SMES' INSOLVENCY ANALYSIS IN ROMANIA IN THE YEAR 2010. A MICROECONOMIC LOGISTIC APPROACH

Maruşa Beca
The Bucharest University of Economic Studies, Romania
Irina Maria Drăgan
The Bucharest University of Economic Studies, Romania

Abstract

In this article we study the relationship between microeconomic factors (financial ratios) and SMEs' insolvencies in Romania using logistic regression model to predict the likelihood of SMEs bankruptcy in the aftermath of the financial and economic crisis. We conducted a logit econometric model for each size category of SMEs (micro, small and medium). The main finding is that the return on assets (ROA) and total debt ratio (TDR) across the three size categories of SMEs are the statistically significant key indicators for the SMEs insolvencies. The best logistic model is the one for small firms because the number of fair estimations represents 80.6%.

Keywords: Insolvency, SME, logit, financial ratios, Romania
JEL classification: C 31, C58, G01, G33

Introduction

The SMEs are the backbone of Romania's economy because they create 54% of the national wealth's added value and 65% of jobs in Romania. The economic crisis has hit hard in the Romanian SME sector, the main problems it faces are the late collection of receivables, the lack of collateral to obtain the loans for investments, and the bureaucracy in accessing European funds.

They play a key role in the economic development of a country because of the contribution they make to creating value added, employment and innovation. However, their importance is not adequately reflected in the economy through the support and openness of financial institutions because there is a constant rejection of banks to the SME sector, especially due to the reasons of asymmetric information, lack of collateral and unfavorable regulations. Financial institutions often ignore the expectations of firms to banks for trust and partnership.

"Small and medium enterprises, as defined by the European Commission, are businesses that meet two conditions: have fewer than 250 employees and an annual turnover of less than € 50 million or an annual balance sheet of less than € 43 million (European Commission Recommendation of May 6, 2003). The SMEs are distinguished in three size classes, based on the number of employees: micro-enterprises - having 0 to 9 employees, small businesses with 10 to 49 employees and medium enterprises with a number of 50 to 249 employees. The Romanian law takes, broadly, the definition and thresholds set by the EC recommendations" (Post-Privatization Foundation 2013).

The insolvency law is the law no. 85/2006 on insolvency proceedings that was modified in 2014. We must distinguish between insolvency and bankruptcy terms. "Insolvency is defined as the patrimonial state characterized by the failure of the borrower of funds available for the payment of outstanding obligations that concern a sum of money, those with other object trimmed by the Common law. Bankruptcy is a procedure for termination of the existence of the company, cease applying to traders (debtors) who cannot pay the debts of their business."(Appraisal & Valuation 2011). Unfortunately in Romania the majority of companies entering the insolvency procedure finally become bankrupt, and there isn't a legal framework that leads to successful reorganization plans.

The main purpose of this article is to establish the relationship between microeconomic factors (financial ratios) and SME insolvencies in Romania using logistic regression model to predict the likelihood of SMEs bankruptcies in the aftermath of the financial and economic crisis. The logit econometric model is used for each size category of SMEs (micro, small and medium).

The study is structured as follows: the second section presents an analysis of previous reference works on SMEs insolvencies at the micro level, the third part refers to data and research methodology used and the fourth section presents the main results, while the last section provides conclusions and recommendations.

Literature review

In many of recent Romanian articles regarding the determinants of corporate failures the enterprises analyzed were the ones listed on the Bucharest Stock Exchange (BSE) because the data were readily available (Mihalca 2011),(Mironiuc et al. 2012)), so we decided to perform a quantitative analysis on the insolvent Romanian SMEs considering the lack of similar studies.

Mișu's (2010) conclusions show the relevance of a model in forecasting the financial performance and ranking the SMEs by their performance. (Bărbuţă-Mișu 2010)

Moscalu (2012) applies multiple discriminant analysis (MDA) on a sample of Romanian SMEs in order to investigate the usefulness of financial ratios and other non-financial variables to forecast SMEs' insolvency. The results showed that bankruptcy can be accurately forecast with at least three years in advance. The best predictors were those concerning the interest coverage, liquidity (immediate and quick ratios), overdue payments, profitability, turnover, growth, and taxation rate (Moscalu 2012).

Brindescu-Olariu and Goleț (2013) test if data from public financial statements in Romania can be used within a logistic regression model to forecast accurately the corporate bankruptcy probability during the period of economic and financial crisis. Their conclusions are as follows: "The model is considered to be of immediate practical utility, as it can represent a tool for performing a fast estimation of the bankruptcy probability of a company that fits the profile of the target population. The research proves that the companies that filed for bankruptcy during the crisis period showed signs of weaknesses before the beginning of the crisis".(Brindescu-Olariu & Goleț 2013)

By using the scoring methods, Bărbuță-Mișu & Codreanu (2014), classify the firms in function of their financial performance into both successful and bankrupt companies. Based on financial data for the period 2008–2012, they performed a comparative analysis of bankruptcy risk, and they conclude that the Conan & Holder model is more relevant to determine the likelihood of bankruptcy. (Bărbuță-Mișu & Codreanu 2014)

Baciu (2014) studies the impact that some structure ratios and the size and age of firms have on the level of debt for the insolvent companies in Romania. **"**Debts of insolvent companies are directly affected by turnover and their growth show that insolvent enterprises finance their insufficient incomes more from current liabilities than from long-term ones. The relationship between fixed assets and indebtedness is a positive one" (Baciu & Georgescu 2014).

Methodology and data

Data collection and variables definitions

We have employed in our analysis more than 15.000 firms (50% insolvent and 50% solvent) but after removing the NA observations there were left only 14.244 firms. In order to perform our analysis, we have employed the cross-sectional database of 7,770 insolvent Romanian SMEs in the year 2010 and 6474 solvent companies. The database was given by Coface Romania.

The main transformations that we performed on the raw data were made in Excel, and the exploratory data analysis was performed in Gretl, which is a free statistical and econometric software. The variables used in the analysis were calculated based on the indicators of 2009 and were the following:

- **ROE** (Return on Equity) – it shows whether management is growing the company's value at an acceptable rate (Investopedia 2015d). ROE is calculated as:

$$ROE = \frac{\textbf{Annual net income}}{\textbf{Shareholders' Equity}}$$

- **ROA (Return on Assets) –** it reveals how much profit a company earns for every dollar of its assets (Investopedia 2015c).

$$\textbf{ROA} = \frac{\textbf{Annual net income}}{\textbf{Total assets}}$$

- **TDR (Total Debt Ratio)** has the following formula (Investopedia 2015a):

$$\textbf{TDR} = \frac{\textbf{Total debt}}{\textbf{Total assets}}$$

- **FLR (Financial Leverage Ratio)** has the following formula (Investopedia 2015b):

$$\textbf{FLR} = \frac{\textbf{Total debt}}{\textbf{Equity}}$$

- **STATUS** is a dummy variable which takes the next two values: 1 – solvable company 0 – insolvent company
- **SIZE** is a categorical variable which takes the next three values: 1-microenterprises, 2- small firms and 3 – medium companies
- **Micro** – dummy variable for micro-enterprises
- **Small** – dummy variable for small firms
- **Medium** – dummy variable for medium companies

From the cross-tabulation table of Size against Status, we observe that the database comprises 55.8% insolvent micro-enterprises and 44.2% solvent micro-enterprises from the total number of micro-firms that we employed in our analysis (10.796). The database contains 50.6% small insolvent firms and 49.4% small solvent firms from the total number of small companies analyzed (2852). We also studied a number of 596 medium enterprises (50.3% insolvent and 49.7% solvent).

The overall database which contains 14,244 firms is divided as follows: 54.5% insolvent firms and 45.5% solvent companies (see **Table 1**).

Cross-tabulation of Size (rows) against Status (columns)

Table 1

		STATUS		
		0	1	**TOTAL**
SIZE	1	55.80%	44.20%	**10,796**
	2	50.60%	49.40%	**2,852**
	3	50.30%	49.70%	**596**
	TOTAL	**54.50%**	**45.50%**	**14,244**

Source: Authors' computations in Gretl

Pearson chi-square test = 29.3457 (2 df, p-value = 4.24296e-007)

The database comprises 7770 insolvent firms (77.6% micro-enterprises, 18.6% small firms and 3.9% medium companies) and 6474 solvent companies (73.7% micro-firms, 21.8% small companies and 4.6% medium companies). The overall database of 14,244 firms is structured as follows: 75.8% micro-enterprises, 20% small firms and 4.2% medium companies (see **Table 2**).

Cross-tabulation of Size (rows) against Status (columns)

Table 2

		STATUS		
		0	1	**TOTAL**
SIZE	1	77.60%	73.70%	**75.80%**
	2	18.60%	21.80%	**20.00%**
	3	3.90%	4.60%	**4.20%**
	TOTAL	**7,770**	**6,474**	**14,244**

Source: Authors' computations in Gretl

Pearson chi-square test = 29.3457 (2 df, p-value = 4.24296e-007)

Research Methodology

In this article we performed a quantitative analysis of the characteristics of the Romanian SMEs that entered into insolvency in the year 2010 and of the solvent SMEs from the same year and then we have built four econometric models for each size of SMEs and for the overall sector. In order to do our research, we have analyzed the descriptive statistics of the data, we have calculated the correlation matrix in order to establish the degree of correlation that exists between the analyzed variables, the cross-tabulations between the qualitative variables and we have performed some exploratory analysis of the insolvent and solvent SMEs used in the study in the year 2010.

When y is dichotomous there are some cumulative distributions that have been employed to give a model for the expectation of y given x - E(y/x), 0<E(y/x)<1.

The logistic function **P(x)** is defined as follows:

$$P(x) = \frac{e^{\beta_0 + \beta_1 x_1 + \cdots + \beta_i x_i}}{1 + e^{\beta_0 + \beta_1 x_1 + \cdots + \beta_i x_i}}$$

P(x) is the probability of the dependent variable ***y*** representing a "success".

The inverse of the logistic function, **g(x)**, the logit or the log odds is defined as follows:

$$g(P(x)) = ln\frac{P(x)}{1 - P(x)} = \beta_0 + \beta_1 x_1 + \cdots + \beta_i x_i$$

where:

- *g(P(x))* refers to the logit function (log-odds)
- *ln* represents the natural logarithm
- β_0 is the intercept from the linear regression equation.
- $\beta_i x_i$ are the regression coefficients multiplied by some values of the predictors
- base *e* represents the exponential function.

The odds of the dependent variable ***y*** representing a success (given some linear combination x of the predictors) equals the exponential function of the linear regression expression.

$$Odds = e^{\beta_0 + \beta_1 x_1 + \cdots + \beta_i x_i}$$

The odds ratio (OR) can be defined as:

$$OR = e^{\beta_i}$$

Summary statistics

From the summary statistics, we notice that the main difference between the solvent and insolvent companies comes from the ratios ROA and FLR. The ROA and FLR median for the insolvent firms are negative and for the solvent firms are positive, except for the median of the insolvent medium companies. For detailed summary statistics see Appendix 1.

Exploratory data analysis

From the correlation matrix for the insolvent SMEs we notice that the variables TDR and ROA are strongly negatively correlated (Pearson's correlation coefficient is -63.88%) and the variables FLR and ROE are slightly negatively correlated (r =-15,83%).

The variables ROA and TDR are negatively correlated for the

insolvent micro firms (-61.5%), small firms (-82.19%) and medium enterprises (-99.87%). The variables FLR and ROE are negatively correlated for the small firms (-41,56%) and medium companies (-85.10%).

From the correlation matrix for the solvent SMEs we notice that the variables TDR and ROA are strongly positively correlated (the correlation coefficient is 81.74%) and the variables FLR and ROE are also positively correlated (37.79%).

From the correlation matrix we observe a strong positive relationship between ROA and TDR (the correlation coefficient is 67.77%) for the entire database (insolvent and solvent firms) and a slightly positive relationship between the variables FLR and ROE (10.33%).

The econometric models

The first logit model comprises the statistically significant variables such as ROA, TDR, FLR and the dummy variables for the small firms and medium enterprises for the overall database, i.e. all 14,244 firms. The variable ROE was discarded from the model because it wasn't statistically significant. The variable FLR is statistically significant at 10% significance level, and the rest of variables are significant at 1% p-value.

We have computed the robust standard errors in order to reduce the effect that might have the outliers on the accuracy of the model (see **Table 3**).

Model 1: Logit, using observations 1-14244.
Dependent variable: Status. QML standard errors

Table 3

	Coefficient	*Std. Error*	*Z*	*p-value*
Const	-0.3428	0.02272	-15.09	<0.00001
ROA	0.07934	0.01441	5.5044	<0.00001
TDR	0.00373	0.00135	2.7723	0.00557
FLR	0.00035	0.00019	1.8411	0.0656
Small	0.27281	0.04206	6.4857	<0.00001
Medium	0.29465	0.08392	3.5109	0.00045
Mean dependent var	0.45451		S.D. dependent var	0.49794
McFadden R-squared	**0.08074**		Adjusted R-squared	0.08013
Log-likelihood	-9021.8		Akaike criterion	18055.6
Schwarz criterion	18101		Hannan-Quinn	18070.7

Number of cases 'correctly predicted' = 9112 (**64.0%)**

f(beta'x) at mean of independent vars = 0.498

Likelihood ratio test: Chi-square (5) = 1584.74 [0.0000]

The logit has the following form for this model:

$$g(P(x)) = -0.34 + 0.08 * ROA + 0.004 * TDR + 0.0003 * FLR + 0.27 * Small + 0.29 * Medium$$

The logistic function is represented as follows:

$$P(x) = \frac{e^{-0.34+\ 0.08*ROA+0.004*TDR+0.0003*FLR+0.27*Small+0.29*Medium}}{1 + e^{-0.34+\ 0.08*ROA+0.004*TDR+0.0003*FLR+0.27*Small+0.29*Medium}}$$

The number of cases correctly predicted by this model represents 64%.

The likelihood ratio chi-square of 1584.74 with a p-value of 0.0000 tells us that our model as a whole fits significantly better than an empty model (i.e., a model with no predictors).

ROA, TDR, and FLR are statistically significant, as are the two indicator variables for size. The logistic regression coefficients give the change in the log odds of the outcome for a one unit increase in the predictor variable.

We interpreted the results of the logit econometric model for SMEs as follows:

- For every one unit change in **ROA,** the log odds of solvency (versus insolvency) increases by 0.08
- For a one unit increase in **TDR**, the log odds of being a solvent firm increases by 0.004
- Being a firm with size =2 (small), versus a micro firm, increases the log odds of solvency by 0.27
- Being a firm with size =3 (medium), versus a micro firm, increases the log odds of solvency by 0.29
- a one unit increase in **ROA**, the odds of being solvent (versus insolvent) increase by a factor of 1.08
- a one unit increase in **TDR**, the odds of being solvent (versus insolvent) increase by a factor of 1.004
- Being a firm with size =2 (small), versus a micro firm, the odds of being solvent (versus insolvent) increase by a factor of 1.31
- Being a firm with size =3 (medium), versus a micro firm, the odds of being solvent (versus insolvent) increase by a factor of 1.34

The second logit model comprises the statistically significant variables such as ROA, TDR and FLR only for the micro-enterprises. The variable ROE was discarded from the model because it wasn't statistically significant. The variable FLR is statistically significant at 10% significance level, and the rest of variables are significant at 1% p-value (see **Table 4**).

Model 2: Logit, using observations 1-10796 (micro-enterprises). Dependent variable: Status. QML standard errors

Table 4

	Coefficient	*Std. Error*	*z*	*p-value*	
Const	-0.3381	0.02254	-14.999	<0.00001	***
ROA	0.08175	0.01578	5.1795	<0.00001	***
TDR	0.00311	0.00112	2.7798	0.00544	***
FLR	0.00039	0.00021	1.863	0.06246	*
Mean dependent var	0.44174		S.D. dependent var	0.49662	
McFadden R-squared	0.09299		Adjusted R-squared	0.09245	
Log-likelihood	-6720.8		Akaike criterion	13449.5	
Schwarz criterion	13478.7		Hannan-Quinn	13459.4	

Number of cases 'correctly predicted' = 6964 (64.5%)

f(beta'x) at mean of independent vars = 0.497

Likelihood ratio test: Chi-square(3) = 1377.99 [0.0000]

The logit has the following form for this model:

$$g(P(x)) = -0.34 + 0.08 * ROA + 0.003 * TDR + 0.0004 * FLR$$

The logistic function is represented as follows:

$$P(x) = \frac{e^{-0.34 + 0.08*ROA + 0.003*TDR + 0.0004*FLR}}{1 + e^{-0.34 + 0.08*ROA + 0.003*TDR + 0.0004*FLR}}$$

The number of cases correctly predicted by this model represents 64.5%.

The likelihood ratio chi-square of 1377.99 with a p-value of 0.0000 tells us that our model as a whole fits significantly better than an empty model (i.e., a model with no predictors).

We interpreted the results of the logit econometric model for micro-enterprises as follows:

- For every one unit change in **ROA,** the log odds of solvency (versus insolvency) increases by 0.08.
- For a one unit increase in **TDR**, the log odds of being a solvent firm increases by 0.003.
- a one unit increase in **ROA**, the odds of being solvent (versus insolvent) increase by a factor of 1.085
- a one unit increase in **TDR**, the odds of being solvent (versus insolvent) increase by a factor of 1.003

The third logit model comprises the statistically significant variables such as ROA and TDR only for the small firms. The variables ROE and FLR

were discarded from the model because they weren't statistically significant. ROA and TDR variables are significant at 1% p-value (see **Table 5**).

Model 3: Logit, using observations 1-2852 (small firms). Dependent variable: Status. QML standard errors

Table 5

	Coefficient	*Std. Error*	*z*	*p-value*	
Const	-0.531	0.05255	-10.106	<0.00001	***
ROA	2.27483	0.07871	28.9014	<0.00001	***
TDR	0.23506	0.0205	11.4658	<0.00001	***
Mean dependent var	0.49404		S.D. dependent var	0.50005	
McFadden R-squared	0.3646		Adjusted R-squared	0.36308	
Log-likelihood	-1256		Akaike criterion	2517.92	
Schwarz criterion	2535.79		Hannan-Quinn	2524.37	

Number of cases 'correctly predicted' = 2300 (80.6%)

f(beta'x) at mean of independent vars = 0.500

Likelihood ratio test: Chi-square(2) = 1441.38 [0.0000]

The logit has the following form for this model:

$$g(P(x)) = -0.53 + 2.27 * ROA + 0.23 * TDR$$

The logistic function is represented as follows:

$$P(x) = \frac{e^{-0.53+ 2.27*ROA+0.23*TDR}}{1 + e^{-0.53+ 2.27*ROA+0.23*TDR}}$$

The number of cases correctly predicted by this model represents 80.6%.

The likelihood ratio chi-square of 1441.38 with a p-value of 0.0000 tells us that our model as a whole fits significantly better than an empty model (i.e., a model with no predictors).

We interpreted the results of the logit econometric model for small enterprises as follows:

- For every one unit change in **ROA,** the log odds of solvency (versus insolvency) increases by 2.27
- For a one unit increase in **TDR**, the log odds of being a solvent firm increases by 0.23
- a one unit increase in **ROA**, the odds of being solvent (versus insolvent) increase by a factor of 9.68
- a one unit increase in **TDR**, the odds of being solvent (versus insolvent) increase by a factor of 1.26

The fourth logit model comprises the statistically significant variables such as ROA, TDR and FLR only for the medium enterprises. The variable ROE was discarded from the model because it wasn't statistically significant.

The variable FLR is statistically significant at 10% significance level, and the rest of variables are significant at 1% p-value (see **Table 6**).

Model 4: Logit, using observations 1-596 (medium enterprises). Dependent variable: Status. QML standard errors

Table 6

	Coefficient	*Std. Error*	*Z*	*p-value*	
Const	-1.3273	0.29325	-4.5262	<0.00001	***
ROA	1.36646	0.37673	3.6272	0.00029	***
TDR	0.93444	0.2628	3.5557	0.00038	***
FLR	-0.0017	0.00092	-1.8428	0.06536	*
Mean dependent var	0.49664		S.D. dependent var	0.50041	
McFadden R-squared	0.21396		Adjusted R-squared	0.20428	
Log-likelihood	-324.72		Akaike criterion	657.431	
Schwarz criterion	674.992		Hannan-Quinn	664.269	

Number of cases 'correctly predicted' = 451 (75.7%)

f(beta'x) at mean of independent vars = 0.500

Likelihood ratio test: Chi-square(3) = 176.773 [0.0000]

The logit has the following form for this model:

$$g(P(x)) = -1.33 + 1.37 * ROA + 0.93 * TDR - 0.002 * FLR$$

The logistic function is represented as follows:

$$P(x) = \frac{e^{-1.33 + 1.37 * ROA + 0.93 * TDR - 0.002 * FLR}}{1 + e^{-1.33 + 1.37 * ROA + 0.93 * TDR - 0.002 * FLR}}$$

The number of cases correctly predicted by this model represents 75.7%.

The likelihood ratio chi-square of 176.773 with a p-value of 0.0000 tells us that our model as a whole fits significantly better than an empty model (i.e., a model with no predictors).

We interpreted the results of the logit econometric model for medium enterprises as follows:

- For every one unit change in **ROA,** the log odds of solvency (versus insolvency) increases by 1.37
- For a one unit increase in **TDR**, the log odds of being a solvent firm increases by 0.93
- a one unit increase in **ROA**, the odds of being solvent (versus insolvent) increase by a factor of 3.93
- a one unit increase in **TDR**, the odds of being solvent (versus insolvent) increase by a factor of 2.53

Conclusions

From our research, it results that the main indicators of SMEs' insolvencies are: the return on assets and the total debt ratio across all the SMEs categories. The best logistic model is the one for the small firms because the number of cases correctly predicted by this model represents 80.6%.

Our findings suggest that the odds of being solvent (versus insolvent) increase by a factor of 1.31 for a small firm versus a micro firm and that the odds of being solvent (versus insolvent) increase by a factor of 1.34, being a medium company versus a micro firm.

We recommend managers, as solutions for reducing the risk of SMEs insolvency, to monitor the evolution of the following indicators: return on assets (ROA) and total debt ratio (TDR) and also use the econometric models to make quick estimates of the probability of bankruptcy for the company they lead and which falls into the targeted profile.

Our analysis might be of interest for the SMEs' managers and/or stockholders, for the insolvency practitioners or financial institutions that want to give credits to the enterprises or third parties that are interested in the health of the company. For further research, we could employ in our analysis three years of data prior to insolvency and perform a multidimensional data analysis or survival analysis.

Acknowledgements

This paper was co-financed from the European Social Fund, through the Sectorial Operational Programme Human Resources Development 2007-2013, project number POSDRU/159/1.5/S/138907 "Excellence in scientific interdisciplinary research, doctoral and postdoctoral, in the economic, social and medical fields - EXCELIS", coordinator The Bucharest University of Economic Studies.

References

1. Appraisal & Valuation, 2011. The distinction between insolvency and bankruptcy. *Dreptonline.ro*. Available at: http://www.dreptonline.ro/articole/articol.php?id_articol=58 [Accessed July 18, 2015].
2. Baciu, E.C. & Georgescu, I., 2014. The analysis of the factors that influence indebtedness for the insolvent companies in Romania. In *Proceedings of the 9th International Conference ACCOUNTING AND MANAGEMENT INFORMATION SYSTEMS AMIS 2014*. pp. 968–988.
3. Bărbuță-Mișu, N., 2010. Assessing of the SME's Financial Competitiveness. *Global Journal of Management and Business Research*, 10(1), pp.140–147.
4. Bărbuță-Mișu, N. & Codreanu, E., 2014. ANALYSIS AND PREDICTION OF THE BANKRUPTCY. *Ekonomika*, 93(2), pp.131–146.

5. Brindescu-Olariu, D. & Goleț, I., 2013. PREDICTION OF CORPORATE BANKRUPTCY IN ROMANIA THROUGH THE USE OF LOGISTIC REGRESSION. *Annals of Faculty of Economics*, 1(1), pp.976–986. Available at: http://econpapers.repec.org/RePEc:ora:journl:v:1:y:2013:i:1:p:976-986 [Accessed March 24, 2015].
6. Investopedia, 2015a. Debt Ratio Definition | Investopedia. Available at: http://www.investopedia.com/terms/d/debtratio.asp [Accessed June 18, 2015].
7. Investopedia, 2015b. Leverage Ratio Definition | Investopedia. Available at: http://www.investopedia.com/terms/l/leverageratio.asp [Accessed June 18, 2015].
8. Investopedia, 2015c. Return On Assets (ROA) Definition | Investopedia. Available at: http://www.investopedia.com/terms/r/returnonassets.asp [Accessed June 18, 2015].
9. Investopedia, 2015d. Return On Equity (ROE) Definition | Investopedia. Available at: http://www.investopedia.com/terms/r/returnonequity.asp [Accessed June 18, 2015].
10. Mihalca, G., 2011. *The effects of market conditions on the capital structure of economic entities*.
11. Mironiuc, M., Robu, M.-A. & Robu, I.-B., 2012. The Analysis of the Influence of Financial and Non-Financial Factors of the Bankruptcy Risk. Obtaining a Deterministic Model for the Firms Listed at Bucharest Stock Exchange. *Proceedings of the 7th International Conference ACCOUNTING AND MANAGEMENT INFORMATION SYSTEMS AMIS 2012*, pp.1061–1079.
12. Moscalu, M., 2012. Business Failure Prediction for Romanian SMEs Using Multivariate Discriminant Analysis. *Revista Economica*, Supplement(4), pp.457–466. Available at: http://economice.ulbsibiu.ro/revista.economica/archive/RE4-5-63-2012.pdf.
13. Post-Privatization Foundation, 2013. Post-Privatization Foundation report on the SME sector in Romania, 2013 edition. *Postprivatizare.ro*. Available at: http://postprivatizare.ro/static/Raport-IMM-2013.pdf [Accessed July 13, 2015].

APPENDIX 1

Summary Statistics, using the observations 1 – 7770
(Descriptive statistics for the insolvent companies)

Table 7

Variable	Mean	Median	Minimum	Maximum
ROE	0.46726	0.36278	-349.35	400.4
ROA	-3.7899	-0.1369	-1751.6	394.808
TDR	9.37	1.13126	-993.61	2620.67
FLR	2.6752	-1.3141	-2295.3	1922.47
Micro	0.77568	1	0	1
Small	0.18571	0	0	1
Medium	0.03861	0	0	1
Size	1.26293	1	1	3
Variable	**Std. Dev.**	**C.V.**	**Skewness**	**Ex. kurtosis**
ROE	11.1415	23.8442	3.16111	606.214
ROA	45.3892	11.9762	-23.01	682.108
TDR	82.8053	8.83728	16.3979	351.225
FLR	88.5683	33.1072	5.73325	282.776
Micro	0.41716	0.53781	-1.3218	-0.253
Small	0.3889	2.09408	1.61638	0.61269
Medium	0.19268	4.99031	4.78959	20.9402
Size	0.52063	0.41224	1.86145	2.58258

Summary Statistics, using the observations 7771 – 14244
(Descriptive statistics for the solvent companies)

Table 8

Variable	Mean	Median	Minimum	Maximum
ROE	0.4513	0.19284	-355.11	353.66
ROA	8.89953	0.32934	-220.37	6376.66
TDR	37.4197	2.08114	-1528.5	42141.7
FLR	6.90369	1.07963	-2091.8	5250.47
Status	1	1	1	1
Micro	0.73664	1	0	1
Small	0.21764	0	0	1
Medium	0.04572	0	0	1
Size	1.30908	1	1	3
Variable	**Std. Dev.**	**C.V.**	**Skewness**	**Ex. kurtosis**
ROE	9.7262	21.5515	2.67541	910.172
ROA	99.9556	11.2316	44.4605	2615.06
TDR	564.769	15.0928	64.7634	4774.83
FLR	118.102	17.1071	25.0558	1060.28
Status	0	0	Undefined	undefined
Micro	0.44049	0.59797	-1.0745	-0.8454
Small	0.41267	1.89613	1.36855	-0.1271
Medium	0.2089	4.5689	4.34966	16.9195
Size	0.55231	0.4219	1.60939	1.62361

Summary Statistics, using the observations 1 – 14244
(Summary statistics for the overall database)

Table 9

Variable	Mean	Median	Minimum	Maximum
ROE	0.46001	0.26404	-355.11	400.4
ROA	1.97752	0.01168	-1751.6	6376.66
TDR	22.1188	1.34379	-1528.5	42141.7
FLR	4.59708	0.37991	-2295.3	5250.47
Status	0.45451	0	0	1
Size	1.28391	1	1	3
Micro	0.75793	1	0	1
Small	0.20023	0	0	1
Medium	0.04184	0	0	1
Variable	**Std. Dev.**	**C.V.**	**Skewness**	**Ex. kurtosis**
ROE	10.5215	22.8724	3.00808	717.833
ROA	75.527	38.1928	44.2853	3713.57
TDR	385.868	17.4452	92.4824	9975.85
FLR	103.064	22.4195	19.1356	916.538
Status	0.49794	1.09557	0.18273	-1.9666
Size	0.53573	0.41727	1.74083	2.10503
Micro	0.42835	0.56516	-1.2044	-0.5495
Small	0.40018	1.99867	1.49825	0.24474
Medium	0.20024	4.78549	4.57635	18.943

Correlation coefficients, using the observations 1 - 7770
5% critical value (two-tailed) = 0.0222 for n = 7770
(Correlation matrix for the insolvent companies)

Table 10

ROE	ROA	TDR	FLR	
1	-0.0043	-0.0001	-0.1583	ROE
	1	-0.6388	0.0036	ROA
		1	-0.0044	TDR
			1	FLR

Correlation coefficients, using the observations 7771 - 14244
5% critical value (two-tailed) = 0.0244 for n = 6474
(Correlation matrix for the solvent companies)

Table 11

ROE	ROA	TDR	FLR	
1	0.0107	0.0113	0.3779	ROE
	1	0.8174	0.0015	ROA
		1	0.0695	TDR
			1	FLR

Correlation coefficients, using the observations 1 - 14244
5% critical value (two-tailed) = 0.0164 for n = 14244
(Correlation matrix for all the enterprises)

Table 12

ROE	ROA	TDR	FLR	
1	0.0044	0.0069	0.1033	ROE
	1	0.6777	0.0037	ROA
		1	0.0532	TDR
			1	FLR