

# PERFORMANCES OF FINANCIAL DISTRESS METHODS IN SELECTING PORTFOLIOS ON LISTED ON BIST100 MANUFACTURING FIRMS BETWEEN 2017-2019

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## Abstract

This research aimed to find whether there is a difference between Modified Altman Z score, Springate S score, Zmijewski score and Grover score in terms of both the firms selected for financially distressed and financially healthy firm groups and the portfolio returns of that groups. 2017-2019 data of Istanbul Stock Exchange manufacturing sector firms are used. Scores are compared in sub-sectors using descriptive statistics. Moreover, annual returns of portfolios which are constructed by financial distress methods are calculated to examine if financial distress methods can be used for choosing stocks. This research concluded that financial distress analysis results have different results. Springate S score was the analysis that showed most firms compared to others while Grover score was the analysis that showed least firms as financially distressed compared to other methods. Analysis results didn't show any difference between sub-sectors individually, according to Kruskal-Wallis analysis results. Furthermore five best and worst firms are choosed according to analysis results and their reveue rates are compared. Analysis showed that every financially healthy firms portfolio had about %20 return except Modified Altman Z' score method. Also found that every financial distress method are successful at indicating non-profitable stocks.

**Keywords:** Financial distress, Portfolio management, Stock choosing, Comparison

## Öz

Bu arařtırmada finansal başarısızlık modellerinden olan modifiye edilmiş Altman Z skor, Springate S skor, Zmijewski skor ve Grover skor yöntemleri hesaplanmış ve sonuçlar arasındaki farklılıklar test edilmiştir. 2017-2019 yılları arasında Borsa İstanbul'da işlem gören imalat firmaları değerlendirilmiştir. Ayrıca finansal başarısızlık analizlerinin hisse seçiminde kullanılıp kullanılmayacağı kısaca test edilmiştir. Analiz metotlarının seçtiği beş en iyi durumda olan firmalardan portföy oluşturulup, bu portföylerin getiri yüzdeleri birbiriyle ve en kötü durumda olan firmalardan portföy oluşturulup, bu portföylerin getiri yüzdeleri de birbirleriyle kıyaslanmıştır. Arařtırmada finansal başarısızlık analizlerinin birbirinden farklı sayılarda sonuçlar verdiği gözlenmiştir. Springate S skoru yönteminin diğerlerine kıyasla en fazla finansal başarısız firma sonucu verdiği, Grover skorunun ise en az başarısız firma sonucunu verdiği gözlenmiştir. Analiz sonuçlarının alt sektörlere göre farklılık göstermediği sonucuna Kruskal-Wallis testiyle ulařılmıştır. Her analiz yönteminden elde edilen beş en iyi durumda olan ve beş en kötü durumda olan firmadan oluşturulan portföyler kendi içlerinde kıyaslanmış ve sonuç olarak başarılı firmalarla oluşturulan portföylerde modifiye edilmiş Altman Z skoru hariç diğer metotların ortalama yüzde 20 getiri getirdiği ve başarısız portföylerde ise analizlerin hepsinin zarar edecek firmaları tatmin edici bir oranda tahmin edebildiği sonucuna ulařılmıştır.

**Anahtar kelimeler:** Finansal başarısızlık, Portföy yönetimi, Hisse seçimi, Kıyaslama

## 1. Introduction

Because of 1973 oil crisis, many companies had bankrupt. Consequently academic communities realized that a signal system for alarming the bad financial situtation of the

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company is a must. Therefore academicians started to give more importance to making researches about creating a preventive system that could show whether company would bankrupt.

Bankruptcy of the big companies not just only affects the company owners. It also ruins all the employees, investors, partners and creditors too. Therefore foreseeing the bankruptcy carries much importance.

Financial failure is a boarder concept than bankruptcy which doesn't necessarily result in bankruptcy. For example Ozdemir (2012), in the research paper pointed out and used the fiscal terms like market value and book value to explain financial failure. Aktas (1993), mentions that in the fiscal failure definition there is different methods, some people defines it with company's lack of solvency, not being able to pay bond interests, appointment of a trustee for the company or three consecutive years in loss. Büyükarıkan and Büyükarıkan (2014) related the financial failure with costant decrease of the investment returns. As there is not one financial failure definition (bankruptcy) in the literature researchers assumed financial failure is an igniter and signal of bankruptcy. Therefore they started to make researches for finding a signal system but since there is different opinions about financial failure, every one of them used different fiscal variables at the different weightage in their formulas. Literatur shows that when creating two groups (0-1) for discriminant analysis, researchers used different methods for detecting 0 "financially distressed group" and 1 "financially wealthy group".

Financial failure starts as a process and in this process firstly sales starts a decrease trend, cash flows disrupts, costs starts to increase (because of reasons such as unexpected extra storage costs, increased interest rates because of firm's returns etc.), company experiences hard times on paying debts, irregularities shows up on some accounting items which are under current assets section of balance sheet, starts to have problems with both customer and supplier firms, slows on operations, fails on fulfilling customer orders, increases employee circulation etc. Financial failure process usually occurs as these steps (Okka,2009:939).

It is undisputed that markets became so competitive as a result of economy's being more global, variety of options for communication, marketing and transportation, competitors who comes from other countries and variety of products that presented to customers. And even a tiny mistake on the financial decision process can cause big casualties against other competitors and causes loss for themselves. Hence companies must pay much attention about their fainancial situations.

Nature of the manufacturing sector contains these variables; producing big amount of products, planning the manufacturing processes by using demand forecasting, planning the stock and storage systems, usually usage of short term credits for decreasing the costs. We must understand that in any crisis situation if one of these items gets harmed, company can experience hard times. That's why companies should examine their financial situation and taking control of it. So they can have flexibility against if something unexpected happens.

Financial failure analysis' can provide signals for being in a bad situation and bankruptcy risk. Also can be used for benchmarking and measure the financial sustainability, so firm's can decide to make preventive moves.

In financial failure analysis, financial ratios are being used. Reason of that is turn the raw data to standart and comparable type of data. If not we can fall on mistakes. For example when comparing a 100.000 dolar current assets firm and 1.000.000 dolar current assets firm we can directly say the firm with higher current assets is in a better financial position. It is a mistake. Because finance is not about how much money you have, it's about how you are using it efficiently. Let's say the 100.000 dolar current assets firm has 20.000 dolar short term debt, and 1.000.000 dolar current assets firm has 2.000.000 short term debt. When we divide current assets by short term debt, now we have short term solvency of the company (in other name: current ratio). Now when we want to compare these two companies, the smaller one has 5 current ratio and the bigger one has 0,5 current ratio. That means smaller firm can pay it's debt 5 times, but bigger firm can't even pay it's debts. So two different data now became comparable and gives more accurate results.

We can define financial distress with not being able to pay debts, can't continue production effectively, can't compete with others, making consecutie losses and as a result proceed to being a smaller organization or ending in bankruptcy. Financial distress analyses targets to creating signals before the unescapable part starts, by using financial statements (balance sheet, income statement etc.). With this purpose in the literature there is classic methods created with discriminant analysis, logistic regression etc. and modern methods created with desicion trees. Only classical methods examined in this research. Classical methods usually is a formula which contains financial ratios with weightages. There will be a certain value depends on which method you are using and if the result is above the limit that means firm evaluated as financially successful, if the result is down the limit that means firm is in financial distress and vice versa. In some methods there is a grey area too.

In this research Altman Z'' Score, Springate S Score, Zmijewski and Grover score methods has been used for examination of 142 manufacturing firm's financial situation. This researches includes only publicly traded manufacturing firms at Istanbul Stock Market (BIST). In this research, 2017-2019 annual reports had been used. In this frame, the aim of the study is comparing financial failure analyze method results with each other and check if they could be used for selecting stocks to invest. If so, finding which one is the most successful at this objective.

## **2. Literature**

Tahu (2019) aimed to compare Altman Z'' score and Springate S score. 8 construction firm has been choosed from 13 construction companies by using purposive sampling. 2014-2018 annual fiscal datas used for calculate Altman Z'' and Springate S scores. The research indicated that Springate S score gives more accurate results.

Ghodrati (2012) used Altman, Shirata, Ohlson, Zmijewski, Springate, CA, Fulmer, Farajzadeh Genetic and McKee models on Tehran Stock Exchange firms (except finance firms). The aim of the study was to find if these methods also could or could not be used for determining financial continuation, as well as comparing them with each other. The firms were seperated into two groups as financially healthy and financially distressed in the data set. He used Iran Trede Law Article 141 as a base strategy for detecting financially distressed firms. Article 141 says that, " If company loses at least half of it's equity there shall be an urgent meeting and

must decide if company will continue to its activities or decide to liquidation “. He classified firms by using Simple Tobin’s Q and detected 30 healthy and 30 distressed firms. Applied financial failure analysis methods on them. In conclusion research showed these methods are usable for detecting financial continuation and AI based techniques has more success than classical methods.

Sayetki (2015) compared the result of Altman Z score and Springate S score on 10 smartphone companies’ 2008-2010 annual reports. He found that Altman Z score had more accuracy at prediction of financial distress than Springate S score.

Husein and Pambekti (2015) aimed to detect accuracy levels of Altman Z, Springate S, Zmijewski and Grover scores on List of Islamic Securities (DES) 2009-2012 firms. For detecting financially distressed firms for dataset group, ROE and two consecutive loss variables had been used. 66 healthy and 66 failed firms detected in the research. Financial failure analyses applied and concluded that all of that methods were usable. However, Zmijewski model had more accuracy rate compared to each other.

Kürklü and Türk (2017) used 2014-2016 annual data of the 166 firm chosen from 7 different sectors. They calculated and compared the Altman Z scores and Springate S scores. They used three types of Altman Z scores and choosed individually most fit ones for companies. They found that Springate S score gave more bankruptcy signal than Altman Z score.

In their research, Fauzi et al. (2021) choosed 4 telecommunication firms from Indonesia Stock Exchange with purposive sampling and applied Altman Z’, Springate S, Zmijewski and Grever models on them with using 2014-2019 dataset. They found that Altman Z’ score gave more accurate results.

In his research Tanjung (2020) choosed 9 pharmaceutical companies from Indonesia Stock Exchange with puposive sampling technique applied Altman Z score, Springate S score, Zmijewski and Ohlson methods on them. He concluded that 4 analysis had significant difference with each other and Altmaz Z score was the most accurate of them.

Laurilla (2020) used Altman Z score, Springate S score and Ohlson score models and compared them. Dataset of the study was all manufacturing companies that traded in NASDAQ, NYSE and American Stock Exchange between the years of 1990-2018. Dataset was 33 bankrupt firms and 414 healthy firms. Accuracy rate of the analyses were found different from each other. Also, Altman Z Score had more accuracy rate at prediction than Springate S score and Ohlson score model. However, there was’nt any significant difference between the methods.

In their research, Elviani et al. 2020) used 53 trade companies in the Indonesia Stock Market and applied Altman Z scoreü Ohlson score, Springate S score and Zmijewski score methods to them. They used binary logistic regression technique. The result of study showed that Springate S score and Altman Z score more accurate compared to others.

Manalu et al. (2017) applied Altman Z score and Zmijewski X score on 4 transportation firm chosen with puposive sampliing technique and traded in Indonesia Stock Exchange. In conclusion, they found out the results of analyse didn’t have any significant difference.

Saudi (2019), in his research, analyzed 17 coal firms that traded in Indonesia Stock Market with their 2012-2016 annual fiscal data. Springate S score, Zmijewski X score and Grover score methods applied and the result rates compared with each other. In conclusion he found that Springate was the most financial distress among given analyses.

Aminian, Mousazade and Khoshkho (2016), in their research, they analyzed 35 textile, ceramic and tile companies that traded in Tehran Stock Exchange with Altman Z' score, Springate S score, Zmijewski X score and Grover score models. Then, the results of the analyses were compared with each other. They found that all models were useful but Grover model had the most accurate prediction rate.

Hirawati and Arifin (2015), in their research, applied Altman Z, Springate S, Ohlson, Zmijewski and Grover score models to 27 financially distressed and 54 financially healthy firms that traded in Indonesia Stock Market. They used 2011-2014 annual fiscal data in research and found out Grover model had the most accurate prediction rate with %85,19.

Tan and Wibisana (2020), in their research, aimed to compare Altman Z'' score and Springate S score models. They used purposive sampling method as 2 consecutive loss and choosed 24 firms from 173 manufacturing firms that traded in Indonesi Stock Exchange. At the end of the study they found out Altman Z'' model gave more accurate results than Springate S score model.

Huo (2006), in his research, aimed to find out if financial analyzes effective on small businesses or not. Altman Z, Springate S and Fulmer H score methods were compared. Dataset of the study was 11 bankrupt restaurant firm between 1993-2003. He concluded that Altman Z score had the most accuracy rate.

### 3. Method

In this research, financial distress level of 142 manufacturing sector firms analyzed with using their 2017-2019 annual reports. While there are 171 manufacturing companies in Istanbul Stock Exchange, for calculation easiness purpose only 142 firms evaluated, because some firms have different dividend distribution policy then others. Mistakes on retained earnings calculation could have contaminate the dataset fatally. Datas obtained from Stockkeys program of FINNET Elctronic and Public Disclosure Platform (KAP). Then, in order to calculate Altman Z'', Springate S, Zmijewski and Grover scores, financial ratios calculated with using quantitative data from fiscal reports of firms.

Abbreviations that used in the research gen and genkat are stands for general and general categorical. Altman Z'' score used for modified Altman Z score.

#### 3.1.Financial ratios

Financial ratios that used in this research are given in Table-1:

**Table 1.** Financial Ratio Definitions

FINANCIAL RATIOS	DEFINITION
Net working capital/Total assets	This ratio shows the net working capital's percentage in total assets. (1)

Retained earnings/ Total assets	This ratio calculates the self-financing value of the firm. It adds up by years, so old firms might have higher retained earnings. Also depends on firm's strategy on stock market. Firms can use dividend distribution for provide demand to stocks or not distribute and use for self-financing.
EBIT / Total assets	This ratio is used for detecting firm's profitability by excluding interest and tax payments.
Equity / Total liabilities	This ratio is for determine the way of financing it's resources. If it's lower than 1, that means firm uses so much debts. If it's higher than 1, that means firm has solvency.
Earning before taxes / Total liabilities	This ratio shows solvency of return before tax.
Sales / Total assets (asset turnover)	This ratio indicates the ability of the firm to convert its assets into income. If it is low investors may think it as firm is not using it's assets effectively and vice versa.
Total liabilities / Total assets	It shows how much of the resources are financing with debt. Credit institutions, banks can decide whether to give loans by looking at this feature of the companies.
Net profit / Total assets	It shows the profit earned per asset owned by the firm. It is a way to compare companies of different sizes.
Current assets / current liabilities (Current ratio)	It shows the ability of the business to pay its short-term debts with its highly liquid assets.

### 3.2.Financial Distress Analysis Methods

Financial distress analyzes that used in this research as follows:

#### 3.2.1. Modified Altman Z'' Score

(Formula 1)

$$Z'' SCORE = 6,56X1 + 3,26X2 + 6,72X3 + 1,05X4$$

X1: Net working capital / Total assets

X2: Retained earnings / Total assets

X3: Earnings before interest and taxes (EBIT) / Total assets

X4: Book value of equity / Total liabilities

If Altman Z'' score is lower than 1,1 that means firm has bankruptcy risk. If it is above 2,6 that means firm is financially healthy. If score is between 1,1 and 2,6 that means nothing can be said about financial situation and also known as grey area (Yıldız, 2021).

Altman is one of the first person who used discriminant analysis for creating a financial distress model. In 1968 he created his first model and it developed twice after that. It has its final form at 1995 (Ananto et al., 2019). First formula was developed for manufacturing firms which traded in stock market. Second one was developed for non-traded firms. The last formula "modified Altman Z score" was developed for both traded and non-traded firms and both manufacturing and service companies.

##### 3.2.1.1.Why Modified Altman Z Score Used In Research?

The first two Altman Z scores are using stock prices in calculation. Stock prices in the Istanbul Stock Exchange may not move as a result of quantitative data. This could be explained with that market's movements are not just depends on quantitative data. It also considers another criteria such as people's reactions to events, news feed, risk perception of individuals etc. As a result of that, we can see so low stock prices on a high value firm and vice versa. It doesn't react as efficient market theory. For this reason, the only formula of Altman without market value is used in this research.

Information influence stock prices immediately, so even uninformed investors can do profit just by looking at the price tableau (Malkiel, 2003).

### 3.2.2. Springate S Score

*(Formula 2)*

$$S \text{ SCORE} = 1,03X1 + 3,07X2 + 0,66X3 + 0,4X$$

X1: Net working capital / Total assets

X2: EBIT / Total assets

X3: Earnings before taxes / Current liabilities

X3: Sales / Total assets

If Springate S score is lower than 0,862, that means firm is in financial distress. If score is above 0,862, that means firm is financially healthy (Yıldız, 2021)

Gordon L.V. Springate did a similar study in 1978 to Altman's 1968 research. For detecting financial distress, he used 19 financial ratios with multiple discriminant analysis and choosed the four ratios that had more representative power on determining financial distress (Tan and Wibisana, 2020).

### 3.2.3. Zmijewski Score

*(Formula 3)*

$$\text{Zmijewski score} = -4,336 - 4,513X1 + 5,679X2 - 0,004X3$$

X1: Net Profit / Total assets

X2: Total liabilities / Total assets

X3: Current assets / Current liabilities

If Zmijewski score is higher than 0, that means firm is in financial distress. If score is lower than 0, that means firm is financially healthy (Helastika and Paramita, 2020).

In his research, Zmijewski (1984) developed a model by using performance, liquidity and leverage ratios. He didn't choose ratios with theoretical methods, he determined ratios by examine pioneer researchs in this field. He analyzed 40 bankrupt and 800 financially healthy firms (Grice Jr et al., 2003).

### 3.2.4. Grover Score

(Formula 4)

$$\text{GROVER SCORE} = 1,650X1 + 3,404X2 - 0,016X3 + 0,057$$

$$\text{Grover Score} = 1.650X1 + 3.404X2 - 0.016X3 + 0.057$$

X1: Net working capital / Total assets

X2: EBIT / Total assets

X3: Net profit / Total assets

If Grover score is equal or lower than -0,02 that means firm has bankruptcy risk. If it is above 0,01 that means firm is financially healthy (Helastika and Paramita, 2020). If score is between -0,02 and 0,01 that means nothing can be said about financial situation and also known as grey area.

This research made by Grover for developing Altman's 1968 work, He used same dataset with Altman and added 13 new financial ratios and made another **formula (Fredy, 2018)**.

### 3.3.Data Analysis

We used the firm averages of each financial failure score which had been calculated annually. The reason of that is sudden changes on any item in the formulas may cause so much effect on results. If we only look one years result, we can see firm is financially healthy or in distress because of a sudden change on an item. Methods that determine financial situation with a threshold value and a sudden change can change the result. That may cause misleading results on firms' financial situation.

In the analysis, descriptive statistics were used to determine if there was any difference in result frequencies or not. Then, with parametric or non-parametric analysis techniques that depend on the normality distribution of the data set, it was examined whether the results vary between the manufacturing sub-sectors. Moreover, it was investigated whether these methods could be used for stock choosing for investment by comparing annual stock returns of five highest and lowest score firms at each method.

## 4. The Results Of Analysis

First of all, the descriptive analysis of 142 Manufacturing company sub-sector were obtained and given Table 2.

### 4.1.Descriptive Statistics

**Table 2.** Descriptive statistics of Sub-Sectors

Sub-Sectors	Frequencies
Food, beverage and tobacco	22
Textile, wearing apparel and leather	18
Wood products including furniture	4



Paper and paper products, printing and publishing	10
Chemicals, petroleum rubber and plastic products	26
Non-metallic mineral products	16
Basic metal	15
Fabricated metal products machinery electrical equipment and transportation vehicles	30
Other manufacturing industry	1
<b>TOTAL</b>	<b>142</b>

As can be seen in Table 2, nine sub-sectors data were used in the research. The sub-sector that has the most firms is fabricated metal products machinery electrical equipment and transportation vehicles. However, the sub-sector that includes lowest firms is other manufacturing industry.

Also, the result of each calculated financial failure methods of 142 manufacturing firms with using annual data of 2017, 2018, 2019 were given Table 3.

**Table 3.** Financial Distress Analysis Categorical Result Frequencies

Analysis	Years	2019			2018			2017		
		0	1	2	0	1	2	0	1	2
<b>Altman Z''</b>		36	76	30	33	82	27	31	78	33
<b>Springate S</b>		67	75	-	61	81	-	62	80	-
<b>Zmijewski</b>		28	114	-	26	116	-	25	117	-
<b>Grover</b>		18	124	-	15	126	1	12	129	1

**Note:** 0 =Financially distressed, 1=Financially healthy, 2=Grey area

As a result of analysis, it is observed in Table 3 that Grover score detected least firms as in financial distress while Springate had the most. This situation is similar for all three years. The number of financially unsuccessful firms given by each analysis for three years is close to each other in itself.

The studies that found the Springate S score method detects firms as in financial distress more than the other were given below:

In the research of Kürklü ve Türk (2017), Springate S score detected more firms than mixed usage of Altman Z scores. In the research of Tahu (2019), financially distressed firms chosen by purposive sampling technique and Springate score gave more distress result than Altman Z'' score. Thus it was found that Springate S score had more accuracy rate for detecting financial distress. In the research of Shalih (2019), Fulmer H and Springate S score had been calculated for 18 firms. Springate S score gave 9 distress result while Fulmer H score gave 0. In the research of Hungan ve Sawitri (2018), they compared Springate S and Grover score methods and found that Springate S score gave more distress result and Grover score had more accuracy rate at predicting financial distress.

Moreover, the classified representation of the results obtained by the financial failure methods by taking the arithmetic mean of the three-year analysis results of the companies is given in Table 4.

**Table 4.** Mean of Three-Year Analysis Results Of The Companies

ANALYSIS	CATEGORY		
	0	1	2
Altman Z''	37	79	26
Springate S	68	74	-
Zmijewski	22	120	-
Grover	13	129	-

**Note1:** 0 =Financially distressed, 1=Financially healthy, 2=Grey area

**Note2:** Categorical means of three-year results of all firms given in the Appendix 1.

Furthermore, for detecting if analysis results show any differences between sub-sectors, first it should be determined if dataset provides normality distribution or not. Therefore, normality distribution tests that are Kolmogorov-Smirnov and Shapiro-Wilk were used and skewness-kurtosis values were checked and shown in Table 5 and Table 6.

#### 4.2. Tests of Normality

**Table 5.** Kolmogorov-Smirnov and Shapiro-Wilk Results of Normality Test

Methods	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Altman	,126	142	,000	,899	142	,000
springate	,149	142	,000	,836	142	,000
zmijewski	,127	142	,000	,695	142	,000
grover	,080	142	,028	,967	142	,002

a. Lilliefors Significance Correction

**Table 6.** Skewness and Kurtosis Results

Methods	Skewness		Kurtosis	
	Statistic	Std. Error	Statistic	Std. Error
Altman	-,926	,203	6,392	,404
Springate	2,319	,203	12,214	,404
Zmijewski	4,532	,203	38,914	,404
Grover	,208	,203	2,310	,404

As can be seen in Table 5 and 6, it was determined that dataset did not provide normal distribution condition for parametric analyzes. Kolmogorov-Smirnov and Shapiro-Wilk test's significance levels were lower than 0,5 and skewness and kurtosis values were not between -2 and 2 (George and Mallery, 2010). Therefore parametric tests couldn't be used.

#### 4.3. Kruskal-Wallis Test

After normality tests, Kruskal-Wallis test, one of the non-parametric tests, was applied and, its results were given in Table 7.

**Table 7.** Kruskal-Wallis Test Results

Null Hypothesis	Test	Sig.	Decision
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1	The distribution of altmangen is the same across categories of sub-sector	Independent-Samples Kruskal-Wallis test	,823	Retain the null hypothesis.
2	The distribution of springategen is the same across categories of sub-sector	Independent-Samples Kruskal-Wallis test	,118	Retain the null hypothesis.
3	The distribution of zmijewskigen is the same across categories of sub-sector	Independent-Samples Kruskal-Wallis test	,889	Retain the null hypothesis.
4	The distribution of grovergen is the same across categories of sub-sector	Independent-Samples Kruskal-Wallis test	,327	Retain the null hypothesis.

As a result of Kruskal-Wallis Test, there was no significant difference between company sub-sector's financial distress method results.

#### 4.4. Stock Returns

Apart from above analysis, an examination applied to determine whether financial distress methods were beneficial at choosing a stock to make investment. In this frame, 2018 stock returns were evaluated. 2017 stock returns couldn't be used because dataset didn't include 2016 quantitative data and 2019 stock market data might be affected by Covid-19 virus. Stock returns were calculated by simple buy and hold strategy. Return data was calculated by using first weekday of 2018 (January 5th) stock prices and last weekday of 2018 (December 28th) stock prices. In the calculation, dividend distributions were ignored.

Return calculations were applied only to the most successful and the most unsuccessful five companies, which financial failure analyzes showed. The calculation results were given in Table 8.

**Table 8.** Return Calculation Results

<b>Altman Z' score</b>			
<b>Highest ones</b>	<b>Return %</b>	<b>Lowest ones</b>	<b>Return %</b>
FMIZP	16,15	DARDL	-37,22
SEYKM	-26,54	SEKUR	-67,19
MEGAP	47,42	OZBAL	-53,87
EGEEN	-1,59	DITAS	-12,42
RTALB	-38,73	EMNIS	-75,05
<b>Springate S score</b>			
<b>Highest ones</b>	<b>Return %</b>	<b>Lowest ones</b>	<b>Return %</b>
FMIZP	16,15	OZBAL	-53,87
EGEEN	-1,59	CEMAS	-61,34
ULUSE	69,21	MERKO	-24,81
MEGAP	47,42	ORMA	10,34
SUMAS	-31,50 (from Feb. 9th )	BSOKE	-34,52
<b>Zmijewski score</b>			
<b>Highest ones</b>	<b>Return %</b>	<b>Lowest ones</b>	<b>Return %</b>
FMIZP	16,15	DARDL	-37,22
EGEEN	-1,59	OZBAL	-53,87
MEGAP	47,42	EMNIS	-75,05
SEYKM	-26,54	MERKO	-24,81
ULUSE	69,21	VKING	-5,17
<b>Grover score</b>			

Highest ones	Return %	Lowest ones	Return %
FMIZP	16,15	DARDL	-37,22
EGEEN	-1,59	OZBAL	-53,87
ULUSE	69,21	MERKO	-24,81
MEGAP	47,42	EMNIS	-75,05
SUMAS	-31,50 (from Feb. 9th )	ORMA	10,34

According to Table 8, the following findings could be expressed;

Altman Z'' score had not so much success at predicting stocks with good returns comparing to other financial distress methods. The most successful stock that found from Altman Z'' score had %47 return rate. It had been found that only two of the 5 most successful companies, which were shown by the altman z score, were in profit. In these two stocks, in profit, MEGAP had %47,42 return rate and FMIZP had %16,15 return rate.

Also, all 5 stock in the unsuccessful categories ended the year in loss. While three of them had over %-50 loss rate, average return rate of the top 5 unsuccessful firms was -%45,16.

Springate S score had average success at detecting good stocks. The most successful stock that found from Springate S score, had %69,21 return rate. It had been found that only three of the 5 most successful companies, which were shown by the Springate S score, were in profit. In these three stocks, in profit, ULUSE had &69.21, MEGAP had %47,42 and FMIZP had %16,15 return rate.

Also, 4 stock in the unsuccessful category ended the year in loss. While three of them had over -%50 loss rate, average return rate of the top 5 unsuccessful firms was -%32,84.

Zmijewski score had average success at detecting good stocks. The most successful stock that found from Zmijewski score, had %69,21 return rate. It had been found that only three of the 5 most successful companies, which were shown by the Zmijewski score, were in profit. In these three stocks, in profit, ULUSE had &69.21, MEGAP had %47,42 and FMIZP had %16,15 return rate.

Also, all 5 stock in the unsuccessful category ended the year in loss. While two of them had over %-50 loss rate, average return rate of the top 5 unsuccessful firms was %-39,22.

Grover score had average success at detecting good stocks. The most successful stock that found from Grover score, had %69,21 return rate. It had been found that only three of the 5 most successful companies, which were shown by the Grover score, were in profit. In these three stocks, in profit, ULUSE had &69.21, MEGAP had %47,42 and FMIZP had %16,15 return rate.

Also, 4 stock in the unsuccessful category ended the year in loss. While two of them had over -%50 loss rate, average return rate of the top 5 unsuccessful firms was -%36,122.

## 5. Conclusion and Discussion

The aim of this research was to examine whether there was any difference between financial failure methods or not. Also, this study was aim to search if financial failure methods could be used for stock choosing by inverstors. In this research, it was found that each financial failure method described a different number of firms as financial failures.

Also result were showed that each financial distress method had consistency in themselves between years with respect to financial distressed firm amount.

Moreover, for detecting difference between analyse methods, descriptive statictics were compared with each other. Three years results were used to determine an average result and for comparison dataset turned into categorical variables. Because each analysis had different treshold values and some of them evaluated minus value as financially healty and some of them evaluated minus value as financially distressed. For this reason, it could be stated that to prevent mistakes using categorical data was crucial in this type of situations. In this direction, according to the categorical results of the averages of three years results, Altman Z'' score method evaluated nearly %26, Springate S score evaluated nearly %47,8 , Zmijewski score method evaluated nearly %15,4 and Grover score method evaluated nearly %9 of the total firms as financially distressed.

Another important observation was that distress firm amount had an increasing tendency in every method. Altman Z'' score distressed firm results were respectively 31-33-36, Springate S score distressed firm results were respectively 62-61-67, Zmijewski score distressed firm results were respectively 25-26-28, and Grover score distressed firm results were respectively 12-15-18. Since each methods had this tendency. It could be said that there was an external factor for this result. Therefore, this external factor could be US dollar/ Turkish lira parity that had increased consistently total of %60 between years of 2017 and 2019. Since Turkey uses import products in manufacturing sector, this changing in exchange rate can be a reason of financial problems.

Furthermore, at the and of the research, financial failure method's usage at stock choosing were briefly tested. In this frame, **average annual return test results were as following**. Altman Z'' score's financially **healty** portfolio return is - %0.658. Springate S score's financially **healty** portfolio return is % 19.938, Zmijewski score's financially **healty** portfolio return is % 20.93, Grover score's financially **healty** portfolio return is % 19.938, Altman Z'' score's financially **distressed** portfolio return is -%45.16, Springate S score's financially **distressed** portfolio return is -%32.84, Zmijewski score's financially **distressed** portfolio return is -%39.22, and Grover score's financially **distressed** portfolio return is -%36.122. These results shows that Altman Z'' score model has lowest return at financially healthy firm portfolio. The other methods have about %20 average returns. On the other hand financialy distressed portfolios has about % 38 loss on capital.

Turkey had %20,3 inflation rate at the end of 2018. Therefore we only can evaluate a portfolio return as good if it is above %20,3. In this frame we can say Zmijewski score method is successful at stock choosing.

Another important result of the study is that every method detected a -%75 return stock but the Springate S score method. This may indicate Springate could not be an effective analysis method comparing to others.

Suggestions for next researchs; A comprehensive financial distress method must be created with classical techniques for invester's using easiness because there are a lot of financial

distress models with different structures but they are giving different results. Stock choosing performances of financial distress methods should be measured for different countries.

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Appendix 1:

<i>FIRMS</i>	<i>ALTMAN Z' , GENKAT</i>	<i>SPRINGATE GENKAT</i>	<i>ZMIJEWSKI GENKAT</i>	<i>GROVER GENKAT</i>	<i>FIRMS</i>	<i>ALTMAN Z' , GENKAT</i>	<i>SPRINGATE GENKAT</i>	<i>ZMIJEWSKI GENKAT</i>	<i>GROVER GENKAT</i>
ASCEL	1	1	1	1	ISDMR	1	1	1	1
ADEL	1	1	1	1	IZDMC	0	0	0	0
AFYON	0	0	1	0	JANTS	1	1	1	1
AKCNS	1	1	1	1	KARSN	0	0	0	1
ATEKS	1	0	1	1	KRTEK	2	1	0	1
AKSA	2	1	1	1	KARTN	1	1	1	1
ALCAR	1	1	1	1	KATMR	1	0	0	1
ALKIM	1	1	1	1	KERTV	1	1	1	1
ALKA	1	1	1	1	KRVGD	2	1	1	1
AEFES	2	0	1	1	KLMSN	1	1	1	1
ASUZU	0	0	1	1	KNFRT	1	1	1	1
ARCLK	1	1	1	1	KONYA	1	1	1	1
ARSAN	1	0	1	1	KORDS	1	1	1	1
AVOD	2	0	1	1	KRSTL	1	0	1	1
AYES	1	1	1	1	KUTPO	1	1	1	1
AYGAZ	1	1	1	1	LUKSK	1	0	1	1
BAGFS	2	0	1	1	MAKTK	0	1	1	1
BAKAB	1	1	1	1	MRSHL	2	0	1	1
BANVT	1	1	1	1	MEGAP	1	1	1	1
BASCM	1	0	1	1	MNDRS	0	0	0	1
BTCIM	0	0	1	1	MERKO	0	0	0	0
BSOKE	0	0	1	0	NIBAS	2	0	1	0
BRKSN	2	0	1	1	NUHCM	1	1	1	1
BLCYT	1	1	1	1	OLMIP	2	0	1	1
BRMEN	0	0	1	0	ORMA	0	0	0	0
BRSAN	2	0	1	1	OTKAR	1	1	1	1
BFREN	1	1	1	1	OYLUM	0	0	1	1
BOSSA	2	1	0	1	OZBAL	0	0	0	0
BRISA	2	0	0	1	PARSN	0	0	1	1
BUCIM	1	1	1	1	PENGD	0	0	1	1
COLLA	1	0	1	1	PETKM	1	1	1	1
CELHA	0	0	1	1	PETUN	1	1	1	1
CEMAS	0	0	1	1	PINSU	0	0	0	0
CEMTS	1	1	1	1	PNSUT	1	0	1	1
CMBTN	0	0	1	1	POLTK	1	1	1	1
CMENT	1	0	1	1	RODRG	0	0	1	1



CIMSA	2	0	1	1	RTALB	1	0	1	1
CUSAN	1	0	1	1	SAFKR	1	1	1	1
DAGI	1	0	1	1	SANFM	0	0	1	1
DARDL	0	0	0	0	SAMAT	0	0	0	1
DMSAS	1	1	1	1	SARKY	1	1	1	1
DERIM	1	0	0	1	SASA	2	0	1	1
DESA	0	0	1	1	SAYAS	0	0	1	1
DEVA	1	1	1	1	SEKUR	0	0	1	1
DNISI	1	1	1	1	SELGD	1	1	1	1
DITAS	0	1	1	1	SEYKM	1	1	1	1
DOBUR	1	1	1	1	SILVR	0	1	1	1
DGKLB	0	0	0	1	SODSN	1	1	1	1
DOGTA	0	0	0	1	SKTAS	0	0	0	1
DURDO	2	1	1	1	SNPAM	0	0	0	1
DYOBY	0	0	0	1	SUMAS	1	1	1	1
EGEEN	1	1	1	1	TATGD	1	1	1	1
EGGUB	2	1	1	1	TOASO	2	1	1	1
EGPRO	1	1	1	1	TUCLK	2	0	1	1
EGSER	1	1	1	1	TUKAS	2	0	1	1
EMNIS	0	0	0	0	TMSN	1	0	1	1
ERBOS	1	1	1	1	TUPRS	2	1	1	1
EREGL	1	1	1	1	PRKAB	2	1	1	1
FMIZP	1	1	1	1	TTRAK	1	1	1	1
FROTO	1	1	1	1	TBORG	1	1	1	1
FORMT	1	0	1	1	ULUSE	1	1	1	1
GENTS	1	1	1	1	ULUUN	1	1	1	1
GEREL	1	0	1	1	USAK	2	0	1	1
GOODY	1	1	1	1	ULKER	1	1	1	1
GOLTS	2	0	1	1	VANGD	1	0	1	1
GUBRF	0	0	1	1	VESBE	1	1	1	1
HATEK	1	0	1	1	VESTL	0	0	0	0
HEKTS	1	1	1	1	VKING	0	0	0	0
HURGZ	2	1	1	1	YATAS	1	1	1	1
IHEVA	1	1	1	1	YKSLN	1	1	1	1
IHGZT	1	0	1	1	YUNSA	2	1	1	1

**Note:** 0 = not successful, 1 = successful 2 = grey area