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DETERMINING FINANCIAL DISTRESS WITH THE HELP OF THE ALTMAN Z-SCORE MODEL[1]

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Abstract

Financial distress is a condition in which a company faces financial difficulties where its cash flows cannot meet its current obligations, such as trade payables or interest costs. Financial distress is the stages of deterioration in the financial condition of a company before bankruptcy or liquidation occurs. In this case, management cannot monitor the financial condition of the company, which causes increased business risk. Financial distress usually emerges with increasing liquidity pressures and then continues in the form of diminishing assets, the inability of the company to meet its financial obligations and dragging the company into bankruptcy. Considering the previous studies in the literature; many factors such as the size of the data used in the detection of financial distress, the type of sector from which it is obtained, the economic structure of the country affect the degree of success of the models. From this point of view, the main purpose of the study is to determine the financial failure degrees of the companies under the chemical, pharmaceutical, petroleum, rubber and plastic products sector classification, whose shares are traded in Borsa Istanbul. In this context, the Z Score Model developed by Altman was used. According to the results obtained from the study, most of the enterprises are either in the risky zone or in the gray zone for the studied 3-year period.

Keywords

Financial Distress
Altman Z Score Model
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ALTMAN Z-SKOR MODELİ YARDIMIYLA FİNANSAL BAŞARISIZLIĞIN TESPİT EDİLMESİ

Öz

Finansal başarısızlık kavramı, bir işletmeye ait nakit akışlarının faiz maliyetleri ya da ticari borçlar gibi var olan yükümlülüklerini karşılayamadığı yani finansal zorluklarla karşılaşması olarak tanımlanabilir. Finansal başarısızlık, tasfiye ya da iflas süreci başlamadan önce bir işletmenin finansal durumunda yaşadığı sıkıntılardır. Bu durumda yönetim şirketin mali durumu hakkında sağlıklı bilgiye sahip olamaz ve devamında sürekli olarak artan iş riski ortaya çıkar. Finansal başarısızlık genel olarak giderek artan likidite baskılarıyla ortaya çıkar ve sonra azalan varlıkların işletmenin finansal yükümlülüklerini yerine getirememesine neden olur. Bu da işletmenin iflasa sürüklenmesi anlamını taşır. Literatürde daha önce yapılmış çalışmalar dikkate alındığında; finansal başarısızlığın tespitinde kullanılacak verilerin büyüklüğü, ülkenin ekonomik yapısı ve verilerin sağlandığı sektör gibi birçok faktörün modellerin başarılı olmasını etkilediği görülmüştür. Buradan hareketle çalışmanın temel amacı hisseleri Borsa İstanbul'da işlem gören kimya, ilaç, petrol, lastik ve plastik ürünler sektör sınıflaması altında bulunan işletmelerin finansal başarısızlık derecelerinin belirlenmesidir. Bu kapsamda Altman tarafından geliştirilen Z Skor Modeli kullanılmıştır. Çalışmadan elde edilen sonuçlara göre genel olarak incelenen 3 yılda işletmelerin çoğu ya riskli bölgede ya da gri bölgede yer almaktadır.

Anahtar Kelimeler

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Altman Z Skor Modeli
Borsa İstanbul

Makale Hakkında

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INTRODUCTION

It is seen that companies whose main purpose is to make profits face various problems during their lifespan, which is considered to be infinite. This situation, which is called business failure, is a negativity that leads companies to bankruptcy and is mainly due to financial reasons. The concept of financial distress; It is explained as the inability of the enterprises to fulfill their financial obligations, in other words, the bankruptcy or the various difficulties in fulfilling these obligations. Financial failure is defined as a long-term process that affects the investment decisions, capital structures and performances of enterprises (Kahl, 2002, p. 135). The financial reports of the companies provide important information in the interpretation of the future of the enterprises. As a result of the analysis of the business reports, the possibilities of financial distress can be predicted and necessary measures can be taken for negative results. Altman Z Score analysis comes first among the prediction models for measuring financial distress. The concept of financial distress entered the finance literature in the 1960s. Afterwards, the importance of the model increased especially during the economic crisis in the 1970s (Akkaya et al. 2009, p. 189). The financial difficulties experienced are most felt during financial crises. Therefore, predicting financial distress is a very powerful tool that can help both businesses and investors make wise and prudent decisions. In this way, it becomes easier to take measures to prevent the financial situation from getting worse, and even the situation can be improved (Thai et al., 2014, p. 197).

There are various financial distress prediction models in the literature. Financial distress models generally enable businesses to take precautions in times of financial distress and are used as a regular diagnostic tool to examine the financial health of businesses (Grice and Dugan, 2001, p. 152). The Z-score is based on the model of detecting multiple differences in a multivariate context, due to the complexity of decision-making processes and the low probability of comprehensively predicting all activities of enterprises in prediction models based on a single criterion (Gerantonis et al., 2009, p. 23). Altman stated that with this model, in which he tried to predict the risk of bankruptcy of publicly traded manufacturing sector enterprises, he successfully predicted the probability of bankruptcy of enterprises at the rate of about 90 percent from the period before one year and about 82 percent from the period two years ago. However, in the studies conducted, it has been seen that this model has received criticism that this model does not give successful results as expected for private enterprises. For this reason, Altman developed two different models by making changes on the model he prepared. He created the Z' model for private manufacturing companies and the Z'' model for service businesses (Altman, 2000, p. 14).

The Altman Z-Score is a statistical forecasting model that combines five financial ratios. These five financial ratios are; liquidity, profitability, leverage, solvency and activity ratios. The model has proven to be a reliable tool to predict failure in various combinations of business assets (Anjum, 2012, p. 214). In the first part of this study, firstly, the concept of financial distress was mentioned and explanatory information about the Altman Z Score was given. In the second part, some of the studies in the national and international literature are summarized. Finally, the method used in the study is mentioned and the findings are given and the results are stated. The main motivation of this study is to determine whether well performing companies are financially healthy in this sector. There are many studies on

financial distress in the literature. However, no study was found in the literature regarding the sector used in this study. Therefore, it is thought that the study will contribute to the literature in this aspect. The reason for choosing this sector is that the relevant sector has been one of the locomotive sectors of Turkey since the 1990s until today. This study consists of 6 chapters. Firstly, the concepts of financial distress and Altman Z Score were mentioned. Then, a summary of some studies in the literature is given. Finally, the findings of the study are explained and conclusions and recommendations are included.

1. Financial Distress and Altman Z Score Model

Financial distress is defined as the problems experienced in the activities of the businesses due to the problems in their financial structure. The problems experienced by the enterprises cover the entire processes from the cessation of operations to the bankruptcy process. The fact that businesses have financial problems also causes negative consequences for both the sector and the country's economy (Altman and Hotchkiss, 2006, p. 5-7). Accordingly, forecasting financial failure; It is considered extremely important in terms of determining the probability of failure of enterprises, taking preventive and corrective measures for failure in enterprises, identifying bad performing enterprises and revealing the factors that cause failure in these enterprises. In this direction, financial failure and studies to predict this failure early have been used by many researchers and practitioners and efforts have been made to improve them (Yıldız and Gürkan, 2022, p. 237-238).

The main purpose of companies in continuing their activities is to maximize the welfare of their partners and increase their market value. If they cannot do this, they will not be able to stand in the market against their competitors, their performance will be adversely affected and they may have to terminate their activities (Kılıç and Seyrek, 2012, p. 678). The reasons that push companies to financial distress are divided into two groups as internal and external. External factors such as inflation, economic recession, and crisis cannot be controlled by the company, and they cause failure by seriously affecting the sales policy of the business and its position in the sector. In addition, it is seen that companies face financial distress due to internal reasons such as the mistakes of business managers, insufficient liquidity or ineffective marketing efforts (Yakut and Elmas, 2013, p. 238).

Altman's studies are based on the thesis that evaluating financial ratios separately will not be sufficient to predict financial failure. However, while basing his studies on this thesis, he especially emphasized that the use of financial ratios should not be pushed into the background. However, in the method he developed, he revealed how to weight these ratios. In Altman's study, companies from different sectors with total assets ranging from 0.7 million dollars to 25.9 million dollars were determined as a sample. Altman, working on a total of 66 enterprises, selected 33 enterprises from those that went bankrupt between 1945 and 1965, while the remaining 33 enterprises were still in existence in 1966. After collecting the balance sheets and income statements of the selected businesses, 22 ratios were determined in order to make an evaluation. These rates have been reduced to 5 in different categories. These 5 categories are liquidity, profitability, leverage, solvency and activity ratios (Altman, 1968, p. 589-609). The model, known as the Altman Z Score in the literature, which is revealed as a result of the analysis made using these ratios, is shown in Equation 1.

$$Z\ Score = 0.012X_1 + 0.014X_2 + 0.033X_3 + 0.006X_4 + 0.999X_5 \quad (1)$$

X_1=Working Capital / Total Asset

X_2=Retained Earnings / Total Assets

X_3=Earnings Before Interest and Taxes / Total Assets

X_4=Market Value of Equity / Total Liabilities

X_5=Sales / Total Assets

The Z score calculated in The Altman Z Score Model is taken into account. If this score is lower than 1.81, it is interpreted that the probability of financial distress (bankruptcy) of the business is high. The Z-score between 1.81 and 2.99 qualifies as a clear assessment of the business regarding financial distress. If the Z score is higher than 2.99, it is considered that the business does not bear the risk of financial distress (bankruptcy).

Altman (2000) made improvements in his model in order to eliminate some deficiencies; introduced two new models for the production and service sectors. In the revised model, the book value was used instead of the variable X_4 (Market Value of Equity / Book Value of Total Liabilities) in the previous model; Other variables were not changed. The model called Altman Z' score is shown in Equation 2 (p. 25-27).

$$Z'\ Score = 0{,}717X_1 + 0{,}847X_2 + 3{,}107X_3 + 0{,}420\ X_4 + 0{,}998X_5$$

X_1=Working Capital / Total Asset

X_2=Retained Earnings / Total Assets

X_3=Earnings Before Interest and Taxes / Total Assets

X_4=Book Value of Equity / Total Liabilities

X_5=Sales / Total Assets

If the Z value calculated in the Altman Z' Score Model is less than 1.23, the probability of financial distress (bankruptcy) of the business in the coming years is considered high. The Z Score between 1.23 and 2.90 qualifies as a clear assessment of the business regarding financial distress. If the Z score is higher than 2.90, it is considered that the business does not bear the risk of financial distress (bankruptcy).

The model developed for businesses in the service sector in Altman (2000)'s study is given in Equation 3. In the model called Altman Z'' Score Model, the variable X_5 was removed from the model presented in Equation 2 in order to reduce the effect of the manufacturing sector; Therefore, the coefficients also changed.

$$Z''\ Score = 6{,}56X_1 + 3{,}26X_2 + 6{,}72X_3 + 1{,}05X_4$$

X_1=Working Capital / Total Asset

X_2=Retained Earnings / Total Assets

X_3=Earnings Before Interest and Taxes / Total Assets

X_4=Book Value of Equity / Total Liabilities

In the Altman Z" Score Model, the intervals determined in other Altman models were rearranged as 1.10- 2.60.

Below 1.10 has a high probability of bankruptcy; Above 2.60 is considered as low probability of bankruptcy.

2. Literature Review

It is possible to come across many studies within the scope of different sectors and businesses in the domestic and foreign literature regarding financial distress. Some of the prominent ones from these studies have been tried to be summarized below.

Kumar and Madhu (2013) tried to determine the financial performance of the company between 2005 and 2012 with the Altman Z" score model by using the financial statement data of Kingfisher Airlines, which is also traded in the stock market. At the end of the study, it was revealed that the results of the measurements made and the results realized were extremely consistent. In other words, the measurement results revealed that the financial performance of the company was quite weak in the mentioned years range. Looking at the actual data, it was clearly seen that the same results were observed (p. 36-48).

Afrin (2014) studied the relationship between Z-score and stock returns in the cement industry in Bangladesh. The results of the correlation and regression analyzes showed that there was no relationship between these two variables. Companies with both weak and strong Z-scores outperformed about 50% of the market, while the rest performed below 50%. The average returns of the two groups are also not significantly different. Therefore, the report concluded that Altman's Z Score had no relevance or relationship to stock returns in the Bangladesh cement industry (p. 1-16).

Tian and Yu (2017) developed separate financial distress models for Japanese and European firms by using 29 financial ratios belonging to 108 Japanese and 112 European companies operating in Japan and European countries during the 1998-2012 period. The results of the developed models were compared with the results of the Altman Z Score Model. As a result of the study, it was stated that retained earnings/total assets, leverage ratio and short-term liabilities/sales ratios were chosen in all models created for Japan, and equity/total debt ratio for European countries. It was determined that the model created in the study performed better than the Altman Z score model (p. 510-526).

In their study, Al-Manaseer and Al-Oshaibat (2018) examined the validity of the Altman Z Score Model to predict the financial distress of insurance companies traded on the Amman Stock Exchange (ASE) in 2011. As a result of the study, it has been determined that the Altman Model has a high predictive power of financial distress (p. 181-189).

Hedija (2019) found that the Altman Z Score Model was relatively successful in estimating the financial distress risks of 368 travel agencies and tour operators in the Czech Republic in the years 2009-2012, while the validity of the Altman Z Score Model was weak (p. 87-93).

Li and Faff (2019) tried to develop a model by using the data of 421 unsuccessful and 441 successful companies operating in the 1988-2011 period, and as a result of the study, it was

determined that the working capital ratio is one of the 11 variables that affect financial distress (p. 1-19).

Alothaim (2019) tried to predict the financial distress of a few selected companies using financial ratios. However, by using Altman Z Score Model, he tried to look at the discriminating power of the monetary crisis and to create a reasonable model for Saudi Arabia. To build the model, it examined two poorly performing and two well-performing companies from 2013 to 2016. As a result of the study, it was determined that two well-performing companies remained in the market, while two poor-performing companies were withdrawn from the market (p. 45-58).

Izquierdo et al. (2020) The Spanish company, which had 404 financial difficulties and 404 did not, evaluated with Altman Z Score Model between 2004-2014. In the study, 5 logistic regression models were created. While all of them are noted to have a high discriminating and predictive power, they state that the classification accuracy of predictive logit models is significantly improved with models that combine accounting and auditing data compared to the traditional financial ratios model (p. 65-97).

Karadeniz and Öcek (2020) tried to analyze the validity of the financial distress risk estimation models, which are the most accepted in finance theory, in the tourism sector on the example of Thomas Cook. In line with this purpose, the financial data of Thomas Cook, which declared bankruptcy in 2019, between 2009 and 2018 were analyzed within the scope of Altman Z Score, Springate, Fulmer and Ohlson O-Score models. As a result of the analysis, it has been determined that Thomas Cook company carries a risk of financial distress in the analysis period according to all forecasting models (p. 394-403).

Natasya and Sienatra (2020) examined the financial ratios that affect the financial failures of start-up companies operating in Indonesia. As a result of their studies, they found that the current ratio, asset turnover and return on equity ratios have significant effects on the financial distresses of start-up ventures (p. 104-119).

Boubaker et al. (2020), in their study examining the impact of CSR activities on financial distress, CSR data of 1201 businesses operating in the USA between 1991 and 2012 were obtained from the MSCI ESG database, and their financial data from Datastream and Worldscope. In the study, which used Altman Z Score to measure the financial distress risk of businesses, regression and GMM analyzes were performed. As a result of the analysis, it has been determined that businesses with high CSR performance face less risk of financial distress compared to low-performing businesses. It has been observed that businesses that perform CSR activities are stronger in the context of financial stability and are resistant to economic crises (p. 1-28).

Çelik and Dursun (2021), in their study, aimed to predict the probability of going bankrupt by using the Altman Z Score bankruptcy estimation method of the Textile, Clothing and Leather Manufacturing Industry companies traded in the BIST 100 index by using the financial data between 2017-2019. As a result of the study, it has been determined that the companies in the research sector have a high probability of going bankrupt (p. 19-29).

Elia et al. (2021) was conducted to predict the financial distress of 10 Lebanese banks in the period of 2009-2018. In the study, Altman calculated Z Scores for non-manufacturing companies and emerging markets using equations. Based on the results of the study, they suggest the Z Score Model as an important instrumental indicator for financial statement users of banks such as auditors, financial managers, investors and Lenders (p. 47-52).

Kendirli and Çıtak (2022) aimed to predict financial distress by applying the Altman Z Score Model on companies operating in the Borsa Istanbul Wood, Paper and Printing Index. In order to make the application, the financial ratios required for the model application were calculated by using the balance sheets and income statements of the companies included in the index, which is the subject of the research, between the years 2016-2020. By multiplying the calculated financial ratios with the coefficients applied in the model, the Z Scores of each company's research years were determined and financial distress was tried to be estimated. As a result of the study, it has been estimated that 7 companies out of 15 companies in the index have a high risk of bankruptcy (p. 86-94).

Tekin and Gör (2022) determined bankruptcy and financial distress risk levels through Altman Z Score and Springate S Score models, in line with the quarterly data of 13 banks operating in the Turkish banking sector between 2010-2019. In the study, it was observed that the results of the Springate S Score model were lower than the other models in terms of financial distress risk (p. 373-395).

Akdeniz and Güven (2023) aimed to estimate the risks of financial distress by analyzing the data of 11 cement companies in Borsa Istanbul between the years 2017-2021. Altman Z Score and Springate S Score models, which are frequently preferred in the literature, were used in the aforementioned risk estimations. According to the results obtained from the two models used in the study, it has been observed that the risk of financial distress in the sector is relatively low. In the evaluation to be made in terms of companies, it can be said that 5 companies are exposed to financial distress risk according to Z Score values and 4 companies according to S Score values (p. 728-735).

Medetoğlu and Tutar (2023) determined the financial distress levels of 23 companies operating in the BIST Textile and Leather Index, with the help of Springate S Score and Fulmer H Score models, within the framework of the financial statement data between the years 2017-2021. In the study, it has been found that the financial distress risk and sector fragility of the companies in the relevant sector are high (p. 307-317).

3. Dataset and Method

The main purpose of this study is to analyze the financial distress prediction of companies under the chemical, pharmaceutical, petroleum, rubber and plastic products sector classification in Borsa Istanbul using the Altman Z Score Model, which is one of the widely preferred models in the literature. In the study, a total of 10 companies with the largest asset sizes in the sector were examined. With the analyzes made in the study, it was tried to reveal how Altman Z Scores followed in 2019, 2020 and 2021 on the basis of the sector in question. For this, the average Altman Z Scores by years were calculated and it was tried to evaluate in which years the sector was prone to financial distress. There are many studies in the literature covering a 3-year period. Therefore, a 3-year period was examined in this study.This study

makes an important contribution to the literature in terms of having information about the financial distress risks of the companies in the BIST 100 Index and seeing whether the sector and companies in question are risky or not.

The data of the businesses included in the analysis within the scope of the study were obtained through the Public Disclosure Platform (KAP). The balance sheets and income statements of these businesses for the years 2019, 2020 and 2021 were analyzed and Altman Z Scores were calculated for these 3 years. According to the limit values in the Altman Z Score Model in 2019, 2020 and 2021, businesses are divided into categories as 'Risky', 'Gray Zone', 'Safe'.

The Altman Z Score Model developed by Altman (1968) has been updated over the years for different types of business and capital structures. Businesses within the chemical, pharmaceutical, petroleum, rubber and plastic products sector include different types of businesses. For example, all of the enterprises producing fertilizers, pesticides and tires are in this sector. Therefore, the asset financing type of these enterprises may also be different. In this study, the equation in the classical model for the production sector, which was first developed by Altman, was used. With the help of this equation, the Altman Z scores of the enterprises were calculated. The parameters and equation in the classical model were given in the previous part of the study.

As Altman suggested in the classification he made in his 1968 study, if the Z score is above 2.99, it is classified as safe, between 2.99 and 1.81 in the gray zone, and below 1.81 as risky. Based on these classifications, businesses located in the risky area, gray area and safe area were determined.

4. Findings

In the study, a total of 10 companies with the largest asset sizes in the sector were examined. The examined businesses were classified as 'safe', 'grey zone' and 'risky' in 2019, 2020 and 2021, and how Altman Z scores changed over the years was evaluated. In Table 1 below, the code names of the companies within the scope of the analysis and the parameters of these companies are given. According to the Table 1, it is striking that the X_1 values of some companies are negative for different years. This is because the net working capital of these companies is negative. This situation is interpreted as the current assets of the companies are not at a level to meet their short-term liabilities.

Table 1. Parameters Required for Z Score Calculation

Code	X_1			X_2			X_3			X_4			X_5		
	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021	2019	2020	2021
C1	0,03	0,17	0,01	0,15	0,10	0,09	0,12	0,17	0,13	0,37	0,38	0,30	0,87	0,83	0,88
C2	0,49	0,49	0,45	0,39	0,22	0,25	0,30	0,32	0,29	0,76	0,72	0,64	1,25	1,00	0,95
C3	-0,02	0,11	0,08	0,08	0,08	0,07	0,07	0,10	0,06	0,17	0,24	0,22	0,67	0,70	0,64
C4	0,27	0,31	0,34	0,19	0,21	0,23	0,20	0,24	0,27	0,49	0,53	0,54	0,65	0,60	0,46
C5	-0,09	-0,01	0,05	0,09	0,13	0,07	0,04	0,09	0,04	0,20	0,34	0,31	1,01	1,05	0,83
C6	0,47	0,15	0,03	0,11	0,12	0,05	0,20	0,12	0,09	0,41	0,34	0,31	0,60	0,50	0,44
C7	0,30	0,30	0,39	0,22	0,19	0,16	0,08	0,07	0,21	0,33	0,38	0,42	0,79	0,61	0,94
C8	0,27	0,24	0,30	0,28	0,13	0,17	-0,03	0,19	0,17	0,88	0,65	0,62	0,17	0,90	0,70
C9	-0,23	-0,15	-0,01	0,02	0,12	0,05	0,03	0,09	0,11	0,33	0,27	0,19	0,36	0,47	0,66
C10	0,00	0,04	0,01	0,11	0,10	0,04	0,04	-0,01	0,00	0,24	0,19	0,17	1,61	1,03	1,47

According to Table 2, 5 of the 10 companies were classified in the risky zone, 4 in the gray zone, and 1 in the safe zone in 2019. In 2020, 1 of these companies were classified as safe, while 3 were classified in the gray zone, while 6 companies were classified in the risky zone. In 2021, 1 company is classified as safe, 3 companies are in the gray zone, and 6 companies are classified as risky. Table 2 below shows the number and rates of companies in the safe, gray and risky zones on a yearly basis. Accordingly, the number of risky companies in the chemical, pharmaceutical, petroleum, rubber and plastic products sector increased in 2020 compared to 2019. On the other hand, the number of companies in the gray zone decreased in 2020 compared to 2019. No change was observed in the number of companies located in the safe zone.

Table 2. Number and Rates of Companies by Categories

Zone	2019	%	2020	%	2021	%
Safe	1	10	1	10	1	10
Gray	4	40	3	30	3	30
Risky	5	50	6	60	6	60
Total	10	100	10	100	10	100

In the study, an evaluation was made on the basis of the chemical, pharmaceutical, petroleum, rubber and plastic products sector, and the results are shown in Table 3.

Accordingly, Altman Z-Score averages increased in the chemical, pharmaceutical, petroleum, rubber and plastic products sector. The minimum score in these three years was 0.42 in 2019, while the maximum score was 3.83 in 2019.

Table 3. Mean, Min and Max Values of Z Scores

Date	Mean	Min	Max
2019	1,77	0,42	3,83
2020	1,84	0,92	3,38
2021	1,82	1,03	3,16

In Table 4 below, there is information showing in which zone the companies are located according to their Altman Z Scores.

Table 4. Altman Z Scores of Companies and Their Zones

Code	2019		2020		2021	
	Z Score	Zone	Z Score	Zone	Z Score	Zone
C1	1,73	Risky	1,95	Gray	1,64	Risky
C2	3,83	Safe	3,38	Safe	3,16	Safe
C3	1,09	Risky	1,42	Risky	1,18	Risky
C4	2,20	Gray	2,39	Gray	2,40	Gray
C5	1,29	Risky	1,79	Risky	1,29	Risky
C6	2,23	Gray	1,43	Risky	1,03	Risky
C7	1,92	Gray	1,70	Risky	2,60	Gray
C8	1,34	Risky	2,38	Gray	2,22	Gray
C9	0,42	Risky	0,92	Risky	1,21	Risky
C10	2,04	Gray	1,30	Risky	1,66	Risky

According to the results in Table 4, 5 of the companies included in the study were located in the risky zone in 2019, 6 in 2020 and 2021. In general, in the 3 years examined, most of the companies are located in either the risk zone or the gray zone. In addition, it was observed that the C2 was located in the safe zone in the said three years. Another striking finding in the study is that C3, C5 and C9 were located in the risky zone for three years. The reason for this is that the X_1 value of the companies is negative as a result of the calculations. In other words, the net working capital of the companies in question is negative. It can be said

that the current assets of these companies are in a risky zone because they are not in a position to meet their short-term liabilities.

CONCLUSION

Financial distress, which has become one of the important fields of study in the recent finance literature, means that financial obligations cannot be met, cash flow deteriorates and financial conditions deteriorate for several periods. The ability of companies to predict future financial distress will enable them to overcome the process with the least loss by gaining time to take precautions. Companies operating in the chemical, pharmaceutical, petroleum, rubber and plastic products sector make significant contributions to the country's economy by exporting, meeting domestic demand and providing employment. It is very important for the employees of the sector, investors, creditors and the government for these companies to continue their activities in a healthy way.

Developed by Altman in 1968, the Z Score Model has been updated over the years for different types of business and capital structures. Companies within the chemical, pharmaceutical, petroleum, rubber and plastic products sector include different types of companies. For example, all of the companies producing fertilizers, pesticides and tires are in this sector. Therefore, the asset financing type of these companies may also be different. In this study, the equation in the classical model for the production sector, which was first developed by Altman, was used. With the help of this equation, the Altman Z Scores of the companies were calculated. Of the companies included in the research, 5 in 2019, 6 in 2020 and 2021 were located in the risky zone. In general, in the 3 years examined, most of the companies are located in either the risky zone or the gray zone. C2 is in the safe zone for all of 2019, 2020 and 2021. C3, C5 and C9 are in the risky zone for all three years. It is understood that the results obtained from this study show similar results to Akdeniz and Güven (2023), Kendirli and Çıtak (2022) and Alothaim (2019).

In future studies, making a comparison with other models developed by Altman, taking into account sectoral differences, will yield healthier results. It is important for companies operating in different sectors to be financially strong in order to achieve their goals. Estimating the current financial situation and future of companies is an important issue for both companies and investors, company partners and the public sector. Also, it is important for investors to know which field the companies are in. Because investors pay attention to which region the companies are in when making decisions. For this reason, cases of financial success and distress are among the topics that are frequently researched in the literature.

Research and Publication Ethics Statement

The study does not require an ethical committee approval.

Contribution Rates of Authors to the Article

This article was prepared by a single author.

Ethics Committee Approval

In this article, ethics committee approval is not required. A signed consent form stating that ethics committee approval is not necessary is included in the article processing files on the system.

Conflicts of Interest Statement

There is no conflict of interest.

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