



# Macroeconomic Determinants of Corporate Insolvency

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**Abstract.** The main aim of this paper was to define relationship between macroeconomic variables and insolvency rates in Lithuania. Using OLS (ordinary least squares) method it was intended to empirically describe how various macroeconomic variables influence number of bankruptcies in Lithuania. Corporate insolvency processes and macroeconomic determinants of corporate insolvency were depicted in the literature review. Furthermore, linear regression models were applied in order to conclude on regression functions. The received results may be very useful for economic policy makers and investors, who are interested in proper definition of the determinants of insolvency rates and proper management of these rates in Lithuania.

**Keywords:** corporate insolvency, bankruptcy, macroeconomic variables.

## I. INTRODUCTION

Corporate insolvency or to be more specific corporate bankruptcy is a widely discussed and researched topic. High level of attention towards this topic is caused by vastly negative consequences of corporate insolvency which usually leads bankruptcy in Lithuania. Bankruptcy of the company has negative impact on its shareholders, clients, employees, society and economy as the whole. In modern, highly interconnected economy failure of one player spreads negative consequences widely beyond its borders. The relevance of the discussed topic increased dramatically during economic recession as the number of bankruptcies increased substantially.

Many researches were carried out in order to understand the causes of the bankruptcy. It was noticed that the majority of these studies were made on the microeconomic level, usually by analyzing financials of the specific companies. These studies were pioneered by Beaver (1967a) and Altman (1968) and are developed until nowadays. It was noticed that there is lack of analysis on the macroeconomic level, in other words how macroeconomic environment influences insolvency rates in the country.

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Major studies on this topic were made in well developed countries (USA, Western Europe), but developing countries are poorly explored. As usually young Lithuanian economy is not so well analyzed comparing to mature economies, so Lithuania was chosen for the research. It is very important to find out how fluctuations of various macroeconomic variables influence the number of bankruptcies in Lithuania. The main goal of this paper was to analyze the relationship between macroeconomic factors and corporate insolvency rates in Lithuania.

## II. CURRENT STATE AND THEORETICAL BACKGROUND

### A. Definition of corporate insolvency

In general corporate insolvency is defined as the inability of corporate entity to pay overdue debts to its creditor. Usually the main definition of insolvent company is provided by the law. So this definition differs in each country.

In this paper the definition of insolvency is taken from the Lithuanian laws. Insolvency is defined in the Enterprise Bankruptcy Law adopted on 20 March 2001. Legally insolvency is defined as the status of the company when it does not meet its liabilities and its overdue debts exceed half of its asset book value. This definition of insolvency enables the creditors to properly defend their rights and as soon as possible take legal action in order to minimize the loss caused by the failure of the company to meet its financial liabilities (Rugenytė, Menciūnienė, Dagilienė 2010). But on the other hand such characterization lets to initiate bankruptcy procedure even then the company is still able to settle the debts in the future (Andriulevičiūtė, Survilaitė 2009: 75).

Corporate insolvency should be researched as the status with two possible outcomes:

- Liquidation of the insolvent company or in other words bankruptcy.
- Actions which will help to recover the solvency of the company. Mentioned actions are implemented during legal restructuring.

Further on in paper bankruptcy was treated as the main consequence of corporate insolvency. Insolvency of the company is most common reason for

commencing a bankruptcy lawsuit (Rugenytė, Menciūnienė, Dagilienė 2010). Legal restructuring is rather new practice in Lithuania and there are few examples of it. According to the data stated by Lithuanian Department of Enterprise Bankruptcy Management, 11269 bankruptcy procedures were started in Lithuania since 1st of January Y1993 until 30th of September Y2011. Only 174 restructuring procedures were started since the 1st of July Y2001 (Legal Restructuring Law became effective) until 30th of September Y2011, moreover for 63 companies restructuring cases were ceased and 41 bankruptcy procedures were started out these ceased restructurings.

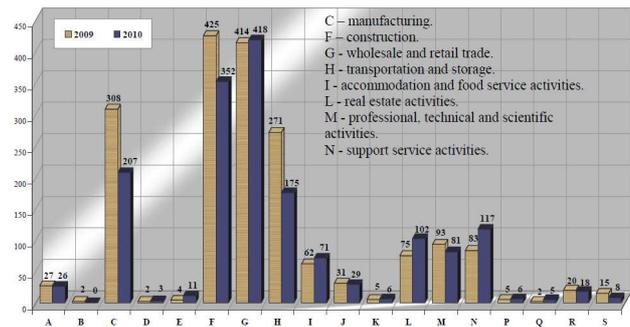
### B. Review of bankruptcy processes in Lithuania

According to the definition of the bankruptcy in the Enterprise Bankruptcy Law the bankruptcy can be initiated only for insolvent company, but more detailed analysis of Enterprise Bankruptcy Law shows that the bankruptcy procedure can be started not only in case then the company is insolvent. It possible to address the court concerning the initiation of bankruptcy lawsuit if one these conditions hold:

- The company does not pay salary or other related payments on time.
- The company does not pay on time for received goods or services, does not repay credits or does not fulfil other financial liabilities.
- The company does not pay taxes or related payments on time.
- The company publicly stated that it will not be able to meet its liabilities to the creditors.
- The company does not have any assets or revenue which may cover its liabilities.

In Lithuania during the period from 1993 to 31 June 2011 bankruptcy was instituted in 10982 enterprises and 14 banks. Out of that number, bankruptcy processes were completed in 7140 enterprises (65 percent) and 14 banks (100 percent) (6950 enterprises were liquidated, in 103 enterprises bankruptcy proceedings or extrajudicial bankruptcy processes were terminated, whereof 3 enterprises were reorganized, 38 enterprises concluded compositions with the creditors, 34 – settled with creditors, creditors of 7 enterprises withdrew their claims).

Instituted bankruptcy processes in 2010 by enterprise's economic activity show that enterprises of trade – 418 (25,6 percent), construction – 352 (21,5 percent), manufacturing – 207 (12,7 percent) and transportation and storage – 175 (10,7 percent) – mostly went bankrupt (see Fig. 1).



Source: The department of enterprise bankruptcy management under the ministry of economy (2011)

Fig. 1. Instituted bankruptcy processes by economic activity.

### C. Influence of macroeconomic environment on corporate insolvency

In the market economy about 2-6 percent of all companies go bankrupt a year (Isachsen, Hamilton 1992). That is the reason why bankruptcy is defined as macroeconomic problem (Purlys 2001: 80), the inevitable process of market economy (Tvaronavičienė 2001), even as the acceptable way of regaining lent money (Šidlauskas 2004).

The literature was analyzed in order to shortlist macroeconomic variables which influence insolvency and bankruptcy of the companies. The researches of European countries were chosen for the analysis in order to analyse the region where Lithuania is situated. Majority of studies were done in Western European countries, there is a great lack of information on Central and Eastern Europe.

Academic resources were analyzed; generally the same macroeconomic indicators as mentioned below are used in the research of relationship between macroeconomic indicators and corporate insolvency. Previous studies show that general macro economical situation affects insolvency rates; it was proved that during recession the number of bankruptcies rises. Everett and Watson (1998) also include unemployment rate into their model, but due very high correlation with general economic indicators (GDP or growth rate of GDP) unemployment rate or real wage (Salman, Friedrichs, Shukur 2007) are rarely used in the researches and will not be used in further executed research. Due to the same reason manufacturing sector value added is not included into the research.

Birth rate of new companies is also frequently used in the researches. The relationship between number of new companies and bankruptcy rates is observed by many researchers. Analysis of bankrupt companies shows that majority of companies fail within five years after the establishment, so young companies are very fragile and at high risk of insolvency. So it is expected that the corporate birth rate is important variable in the analysis of insolvency rates (Altman, 1983) and the relationship can also be found in Lithuania.

The conditions of business financing in the banking sector makes the important influence on the financial



health of the companies. The commercial banks' base rate may be influenced by monetary policy or external shocks. The commercial banks' base rate influences market interest rate and therefore is related to the market price of financing. Credit availability is also very important indicator. Credit which amounts to total loans to the enterprises, can be used to describe financing activities in the economy (Bernanke and Gertler, 1995). In order to better indicate credit availability the total corporate credit share to GDP ratio will be used for the research.

Inflation is taken into the research because it is expected that it would be important macroeconomic factor of corporate insolvency in Lithuania. Liu and Pang (2009), Gordon (1981), Wadhvani (1986) included inflation into their research of other countries. It is noticed that inflation can make short term effect on company's possibility to outlast.

Economic openness is an important variable for such small and open economy as Lithuania. Lithuania is highly dependent on foreign trade. Changes in the foreign markets have significant influence on internal companies and mostly impacts companies engaged to international business. The variable selected to reflect openness of the economy is exports plus imports as a percentage of GDP (Hazak and Mannasoo, 2007). For some companies increased openness of the economy has positive effect as they have opportunity to operate in the new markets. On the other hand, for others increased openness leads to increase in competition from external players of the market. However competition stimulates local companies. It encourages development of enterprises in that way so they can challenge international competition.

To summarize after review of previous analysis such macroeconomic variables were selected for the research:

- growth rate of GDP;
- birth rate of companies;
- commercial banks' base rate;
- corporate credit share to GDP;
- inflation;
- exports plus imports as a percentage of GDP.

The research was also complemented by relevant aggregated financial ratios which were identified after empirical research. Primarily the research included the aggregated solvency ratios counted by the Lithuanian Department of Statistics (profit margin, ratio of current assets to current liabilities, equity to liabilities, ratio of liabilities to assets) and financial ratios from Altman z-score model.

### III. EMPIRICAL RESEARCH

#### A. Sequence of research

Ordinary Least Squares (OLS) method was used in order to establish regression relationship between macroeconomic factors (independent variables) and

number of bankruptcies in Lithuania. Employed method enabled to find out empirical data for explaining relationship between macroeconomic factors and insolvency rates. Quarterly data from 1Q Y2002 until 2Q Y2011 was used for the research.

First, the general model describing the relationship between macro economy and insolvency was built. Further the structure of the insolvency rates was analyzed in order to have a broader outlook at the researched relationship. The bankrupt companies were divided into groups according to the type of activity. The relationship between macro economy and different types of companies was established.

#### B. Findings concerning general model

First, correlation analysis showed that there is no significant correlation between number of bankruptcies and the following variables: birth rate of companies, bank rate, exports plus imports as a percentage of GDP. Contrary to the conclusions made in after literature review these variables does not have significant relationship with number of bankruptcies in Lithuania. Further on while building linear regression model other variables were excluded from the model as they did not generate significant coefficients in the model, excluded variables were the following: corporate credit share to GDP, profit to assets (Altman X3). In the end the following statistically significant model was created:

Number of bankruptcies =  $672 - 8.04 * \text{Growth rate of GDP} + 3.74 * \text{Inflation}$ .

In Lithuania number of bankruptcies can be predicted using two macroeconomic factors: growth rate of GDP and inflation. As it can be seen from the model changes of "growth rate of GDP" have bigger impact on number of bankruptcies comparing the influence of inflation. These two factors are the main instruments for economic policy makers aiming to reduce number of bankruptcies in Lithuania.

Second, it was attempted to build the model with highest explanatory ability and the following model was received:

Number of bankruptcies =  $1299 - 13.5 * \text{Growth rate of GDP} + 0.03 * \text{Birth rate of companies} - 18.9 * \text{Commercial banks' base rate} - 32.6 * \text{Corporate credit share to GDP} + 2.7 * \text{Inflation} + 74.3 * \text{exports plus imports as a percentage of GDP}$

Taking into account statistical significance of the coefficients there are only three variables, which have significant relation with the number of bankruptcies. These variables are again "growth rate of GDP", "inflation" and one additional "bank rate". So in general main external macroeconomic causes of corporate in Lithuania is fluctuations of GDP, inflation and price of financing.

### C. Findings concerning bankruptcy rate across different economic activities

In the same way the models were created for the main economic sectors of Lithuania. The received regressions can be summarized in one table I.

TABLE I  
SUMMARIZED ANALYSIS OF BANKRUPTCIES ACROSS SECTORS.

Sector	Coeff. of growth rate of GDP	Sig.	Coeff. of inflation	Sig.	R squared
Manufacturing	-3,354	0,004	-0,558	0,395	0,612
Construction	-4,503	0,001	3,505	0,001	0,901
Wholesale and retail trading	-2,038	0,151	0,362	0,703	0,309
Transportation and storage	-3,695	0,000	1,068	0,046	0,872
Accommodation and food services	-0,174	0,382	0,744	0,000	0,836

The proper relationship between growth rate of GDP, inflation and number of bankruptcies in trading sector could not be established, as the coefficients of the model were not significant and the R squared was very low. It can be concluded that there is no significant relationship between macroeconomic fluctuations and bankruptcy rates in trading sector, so number of bankruptcies in trading sector is mostly influenced by other factors (for example, changes of legislation, technological and so on).

During macroeconomic fluctuations (economic cycles, changes of GDP growth) number of bankruptcies in construction sector fluctuates the most, so the insolvency rates of this sector is the most dependent on GDP fluctuations. The least dependent is sector of accommodation and food services.

Fluctuations of inflation the same as fluctuations of GDP growth have the biggest influence on insolvency rates of construction sector. To summarize, the research shows that insolvency rates of constructions sector are the most sensitive to changes of macroeconomic variables in Lithuania.

Manufacturing sector is unique comparing to other sectors, because number of bankruptcies decreases when the inflation increases. In case of other sectors the relationship is opposite.

#### D. Limitations of the research

In this paper corporate insolvency rates were analyzed. Only one variable (number of bankruptcies) is used as the proxy for corporate insolvency rates for the empirical research. It was attempted to find other proxies, but no significant results were received.

While building the shortlist of determinants of corporate insolvency the previous studies were analyzed. These studies were made in USA and Western Europe; there is great lack of studies in the Eastern Europe and other similar countries to Lithuania. So the

background for model creation was based on the studies made in the different economies comparing to Lithuania.

In order to obtain more sufficient results the longer period has to be taken. In this research only one macroeconomic cycle of Lithuanian economy was taken. But this limitation is present in majority researches of Lithuanian economy as Lithuania did not accumulate large amount of statistical data.

Only linear regression method was used in order to create the models. This method has a lot of limitations, so in order to have more precise models it would be important to implement other statistical methods of research, compare the results and then conclude on the models.

## CONCLUSIONS

The aim of this paper was to analyze the relationship between macroeconomic factors and insolvency rates in Lithuania. Further on the major conclusions are listed:

While analyzing the definition of insolvency, bankruptcy and relationship between them, it was noticed that the major consequence of insolvency is bankruptcy of the company in Lithuania. So number of bankruptcies in Lithuanian was treated as the proxy for insolvency rates.

Corporate bankruptcies have remarkable negative effect on the economy, but despite that fact there are also some positive aspects (for example, ineffective companies leave the market, development of technologies is accelerated, unnecessary employees can be fired and so on).

Review of the causes of the corporate bankruptcies defined two major groups: internal and external causes. The main internal factor is quality of management. The most important external factors where macroeconomic



variables. Also it was noted what the determinants are highly interconnected, which means that macroeconomic fluctuations may increase the scale of internal problems.

After the review of previous studies the following most important macroeconomic determinants of corporate insolvency were chosen for the research: growth rate of GDP, birth rate of companies, commercial banks' base rate, corporate credit share to GDP, inflation, exports plus imports as a percentage of GDP and relevant aggregated financial ratios (profit margin, ratio of current assets to current liabilities, equity to liabilities, ratio of liabilities to assets and financial ratios from Altman z-score model).

From the list of analyzed aggregated financial ratios it was decided to include Altman X3 (earnings before interest and taxes/total assets) variable into further research as it showed most significant correlation with number of bankruptcies.

By analyzing relationship between above mentioned variables and number of bankruptcies the statistically significant model was concluded:

Number of bankruptcies =  $672 - 8.04 * \text{Growth rate of GDP} + 3.74 * \text{Inflation}$ .

As it can be seen the number of bankruptcies in Lithuania is significantly related to the "growth rate of GDP" and "inflation". These are the major factors that can be used for prediction or adjustments of number of bankruptcy.

Other not so statistically significant model, but with better explanatory ability was created:

Number of bankruptcies =  $1299 - 13.5 * \text{Growth rate of GDP} + 0.03 * \text{Birth rate of companies} - 18.9 * \text{Commercial banks' base rate} - 32.6 * \text{Corporate credit share to GDP} + 2.7 * \text{Inflation} + 74.3 * \text{exports plus imports as a percentage of GDP}$ .

The empirical analysis of the relationship between macro economy and number of bankruptcies revealed that there is no significant relationship between number of new companies and insolvency rates in Lithuania, which contradicts to the previous studies in the Western Europe and North America.

The models were created for various sectors, where the biggest number of bankruptcies occurs (manufacturing, construction, wholesale and retail trading, transportation and storage, accommodation and food services). The relationship between macroeconomic factors and number of bankruptcies in trading sector was not established so it was concluded that macroeconomic determinants do not play important role between the causes of bankruptcy in this sector. Construction sector is the most sensitive to macroeconomic fluctuations, accommodation and restaurants sector is least sensitive. Manufacturing sector is distinguished because it is the only sector where number of bankruptcies diminishes when inflation raises, this relationship is opposite in other sectors and in the general model.

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