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The Determinants of Financial Distress: An Application on Borsa Istanbul

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Extensive Summary

Introduction

Rapid changes in economic terms, especially since the 1990s, have increased uncertainties and future risks for firms. Therefore, the determination of firms' financial risks has become essential for long-term success.

Financial distress is defined as "the likelihood of bankruptcy, which depends on the level of liquid assets as well as on credit availability" (Hendel, 1996, 310). The problem of financial distress is gaining importance in view of the number of firm failures, following the market failure of the early 1990s.

The presence in the highly competitive environment in recent years complicates the activities of firms. The risk of mild financial failure resulting from loss of firm and/or liquidity problem may go up to the bankruptcy of the company. Financially distressed firms have problems paying off their due or overdue financial obligations to their creditors. In parallel with this situation, understanding financial distress and bankruptcy risks is getting important to managers, creditors, auditors and financial analysts.

Numerous studies attempt to predict financial distress based on firm specific characteristics. Studies in the literature often focus on the comparison and effectiveness of financial failure prediction models. However, while trying to predict which model will lead to bankruptcy risk, it is neglected which variables are directly related to failure. Therefore, the firm-specific factors which may be the determinants of the bankruptcy risk, have been examined within the scope of this study.

The aim of this study is to determine the firm-specific factors affecting bankruptcy risk. Another aim is to contribute to the finance literature. In the model of study, modified Altman Z score was used as a proxy of bankruptcy risk. The study attempts to test the effects of as many factors as possible to financial distress.

In this study, the firm-specific factors assumed to affect bankruptcy risk were analyzed by applying panel data analysis method. It is expected that the results obtained will be evaluated by both financial managers and investors and will guide future financial decisions.

Method

The aim of this paper is to reveal the factors affecting bankruptcy risk. In the paper, the factors affecting bankruptcy risk is examined by testing 82 listed Turkish manufacturing firms traded on Borsa Istanbul, with 410 observations from 2010 to 2014.

The situation often arises in financial modeling where the data comprising both time series and cross-sectional elements, and such a data set is known as "panel data" or "longitudinal data". A panel of data will embody information across both time and space. Importantly a panel keeps the same individuals or objects and measures some quantity about them over time. (Brooks, 2008: 487).

This study included all the possible alternatives of the variables (bankruptcy risk, value, profitability, size, growth, maturity, dividend paying, free float ratio and intellectual capital) and considered the most explanatory ones.

The data for the variables in the models were obtained using the financial tables and audit reports of the firms taken into consideration for the study. The financial tables of the firms were accessed through the official web site of the ***"Public Disclosure Platform"*** (www.kap.gov.tr). Explanations for all the variables are presented in Table 1.

Table 1. Variables – Proxies

VARNAME	VARIABLES	PROXIES
(Z')	Bankruptcy Risk	Modified Altman Z Score (Z')
(ROIC)	Profitability	Return on Invested Capital
(LEV)	Leverage	Long Term Debt / Total Assets
(SIZE)	Size	Natural logarithm of Total Assets
(GROW)	Growth	(Total Assets $_{t}$ / Total Assets $_{t-1}$) -1
(AGE)	Maturity	Natural logarithm of Firm Age
(VALUE)	Firm Value	Natural Logarithm of Tobin's Q
(DER)	Derivative Dummy	Using Derivatives (1-0)
(DIV)	Dividend Payment	Dividend Payment / Equity Value
(OS1)	Ownership Structure 1	The Largest Shareholder Equity Ratio
(OS2)	Ownership Structure 2	Publicly Traded Shares / Total Equity
(VAIC)	VAIC	Value Added Intellectual Capital

Modified Altman Z score was used as dependent variable representing bankruptcy risk for the model. The following model was composed for the study.

Model:

$$Z_i^{'} = \alpha + \beta_1 ROIC_{1it} + \beta_2 LEV_{2it} + \beta_3 SIZE_{3it} + \beta_4 GROW_{4it} + \beta_5 AGE_{5it} + \beta_6 VALUE_{6it} + \beta_7 DER_{7it} + \beta_8 DIV_{8it} + \beta_9 OS_{9it} + \beta_{10} VAIC_{10it} + \varepsilon_i \quad (1)$$

It is expected that the variables of profitability, firm value and intellectual capital will determine the effect of reducing bankruptcy risk (increasing the Z score).

Leverage and size are expected to determine the effect of increasing bankruptcy risk (reducing the Z score). Nevertheless, there is no clear forecast for the effects of growth, age, derivative use, dividend payment and free float ratio.

Results

Two different estimators for the parameters of a panel data regression model as treated by Hausmann. Specifically, it is well known that both the "random effects" and the "fixed effects" panel estimators are consistent under the assumption that the model is correctly specified and that the regressors are independent of the "individual-specific effects".

It is often said that the random effects model is more appropriate when the entities in the sample can be thought of as having been randomly selected from the population, but a fixed effect model is more plausible when the entities in the sample effectively constitute the entire population (for instance, when the sample comprises all of the stocks traded on particular Exchange). However, the random effects approach has a major drawback which arises from the fact that it is valid only when the composite error term is uncorrelated with all of the explanatory variables. If they are uncorrelated, a random effects approach can be used; otherwise the fixed model preferable (Brooks, 2008: 500).

The Hausmann test was performed on the models to determine appropriate model. The *p*-value for the tests are less than 1%, indicating that the random effects model is not appropriate and that the fixed effects specification is to be preferred. The panel data analysis was performed according to the fixed effect model.

A common assumption in many time series models is that the data are stationary. A stationary process has the property that the mean, variance and autocorrelation structure do not change over time. Stationarity tests allow verifying whether a series is stationary or not. According to Augmented Dickey-Fuller test (ADF), the null hypothesis is that the series possesses a unit root and hence is not stationary. In the study, ADF unit root test was performed on the final series and it was concluded that the series were stationary.

The coefficient of determinant also called R-squared shows the percentage of the effects on the dependent variables explained by the independent variables. The adjusted R-squared is considered a more effective result in terms of statistics. Additionally, the F statistic shows the overall significance of the model. The model is statistically significant at 1% level. According to the results, there is a significant relationship at the level of 1% between leverage, liquidity, efficiency and bankruptcy risk.

While intellectual capital is significant at the level of 5%, profitability is significant at the level of 10%. And there is no significant relationship for the other variables.

Conclusion

Numerous studies have been carried out to develop a suitable model for estimating financial distress of firms and for classifying firms according to their financial status. However, studies directly identified by the determinants of the financial failure risk remain in the minority. In this study, unlike the general literature, it was aimed to determine firm-specific factors that affect bankruptcy risk.

Within the scope of the research, a total of 82 manufacturing firms in Borsa İstanbul between the years of 2010 and 2014 were examined by applying multivariate model. Modified Altman's Z score which is the dependent variable of the model, developed by Edward I. Altman in 1983 by considering publicly traded manufacturing firms. It is assumed that the discriminant function of the relevant test is also effective in the Turkish sample. In this regard, the research sample is limited to the manufacturing industry in Borsa Istanbul.

When the results of the research are evaluated in general, the leverage increases bankruptcy risk (decreases the Z score); the variables of profitability, liquidity, efficiency and intellectual capital decrease bankruptcy risk (increase the Z score). Significant findings were not obtained for other variables.

As predicted, sustainable profitability positively affects financial success. In parallel, it has been found that profitability increases firm value and financial performance in many studies in the literature.

As might be expected, strong evidence is found that the leverage increases bankruptcy risk. This implies that firms using foreign resources are exposed to the negative financial leverage effect.

Intellectual capital represents the experience and knowledge of the firms. According to findings, it can be stated that intellectual capital reduces bankruptcy risk. Firms with high intellectual capital have a more advantageous position than their competitors.