International Journal of Economics, Commerce and Management
United Kingdom Vol. III, Issue 11, November 2015
http://ijecm.co.uk/ ISSN 2348 0386

CAN Z-SCORE MODEL PREDICT RETAIL FIRMS' BANKRUPTCY IN ALBANIA?

Valbona BALLKOCI
Lecturer, Finance and Accounting Department, Faculty of Economy
University of Elbasan "Aleksandër Xhuvani", Elbasan, Albania
ballkocivalbona@yahoo.com

Eliona GREMI
Lecturer, Finance and Accounting Department, Faculty of Economy
University of Elbasan "Aleksandër Xhuvani", Elbasan, Albania
elionagremi@yahoo.com

Abstract

The Altman Z-score model for predicting bankruptcy of businesses was constructed and applied in the USA since 1968. This paper ascertains if this model can correctly predict the failure of Albanian commercial firms. First, we have analyzed the theoretical and practical characteristics of the Z-score model and its application in various economic fields. Second, we have examined a sample of 30 commercial firms who are active in the period 2010-2012; 30 companies had had their shares permanently suspended or delisted because of a default. According to the characteristics of commercial businesses, in our study are taken into account 24 financial ratios, to be representative of the financial situation of these businesses. We investigated whether the Z-score model could have predicted the default of the firms in the sample for up to three years earlier, with a degree of accuracy and reliability comparable to the one obtained by Altman (and by many other authors) in the tests performed nowadays. Study concluded that the original model of the Altman Z score cannot be applied in our country. Therefore was built multivariate discriminate model to predict the phenomenon of bankruptcy for commercial businesses in the district of Elbasan. As in many other studies carried out previously for the phenomenon of bankruptcy prediction was confirmed that the financial statements received from the financial statements of businesses serve to forecast this phenomenon.

Keywords: Z-score, Altman, bankruptcy prediction models, financial ratio, accuracy

INTRODUCTION

Early studies with regard to the prediction of financial difficulties companies date back to the 1930s these studies were based on a functional analysis. They focus on financial ratios derived from the financial statements of companies that eere already closed due to insolvency, compare these financial statements eith the financial ratioss of companies that eere ongoing.

Business failures are natural phenomena in our economic system with firms entering and exiting as a function of overall business activity and expectations (Altman & Loris, 1976, p.1). The failure of much business is the sequential conclusion due to systematic and non-systematic factors. Financial and accounting literature has over and over again renewed the confidence in ratio analysis as a proficient predictor of business failure. Nevertheless, more attention should be focused on the prediction of their failures.

During the past three decades this industry seen as a dynamic and innovative. But also it is seen as one of the industries with the highest rates of bankruptcy. Even in the district of Elbasan, Albania by data published by INSTAT, by the end of 2014 the commercial sector occupies 42.7% of the economy, trading enterprises are 3354, by 7859 the total active enterprises. Given this it is necessary to modeled models that make possible the prediction of the phenomenon of bankruptcy for this sector of the economy and in the district of Elbasan, Albania, since this city is the focus of this study and ay available with easy base to data.

LITERATURE REVIEW

Simic, Kovac & Simic (2012, p.536) stated ‘corporate failure prediction is essential for the prevention or mitigation of negative economic cycles in a national economy. Particularly after the collapse of large banks during the great depression such as Fannie Mae, Citigroup Nee York, Merrill Lynch and, of course, Lehman Brothers and Anglo Irish Bank. The importance of bankruptcy prediction has become a significant concern for corporate governance

Fitz Patrick (1932) concluded that the financial ratioss should be given importance are net profit / Total Debt. Successful companies had favorable ratioss compared eith companies failed, cilve ratioss that eere unfavorable compared eith the industry average. Smith and Winakor (1935) working capital / total assets ratios had a fair forecast financial problems than Cash / Total Assets and current ratio.

Studies for predicting bankruptcy folloeed eith Altman in 1968. He used multivariate analysis to the study of 33 manufacturing companies that eent bankrupt during the period 1946-1965.

He analyzed 22 ratioss of five different categories: liquidity, profitability, financial leverage, solvency and ordinary activity of the company. Altman brought an indicator, the indicator Z-

Score ehich is based on five financial ratioss: And it can share 94% of insolvent companies, and 97% of front companies as a going concern eith the financial data of one year before the bankruptcy.

Deakin (1972) used multivariate analysis to analyze a combination of 97 insolvent companies and 97 companies sequential using 14 financial ratioss for a period of three years. The findings of the study indicate that the model can predict in 94% of cases the bankruptcy of companies a year before their closing. Ratios include: cash / current liabilities, cash / sales, cash / total assets, cas floe / total liabilities, short-term assets / short-term liabilities, short-term assets / sale, short-term assets / total assets, net income / total assets, eorking capital / sales and eorking capital / total assets.

Ohlsson (1980) to overcoming the disadvantages of the analysis more variables implemented a nee type of research in this area. Conditional's log analysis. In his study of 2058 included a going concern and 9 company insolvent company. He analyzed the financial and nonfinancial 9 ratioss for the period 1970-1976. Ohlsson claimed that to study the prediction of bankruptcy does not necessarily need coupling companies. Results shoe that financial liquidity ratios, the financial performance of the companies the structure and size of the companies are related to bankruptcy eithin one year of closing companies.

Kim and Gu (2006) used teo methods, analysis and log's discriminatory, in a group of 18 restaurants in the United States for the period 1986-1988. The results shoeed that the method enables predictive logit higher than diskriminueses analysis eith a 94% confidence level respectively and 92%.

There are few studies conducted to retail sector. Begley et al. (1996), Bhargava et al. (1998), McGurr and Devaney (1998) Lennox (1999) in the UK, Lugovskaja (2009), Keener (2013) USA etc.

RESEARCH METODOLOGY

Forecasting statistical model of bankruptcy

In world are used many models for predicting bankruptcy of businesses. But each of them has advantages and disadvantages. We can mention:

1**. Univariate Analyze**

One of the early researchers forecast the bankruptcy of entities was Beaver. Since 1966 he was the first researcher who applied a model with a variable based on some financial ratioss of a group of insolvent companies and going concern company activity. The emphasis in this model is placed in individual bankruptcy signals. A classification procedure is done for each financial

ratios included in the model. On classification of companies in bankruptcy or not, the amount of any financial ratios is analyzed in particular, and depending on this indicator, the cutoff point, the company is insolvent if it is classified or not.

In general, if the value of the financial ratios is below is classified as healthy, if the value is above the financial ratios is classified as a bankrupt company. In this model classification accuracy is measured by the percentage of correct non-classify, and % of the first-type error, and% second-type error. The advantage of this model is its simplicity of application. It is one of the simplest statistical models for use

2. Risk index models

This model is based on a rating scale. Tamar (1966) who's created this model is based on the argument that all lending institutions that allow businesses must have a way to determine the degree of risk that showed clients with their financial situation. Most banks use the analysis of financial ratios to identify risk customers. In this way to protect und atom and they from risk. Tamar in his study analyzed 60 companies of the same industry, which ye have received loans for a long time, and which had gone bankrupt.

3. Multivariate Analyze

Univariate Analysis of the Beaver laid the foundations of multivariate analysis for finding a bankruptcy prediction model. (Drapeau, 2004). Discriminate multivariate analyze is a statistical method which is designed to classify a given survey in one of the target groups, based on relevant characteristics survey. This method is used primarily for classification and prediction in cases where the dependent variable is qualitative, for example, bankrupt or not bankrupt.

The classification is done by means of a function of multiple, which is a combination of independent variables. This is achieved by using statistical rule of maximizing the variance between groups compared with the variance within the group. Discriminate analyze issued a linear combination of individual characteristics, in this case the financial ratios, which makes better distinguish between groups by means of an equation of the form:

Z = _0 + _1x1 + _2x2 +.....+ _nxn

Where:

Z is dependent variable

Bi (i = 1, 2 ..., n) discriminate coefficients

Xi ((i = 1, 2 .., n) independent variables, financial ratios

4. Logistic Analyze

Logistic analysis is one of the most recent techniques and advanced, which is used in the social sciences to model discrete results. The basis of this analysis is the theory of discrete choice (Jones and Henser, 2004). This theory has to do with the sense of discrete behavioral responses of individuals to the operations of the economy and markets over government in the face when two or more results. Logistic value for a given company compared to dividing border point and is greater if logistic value, and then it is more likely that the bankrupt company, the contrary if logistic value is smaller. This technique assumes the dependent variable in the model is the dichotomy. Function which is obtained from this model to predict bankruptcy is of the form:

$$P1(Xi) = 1/ [1 + \exp – (B0 + B1X1 + B2X2 +.....+ BnXn)] = 1 / [1+ \exp – (Di)]$$

Where:

P1 (Xi) = probability of bankruptcy.

Bj = coefficient of attribute j where j = 1... n.

Xij = value attribute j (with j = 1... n) to the firm. Independent variables, financial ratioss

Di = "logistic" value of the firm.

Data collection and data analysis

This study aims at verifying the reliability of the *Z-score* model in predicting future defaults in Albanian trade firms especially in Elbasan district. Business financial statements are taken for three consecutive years, 2010, 2011 and 2012. Given that most of the models used for prediction of bankruptcy are based on the principle of "correspondence", "coupling", data were taken and the financial statements of 38 businesses inactive. A business is considered inactive, meaning that it has stopped its activity. But the reasons for the closure of a business may be multiple: end of the contract, enters into liquidation, disputes between partners, the failure of the profit target, change activity, merging with another company, bankruptcy etc.

Since the focus of this study is the phenomenon of bankruptcy prediction, corresponding businesses were considered insolvent if the following conditions:

- Entry into the procedure of liquidation
- Closing the activity after the declaration of losses in previous years
- Reporting net losses for at least three consecutive years

From this sample of data were eliminated businesses which had extreme values of financial ratios compared with other businesses, and any business bankrupt was paired with business as a going concern with the size of similar assets, and for the same year, thus creating a database

for 30 sequential businesses and 30 businesses considered in bankruptcy. Footnote: given that the provision of data for business bankruptcy is more difficult study focused on 30 businesses. From the characteristics of commercial businesses, in our study are taken into account 24 financial ratios are thought to be representative financial situation of these businesses. These financial ratios are divided into four groups.

Financial Ratios R1, R2, R3, R4, R5, R6, are grouped as liquidity ratios. Liquidity refers to the ability of the company to meet short-term debt obligations in a timely fashion. It also refers to how quickly can convert assets into cash and as low cost, and prospects for the generation of working capital funds.

Financial Ratios R7, R8, R9, R10, R11, R12 and R13 are grouped as solvency ratios and express whether company's cash flow is sufficient to meet its short term and long term liabilities.

Financial Ratios R14, R15, R16, R17, R18, R19 and R20 are grouped structure ratios. Ratios of the structure, also known as the leverage ratios are the most important ratios for insolvency in literature. They measure a company's ability to meet its long-term financial obligations, along with its ability to raise additional capital borrowing. The ratios provide an overview of the structure of the overall financial health and financial risk the company.

Financial ratios R21 and R22 are representative of return to business ratios. Profitability ratios indicate the company's ability to control its costs and generate a return of resources committed to the business.

Financial ratios are calculated for three consecutive years, 2010, 2011 and 2012 as a going concern for businesses as well as for businesses considered insolvent. The study analyzes three consecutive years in order to determine the time at which the accuracy of forecasting the phenomenon of bankruptcy is higher, one year before the bankruptcy, two years before the three years prior to bankruptcy or insolvency.

EMPIRICAL RESULTS

Discriminate analyze is the statistical method which explains the relationship between a dependent variable and an independent variable, where the dependent variable or otherwise discriminating variable is the event of being bankrupt or not for a business, and independent variables are financial ratios. The number of independent variables used in this model is high, so to select variables that have great skill with discriminate methods used step by step. These methods are in three forms: the method of selection "Forward", the method of "Backward" selection and "Stepwise" methods.

According to the "Forward" selection method process automatically starts by introducing the variables one by one based on the discriminate power of each variable, beginning with the independent variables that have the highest correlation. In the model are added variables which have lower correlation. Variables which increase the accuracy of the model kept in the final model, if not excluded from the model. The process continues until no additional variables which have statistical value of $p < 0.5$. Complexity of these variables thought to give the maximum contribution to increasing the accuracy of the final model.

According to the “Backward” method process begins automatically with the full model, all variables are included in the model. The variable which is less important, given the other variables removed from the model. This process continues until all remaining variables have statistical value of $p < 0.10$.

"Stepwise" method of selection is the combination of the first two methods. Variables are statistically tested at every stage which should be included or excluded from the model. This method tests the variables which are included in the model, these variables and may be excluded from the model if their statistical significance is lower than the importance of the new variables being tested.

The final discriminate function is:

$D = \alpha + \beta 1\ X1 + \beta 2\ X2 + ... + \beta i\ Xi$

where:

βi are discriminatory coefficient, Xi are independent variables, and D is constant of the model

Before starting with the of multiple discrimination analysis seen if its assumptions are fulfill, the normal distribution of data, the equal variance matrix / covariance between the two groups of data, low multicolinearity between variables, the existence of differences between the two groups. To test whether the data have normal distribution we have used two statistical tests: Kolmogorov-Smirnov test and Shapiro Wilk test. We used our study Wilk Shapiro test, since it is suitable for small to a choice of populating given. This test is important because one of the assumptions of the discriminatory use of multiple analyses is the normal distribution of the data in the study. However it should be noted that the study is carried out only based on financial data from financial statements provided to businesses, and by nature of the data has multicolinearitety, some financial ratios are calculated in view of each other. However, it is acceptable a slight deviation from normality, because this fact does not have influence on the predictive accuracy of the whole model. Based on Shapiro Wilk test results, noted that the assumption of the normal distribution are not fulfilled for the majority of financial ratios, in the

three years in the study. Shapiro Wilk test value sig < 0.05, which shows the non-existence of normal distribution of data.

Then test the statistical significance of all independent variables included in the study. This test is done to determine which variables are statistically significant to explain the differences between the two groups of businesses go bankrupt or not bankrupt. For this test is used the equity averages to each group for each of the independent variables.

From 22 financial ratios, 17 of them are statistically significant to determine the differences between the two groups, businesses failed and not insolvent businesses. So through this test is completed the analysis assumption that there are differences between the two study groups selected. After fulfill the main assumptions of the analysis of multiple discrimination, the next step is to build a model based on this analysis. For reducing the number of financial ratios stepwise selection method is used, step by step, the computer statistical program SPSS 21. All variables are involved in the selection method step by step, not only those who were statistically significant for differences two groups, because although some variables have the ability not discriminatory.

In conclusion of this analysis is achieved 5 financial ratios which classify better businesses insolvent trading by commercial businesses not bankrupt a year before the bankruptcy phenomenon.

These ratios are for the first year of the current ratio, the ratio of ability to repay debts, the ratio of accounts receivable turnover ratio of total liabilities structure on total assets, ROA and return ratio.

Table 1. Shapiro Wilk test

	Wilks' Lambda	F	df1	df2	Sig.
R1	.991	3.532	1	58	.001
R6	.962	2.277	1	58	.000
R11	.664	29.364	1	58	.000
R20	.874	8.369	1	58	.000
R21	.944	3.449	1	58	.000

One of the assumptions of the multiple discriminative analyses was equality of variance matrices and covariance between the two groups in the study. Box M tests the hypothesis that the covariance matrices do not differ between the two groups. We want this test to not be statistically significant, so that the hypothesis that there are not differences be accepted. M index is statistically significant 148,976 sig = 0.000. So there are differences between the

covariance matrices. This disparity derives from the abnormal distribution of data. When the number of businesses in the study is large, this problem is avoided and there is no impact on the quality of the model.

Table 2. Canonical Discriminant Function Coefficients

	Function 1
R1	-.030
R6	-.376
R11	.498
R20	.108
R21	-.565
(Constant)	-1.790

The high correlation between independent variables is indicative of multicollinearity, which brings the value of the test each coefficient to evaluate the model. In order to identify whether there is risk of multicolinearity, it performed a correlation analysis between the independent variables. These variables exhibiting high correlation removed from the model and are not discriminatory determinative function.

Table 3. Pooled Within-Groups Matrices

		R1	R6	R11	R20	R21
Correlation	R1	1.000	-.034	-.007	.143	.181
	R6	-.034	1.000	-.007	-.039	.522
	R11	-.007	-.007	1.000	-.137	.177
	R20	.143	-.039	-.137	1.000	.103
	R21	.181	.522	.177	.103	1.000

The canonical discriminatory function derived from the model is:

Z = -1.790 -0.003R1 – 0.376 R6 + 0.498 R11 + 0.108 R20 - 0.565 R21

To test statistical significance canonical discriminatory function used canonical correlation coefficient indicator, the indicator Wilk's Lambda and Chi square Test to test the statistical significance of discriminatory activity as a whole.

For the first year before the bankruptcy we have:

Table 4. Cannonical Correlation

Function	Eigenvalue	% of Variance	Cumulative %	Canonical Correlation
1	.801[a]	100.0	100.0	.667

Canonical correlation coefficient of statistical significance tests of function discriminatory to make distinctions between the two groups, in our case the insolvent business and jot bankrupt businesses. The higher the canonical correlation coefficient the more accurate is the model that we have built for discrimination between the two groups. This coefficient is approximately 67% and for the year first before bankruptcy.

Wilk's Lambda indicator serves to show part of the total variance unexplained differences between the two business groups. The table is seen to function discriminatory for a year before the phenomenon of bankruptcy is statistically significant sig = 0.000 and 35.5% of the variation in values between the two groups failed to explain the difference between the two groups of business, bankrupt, and not insolvent.

Table 5. Wilks' Lambda

Test of Function(s)	Eilks' Lambda	Chi-square	df	Sig.
1	.355	32.661	5	.000

One way to interpret the results of the classification of commercial businesses in businesses failing or not failing is to use average values of each group. Table represents centers indicators Z value for each group to take the survey.

Table 6. Z value

Y	Function
	1
0	.980
1	-.680

Relying on the principle of symmetry point of separation (cut-off point) is defined as the average of the indicator Z for each group.

Cut-off point = (0.980-0.680) / 2 = 0.15

Retail businesses with indicator Z equal to or greater than 0.15, failing classified site with a probability of error of less than 50%. Trading businesses with index Z of less than 0.15, classified by function not discriminatory insolvent businesses with an error probability of 50%.

From the study we concluded that the original model of the Altman Z score cannot be applied in our country. Overall predictive accuracy of the Altman Z score was very low when this model is applied to the commercial businesses in the study. This is because of the change of economic conditions between countries, accounting procedures, legal regulation, etc. nature of business. Therefore was built multivariate discriminate model to predict the phenomenon of bankruptcy for retail businesses in the district of Elbasan. Accuracy of forecast model we grew by 81.7%. So this model is able to predict the phenomenon of bankruptcy for 81.7% of businesses in the study. As in many other studies carried out previously for the phenomenon of bankruptcy prediction was confirmed that the financial statements received from the financial statements of businesses serve to forecast this phenomenon.

CONCLUSIONS AND RECOMMENDATIONS

The variables which had discriminate power in classifying bankrupt businesses from non bankrupt businesses are liquidity ratios (current ratio), Cash flow from operations to total debt, leverage ratio (debt/ total assets), activity ratio (sales/ receivables) and profitability ratio (retained earnings/total assets).

The current ratio is the ratio between short term assets and short term liabilities, an accounting measure of the company structural liquidity position. The higher the ratio, the lower bankruptcy risk is. The ratio of cash flow to total debt, measures a company's ability to cover future debt obligations, is a good predictor of bankruptcy.

Operating cash flow is a measure of how much cash a company has on hand; while debt shoes expenses it must pay in the near future. The operating cash flow ratio thus shoes a company's ability to meet these liabilities without having to sell assets or take any similar actions.

Debt to total assets is an accounting measure for the company leverage. The higher the ratio, the higher the bankruptcy is.

The sale to receivables is a classic measure to control the dynamic of company's working capital. It indicates the ability of a company to convert its receivables into cash flow. The higher the ratio, the higher the bankruptcy is.

A higher retained earnings compared to total assets indicates a financial healthy state of the company. This ratio is usually higher for established companies versus nee companies. The higher the ratio, the lower bankruptcy risk is.

In conclusion we have to mention that the sample size is small, and the conclusions of the study can't be generalized. Also in future studies are recommended to use other prediction models like logit, neural network etc. We suggest also including qualitative variables, macroeconomic factors in future research.

REFERENCES

Altman, E. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy. The Journal of Finance, Vol. 23, No.4. (Sep.,1968), pp. 598-609.

Altman, E. (1971). Railroad Bankruptcy Propensity. The Journal of Finance, Vol. 26, No.2 (May, 1971), pp. 333-345.

Altman, E., Eom, Y., Kim, W. (1995), Failure Prediction: Evidence from Korea. Journal of International Financial Management and Accounting, 6:3(1995).

Beaver,W. (1966). Financial Ratios As Predictors of Failure. Journal of Accounting Research, Vol. 4, Empirical Research in Accounting: Selected Studies (1966), pp. 71-111.

Blum, M. (1974). Failing Company Discriminant Analysis. Journal of Accounting Research, Vol. 12, No.1.(Spring, 1974), pp. 1-25.

Casey, C.J. and Bartczak, N.J. 1984. Cash flow – it's not the bottom line. Harvard Business Review July-August: 61-66.

Coats, P. 1993. Recognizing financial distress patterns using a neural network tool. Financial Management 142-155

Deakin, E.(1972). A Discriminant Analysis of Predictors of Business Failure. Journal of Accounting Research, Vol.10, No.1, (Spring, 1972), pp. 167-179. The Institute of Professional Accounting, Graduate School of Business, University of Chicago.

Edmister, R.(1972), An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction. The Journal of Financial and Quantitative Analysis, Vol.7, No. 2,.1477-1493.

Eisenbeis, R, A.(1977), Pitfalls in the Application of Discriminant Analysisin Business, Finance, and Economics. The journal of Finance, Vol. 32, pp. 875-900.

Lennox, C. (1999). Identifying Failing Companies: A Reevaluation of the Logit, Probit and DA Approaches. North Holland. Elsevier Science Inc.

Maddala, G.,S.(1991). A Perspective on the Use of Limited-Dependent and Qualitative Variables Models in Accounting Research. The Accounting Review, Vol. 66, No. 4. (Oct., 1991), pp. 788-807.

Meyer, P., A, Pifer, H., W.(1970). Prediction of Bank Failures. The journal of Finance, Vol. 25, No.4, (Sep., 1970), pp. 853-868.

Noreen, E. (1988). An Empirical Comparison of Probit and OLS Regression Hypothesis Tests. Journal of Accounting Research, Vol. 26, No. 1. (Spring, 1988), pp. 119-133.

Northon, L, Smith, E.(1979). A Comprasion of General Price Level and Historical Cost Financial- A statement in the Prediction of Bankruptcy. The Accounting Review, Vol. 54, No. 1 (Jan., 1979), pp. 72-87.

Shumway, T. 2001. Forecasting bankruptcy more accurately: A simple hazard model. Journal of Business 74: 101-124.

Yang, Z. R., Platt, M. B., and Platt, H.D. 1999. Probabilistic neural networks in bankruptcy prediction. Journal of Business Research 44: 67-74.

Zavgren, C. 1983. The Prediction of Corporate Failure: The State of the Art. Journal of Accounting Literature 2: 1–38.