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Measurement of the effects of capital structure in enterprises on the probability of bankruptcy: A research on the enterprises traded in the BIST industrial index

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Abstract. This study aims to measure the relationship between the Altman Z-Score, which is used to determine the financial failure of the enterprises, and the decisions on the capital structure. In other words, it has been tried to determine whether the capital structure has any effect on the risk of bankruptcy. In the scope of the research, 112 enterprises that continue their activities uninterruptedly and are traded on the industrial index between 2006 and 2014 have been examined. Panel data analysis has been utilized in order to examine the effect of capital structure on the financial failure and/or performance in the enterprises. Through the use of the Altman Z-Score (ZSCORE) which is an indicator of the risk of bankruptcy in the models formed based on the panel data analysis, a statistically negative and significant correlation has been found between the capital structure of the enterprises and the risk of bankruptcy. The leverage ratio (TBTV), which is considered as a variable that represents the capital structure, and thenon-debt tax shields (BDVK), which represent the control variable, have been used. In the correlation between the control variable and the ZSCORE, it has been found that the BDVK has not any significant effect on the ZSCORE and has not caused any increase in the total variance. The findings of this study indicate that the debt ratio in the enterprises causes an increase in financial failure, and they are also compatible with the validity of the trade-off theory.
Keywords. Capital structure, Altman Z Score, Panel Data, Financial Performance, Trade-Off Theory, BIST.
JEL. C23, G32, G33.

1. Introduction

In our day, the changes that occur on a global scale also reveal the concepts of financial failure and risk in terms of the enterprises. Nowadays, it is seen that the enterprises which carry on their activities all around the world go through a financial failure and eventually encounter with the risk of bankruptcy. It is known that the financial problems occur in different geographical regions and under different conditions. This fact may cause some difficulties in predicting financial crises and taking necessary precautions. The financial crises which occur on a global scale and their results naturally affect the enterprises located in Turkey. Reflections of the global financial crises are seen in the financial decisions and transactions, and this case affects the enterprises in the manufacturing and industrial sectors through technological developments. The fact that the enterprises encounter with financial problems and insolubilities affects all shareholders in the enterprises, and such effects also cause some social problems when they are not limited to a single enterprise but also spread to the whole sector.

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As a term, financial failure has been involved in the literature at the beginning of the 1960s and used more frequently after the financial crises occurred globally in the 1970s (Akkaya, Demireli & Ümit, 2009). As mentioned above, the financial problems in the enterprises cause a detrimental effect on the main principle adopted by the enterprises to increase the market value and the income of the shareholders. The termination of the business activities due to any financial failure can be prevented, and all contingent damages that may be caused by a possible liquidation process can be minimized (Kaya, Tokay & Kaya, 2014).

Though the main point of focus for the executives in the enterprises until the year of 1958 was to achieve a capital structure that would be constant and suitable under every condition, a study conducted by Modigliani and Miller (M&M) in the relevant year has found that there is not any relation between the capital structure, the capital cost and the enterprise value, and that the risks had by the enterprises are more remarkable. In other words, the study conducted by M & M on the issue of capital structure is the first example of the business finance theory in today's context. In the period following the model created by M & M in the modern sense, various studies have been conducted on the variables which are influential to the construction of the capital structure in the enterprises.

The studies, which reveal what the capital structure is, reach very different results in accordance with the factors they focus on. Briefly, the trade-off theory focuses on the issue of taxation, the financing hierarchy focuses on the information asymmetry, the model created by Modigliani and Miller focuses on the consistent and stable markets, and the agency theory focuses on the importance of the agent costs. More clearly, the trade-off theory suggests that the enterprises should provide their financing through the use of foreign sources due to the effect of tax savings rather than any other addition to be made in their capital, and the pecking order theory suggests that the enterprises should provide their financing through the use of internal sources especially with the sale of their undistributed profits and assets. In addition, the agency theory focuses on the conflicts between the interest groups in an enterprise. Jensen & Meckling (1976) are the first economists who have introduced the agency theory. In this study, the enterprises determine the most suitable capital structure, make decisions on the relevant structure, and try to find the point which will minimize the agent costs through the funds which will be probably acquired by the foreign assets and the issuance of new shares.

The executives, who are responsible for financial decisions in the enterprises, have to maintain a balance between the financial risks and profitability factors, and should increase the enterprise value. The decisions on the capital structure, which are made in accordance with the relevant purpose, will have an important role in the prevention of the probability of financial failure, in other words, the risk of bankruptcy. If the financial, in other words, capital structure decision which is to be made requires an excessive indebtedness, the financial structure of the enterprise enters into the process of deterioration, therefore, the enterprise has a difficulty to meet its responsibilities, and legal existence of the enterprise is terminated. On the other hand, the decisions, which will strengthen the capital structure of the enterprise and provide the provision of lower cost resources, will be effective in minimizing the risk of bankruptcy.

The fact that the decisions to be made on the capital structure are the factors that can prevent both the financial failure and any potential financial failure has made the decisions on the capital structure an issue which requires an examination of the effects on the probability of bankruptcy in the enterprises. For this reason, in this study, it is aimed to determine to what extent the decisions made on the capital structure are effective on the probability of bankruptcy in the enterprises. Within this context, the conditions, which indicate the financial performance and failure of the enterprises that continue their activities uninterruptedly and are traded on the Istanbul Stock Exchange (BIST) Industrial Index between 2006 and 2014, will be determined through the Altman Z-Score model. In addition, the capital structure of the enterprises will be determined through the non-debt tax shields and the leverage

ratio in which the total debt and assets of the enterprise are discussed. The panel data regression analysis will be preferred to determine whether there is a relation between the results, which indicate the financial performance and/or failure of the enterprise, and the decisions made on the capital structure. Following the introduction, the relevant literature review will be included in the study. Then, in addition to the methodology of the study, the results, which analyze the relation between the concepts of financial performance and/or failure and the decisions on the capital structure, will be evaluated. Finally, the section of conclusion and evaluation will be included in the study.

2. Theory and literature

2.1. Capital structure (Leverage ratio)

The leverage ratio determines how much amount of debt has been used by the enterprises in order to finance their investments which are planned. A high level of leverage ratio indicates that the financing of the enterprise is realized in a speculative manner, the enterprise does not provide sufficient confidence to the creditors regarding the changes in its sales, the margin of safety is perceived as narrow, and that the enterprise has a high risk of financial failure because it may encounter with difficulties in making its principal, installment and interest payments which put the enterprise under an obligation for repayment due to the debt taken (Aktan & Bodur, 2006).

The total debt/total assets ratio, which is also defined as the financial leverage ratio, is a ratio which indicates what percentage of the assets an enterprise holds is funded by debt. Even though the use of this ratio by the enterprises at a certain level can be positively reflected to the profitability generated through their activities, it may cause an increase in the costs which are related to the debt by driving the enterprises to financing with a higher amount of debt than the amount which should be used (Sokmen, 2013). The capital structure decision is one of the most important decisions encountered by the financial managers in the enterprises. Any change which may occur in the financial leverage ratio of an enterprise affects the financial capacity, the current risks, the capital costs, the investments to be made, the strategic decisions regarding the activities, and the profit of the shareholders the enterprise is liable for (Cai & Zhang, 2011).

When the current economic condition is well and the cash flow obtained from the investments is strong, the realization of a high financial leverage ratio by the enterprises causes a significant increase in the shareholders' current welfare level. On the other hand, in the periods when the economic stability progresses negatively compared to the previous years and the cash flows show a decrease relatively, keeping the leverage ratio high both damages the enterprise and leads to a decrease in the shareholders' welfare (Müslümov, 2001).

The concept of financial risk in enterprises is one of the risk types that reveal in the enterprises, which use debt in order to benefit from the advantages provided by the use of the financial leverage while forming the capital structure and added to the risk of the enterprise in terms of the shareholders (Aydın, Başar & Coşkun, 2004). The financial risk can be measured by the enterprises through the use of the financial leverage. In general, the financial leverage level of the enterprises in the industries, where the risk of the enterprise is high, is expected to be low or negative (Myers, 2001). The financial risk in the enterprises results from the use of the securities which impose the enterprises an obligation to pay interest. This situation may lead to an increase in the variability, which may be seen in the net profit at the end of the period or the earnings per share of the enterprise, and may increase the probability of having difficulty to repay the relevant debt (Brigham & Houston, 2004; Moyer, McGuigan & Rao, 2007). An increase in the share of debt obtained by the enterprise in the capital structure causes an increase in the fixed financial costs, in which the enterprise is liable to meet, and consequently leads to a high financial risk in the enterprise (Arnold, 2002).

The enterprises which have a high risk and may have a difficulty to pay their debts should not benefit from the financial leverage at a high level. The fact that the income generated by the enterprises through their activities varies by periods and the possibility of financial problems in the enterprise represents the indicators of the possible risk which may occur in the enterprise (Wiwattanakantang, 1999). An irregularity in the earnings of the enterprise increases the risk of financial problems and prevents the enterprise from fulfilling its liabilities imposed by financing through borrowing. In this case, the borrowing level of the enterprise decreases due to the irregularity seen in the earnings and causes a negative relation between the borrowing level and the enterprise risk (Deesomsak, Paudyal & Pescetto, 2004).

When we examine the financial leverage ratio from the point of view of the business partners, it has been seen that the partners expect the total debt/total assets ratio will be found at a high level. The high level of this ratio indicates that the management is not shared with other parties. It is not possible for the business partners to increase this ratio continuously and to benefit from the advantages provided by the leverage because of the reactions of the creditors and other partners (Ceylan, 2001). Partners who do not want to put the enterprise's future at risk will not demand to acquire financing through debt after a certain period of time. Therefore, the organizations that fund the enterprise will make the conditions more difficult as the debt level increases, and eventually they will end the loaning procedure (Akgüç, 1998).

Another condition to benefit from the total debt/total assets ratio is that the profit ratio acquired is higher than the costs arising from the debt. If the relevant condition is not fulfilled as stated, the profitability of the debtor regarding the equity will be lower than that of the enterprise without any debt (Bolak, 1990).

2.2. The Altman Z-score model

The Altman Z-Score was first introduced by Altman in 1968 through the use of multiple discriminant method and a dataset of 66 publicly-traded manufacturing enterprises in the U.S.A. 50% of these enterprises evaluated in the relevant model had already filed for bankruptcy between 1946 and 1968, and the remaining enterprises had continued their activities without any problem. The Z-Score is a model that is widely used to predict any possible financial failure of the enterprises (Kulalı, 2016). Altman has determined the financial coefficients of the enterprises by using the financial indicators, which yield different results, and created the Z-Score model through the use of the coefficients found. Especially in the last 40 years, this method has taken an important role in determining the credit risks of enterprises and predicting the future conditions of the relevant enterprises (Nadirli, 2015).

The reliability of the model created has been tested through various studies, and the success rate, in other words, the probability of bankruptcy in the enterprises was found at the rate of 72% for two years before the bankruptcy and 94% for one year before the bankruptcy (Altman, 1968). In the tests made for the validity of the model within 31 years following the formation of the Z-Score model, the enterprises were classified with the possibility of bankruptcy despite they had not failed, and the probability ratio of bankruptcy in these enterprises has been found in the range of 80-90% within the last one year before the bankruptcy (Kulalı, 2016).

As mentioned above, Altman (1968) has determined 33 failed and non-failed enterprises through the random sample method and used the best five financial performance ratios which indicate the financial status of the enterprises. The model consists of seven values in total, and these values were initially constructed from one market-based indicator and six accounting-based indicators. The Z-Score calculation has been expressed in order to use in the model through the relevant seven values in total in accordance with the five groups of ratio stated below (Aydın, Başar & Coşkun, 2007, as cited in Karakozak, 2012).

Z-Score= 1.2X1+1.4X2+3.3X3+0.6X4+0.999X5 (1)

Z-Score= Point value of an enterprise (general index)
X1= Working Capital/Total Assets
X2= Retained Earnings/Total Assets
X3= Earnings before Interest and Taxes/Total Assets
X4= Market Value of Equity/Total Liabilities
X5= Sales Revenue/Total Assets

Each of the ratios used in the calculation provides information on various activities of the enterprise. The relevant five ratios consist of the capital adequacy, cumulative profitability, market-based leverage ratio, liquidity, and efficiency of assets.

Then, some changes were made in order that the formula can be applied in non-public enterprises and accurate findings can be obtained as a result of the application of the relevant formula in the enterprises.

The ratio X4 has been revised as X4= Current Value of Equity/Book Value of Liabilities. As a natural result of the relevant revision, some changes occurred in the coefficients and the Z-Score ranges. After the relevant changes, the score has been found in the range of 1.23 <Z <2.99 (Altman, 2002).

Z-Score=0.717X1+0.847X2+3.107X3+0.420X4+0.998X5 (2)

for the enterprises in the private industries

As a result of the calculations made, it has been found that a score of less than 1.81 indicates that the enterprise has a very high risk of going into a financial failure. On the other hand, the score between 1.81 and 3.00 indicates that the probability of financial failure is low though the financial performance of the enterprise in the following period is not too high. Moreover, the Z-Score greater than 3.00 indicates that the enterprise has not any financial problem and that there is not any probability of bankruptcy (Poyraz & Didin, 2008).

After the abovementioned two models developed, the ratio of sales revenue was excluded from the model in 1993. It has been found that a score of 1.10 or lower indicates that bankruptcy is likely in the enterprise. However, it has been stated that the score should be found 2.60 or above for the enterprises in which any risk of bankruptcy is not likely (Kulalı, 2016).

Following the changes made, the model created for non-productive enterprises has been stated below.

Z-Score = 6.56X1 3.26X2+6.72X3+1.05X4 (3)

for non-productive enterprises

In this model, it is aimed to reduce the effect of the potential industry by excluding the ratio of Sales Revenue/Total Assets defined as X5 variable.

Table 1. *The Z-score models (Yıldız, 2014)*

The Z-Score for Manufacturing Enterprises Quoted on the Stock Exchange	The Z-Score for Private Industrial Enterprises	The Z-Score for Non-Manufacturing and Service Enterprises
Z<1.8 Distress zone (red zone)	Z'<1.23 Distress zone (red zone)	Z''<1.1 Distress zone (red zone)
1.8<Z<2.99 Uncertain zone (gray zone)	1.23<Z'<2.9 Uncertain zone (gray zone)	1.1<Z''<2.6 Uncertain zone (gray zone)
Z>2.99 Safe zone (green zone)	Z'>2.9 Safe zone (green zone)	Z''>2.6 Safe zone (green zone)

The enterprises found in the red zone, where the risk of bankruptcy is seen, have to make necessary changes in their strategies and activities within a short time. On the other hand, the analysis period should be continued for the enterprises

found in the gray zone, and it should be determined how the enterprises show a tendency toward the red or green zone. Even though the enterprises found in the green zone are considered more reliable than the enterprises found in other zones, the financial power of the enterprise should be kept under control.

As can be seen in the table above, there are different Z-Score models for enterprises with different structures. It has been stated that the original Z-Score model is more frequently used to determine the risk of bankruptcy, with the relevant different models (Yıldız, 2014).

The model has been revised by Altman, Hartzell & Peck (1995) for the enterprises which carry on their activities in an area where the markets are dominant. The fixed value of 3.25 has been added in the equation formed through the change made (Altman, 2000).

The main determinant codes of institutional bankruptcy used in the model developed by Altman (1968) provide an opportunity to minimize the financial risk factor between the banks, the investors, the executives of credit institutions, and the market makers. The studies conducted to predict the risk of bankruptcy in the enterprises are not sufficiently beneficial for the executives of the enterprises in terms of time. The main reason for this is that the bankruptcy in the enterprises has realized immediately after the period when a financial difficulty has been experienced. The most important advantage of the methods developed is that all potential risks of bankruptcy and financial difficulty in the enterprises which have not experienced any financial difficulty can be prevented. These methods allow the enterprises to understand the difference between the concepts of financial difficulty and bankruptcy and to determine which financial difficulties may result in bankruptcy.

A scientific approach has been introduced by Beaver (1966) to determine the probability of financial failure in the enterprises through the use of a dichotomous classification test. Then, he selected a sample of seventy-nine financially failed enterprises from thirty-eight different industries, and conducted a study in which the financial data of these seventy-nine enterprises in the periods between 1954 and 1964 were used. In the study conducted, the possible reasons of bankruptcy in the period for five years prior to the bankruptcy were investigated through the ratios. Moreover, a secondary sample group was formed in addition to the model created depending on the study. The relevant sample group was composed of the enterprises which are similar in term of the industry and the scale of enterprise. Thirty financial ratios were used in this model, and these financial ratios used were examined under six main categories which can be defined as cash flow ratio, net return ratio, liabilities/total assets, liquid assets/total assets, liquid assets/foreign assets, and the rate of return.

In the study conducted, the enterprises which cannot pay their due debt are defined as the financially failed enterprises. According to the model developed by Beaver (1966), the most important factors in realization of the prediction made for the possibility of financial failure in the enterprises are the results acquired by the ratio of net cash flow to total foreign assets.

In 1974, Blum conducted another study for prediction of the risk of bankruptcy in the enterprises. In the relevant study conducted, the financial data of 230 failed and non-failed companies in the period between 1954 and 1968 were examined. The financial ratios which indicate the profitability, liquidity and variability of the enterprises were tested through the discriminant analysis. The relevant ratios subjected to the discriminant analysis were categorized into three groups as liquidity, profitability and variability. As a result of the study, it has been found that the ratios which reflect the financial failure in the best manner are the results obtained from the liquid assets/inventories, any change of the net return, and the cash flow ratio. According to the results obtained, it has been determined that the probability of bankruptcy can be predicted accurately at the rate of 70% three years prior to failure, 80% two years prior to failure, and 90% one year prior to failure (Blum, 1974).

Another study was conducted by Deakin (1972) to predict the probability of bankruptcy by taking the models developed by Altman (1968) and Beaver (1966) into consideration. A sample, which consisted of 64 enterprises in the period between 1964 and 1970, was formed. These sixty-four enterprises were divided into two groups as thirty-two failed enterprises and thirty-two non-failed enterprises. In total, fourteen financial ratios were determined through the use of financial data of the sixty-four enterprises in the relevant periods. These fourteen financial ratios, which were used comparatively in the two models developed by Deakin, were categorized into four main groups as illiquid assets, liquid assets, liquid assets/total liabilities, and return on asset ratio.

In the study, the discriminant analysis method used in the study conducted by Altman in 1968 and the dichotomous classification method based on the study conducted by Beaver (1966) were also used. Moreover, it has been found that a financial failure which results in bankruptcy can be predicted by the discriminant analysis method with a margin of error at the rate of 18% three years prior to failure and 12% one year prior to failure. In addition to these studies conducted, though Deakin (1972) also stated that the financial failure can be predicted two years prior to the failure with a margin of error at the rate of 10%, he could not be successful in presenting a profound reason for reliability of the realization of the relevant margin of error.

A question related to the models is that the factors which indicate a financial failure may also be valid for the enterprises which have a financial difficulty. The important point here is to reveal whether these models, which help to predict the bankruptcy of enterprises, can also help to predict their financial difficulties (Platt & Platt, 2006). With the implementation of new methods for prediction and prevention of the risk of bankruptcy, the relevant studies have been continued. Though there are some differences between the methods, the factors used to predict the bankruptcy are mainly liabilities, profitability, liquidity, operational performance, and business growth. Failed enterprises take legal action and cooperate with the courts in order to maintain their assets in the restructuring process.

As it is necessary to know the difference between the financial difficulty and the bankruptcy, the enterprises with a financial difficulty have not yet reached the level of financial incapability which may require any legal action. Therefore, such enterprises prefer to take necessary measures, which may eliminate the financial difficulty, such as managerial regulations or increasement of the business capital through the sale of the assets (Platt & Platt, 2008). In this respect, the accuracy of the models, which are used to predict the risk of bankruptcy, is dependent not only on the method used but also on the assumptions made for the availability and structure of the data used and the classification of the risk of bankruptcy (Outecheva, 2007).

3. Methodology

3.1. Aim and scope of the study

The aim of this study is to examine the effects of capital structure in the enterprises, which are traded in Istanbul Stock Exchange (BIST) and included in the industrial index, on the probability of bankruptcy through the Altman Z-Score method. In the study, the data of 112 enterprises, that continue their activities uninterruptedly and are traded on the relevant industrial index between 2006 and 2014, have been used. Moreover, this study also aims to explain whether the leverage ratio considered as a variable of the capital structure and the non-debt tax shields, which represent the control variable of the capital structure, have an effect on the Z-Score which indicates the financial failure and/or performance of the enterprises through an empirical model.

3.2. Data set and limitations used in the study

The firms in this study were selected from the enterprises which are traded in Istanbul Stock Exchange (BIST) and listed on the industrial index. It has been paid attention to prefer the enterprises listed on the industrial index without any industrial distinction and to properly collect the nine-year (2006-2014) data of 112 enterprises. The aim here is to obtain reliable results on the relevant study through the examination of the effects of different capital structures in the enterprises on the financial performance and/or failure in different years. The main reason for collection of the research data in 2006 and the following years is that the effects of the economic crisis experienced around the world in 2008 on the probability of bankruptcy in the enterprises can be examined closely. Furthermore, it should be particularly considered that the enterprises, in which their data will be used in the relevant study, do not include all enterprises which are located in Turkey and traded in the BIST.

In the beginning of the study, all data of 147 enterprises, which are traded on the industrial index between 2006 and 2014, were included in the scope of the analysis. However, 35 enterprises in total were excluded from the analysis as they did not meet the data of the relevant years. As a result, 1008 (112*9) data in total were analyzed through the nine-year data of 112 enterprises. During the analysis, it has been determined that the series were not stationary due to the unit root problem. In order to ensure the stability of the series, the first and second-degree difference, square root and logarithmic transformations were made. As a result of such transformation procedure, a decrease has been found in the number of observation. Therefore, 890 observations were subjected to analysis in the industrial index.

The financial data of the enterprises subjected to the analysis were obtained in two different ways. The relevant financial data of the enterprises, which are listed on the both indices, in 2008 and the early period were acquired from the official website [Retrieved from] of Istanbul Stock Exchange (BIST). Moreover, the data in 2009 and later were acquired from the public information published on the official website of the BIST, the official website [Retrieved from] of the Public Disclosure Platform (KAP), Finnet Excel Add-in, Finnet Financial Analysis programs, and the official websites of the enterprises.

3.3.Variables used in the study

In the study, dependent, independent and control variables were primarily preferred. In determination of the variables, it has been paid attention to prefer the variables reached the most consensus in the literature. The variables used in the study are classified under two titles as the capital structure and the financial performance/failure indicator. The independent variables used in the study consist of the variables which represent the capital structure. On the other hand, the dependent variable consists of the variable which represents the risk of bankruptcy of the enterprises.

Table 2. *Independent variables of the model*

Variables	Description	Symbol	Calculation of the Variable	Author
Capital Structure	Leverage Ratio	TBTV	Total Liabilities/ Total Assets	Albayrak & Akbulut (2008); Ata & Ağ (2010); Bevan & Danbolt (2002); Chakraborty (2010); Karadeniz (2008); Karamustafa & Karakaya (2007); Leyli-Elitaş & Doğan (2013); Wiwattanakantang (1999)
Capital Structure	Non-Debt Tax Shields	BDVK	Amortization / Total Assets	Albayrak & Akbulut (2008); Chang *et al.* (2009); Chakraborty (2010); Demirhan (2007); Durukan (1997); Huang & Song (2006); Titman & Wessels (1988)

Table 3. *Dependent variable of the model*

Variables	Description	Symbol	Calculation of the Variable	Author
Dependent	The Altman Z-Score	ZSCORE	Z-Score= 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 +0.999X5 Z-Score= Point value of an enterprise (general index) X1= Working Capital / Total Assets X2= Retained Earnings / Total Assets X3= Earnings before Interest and Taxes/Total Assets X4= Market Value of Equity / Total Liabilities X5= Sales Revenue / Total Assets	Altman (1968) İçerli & Akkaya (2006) Chung *et al.* (2008) Wong & Ng (2010) Yuzbasıoglu *et al.* (2011)

3.4. Research Method

As a result of the literature research, it has been found that three types of data sets as cross-sectional data, time series data and panel data are used in the studies conducted. In the relevant study, the effect of the ownership structure on financial performance of the enterprise has been examined through the use of panel data method with the program called Eviews 8.0. In addition, descriptive statistics will be included in the study for all variables used in the regression models. In this regard, the mean, median, minimum and maximum values as well as the standard deviation, Jarque-Bera, kurtosis and skewness values will be shown in the relevant table.

Any significant relationship should not be found between the determining variables used in the regression models in order to prevent the multicollinearity problem. To determine the relevant situation, a correlation analysis will be made.

The method which analyzes the data of the different units at the same point of time is called as the cross-sectional data analysis, and the method which analyzes the change of the same units in time is called as the time series analysis. The type of analysis made through the use of the cross-sectional data with time dimension is defined as the panel data analysis (Baltagi, 1995).

If the data are not stationary in the dimension of the time series of the panel data, in other words, if there is a unit root problem in the data, the results to be obtained from the regression analysis will be misleading. The unit root tests will be made in order to determine whether the data are stationary.

There are many unit root tests used in order to determine whether the data are stationary in the panel data analysis. These tests are used both for the balanced panel data and the unbalanced panel data. LLC (Levin, Lin & Chu, 2002; Levin & Lin, 1992; 1993), IPS (Im, Pesaran & Shin, 1997; Im, Pesaran & Shin 2003), Hadri LM (Hadri, 2000), Maddala & Wu (1999), Harris & Tzavalis (1999), Breitung (2000) and Harris-Sollis (2003) are some of the relevant tests. Within the scope of the study, the unit root tests will be made depending on whether the data show a balanced or unbalanced panel data characteristic. If the data are sorted imbalancedly, Fisher-type unit root tests, which are prepared based on the LLC test and the Augmented Dickey-Fuller methodology, are selected.

The panel data analysis provides an opportunity to work with a wider data set, gives a higher degree of freedom, and offers an opportunity to analyze the data with its heterogeneity. The linear panel data model is ordinarily as follows:

$$y_{it} = \beta_0 + \beta_1 x_{1it} + \beta_2 x_{2it} + \beta_3 x_{3it} + \cdots + \alpha_i + u_{it} \quad , \quad i = 1, 2, \dots, N \; ; \; t = 1, 2, \dots, t \tag{1}$$

In the model; y_{it} defines the dependent variable, x_{it} defines the independent variables, β defines the coefficient parameters, α_i defines the unobservable individual effects which are stationary in the time dimension, i defines the cross-sectional unit, t defines the time period, and u_{it} defines the error term.

In the study, the Fixed Effects Method and the Random Effects Method will be used as an estimator for the panel data. Furthermore, the results of the Hausman test which determines if the method of Fixed or Random Effects should be used in the analysis will be discussed.

In the Fixed Effects method, the fixed effect estimator allows the unobservable individual effects in time (α_i) to be associated with the independent variables. The model, which is obtained through the time average of the unidirectional non-observable components model in the equality numbered (2) and the unidirectional non-observable components model in the equality numbered (3), has been stated:

$$y_{it} = \beta_0 + \beta_1 x_{it} + \alpha_i + u_{it} \quad , \quad i = 1,2,\dots,N;\ t = 1,2,\dots,t \tag{2}$$

$$\bar{y}_i = \beta_1 \bar{x}_i + \alpha_i + \bar{u}_i \quad , \quad t = 1,2,\dots,t \tag{3}$$

By subtracting these two equations from each other, the equation numbered (4) which is also called within transformation has been obtained. The equation numbered (5) is a representation of the equation numbered (4) with a differential operator.

$$y_{it} - \bar{y}_i = \beta_1 (x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i)\ , i = 1,2,\dots,N;\ t = 1,2,\dots,t \tag{4}$$

$$\ddot{y}_{it} = \beta_1 \ddot{x}_{it} + \ddot{u}_{it}\ , i = 1,2,\dots,N;\ t = 1,2,\dots,t \tag{5}$$

If the Pooled Least Squares estimation method is applied to the model, the fixed effects estimator is found (Wooldridge, 2010).

In the Random Effects method, it is assumed that the unobservable individual fixed effects in the time dimension are not associated with all descriptive variables in all time dimensions. In the relevant method, the Generalized Least Squares (GLS) estimation method is used as the error term includes an autocorrelation. Through the Generalized Least Squares method, the standard errors and the statistics of t and F become valid again. In the equation numbered (6), the model with transformation of the Generalized Least Squares is indicated.

$$y_{it} - \theta \bar{y}_i = \beta_1 (x_{it} - \theta \bar{x}_i)^T + (v_{it} - \theta \bar{v}_i) \tag{6}$$

In the equation; yit defines the dependent variable, θ defines the coefficient used in transformation of the GLS, xit defines the independent (descriptive) variable, vit defines the error margin transformed ($vit = \alpha i + uit$), and $\bar{y}i$, $\bar{x}i$, and $\bar{v}i$ define the time average of the variables. As it is seen in the equation numbered (6), the Random Effects estimator subtracts only the rate of θ of the time averages from the variables, and the Pooled Least Squares method is applied to the estimation acquired by the Generalized Least Squares method (Baltagi, 2005).

The main difference between the Fixed Effects and the Random Effects is resulted from the relationship of the fixed individual effects in the time dimension with the independent variables. Though the Fixed Effects model allows the fixed individual effects in the time dimension for the relationship with the independent variables, the Random Effects model does not allow the fixed individual effects in the time dimension for the relationship with the independent variables. The Hausman Test, which identifies which method gives more consistent results and whether the difference between the estimators of the two methods is statistically significant in the model, determines the results. Accordingly, the test statistic is stated below:

$$H = (\hat{\beta}_{FE} - \hat{\beta}_{RE})^T \left[Avar(\hat{\beta}_{FE}) - Avar(\hat{\beta}_{RE}) \right]^{-1} (\hat{\beta}_{FE} - \hat{\beta}_{RE}) \tag{7}$$

$\hat{\beta}_{FE}$ indicates the fixed effects estimator, $\hat{\beta}_{RE}$ indicates the random effects estimator, and $Avar$ identifies the asymptotic variance of them. The null hypothesis ($H0$) of the Hausman Test which shows the $\chi 2$ distribution with the degree of freedom determined by k is as ‘’the Random Effects method is

consistent''(Greene, 2003). In the test result, the rejection of *H*0 indicates that the Fixed Effects method should be preferred.

3.5. Research models and hypotheses

The following models have been developed in accordance with the aim and scope of this study, and the effect of the capital structure on the probability of bankruptcy of the enterprises has been investigated.

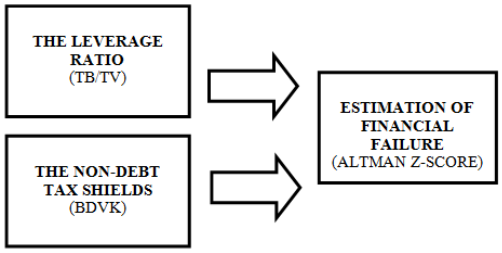

Figure 1. *Research model*

In accordance with the literature, two main hypotheses have been developed for the hypotheses which will be tested in the study. In the hypotheses developed for the study, it has been examined that whether the relevant factors, which represent the capital structure of the enterprises, have an effect on the risk of bankruptcy in the enterprises. Moreover, it is expected that the variables of the leverage ratio and the non-debt tax shields will have an effect which increases the risk of financial failure, in other words, the Z-Score.

H_1: The leverage ratio of an enterprise has an effect on the probability of bankruptcy in the enterprise.

H_2: The non-debt tax shields of an enterprise have an effect on the probability of bankruptcy in the enterprise.

In the study, two models, in which the leverage ratio (TB/TV) which represents the capital structure is used as an independent variable, the non-debt tax shields (BDVK) is used as a control variable, and the Altman Z-Score (ZSCORE) is used as a dependent variable, have been developed.

Time series are the sequence of observation made at periodical time intervals. One of the most important issues in the time series is stability. Almost all statistical inferences are made through the assumption of the stability in the series. If there is not any stability, the series should be stabilized in any way before proceeding to the conclusion (Akdi, 2010). The variables should be stable in order to prevent the false relationships between the variables in the panel data analysis which performs both time series and the cross-sectional analyses together. It is suggested that the stability should be examined in two ways. The common unit root process has been examined with Levin, Lin & Chu (2002) test and each unit has been examined with Im, Pesaran & Shin (2003) and ADF-Fisher Chi-Square (1979) tests. Results of the panel unit root test are shown in the Table 4. The unit roots have been first examined in the level; it has been stabilized by respectively taking the first or second difference when the unit root was detected in the relevant level.

Table 4. *Descriptive statistics and stability (Unit Root) test results of the industrial index series*

Series	X	SS	Md	Mn	Mx	S	K	JB	LLC	IPS	ADF[1]
D(LZSCORE)	-0,03	0,53	-0,01	-2,24	2,41	0,17	5,28	117,8**	-13,316**	-3,279**	148,671**
D(TBTV)	0,42	0,21	0,41	0,02	1,31	0,36	2,68	27,07**	-29,693**	-7,727**	440,954**
SBDVK	0,18	0,05	0,19	0,00	0,49	-0,00	5,09	184,2**	-24,359**	-6,852**	415,115**

Notes: *p<0,05 **p<0,01 [1]:Asymptotic X^2

H0: There is a unit root.
H1: There is not any unit root.

Table 5. *Results of the correlation analysis between the industrial index variables*

Variables	1	2	3
1. SZSCORE	1,00	-0,49	0,04
2. TBTV		1,00	-0,06
3. SBDVK			1,00

3.6. Research findings

Model 1. *Results of the panel regression analysis*

Dependent Variable: SZSCORE Method: Panel LS&AR				
Independent Variables*	Coefficient	SH	t	p
TBTV	-2,275	0,251	-9,061	0,000
C	2,332	0,138	16,808	0,000
Number of the panel variable observed	702		Model F	181,89
Number of the cross sections included	106		Prob(F)	0,000
Hausman (X^2)	2,635		Durbin Watson	1,346
Prob Hausman (X^2)	0,104		ΔR^2	0,205
Model	Random effects			
Correction	White cross-section Swamy-Arora			

As the H0 hypothesis which indicates that the random effects model is more effective than the fixed effects model in the model1 formed for the ZSCORE dependent variable has been accepted as a result of the Hausman test (X^2=2.635; p>0.05), the random effects method has been used in the panel data estimation for the model1. It has been found that the model is significant (F=181.89; p<0.01) in the random effects panel regression equation made for the model1. Furthermore, it has been determined that the variable of TBTV (t=-9.06; p<0.01) has a significant effect on the ZSCORE. It has been seen that the variable of TBTV explains averagely 21% of the variance in the variable of ZSCORE. As a result, it has been considered that the variance is real as the Durbin Watson score (DW=1.35) is higher than the R^2.

$$ZSCORE = 2.33 - 2.28*TBTV + \varepsilon_{it}$$

Model 2. *Results of the panel regression analysis*

Dependent Variable: SZSCORE Method: Panel LS&AR				
Independent Variables*	Coefficient	SH	t	p
SBDVK	-1,306	0,689	-1,894	0,059
TBTV	-2,305	0,254	-9,069	0,000
C	2,584	0,208	12,373	0,000
Number of the panel variable observed	702		Model F	94,966
Number of the cross sections included	106		Prob(F)	0,000
Hausman (X^2)	4,808		Durbin Watson	1,347
Prob Hausman (X^2)	0,090		ΔR^2	0,211
Model	Random effects			
Correction	White cross-section Swamy-Arora			

As the H0 hypothesis which indicates that the random effects model is more effective than the fixed effects model in the model 2 formed for the dependent variable of ZSCORE and used the BDVK as a control variable has been accepted as a result of the Hausman test (X^2=4.81; p>0.05), the random effects method has been used in the panel data estimation for the model 2.It has been found that the model is significant (F=94.96; p<0.01) in the random effects panel regression equation made for the model10b. Furthermore, it has been determined that the variable of TBTV (t=-9.07; p<0.01) has a significant effect on the ZSCORE. It has been seen that all variables included in the model explain averagely 21% of the variance in the variable of ZSCORE. As a result, it has been considered that the variance is real as the Durbin Watson score (DW=1.35) is higher than the R^2. In accordance with the results of the Model 2, it has been seen that there is not any

increase in the total variance obtained after involving the variable of BDVK in the relevant model (Model10a R^2=0.21; Model10b R^2=0.21).

ZSCORE = 2.58 – 1.31 *BDVK – 2.31*TBTV+ ε_{it}

H1 *Acceptance*: The variable of TBTV has a negatively significant effect on the ZSCORE.

H2 *Rejection*: The variable of BDVK has not any significant effect on the ZSCORE.

4. Conclusion

The executives, who are responsible for decisions on the financial structure of the enterprises, should maintain the most appropriate balance between the risk and profitability factors. Depending on this situation, the main point that should be considered in all decisions to be made on the capital structure is to avoid the decisions, which will cause a financial failure and reduce the risk of bankruptcy, and to achieve a sustainable success. A part of the financial risks that are encountered by the enterprises results from the non-operating factors such as market fluctuations and political developments which are also defined as macroeconomic variables. Another part of the financial risks results from the operational factors such as managerial mistakes, high level of borrowing, incapability to comply with the industrial developments, and deterioration in the financial and organizational structure of the enterprises. The fluctuations in the cash flow that occur as a result of the business activities, the size in connection with the life cycle of the enterprise, the history and growth rate of the enterprise can also be listed on the operating factors. Though there is not any possibility to take direct precautions for these external risks, the factors that occur within the enterprise can be kept under control (Akpınar & Akpınar, 2017).

In this study, the relationship between the capital structure and the financial failure score of 112 enterprises, which continue their activities uninterruptedly, are traded in Istanbul Stock Exchange and listed on the industrial index between 2006 and 2014, has been examined through the panel data method. When the results of the study were evaluated in general, a statistically negative and significant relationship has been found between the leverage ratio (TB/TV) and the Z-SCORE. On the other hand, it has been found that the tax incentives, which are defined as the non-debt tax shields and included in the model as a control variable, do not have any significant effect on the Z-SCORE. The negative relationship between the leverage ratio and the Z-SCORE is compatible with the necessity which indicates that the enterprises should prefer to borrow at a certain level due to their financial problems as it is stated in the trade-off theory. The trade-off theory is an approach which is based on the creation of the most appropriate capital structure in which the cost of equity is the lowest. According to the trade-off theory, the decisions made by the enterprises on the capital structure include a balance between the tax savings generated by interest and the costs arising from financial problems (Ross, Weskerfield & Jaffe, 2002). As a result of the analysis, reliable results which indicate that the leverage ratio increases the risk of financial failure have been obtained. These results reveal that the enterprises, which prefer foreign sources, in other words, outsourcing, have to encounter with a negative effect of the financial leverage.

As the data in the period before 2006 are added in the relevant period examined, various industries and/or indices in addition to the industrial index are taken into the scope of the analysis, and other variables which represent the capital structure are included in the variables used in the analysis, this study will also allow for the determination of other capital structure variables which have a significant effect on the financial failure of the enterprises. Moreover, the scope of the studies can be further improved through the use of other estimation models in addition to the Altman Z-Score method and the change of the analysis techniques.

References

Akdi, Y. (2010). *Zaman Serileri Analizi (Birim Kökler ve Kointegrasyon)*, Genişletilmiş 2. Baskı, Gazi Kitabevi.

Akgüç, Ö. (1998). *Finansal Yönetim*, 7. Baskı, Avcıol Basım Yayın.

Akkaya, G.C., Demireli, E.Y., & Ümit, H. (2009). İşletmelerde finansal başarısızlık tahminlemesi: yapay sinir ağları ile İMKB üzerine bir uygulama. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi*, 10(2), 187-216.

Akpınar, O., & Akpınar, G. (2017). Finansal başarızlık riskinin belirleyicileri. *İşletme Araştırmaları Dergisi*, 9(4), 932-951.

Aktan, B., & Bodur, B. (2006). Oranlar aracılığı ile finansal durumunuzu nasıl çözümlersiniz? Küçük işletmeler için bir rehber. *Journal of Yaşar University*, 1(1), 49-67.

Albayrak, A.S., & Akbulut, R. (2008). Kârlılığı etkileyen faktörler: İMKB sanayi ve hizmet sektörlerinde işlem gören işletmeler üzerine bir inceleme. *Zonguldak Karaelmas Üniversitesi Sosyal Bilimler Dergisi*, 4(7), 55-83.

Altman, E.I. (1968). Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, *The Journal of Finance*, 23(4), 589-609.

Altman, E.I. (2000). Predicting financial distress of companies: Revisiting the z-score and zeta models, 7-36. [Retrieved from].

Altman, E.I. (2002). Revisiting credit scoring models in a basel 2 environment, *NYU Working Paper* No: S-CDM-02-06, 1-37. [Retrieved from].

Altman, E., Hartzell, J., & Peck, M. (1995). *Emerging Markets Corporate Bonds: A Scoring System*, Salomon Brothers Inc.

Arnold, G. (2002). *Corporate Financial Management*, 2nd Edition, Financial Times Prentice Hall.

Ata, H.A., & Ağ, Y. (2010). Firma karakteristiğinin sermaye yapısı üzerindeki etkisinin analizi. *İstanbul Üniversitesi İktisat Fakültesi Ekonometri ve İstatistik Dergisi*, 11, 45-60.

Aydın, N., Başar, M., & Coşkun, M. (2004). *Finansal Yönetim,* 1. Baskı, Detay Yayınevi.

Aydın, N., Başar, M., & Coşkun, M. (2007). *Finansal Yönetim*, Genç Copy Center, akt. Karakozak, Ö. (2012). 2008 Küresel krizinin finansal oranlar üzerine etkisi: İMKB'de işlem gören imalat sanayi işletmeleri üzerine bir uygulama, *Yüksek Lisans Tezi*, Niğde Üniversitesi.

Baltagi, B.H. (1995). *Econometric Analysis of Panel Data*, 1st Edition, John Wiley & Sons Inc.

Baltagi, B.H. (2005). *Econometric Analysis of Panel Data*, 3rd Edition, John Wiley & Sons Ltd.

Beaver, W.H. (1966). Financial ratios as predictors of failure. *Journal of Accounting Research, Empirical Research in Accounting: Selected Studies*, 4, 71-111. doi. 10.2307/2490171

Bevan, A.A., & Danbol, J. (2002). Capital structure and its determinants in the UK-a decompositional analysis. *Applied Financial Economics*, 12(3), 159-170. doi. 10.1080/09603100110090073

Blum, M. (1974). Failing company discriminant analysis. *Journal of Accounting Research*, 12(1), 1-25. doi. 10.2307/2490525

Bolak, M. (1990). *Finansman*, 1. Baskı, İstanbul Teknik Üniversitesi Matbaası.

Breitung, J. (2000). The local power of some unit root tests for panel data. *In* B.H. Baltagi, T.B. Fomby & R.C Hill (Eds.), *Nonstationary Panels, Panel Cointegration and Dynamic Panels* (Advances in Econometrics, Volume 15), (pp.161-177). Emerald Group Publishing Limited.

Brigham, E.F., & Houston, J.F. (2004). *Fundamentals of Financial Management*, Concise 4th Edition, South-Western Educational Publication.

Cai, J., & Zhang, Z. (2011). Leverage change, debt overhang, and stock prices. *Journal of Corporate Finance*, 17(3), 391-402. doi. 10.1016/j.jcorpfin.2010.12.003

Ceylan, A. (2001). *İşletmelerde Finansal Yönetim*, 7. Baskı, Ekin Basın Yayın Dağıtım.

Chakraborty, I. (2010). Capital structure in an emerging stock market: The case of India. *Research in International Business and Finance*, 24(3), 295-314. doi. 10.1016/j.ribaf.2010.02.001

Chang, C., Lee, A.C., & Lee, C.F. (2009). Determinants of capital structure choice: A structural equation modeling approach. *The Quarterly Review of Economics and Finance*, 49(2), 197-213. doi. 10.1016/j.qref.2008.03.004

Chung, K.C., Tan, S.S., & Holdsworth, D.K. (2008). Insolvency prediction model using multivariate discriminant analysis and artificial neural network for the finance ındustry in New Zealand. *International Journal of Business and Management*, 3(1), 19-28.

Deakin, E.B. (1972). A discriminant analysis of predictors of business failure. *Journal of Accounting Research*, 10(1), 167-179. doi. 10.2307/2490225

Deesomsak, R., Paudyal, K., & Pescetto, G. (2004). The determinants of capital structure: Evidence from the Asia Pacific region. *Journal of Multinational Financial Management*, 14(4-5), 387-405. doi. 10.1016/j.mulfin.2004.03.001

Demirhan, D. (2007). Sermaye yapısını etkileyen firmaya özgü faktörlerin analizi: İMKB hizmet firmaları üzerine bir uygulama. *Ege Akademik Bakış*, 9(2), 677-697.

Durukan, M.B. (1997). Hisse senetleri İMKB'de işlem gören firmaların sermaye yapısı üzerine bir araştırma 1990-1995. *İMKB Dergisi*, 1(3), 75-91.

Greene, W.H. (2003). *Econometric Analysis*, 5th Edition, Pearson Education.

Hadri, K. (2000). Testing for stationarity in heterogeneous panel data. *The Econometrics Journal*, 3(2), 148-161. doi. 10.1111/1368-423X.00043

Harris, R.D.F., & Tzavalis, E. (1999). Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of Econometrics*, 91(2), 201-226. doi. 10.1016/S0304-4076(98)00076-1

Harris, R., & Sollis, R. (2003). *Applied Time Series Modelling and Forecasting*, 1stEdition, John Wiley & Sons Ltd.

Huang, G., & Song, F.M. (2006). The determinants of capital structure: Evidence from China. *China Economic Review*, 17(1), 14-36. doi. 10.1016/j.chieco.2005.02.007

Im, K.S., Pesaran, M.H., & Shin, Y. (1997). *Testing for Unit Roots in Heterogeneous Panels*, Manuscript, Department of Applied Economics, University of Cambridge.

Im, K.S., Pesaran, M.H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74. doi. 10.1016/S0304-4076(03)00092-7

İçerli, M.Y., & Akkaya, G.C. (2006). Finansal açıdan başarılı olan işletmelerle başarısız olan işletmeler arasında finansal oranlar yardımıyla farklılıkların tespiti. *Atatürk Üniversitesi İktisadi ve İdari Bilimler Dergisi*, 20(1), 413-421.

Jensen, M.C., & Meckling, W.H. (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics*, 3(4), 305-360. doi. 10.1016/0304-405X(76)90026-X

Karadeniz, E. (2008). Türk konaklama işletmelerinde sermaye yapısını etkileyen faktörlerin analizi, *Doktora Tezi*, Çukurova Üniversitesi.

Karamustafa, O, & Karakaya, A. (2007). KOBİ'lerin borçlanma yapılarına ampirik bir bakış. *Türkiye Sosyal Araştırmalar Dergisi*, 11(2), 119-138.

Kaya, E.Ö., Tokay, S.H., & Kaya, B. (2014). Sigorta sektöründe sermaye yeterliliği ve Türk sigorta sektöründe solvency II kapsamında değerlendirilmesi. *Muhasebe ve Finansman Dergisi*, 63, 109-138.

Kulalı, İ. (2016). Altman z-score modelinin BİST şirketlerinin finansal başarısızlık riskinin tahmin edilmesinde uygulanması. *Uluslararası Yönetim İktisat ve İşletme Dergisi*, 12(27), 283-292.

Levin, A., & Lin, C.F. (1992). *Unit root test in panel data: asymptotic and finite-sample properties*, Discussion Paper No: 92-93, Department of Economics, University of California at San Diego.

Levin, A., & Lin, C.F. (1993). *Unit Root Tests in Panel Data: New Results*, Discussion Paper No: 93-56, Department of Economics, University of California at San Diego.

Levin, A., Lin, C.F., & Chu, C.S.J. (2002). Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, 108(1), 1-24. doi. 10.1016/S0304-4076(01)00098-7

Leyli-Elitaş, B., & Doğan, M. (2013). Sermaye yapısını belirleyen faktörler: İMKBSigorta şirketleri üzerine bir araştırma. *Muhasebe Bilim Dünyası Dergisi*, 15(2), 41-57.

Maddala, G.S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61(S1), 631-652. doi. 10.1111/1468-0084.0610s1631

Modigliani, F., & Miller, M.H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, 48(3), 261-297.

Moyer, R.C., McGuigan, J.R., & Rao, R.P. (2007). *Fundamentals of Contemporary Financial Management*, 2nd Edition, Southwestern Publishing Group Co.

Müslümov, A. (2001). *Türkiye 'de ekonomik krizlerin halka açık kobi'lere etkisi*, Kosgeb 1. Orta Anadolu Kongresi: Kobi'lerin Finansman ve Pazarlama Sorunları, 18-21 Ekim, Nevşehir,

Myers, S.C. (2001). Capital structure. *Journal of Economic Perspectives*, 15(2), 81-102.

Nadirli, N. (2015). Kredi riskinin ölçülmesinde z- skor yönteminin rolü. *Bankacılık ve Finansal Araştırmalar Dergisi (BAFAD)*, 2(1), 1-6.

Outecheva, N. (2007). Corporate financial distress: An empirical analysis of distress risk, *Doctoral Dissertation,* No: 3430, The University of St. Gallen, Graduate School of Business Administration, Economics, Law and Social Sciences (HSG). [Retrieved from].

Platt, H.D., & Platt, M.B. (2006). Understanding differences between financial distress and bankruptcy. *Review of Applied Economics*, 2(2), 141-157.

Platt, H.D., & Platt, M.B. (2008). Financial distress comparison across three global regions. *Journal of Risk and Financial Management*, 1(1), 129-162.

Poyraz, E., & Didin, S. (2008). *Finansal hizmetler sektöründe finansal başarısızlık riskinin Altman finansal analiz sistemi yardımıyla ölçülmesi*, International Symposium on International Capital Flow and Emerging Markets, 1-10, 24-27 April, Balıkesir/Bandırma.

Ross, A.S., Weskerfield, W.R. & Jaffe, J. (2002). *Corporate Finance*,6th Edition, McGraw Hill Higher Education.

Sökmen, A.G. (2013). Çalışma sermayesi yönetiminin firma performansı üzerindeki etkisi: Borsa İstanbul'a kote edilmiş imalat şirketleri üzerine bir araştırma, *Doktora Tezi*, Çukurova Üniversitesi.

Titman, S., & Wessels, R. (1988). The determinants of capital structure choice. *The Journal of Finance*, 43(1), 1-19. doi. 10.1111/j.1540-6261.1988.tb02585.x

Wiwattanakantang, Y. (1999). An empirical study on the determinants of the capital structure of Thai firms. *Pacific-Basin Finance Journal*, 7(3-4), 371-403. doi. 10.1016/S0927-538X(99)00007-4

Wong, J.M.W., & Ng, T.S.T. (2010). *Company Failure in the Construction Industry: A Critical Review and a Future Research Agenda*, The 24th FIG International Congress: Facing the Challenges – Building the Capacity, 1-18, 11-16 April, Sydney/Australia, [Retrieved from].

Wooldridge, J.M. (2010). *Econometric Analysis of Cross Section and Panel Data*, 2nd Edition, The MIT Press.

Yıldız, A. (2014). Kurumsal yönetim endeksi ve Altman z skoruna dayalı lojistik regresyon yöntemiyle şirketlerin kredi derecelendirmesi. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, 19(3), 71-89.

Yuzbasioglu, N., Yoruk, N., Demir, M.O., Bezirci, M., & Coskun-Arslan, M. (2011). Comparison of financial failure estimation models for Turkey: An empirical study directed towards automotive and spare parts sector. *Middle Eastern Finance and Economics*, 11, 95-106.