunch, and much above it indicates excess cash (Akdoğan and Tenker, 2010: 649). The cash ratio calculation method is given below.

$$\text{Cash Ratio} = (\text{Fixed Assets} + \text{Marketable Securities}) / \text{ShortTerm Liabilities}$$

As a result of the analysis made in the study, the liquidity ratios (current ratio, acid-test ratio, and cash ratio), which are the determinants of the capital adequacy and short-term solvency of the food products manufacturing sector between 2009-2019, are shown in Chart-1.

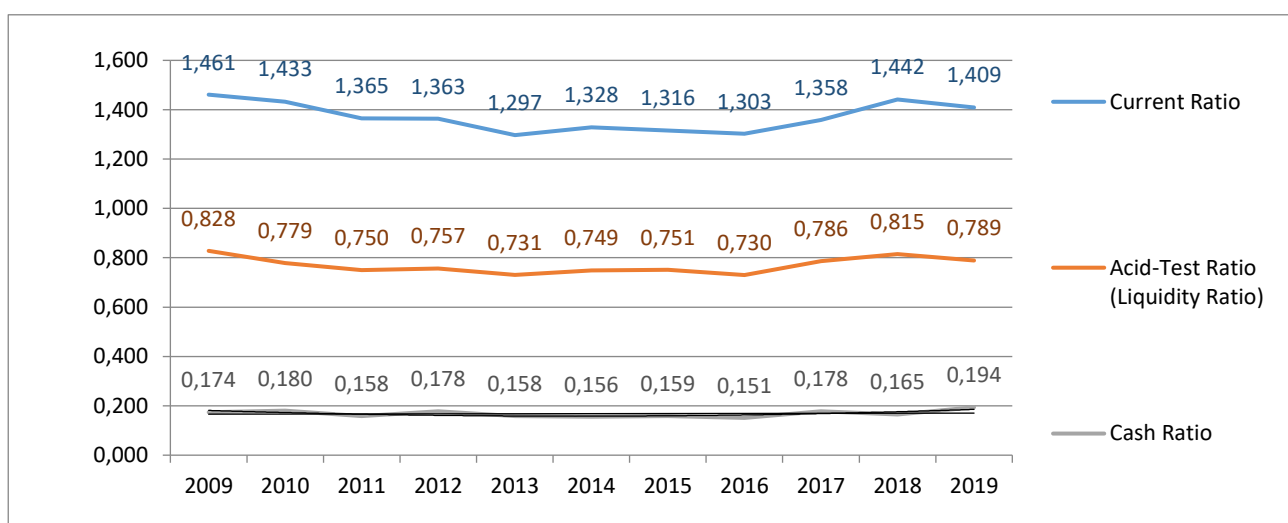


Chart-1: Liquidity Ratios of the Food Products Manufacturing Sector (2009-2019)

When Graph 1 is examined, the values related to the current ratios of the food products manufacturing sector covering the years 2009-2019 vary between 1.297 and 1.461. As it will be remembered, these values are generally required to be 2 in developed countries and 1.5 in developing countries. Therefore, considering the current ratios above, it can be said that the net working capital of the food products manufacturing sector in Turkey is insufficient. Again, it is possible to say that there are difficulties in fulfilling short-term obligations in the sector. When the acid-test ratio (liquidity ratio) of the sector is evaluated, it is seen that it varies between 0.730 and 0.828 over the years, which is lower than the generally accepted ratio of 1. This indicates that unless the stocks are disposed of the food products manufacturing sector will have difficulties in paying its short-term debts. When the cash rates of the food products manufacturing sector are taken into account, it is understood that it is below the generally accepted cash rate of 0.20. Cash ratios for the said years are between 0.151 and 0.194. In other words, it varies between approximately 0.15 and 0.19. When these ratios are interpreted, it can be concluded that there is a shortage of cash in the food products manufacturing sector, the liquid assets are not at a sufficient level, the sales in the sector are disrupted and the liabilities are not fulfilled in cases such as the collection of receivables.

Financial Structure Ratios; It is used to determine to what extent the assets of the enterprise are covered by equity and foreign resources. In this study, financial leverage ratio, equity ratio, ratio of tangible fixed assets to equity and ratio of short-term liabilities to total liabilities are considered.

The financial leverage ratio is used to determine to what extent the assets of the enterprise are covered by borrowing. While the limit of the financial leverage ratio is 50% in developed countries, it can be over 60% in developing countries. In fact, a high rate of return is a desirable situation for the shareholders as it will have a positive effect on the return on equity ratio. On the other hand, creditors who provide loans to the business may want this ratio to be low in order to determine the equities that will have the feature of

collateral for their receivables (Çabuk and Lazol, 2010: 211-213; Okka, 2006: 90). The financial leverage ratio calculation method is given below.

$$\text{Financial Leverage Ratio} = \text{Total Liabilities} / (\text{T. Liabilities} + \text{T. Shareholders' Equity})$$

The equity ratio, on the other hand, reveals the resource structure of the enterprise, in other words, it shows the ratio of own funds and foreign resources among liabilities. A high equity ratio is desirable. Because it is a sign that the business will not have any difficulties in fulfilling its long-term obligations (Akdoğan, and Tenker, 2010: 653). The equity ratio calculation method is given below.

$$\text{Equity Ratio} = \text{T. Shareholders' Equity} / (\text{T. Liabilities} + \text{T. Shareholders' Equity})$$

Another financial structure ratio is the ratio of short-term liabilities. This ratio reveals the part of the assets which are financed with short-term foreign resources and it is generally recommended that it should not exceed 1/3. The short-term liabilities ratio calculation method is given below.

$$\text{T. ShortTerm Liabilities} = \text{T. Short Term Liabilities} / (\text{T. Liabilities} + \text{T. Shareholders' Equity})$$

The final financial structure ratio used in the study is the ratio of tangible fixed assets to equity, which determines the part of tangible fixed assets financed with equity. This ratio is required to be less than 1 (Akdoğan, and Tenker, 2010: 657; BellerDikmen, 2021: 85). The method of calculating the ratio of tangible fixed assets to equity is given below.

$$\text{Ratio of Tangible Fixed Assets to T. Equity} = \text{Tangible Fixed Assets} / \text{T. Equity}$$

The financial structure ratios found as a result of the analysis of the financial statements of the food products manufacturing sector between the years 2009-2019 are given in Chart-2.

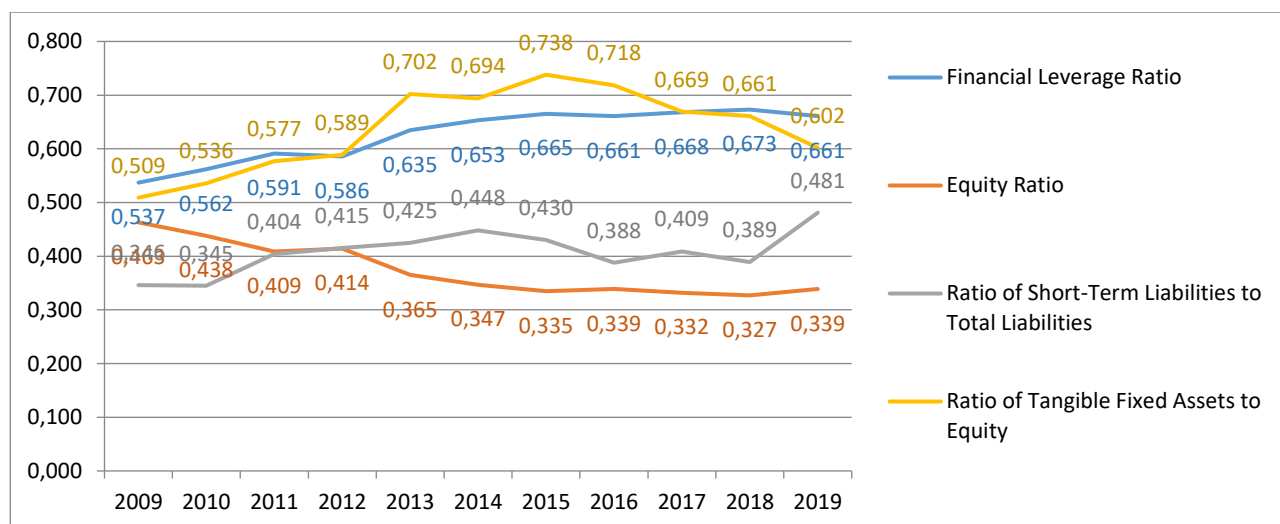


Chart-2: Financial Structure Ratios of the Food Products Manufacturing Sector (2009-2019)

When Chart-2 is analysed, it is seen that the financial leverage ratios of the food products manufacturing sector vary between 0.537 and 0.673. These ratios are higher than the generally accepted 0.50 financial leverage ratio. Therefore, with a general interpretation, it can be said that the majority of the asset purchases of the enterprises operating in the food products manufacturing sector are financed by foreign resources. On the other hand, when the equity ratio is evaluated, it can be stated that the ratios hover between 0.327 and 0.463, which complements the financial leverage ratio and means that the assets in the sector are less financed with equity. The ratio of short-term liabilities to total liabilities varies between 0.345 and 0.481 over the years. These ratios show that the companies operating in the sector finance their assets in a balanced manner with short-term foreign resources. The ratio of tangible fixed assets to own funds varies between 0.509 and 0.738. The fact that these ratios are below 1 indicates that the purchases of tangible fixed assets are met under the generally accepted ratios.

Asset Utilization Rates; They are the ratios used to determine whether businesses use the assets they have effectively during their activities (BellerDikmen, 2021: 85; Mashkour, 2019: 2). In this study, the asset utilization rates; receivables turnover, inventory turnover, asset turnover and equity turnover are taken into account.

The receivables turnover rate is the rate that shows how many times the receivables of the enterprise are collected in a year, in other words, the rate at which the receivables turn into money (Ertuğrul and Karakaşoğlu, 2009: 703-704). The receivable turnover rate calculation method is given below.

$$\text{Receivables Turnover} = \text{Net Sales} / (\text{Short T. Trade Receivables} + \text{Long Term Trade Receivables})$$

Inventory turnover rate shows how many times the stocks of the enterprise are renewed during the year. The inventory turnover rate calculation method is given below.

$$\text{Inventory Turnover} = \text{Cost of Sales} / \text{Inventories}$$

Asset efficiency in enterprises is determined by the asset turnover rate. Asset turnover rate shows how many times the total assets of the business are turned over during the year. Although it varies between sectors, the accepted ratio is 1.5. The active turnover rate calculation method is given below.

$$\text{Asset Turnover} = \text{Net Sales} / \text{Total Assets}$$

The equity turnover rate determines equity efficiency. It does not have a specific standard and is used to make comparisons on a yearly basis. The equity turnover rate calculation method is given below.

$$\text{Equity Turnover} = \text{Net Sales} / \text{Equity}$$

The asset utilization rates obtained as a result of the analysis of the financial statements of the food products manufacturing sector between 2009 and 2019 are given in Chart-3.

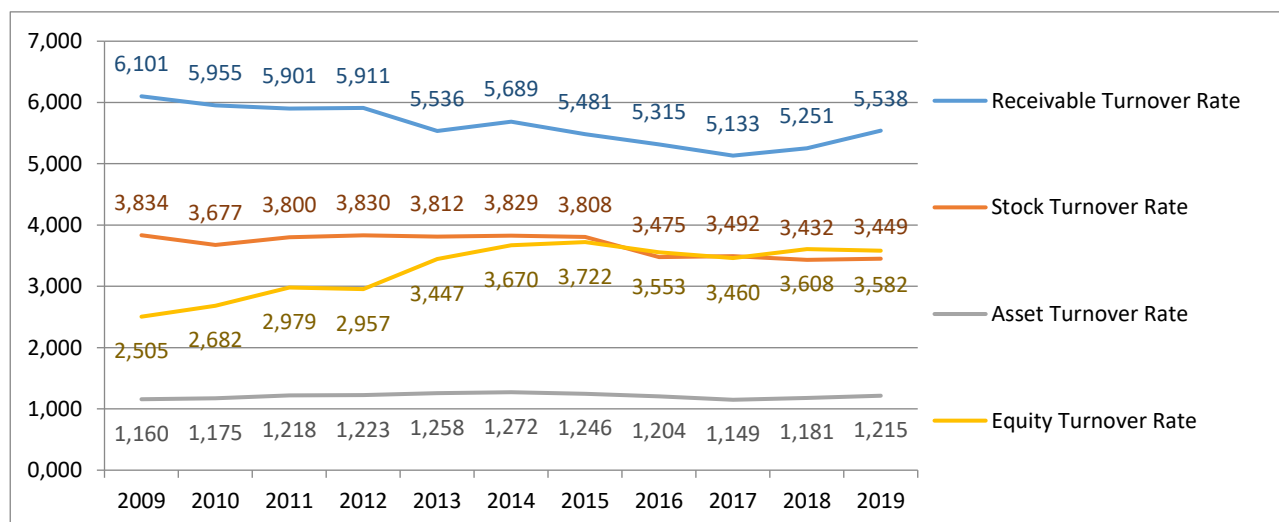


Chart-3: Asset Utilization Rates of the Food Products Manufacturing Sector (2009-2019)

When Chart-3 is examined, it is seen that the receivable turnover values of the food products manufacturing sector are approximately 5 and 6 over the years. This shows that the receivables in the sector are turned over 5-6 times a year. The stock turnover rate of the sector varies between 3,432 and 3,834 values. It is understood from these values that the stocks in the sector are renewed approximately 3-4 times a year. The asset turnover ratio of the sector is between 1.149 and 1.272. It is lower than the general average of 1.5. The fact that this ratio is below 1.5 indicates that the sales in the sector are not at a reasonable rate. In the equity turnover rate, the ratios vary between 2,505 and 3,722. From these ratios, it is understood that the equity is used more efficiently in the other years compared to the years 2009, 2010, 2011 and 2012 in the sector.

Profitability Ratios; One of the success criteria of businesses is profitability. Profitability ratios give the opportunity to evaluate the profitability of the enterprise by measuring its profit-making capacity (Yenisu, 2019: 31; Bilici, 2019: 184). Profitability rates used in the study; gross profit margin, operating profit margin, net profit margin, return on assets ratio and return on equity ratio.

Gross margin is calculated by dividing gross profit by net sales. This ratio shows what percentage of net sales is gross sales profit. It is desired that the ratio be high or in an upward trend. Because this ratio contributes to net profit by covering all expenses (Akdoğan and Tenker, 2010: 669). The gross profit margin calculation method is given below.

$$\text{Gross Profit Margin} = \text{Gross Profit} / \text{Net Sales}$$

The operating profit margin gives information about the profitability of the main activities of the enterprise. A high operating profit margin indicates that the firm is profitable and efficient at its core business (Çabuk and Lazol, 2010: 230). The operating profit margin calculation method is given below.

$$\text{Operational Profit Margin} = \text{Operational Profit} / \text{Net Sales}$$

Net profit margin gives the profitability of the business in sales. More clearly, it shows how much profit the business makes from each 1 lira net sale (Yenisu, 2019: 33). Net profit margin calculation method is given below.

$$\text{Net Profit Margin} = \text{Net Profit of the Period} / \text{Net Sales}$$

The return on assets ratio determines to what extent the company's assets are used efficiently. It can also be said that the sector expresses the return on assets obtained with the investments made (Bilici, 2019: 184). The method of calculating the return on assets ratio is given below.

$$\text{Return on Assets} = \text{Net Operating Profit} / \text{Total Assets}$$

The last profitability ratio used in the study is the return on equity ratio. The return on equity ratio shows how efficiently the resources provided to the business by the owner or partners of the business are used. In other words, it helps to determine the share of the profit for the period in equity and this ratio is expected to be high (BellerDikmen, 2021: 85; Bilici, 2019: 185). The return on equity ratio calculation method is given below.

$$\text{Return on Equity Ratio} = \text{Net Profit for the Period} / \text{Equity}$$

The profitability ratios obtained as a result of the analysis of the financial statements of the food products manufacturing sector between 2009-2019 are given in Chart-4.

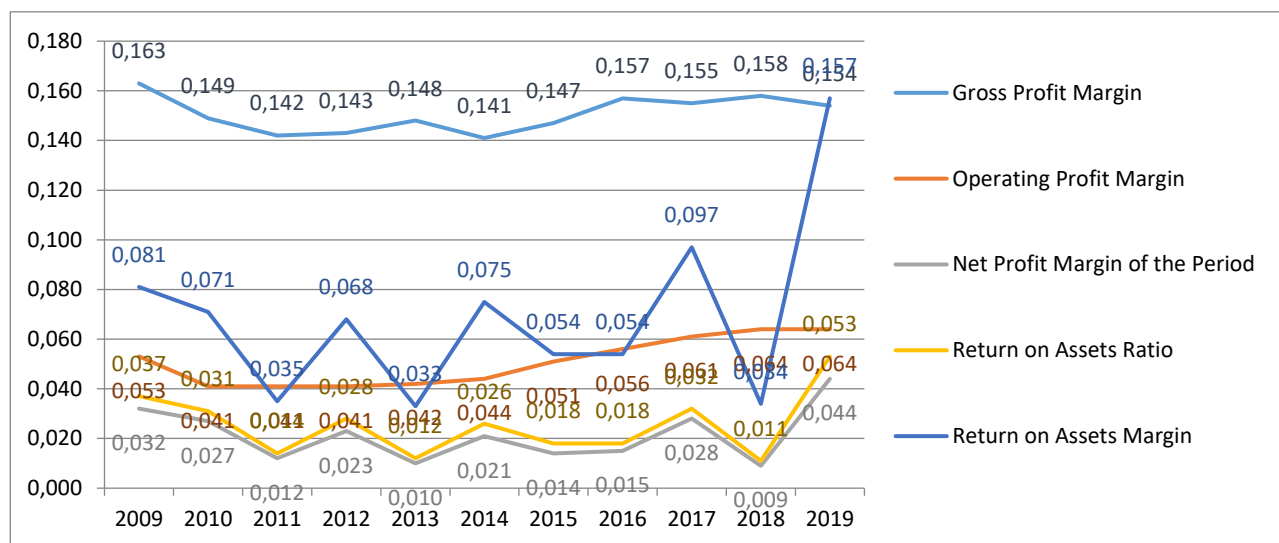


Chart-4: Profitability Rates of the Food Products Manufacturing Sector (2009-2019)

When Graph 4 is examined, the gross profit margin ratios of the food products manufacturing sector by years are between 0.141 and 0.163. In other words, it varies between approximately 14 per cent and 16 per cent. The gross profit margin ratio in the sector does not show much increase or decrease in the said 11 years. Operating profit margin ratios, on the other hand, vary from year to year between these values, with the lowest being 0.041 and the highest 0.064. When the income statements of the sector are analysed, the reason for the low operating profit of the sector is due to the high operating expenses. General administrative expenses, especially marketing, sales, and distribution expenses, are significantly high. When the net profit margin ratios of the sector are analysed, it varies between 0.009 and 0.044. The lowest net profit margin was below 1% in 2018, and the highest profit margin was over 4% in 2019. When the income statement is analysed to understand the reason for the decrease in 2018, it is seen that ordinary income and losses from other activities and financing expenses increased considerably in the said year. On the other hand, it is understood that the return on assets values in the sector are between 0.011 and 0.053 and show significant changes. For this situation, it can be said that the companies operating in the sector cannot use their assets efficiently. The equity profitability ratio also varies between approximately 3 per cent and 16 per cent, and

the highest rate was achieved in 2019. Therefore, it can be stated that the sector used its own resources more efficiently in 2019 compared to other years.

The coding for the application of the ratio analysis results to the TOPSIS method in the study is given in Table-1.

Table 1: Ratios and Codes Used in the Study

Main Ratios	Sub-Ratios	Codes
Liquidity Ratios	Current Ratio	LR1
	Acid-Test Ratio (Liquidity Ratio)	LR2
	Cash Ratio	LR3
Financial Structure Ratios	Financial Leverage Ratio	FSR1
	Equity Ratio	FSR2
	Ratio of Short-Term Liabilities to Total Liabilities	FSR3
	Ratio of Tangible Fixed Assets to Equity	FSR4
Asset Turnover Ratios	Receivable Turnover Rate	ATR1
	Stock Turnover Rate	ATR2
	Asset Turnover Rate	ATR3
	Equity Turnover Rate	ATR4
Profitability Ratios	Gross Profit Margin	PR1
	Operating Profit Margin	PR2
	Net Profit Margin of the Period	PR3
	Return on Assets Ratio	PR4
	Return on Assets Margin	PR5

As can be seen from Table 1, the main rates have been shortened and consecutive numbers have been added according to the order of each sub-ratio. For example, the liquidity ratio, which is the main ratio, is abbreviated as LR, and the current ratio, which is the first lower ratio of the liquidity ratios, is given the number 1. As a result, LR1 represents the current ratio from the liquidity ratios.

3.3.1. TOPSIS Analysis and Findings

It is stated that the TOPSIS method was found by Hwang and Yoon in 1980 (and in some sources, the founding year is 1981). The method is one of the multi-criteria decision-making methods based on quantitative data. Among the alternatives, the characteristics of having the shortest and longest distances from the geometrically ideal and negative ideal solutions, respectively, are considered. This method is used in many different fields (Olson, 2004: 721; Chen, 2000: 2; Akbulut and Rençber, 2015: 123). Each step of the TOPSIS method, which consists of 6 stages, and its application to the study data are given below in order.

In the first stage, the decision matrix is created: In the first stage, the decision matrix, also called the initiation matrix, must be created by the decision-maker. The other stages of the TOPSIS method are carried out over this matrix (Ömürbek and Mercan, 2014: 242). As can be seen in the sample matrix given below, (m) alternatives in this matrix represent (n) evaluation criteria (BellerDikmen, 2021: 86).

$$A_{ij} = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \dots & a_{mn} \end{bmatrix}$$

The initial decision matrix created by entering the values obtained as a result of the ratio analyzes applied to the data of the food products manufacturing sector is given in Table 2.

Table-2: Decision Matrix of the Food Products Manufacturing Sector

Years	Ratio Codes															
	LR1	LR2	LR3	FSR1	FSR2	FSR3	FSR4	ATR1	ATR2	ATR3	ATR4	PR1	PR2	PR3	PR4	PR5
2009	1,461	0,828	0,174	0,537	0,463	0,346	0,509	6,101	3,834	1,160	2,505	0,163	0,053	0,032	0,037	0,081
2010	1,433	0,779	0,180	0,562	0,438	0,345	0,536	5,955	3,677	1,175	2,682	0,149	0,041	0,027	0,031	0,071
2011	1,365	0,750	0,158	0,591	0,409	0,404	0,577	5,901	3,800	1,218	2,979	0,142	0,041	0,012	0,014	0,035
2012	1,363	0,757	0,178	0,586	0,414	0,415	0,589	5,911	3,830	1,223	2,957	0,143	0,041	0,023	0,028	0,068
2013	1,297	0,731	0,158	0,635	0,365	0,425	0,702	5,536	3,812	1,258	3,447	0,148	0,042	0,010	0,012	0,033
2014	1,328	0,749	0,156	0,653	0,347	0,448	0,694	5,689	3,829	1,272	3,670	0,141	0,044	0,021	0,026	0,075
2015	1,316	0,751	0,159	0,665	0,335	0,430	0,738	5,481	3,808	1,246	3,722	0,147	0,051	0,014	0,018	0,054
2016	1,303	0,730	0,151	0,661	0,339	0,388	0,718	5,315	3,475	1,204	3,553	0,157	0,056	0,015	0,018	0,054
2017	1,358	0,786	0,178	0,668	0,332	0,409	0,669	5,133	3,492	1,149	3,460	0,155	0,061	0,028	0,032	0,097

2018	1,442	0,815	0,165	0,673	0,327	0,389	0,661	5,251	3,432	1,181	3,608	0,158	0,064	0,009	0,011	0,034
2019	1,409	0,789	0,194	0,661	0,339	0,481	0,602	5,538	3,449	1,215	3,582	0,154	0,064	0,044	0,053	0,157

As can be seen from Table 2, the values found as a result of the ratio analyses applied are entered in each line under the title of ratio code on a yearly basis. In this way, the decision matrix creation process, which is the first step of the TOPSIS method, was carried out.

In the second stage, the normalized decision matrix is created: In the second stage, the normalized decision matrix should be created by using the A matrix. The formula shown below is used in the creation of the normalized decision matrix (Bilici, 2019: 189).

$$R_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^m a_{ij}^2}} (i = 1, \dots, m) (j = 1, \dots, n)$$

The normalized decision matrix obtained using the formulas is shown as follows.

$$R_{ij} = \begin{bmatrix} r_{11} & r_{12} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ r_{m1} & r_{m2} & \dots & r_{mn} \end{bmatrix}$$

The results of the study, in other words, the decision matrix obtained as a result of normalizing the ratio values of the study data of the food products manufacturing sector is shown in Table-3.

Table-3: Normalized Decision Matrix of the Food Products Manufacturing Sector

Years	Ratio Codes															
	LR1	LR2	LR3	FSR1	FSR2	FSR3	FSR4	ATR1	ATR2	ATR3	ATR4	PR1	PR2	PR3	PR4	PR5
2009	0,321	0,324	0,311	0,258	0,371	0,255	0,240	0,327	0,314	0,289	0,228	0,326	0,310	0,407	0,396	0,317
2010	0,315	0,305	0,322	0,270	0,351	0,254	0,252	0,319	0,301	0,293	0,244	0,298	0,240	0,343	0,332	0,278
2011	0,300	0,294	0,282	0,284	0,328	0,298	0,272	0,316	0,311	0,304	0,271	0,284	0,240	0,153	0,150	0,137
2012	0,300	0,296	0,318	0,281	0,332	0,306	0,277	0,317	0,314	0,305	0,269	0,286	0,240	0,292	0,300	0,266
2013	0,285	0,286	0,282	0,305	0,292	0,313	0,331	0,297	0,312	0,314	0,314	0,296	0,246	0,127	0,128	0,129
2014	0,292	0,293	0,279	0,313	0,278	0,330	0,327	0,305	0,314	0,317	0,334	0,282	0,257	0,267	0,278	0,294
2015	0,289	0,294	0,284	0,319	0,268	0,317	0,348	0,294	0,312	0,311	0,339	0,294	0,298	0,178	0,193	0,211
2016	0,286	0,286	0,270	0,317	0,272	0,286	0,338	0,285	0,285	0,300	0,323	0,314	0,328	0,191	0,193	0,211
2017	0,299	0,308	0,318	0,321	0,266	0,301	0,315	0,275	0,286	0,286	0,315	0,310	0,357	0,356	0,342	0,380
2018	0,317	0,319	0,295	0,323	0,262	0,287	0,311	0,281	0,281	0,294	0,328	0,316	0,375	0,114	0,118	0,133
2019	0,310	0,309	0,347	0,317	0,272	0,355	0,284	0,297	0,283	0,303	0,326	0,308	0,375	0,559	0,567	0,615

In the third stage, a weighted decision matrix is created: At this stage, the weight values (w_i) of the evaluation criteria are determined. The formula given below is used for this process (Ömürbek and Kınay, 2013: 353).

$$\sum_{i=1}^n w_i = 1$$

The values in the columns of the R matrix are multiplied by the corresponding (w_i) value, thus forming the weighted standard decision matrix (V). The generated (V) matrix is shown as follows (Ömürbek and Kınay, 2013: 353).

$$V_{ij} = \begin{bmatrix} w_1 r_{11} & w_2 r_{12} & \dots & w_n r_{1n} \\ w_1 r_{21} & w_2 r_{22} & \dots & w_n r_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ w_1 r_{m1} & w_2 r_{m2} & \dots & w_n r_{mn} \end{bmatrix}$$

In the study, since 16 financial ratios were used in the calculation of the weighted normalized decision matrix ($1/16=0.0625$), the weight vector was used. In this way, equal weight can be attributed to financial

performance criteria (Beller Dikmen, 2021: 94). The weighted decision matrix calculated in the study is shown in Table 4.

Table-4: Weighted Normalized Decision Matrix of the Food Products Manufacturing Industry

Year s	Ratio Codes															
	LR1	LR2	LR3	FSR1	FSR2	FSR3	FSR4	ATR1	ATR2	ATR3	ATR4	PR1	PR2	PR3	PR4	PR5
2009	0,020 1	0,020 3	0,019 4	0,016 1	0,023 2	0,015 9	0,015 0	0,020 4	0,019 6	0,018 1	0,014 2	0,020 4	0,019 4	0,025 4	0,024 7	0,019 8
2010	0,019 7	0,019 1	0,020 1	0,016 9	0,021 9	0,015 9	0,015 8	0,019 9	0,018 8	0,018 3	0,015 3	0,018 6	0,015 0	0,021 5	0,020 7	0,017 4
2011	0,018 8	0,018 4	0,017 6	0,017 7	0,020 5	0,018 6	0,017 0	0,019 8	0,019 5	0,019 0	0,016 9	0,017 7	0,015 0	0,009 5	0,009 4	0,008 6
2012	0,018 7	0,018 5	0,019 9	0,017 6	0,020 7	0,019 1	0,017 3	0,019 8	0,019 6	0,019 1	0,016 8	0,017 9	0,015 0	0,018 3	0,018 7	0,016 6
2013	0,017 8	0,017 9	0,017 6	0,019 0	0,018 3	0,019 6	0,020 7	0,018 5	0,019 5	0,019 6	0,019 6	0,018 5	0,015 4	0,007 9	0,008 0	0,008 1
2014	0,018 2	0,018 3	0,017 4	0,019 6	0,017 4	0,020 6	0,020 4	0,019 1	0,019 6	0,019 8	0,020 9	0,017 6	0,016 1	0,016 7	0,017 4	0,018 4
2015	0,018 1	0,018 4	0,017 7	0,019 9	0,016 8	0,019 8	0,021 7	0,018 4	0,019 5	0,019 4	0,021 2	0,018 4	0,018 7	0,011 1	0,012 0	0,013 2
2016	0,017 9	0,017 9	0,017 7	0,019 8	0,017 0	0,017 9	0,021 1	0,017 8	0,017 8	0,018 8	0,020 2	0,019 6	0,020 5	0,011 9	0,012 0	0,013 2
2017	0,018 7	0,019 2	0,019 9	0,020 0	0,016 6	0,018 8	0,019 7	0,017 2	0,017 9	0,017 9	0,019 7	0,019 4	0,022 3	0,022 2	0,021 4	0,023 7
2018	0,019 8	0,019 9	0,018 4	0,020 2	0,016 4	0,017 9	0,019 5	0,017 6	0,017 6	0,018 4	0,020 5	0,019 7	0,023 4	0,007 2	0,007 4	0,008 3
2019	0,019 4	0,019 3	0,021 7	0,019 8	0,017 0	0,022 2	0,017 7	0,018 5	0,017 7	0,018 9	0,020 4	0,019 2	0,023 4	0,035 0	0,035 4	0,038 4

In the fourth step, ideal and negative ideal solutions are calculated: Ideal and negative ideal solutions expressed as (A^+) and (A^-) weighted normalized values, are calculated with the help of the formulas given below. In the equation, (J) is the benefit criterion and (J') is the cost criterion (Yıldırım, Altan, & Gemici, 2018: 140).

$$A^+ = \{(max_{i=1,2,...,m} V_{ij} | j \in J), (min_{i=1,2,...,m} V_{ij} | j \in J')\} = \{V_i^+ | i = 1, 2, ..., n\}$$

$$A^- = \{(min_{i=1,2,...,m} V_{ij} | j \in J), (max_{i=1,2,...,m} V_{ij} | j \in J')\} = \{V_i^- | i = 1, 2, ..., n\}$$

The largest value in each column of the weighted decision matrix is chosen for the ideal solution, and the smallest value for the negative ideal solution (Ömürbek and Kınay, 2013:358). Accordingly, the calculated (A^+) ideal and (A^-) negative ideal solutions of the food products manufacturing sector are shown in Table 5.

Table-5: Ideal and Negative Ideal Solutions of the Food Products Manufacturing Industry

	Ratio Codes															
	LR1	LR2	LR3	FSR1	FSR2	FSR3	FSR4	ATR1	ATR2	ATR3	ATR4	PR1	PR2	PR3	PR4	PR5
A^+	0,0201	0,0203	0,0217	0,0161	0,0232	0,0159	0,0217	0,0204	0,0196	0,0198	0,0212	0,0204	0,0234	0,0350	0,0354	0,0384
A^-	0,0178	0,0179	0,0174	0,0202	0,0164	0,0222	0,0150	0,0172	0,0176	0,0179	0,0142	0,0176	0,0150	0,0072	0,0074	0,0081

As can be seen from Table 5, the combination of the best criterion values is seen in the ideal solution, and the worst criterion value combination is in the negative ideal solution (Yıldırım, Altan, & Gemici, 2018: 141).

In the fifth step, distance separation measures are calculated: The deviation values for the alternatives are expressed as the ideal separation (S_i^+) and the negative ideal separation (S_i^-) . The distance of each alternative from the ideal solution and the negative ideal solution is calculated with the help of the following formulas (Ömürbek and Mercan, 2014: 244; BellerDikmen, 2021: 87).

$$S_i^+ = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^+)^2} \quad i = 1, 2, ..., m$$

$$S_i^- = \sqrt{\sum_{j=1}^n (V_{ij} - V_j^-)^2} \quad i = 1, 2, ..., m$$

In the sixth step, the relative closeness to the ideal solution is calculated: In the last step of the TOPSIS method, ideal and negative ideal discrimination criteria are used to calculate the relative closeness of each

alternative to the ideal solution. In fact, this criterion is the share of the negative ideal discrimination measure in the total discrimination measure. The following formula is used in the calculation (Ömürbek and Kınay, 2013: 354).

$$C_i^* = \frac{S_i^-}{S_i^- + S_i^*}$$

If the values to be obtained at the end of the calculations are arranged from largest to smallest, the order of importance of the alternatives, in other words, performance rankings will be made (BellerDikmen, 2021: 88). Accordingly, the distances of the food products manufacturing industry from the ideal and negative ideal solution between 2009-2019, the performance scores for each year and the performance rankings based on these scores are shown in Table-5.

Table 6: Rankings of Performance Calculated by Relative Closeness to the Ideal Solution

Years	S_i^*	S_i^-	C^*	Ranking
2009	0,0259	0,0305	0,5414	2
2010	0,0316	0,0240	0,4319	4
2011	0,0487	0,0083	0,1458	11
2012	0,0343	0,0198	0,3665	5
2013	0,0505	0,0091	0,1529	10
2014	0,0349	0,0197	0,3603	6
2015	0,0433	0,0136	0,2389	8
2016	0,0426	0,0141	0,2484	7
2017	0,0260	0,0283	0,5212	3
2018	0,0507	0,0127	0,2010	9
2019	0,0109	0,0513	0,8244	1

As can be seen from Table-5, 2019 is the first, 2009 is the second and 2017 is the third in the ranking. The last in the ranking is 2011. In this context, according to the results of the TOPSIS method applied to the period covering the years between 2009 and 2019, 2019 is the year in which the performance of the food products manufacturing sector in Turkey is the best. Among the said years, the lowest performance of the sector was determined as 2011.

4. CONCLUSION

The food sector is a sector where the basic needs of people to survive are met. The biggest danger for this strategic sector is climate and nature changes due to environmental problems. Because agricultural products are generally used as raw materials in food production. On the other hand, it is a sector that is constantly growing with the increasing population and is less affected by economic fluctuations compared to other sectors, since people are one of the essential needs. Again, due to reasons such as health and hygiene concerns, the increasing demand for food products produced by certain standards paves the way for the development of the sector. This development brings along sectoral changes and requires the businesses operating in the sector and their stakeholders to make important financial decisions. Today, multi-criteria decision-making methods such as the TOPSIS method are used together with ratio analysis for these decisions. Thus, more rational decisions can be made.

In the study, the financial performance of the Turkish food products manufacturing sector for the 11-year period covering the years 2009-2019 was evaluated by ratio analysis and the TOPSIS method. When the analysis results of the study are summarized, it can be said that the net working capital of the food products manufacturing sector is insufficient, the liquidity ratios are low, and there is a cash crunch in the period under consideration. Again, it can be stated that although the sector's sales are less than they should be, the gross profit is at the level of 14-16 per cent, the net profit is realized at the level of 4-6 per cent. In addition to these, in terms of the years evaluated within the scope of the study, 2019 was determined as the year with the best sector performance and 2011 as the year with the lowest sector performance.

As a result, ratio analysis and the TOPSIS method allowed the financial performance of the food products manufacturing sector to be evaluated practically within all selected financial indicators. When the results of the study are compared with previous studies, many similarities are seen. In particular, it can be said that the results of BellerDikmen's (2021) study on the furniture manufacturing sector match exactly. In the aforementioned study, it was determined that 2019 was the best in terms of financial performance, while

there were problems such as low-profit rate, insufficiency of net working capital, low liquidity situation and cash crunch in the sector.

In addition, if it is necessary to make suggestions for future studies, the period of COVID-19 and after can be compared in the evaluation of the financial performance of the Turkish food products manufacturing sector. Thus, the effects of the COVID-19 epidemic process on the food products manufacturing sector can be revealed.

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