Charles University in Prague

Faculty of Social Sciences
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MASTER THESIS

Impacts of European Bailout Programs on SMEs Distress rate

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Declaration of Authorship

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Prague, July 30, 2015

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Signature

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Abstract

This thesis empirically investigates impact of countries' bailouts on probability of SME segment distress. The impact is examined by multi-period logit model where dependent variable is distress rate and explanatory variables includes self-constructed bailout variable, several binary predictors and firm-specific and macroeconomic control variables. The hypotheses are tested on dataset for period from 2005 to 2013 including observations from seven European countries which received financial assistance program (bailout) from Troika. Every bailout from Troika comes with the requirement for austerity measures and our results suggest that impact of bailouts on SMEs probability of distress are depended on the success of application in individual countries and the impacts are more positive in non euro-zone countries.

Keywords Bailout, Financial crisis, Credit risk, SME segment, Distress rate

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Abstrakt

Tato práce se zabývá empirickým výzkumem dopadu mezinárodní finanční pomoci (bailout) na segment malých a středních podniků, jmenovitě na podíl těchto podniků ve finanční tísni (distress rate). Tento dopad je zkoumán pomocí multi-period logit modelu kde závislou proměnnou je míra finanční tísně a vysvětlujícími proměnnými jsou mimo jiné přijatá finanční pomoc (vytvořeno autorkou), několikeré binární proměnné, makroekonomické proměnné a proměnné specifické pro každou firmu. Hypotézy jsou testovány na datech z let 2005-2013 za sedm evropských zemí, které obdržely finanční pomoc (bailout) od takzvané Troiky. Veškerá finanční pomoc od Troiky je podmíněna úspornými opatřeními a naše výsledky naznačují, že dopad finanční pomoci na míru finanční tísně malých a středních podniků závisí, mimo jiné, na úspěšnosti zavedení úsporných opatření, ale dopady se zdají být pozitivnější v zemích mimo Eurozónu.

Klíčová slova Finanční pomoc (bailout), finanční krize, úvěrové riziko, segment malých a středních podniků, Distress rate

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Master Thesis Proposal

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Proposed Topic:

Impacts of bailout programs on SME segment distress rate.

Motivation:

Although small and middle enterprises (SMEs) play essential role in the economies of the most countries there is a noticeable lack of evidence from this area - especially concerning SME credit risk modeling and indentifying the most appropriate determinants to predict firm distress. Moreover, with the new Basel requirements and high SME distress during crisis there is a high need for SME-specific research. In this thesis I want to focus on modeling distress probabilities of SMEs in European countries with unstable economic and financial situation.

The aim of this thesis is twofold. The goal of the first part is to develop distress prediction model for SME segment in EU countries which experienced financial problems and participated in bailout programs. Since these bailouts are usually coming with different conditions and policies, the second part of the thesis will be focused on determining the effects of individual policies on the SME segment.

As mention above, there is a lack of specific literature on this topic. Literature review can be split into two parts. First part covers literature concerning credit risk modeling of the SME segment. It is very challenging topic since one cannot simply apply models used for listed companies (i.e. Merton's type model) but at the same time we cannot put SME segment to the group with retail (consumer) segment. Second part of literature review includes discussion concerning policy implications.

The most of the research focused on credit risk modeling of SMEs involves only one specific country or only one specific group of indicators – typically combination of accounting ratios. Altman and Sabato (2007) developed one year default prediction model specifically for SME segment. They use US data and only accounting information. In later study, Altman et al. (2010) included also non-financial indicators to the model what significantly increased its

default prediction power. Similar studies trying to develop credit risk models for the SME segment using financial indicators were conducted also on data samples from for example Ireland McCann and McIndoe-Calder (2012), Spain, Germany and Italy. Macroeconomic indicators were so far used mostly for corporate level data, therefore not for the SME segment. Wilson (1997) considers how macroeconomic scenarios affect corporate sector default rates. Berger and Udell (1998) confront effects of macroeconomic environment on SME segment. The only unique work considering multi-country and multi-area indicators is recent study of Michala, Grammatikos and Ferreira Filipe from September 2013 (updated in February 2014). These authors forecast distress in European SME portfolios in 9 EU countries for period 2000-20009 using panel structure dataset allowing them to differentiate between firm-specific, macroeconomic and industry effects. My distress prediction model for SMEs will be motivated by this model with main focus on macroeconomic variables to which countries in worse unstable financial situations seems to be more vulnerable.

Hypotheses:

1. Hypothesis #1: Macroeconomic indicators have significant effect on distress rate of SMEs in economically unstable EU countries.
2. Hypothesis #2: Including policy indicators to the model have significant effect on distress rate of the SME segment.
3. Hypothesis #3: Bailout programs decrease distress rate of the SME segments.

Methodology:

The first task will be to properly define all variables. Defining distress in the SME segment may be more problematic since we have to distinguish between actual distress and closure of the company. Moreover we have to specify under which conditions the company is considered to be distressed. Regarding the data, the goal is to create comprehensive sample of data for 7 EU countries (Greece, Hungary, Ireland, Latvia, Portugal, Romania and Spain) which received bailouts what is always very challenging for non-listed companies. Firm specific data will be extracted from the Amadeus database and Orbis Database which includes non-listed companies. Datastream, World Bank and European Central Bank as well as local databases will be used for macroeconomic indicators.

In this area of research there are few applicable methodologies which should be considered – probit regression, logit regression or hazard model. From the accessible literature, Shumway (2001) hazard model seems to be the most applicable in this situation. Shumway T. (2001) proved in his paper that discrete-time hazard model with adjusted standard error structure is equivalent to multi period logit model. Following Michala, Grammatikos and Ferreira (2014) hazard rate (marginal probability of distress) over next year follows logistic distribution expressed by particular equation where on the left side is an indicator which equals one if firm is distressed in year t. The right side of equation contains function of firm-specific characteristics (firm-specific variables) and baseline hazard function (specified by using macroeconomic variables). In the second part of the thesis policy indicators will be incorporated to the model.

Expected Contribution:

This thesis is aimed at contributing to the contemporary research in several ways. Firstly, it will be only second study using multi-country setting in modeling distress of SME portfolio. Secondly, it will contribute to credit risk modeling of SME segment in countries with unstable economic and financial situations. Finally it will investigate effects of policies on SME segment from the credit risk point of view.

Outline:

1. Introduction
2. Literature review: Review of literature concerning credit risk modeling for SMEs, proper definition of distress and literature concerning bailout policy, its conditions and implications
3. Methodology: Building the model
4. Data: Description and analysis of constructed dataset
5. Results of the developed model
6. Result of model with incorporated policy indicators
7. Robustness checks
8. Discussion of findings and their further implications for policy and future research.
9. Conclusion

Core Bibliography:

Altman, Edward I., and Gabriele Sabato. (2007). "Modelling Credit Risk for SMEs: Evidence from the U.S. Market." Abacus 43(3), 332-357.

Altman, Edward I., Gabriele Sabato, and Nicholas Wilson. (2010). "The Value of Non-Financial Information in SME Risk Management." Journal of Credit Risk 6(2), 95-127.

Berger, Allen N., and Gregory F. Udell. (1998) „The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle." Journal of Banking and Finance 22(6-8), 613-673

Haque, N. and Khan, M., (1998). Do IMF Supported Programs Work? A Survey of Cross-Country Empirical Evidence. imf working paper wp/98/16g.

McCann, Fergal and Tara McIndoe-Calder (2012). "Determinants of SME default: The Importance of borrower-level heterogeneity", mimeo, Central Bank of Ireland

Michala, Dimitra; Grammatikos, Theoharry; Ferreira Filipe, Sara. (2014). Forecasting Distress in European SME Portfolios. EIF Working Paper Series No 13-17, LSF Research Working Paper Series No 13-02.

Shumway, Tyler. (2001). "Forecasting Bankruptcy More Accurately: A Simple Hazard Model." Journal of Business 74(1), 101-124.

Wilson, Thomas C. (1997a). „Portfolio Credit Risk (I)."Risk 10(9), 111-117

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1. Introduction

During the past several years countries in the European Union had to face financial crisis which until today impacts different segments of each economy including banking, public and private sectors. Some countries after years of prosperity and high spending experienced sudden recession accompanied by extremely high government debts, increasing unemployment and low or negative real GDP growth. Most of these countries were at some point forced to apply for financial assistance program or so called ‘’bailout’’ usually provided by Troika (European Union, International Monetary Fund and World Bank). The main goal of bailouts was to prevent further recession and help the countries’ economies to get back on their feet and improve macroeconomic situation.

The backbone of every economy is a segment of small and middle-sized enterprises which employ in average 70% of population in European Union and create almost 60% of value added. However, when financial crisis started they had been heavily hit and especially severely in the countries which had to apply for bailouts.

The main topic of this thesis is to investigate what are the impacts of bailouts received by the countries on probability of SMEs distress. The research is conducted on data including observations from seven European countries (Cyprus, Greece, Portugal, Latvia, Ireland, Romania and Hungary) for period covering years 2005 to 2013. Besides the main hypothesis we also try to inspect whether there is a difference in impacts in case of euro-zone countries comparing to non euro-zone countries. In order to empirically test our hypotheses we build a multi-period logistic model based on Shumway (2011) including firm-specific financial and quantitative control variables. Additionally we also include macroeconomic control variables which so far have been included in this type of models only in limited number of studies, however seems to add explanatory power to the models.

The second chapter of this thesis provides literature review and background. We firstly introduce SME segment and analyze its business environment, structure and recent developments in focus countries. In the second part of the chapter we discuss overall economic situation and conditions under which the bailouts have been requested and received. The last part of the chapter reviews literature considering credit risk modeling with focus on SMEs.

In the third chapter we present our research design, introduce the model and corresponding hypotheses. The chapter is followed by variables introduction and data analysis included in chapter 4. Chapter 5 provides overall empirical results' including summarizing discussion. Chapter 6 concludes.

2. Literature review and Background

2.1. Introduction to SMEs

Small and middle enterprises (SMEs) are companies with less than 250 employees and annual turnover less or equal to 50 million EUR or balance sheet total less or equal to 43 million EUR as defined by the European Commission in 2003 (for detailed definition see Appendix A). These companies account for approximately 99% of enterprises in Europe and employ more than approximately 70% of working population (European Commision (2013)). They are the source of innovation, development and they are crucial for enhancing competitiveness what makes them integral part of every economy (Verheugen (2003)). However, decreasing effectiveness, difficulties with obtaining capital, declining number of employees and decreasing value added by SME sector during past years were especially alarming given the importance of SME segment in European markets.

European SMEs have been experiencing highly unstable economic environment since 2008. When global financial crisis hit Europe, SMEs had to face considerable increase of their main financial risks (market, credit and liquidity risk). The adverse economic situation led to an increase in uncertainty of future earnings resulting from changes in market conditions. SMEs started to face a drastic decrease in demand for their goods and services (especially in domestic markets on which they rely), increase in commodity price risk and shortage of change in working capital caused by increased delays on receivable payments and increase in inventories. Moreover, volatile markets led to uncertain fluctuations of exchange rates what negatively influenced export/import oriented enterprises since it changed the amount of their payables and receivables hence increasing their exposure (however, there is an ongoing discussion whether countries in Eurozone actually protect their SMEs from the exchange rate risk as compared to countries outside of the Eurozone). (Tothova (2014))

The first years during the crisis were characterised mainly by liquidity issues naturally followed by solvency problems and increased number of bankruptcies. SMEs which usually depend on bank financing (overdrafts or term loans) experienced a tightening in credit terms. They found it very difficult to obtain credit from banks and experienced a strong increase in credit spreads (increase in interest rate risk) what sharply raised borrowing costs paid by companies and severely

worsened their cash flows. Problems with obtaining bank financing led to problems with financing of day-to-day operations, ability to cover expenses and meeting financial obligations.

Recent research suggests that SMEs are important for general economic success of a particular country. But improvements of SMEs performance in EU strongly correlate with the macroeconomic situation and recovery. (European Commission (2014), D'Imperio R)

2.2. Analysis of SME's business environment

As we described in the previous section, European SMEs experience a turbulent period during past years. However, future projections are promising since after the years of downturn we are noticing again an increase of SME sector performance. The period from 2008 onwards was very challenging especially for the focus countries of this study. Number of enterprises in SME segment was sharply decreasing what led to a declining trend in total number of employees in SME segment and in result to decreasing overall value added by SME sector. (European Commission (2013))

European Commission (EC) is closely watching European SME segment since 2008 when EC adopted Small Business Act (SBA). Under the SBA European Union together with the Member States implemented on average almost 90 SME policy measures per country in order to mitigate the effects of the crisis, sustain SME development and eliminate obstacles to SMEs growth. EC annually reports three, highly correlated, main performance indicators – employment, total number of SMEs and value added. (European Commission (2013))

Additionally, EC also monitors the performance of individual SME sectors. In the EU, the four fifths of all SMEs are active in manufacturing, construction, accommodation/food and "professional scientific and technical activities")[1]. As Figure 1 below suggests, there have been noticeable differences in the behaviour of these sectors in the EU 28 during the period. The worst performers in all three categories were construction and manufacturing sectors. Construction experienced approximately 22% decline in value added from 2008 to 2013 followed by the "manufacturing" which in 2013 operated with employment 10% lower than in 2008. Nevertheless, the outlook for coming years is positive and expects recovery. On the contrary, "services" (business services, accommodation, retail and wholesale trade)

[1] From which the most important are considered wholesale and retail trade sector)

posted positive percentage change during the period for all three performance indicators. (European Commission (2013))

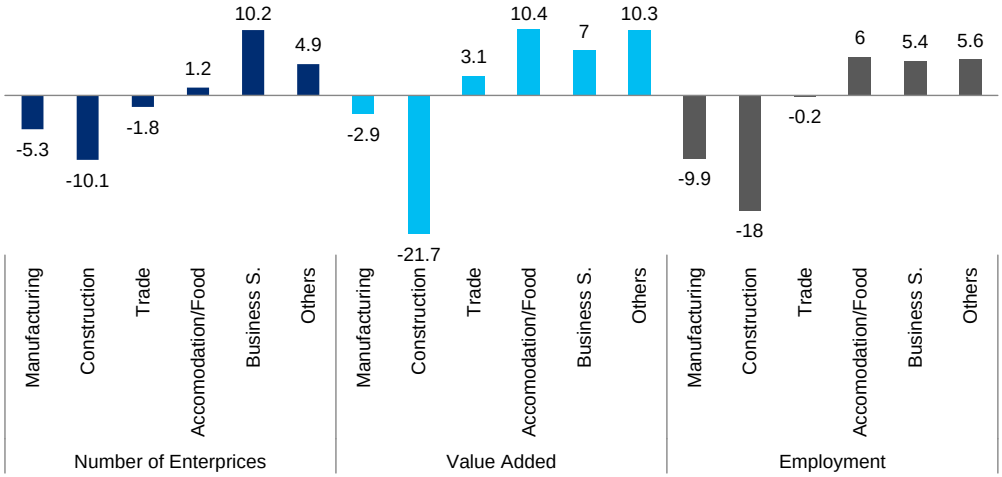

Figure 1: Change (in %) in SME indicators between 2008-2013 in the EU28. Key SME sectors

Source: A partial and Fragile Recovery, Annual Report on European SMEs 2013/2014, European Commission (2013)

One cannot deny that SME's performance and success highly depend on the macro-economic conditions (although they do not identically mirror all of them). Therefore we can naturally expect that situation in the countries severely hurt by financial crisis will be even worse than the EU 28 average. In the following subsections we analyze more closely the structure and development of SME segments and SBA performance indicators in the countries which are considered in this thesis, i.e. countries which received any form of financial support (bailout) from "Troika"[2] during the period from 2008 to 2013. Namely we include[3]: Cyprus (2011), Greece (2010), Portugal (2011), Romania (2011), Hungary (2008), Latvia (2008) and Ireland (2010).[4] It is to notice that South European countries (i.e. Cyprus, Greece, Portugal and Romania) entered bailout programs in later stage of the crisis during 2010-2011 compared to Hungary and Latvia which received support in 2008 and Ireland slightly later in 2010.

[2] Refers to committee formed by the European Commission, the European Central Bank and the International Monetary Fund

[3] Year of entering bailout program is noted in the parenthesis

[4] Spain was omitted due to the data availability since it received bailout in 2012 and there would not be sufficient data amount for further anaylises.

2.2.1. Structure and development of SMEs

2.2.1.1. Hungary, Ireland and Latvia

Hungary, Ireland and Latvia[5] received bailouts between 2008 and 2010, therefore during the first years after the start of the crisis. Table 1 below presents structure of performance indicators according to SME size in year 2013 and provides a comparison between the relevant countries.

	Number of enterprises				Number of employees				Value added			
	Hungary	**Ireland**	**Latvia**	**EU27**	**Hungary**	**Ireland**	**Latvia**	**EU27**	**Hungary**	**Ireland**	**Latvia**	**EU27**
Micro	94.6%	87.7%	87.8%	92.2%	35.5%	24.8%	26.8%	29.7%	18.7%	13.1%	17.5%	21.5%
Small	4.5%	10.2%	9.8%	6.5%	18.9%	24.6%	26.4%	20.6%	15.8%	16.5%	22.9%	18.6%
Medium	0.8%	1.8%	2.1%	1.1%	16.8%	20.6%	25.4%	17.2%	18.6%	20.4%	28.1%	18.3%
SMEs	99.9%	99.7%	99.7%	99.8%	71.2%	70.0%	78.6%	67.5%	53.2%	50.0%	68.6%	58.4%
Large	0.1%	0.3%	0.3%	0.2%	28.8%	30.0%	21.4%	32.5%	46.8%	50.0%	31.4%	41.6%

Table 1: SMEs segment statistics – HUN, IRL, LAT

Source: European Commission (2013)

In general, the European SME segment represents approximately 99,8% of all businesses, highlighting the importance of this segment. From out sample, the micro segment is the most dominant in Hungary where it is above the European average. But, small and medium segment is more pronounced in Ireland and Latvia than in the rest of the European Union based on the number of enterprises.

In terms of number of employees, we see that despite virtually same number of SMEs in these countries compared to EU27, they employ more population. This is especially the case of Latvia, where 78.6% of population is employed in SMEs comparing to 67.5% EU27 average. Moreover, even though in Latvia micro enterprises account for 87.8% of all companies in the country, they employ comparable number of employees that small and medium size firms do.

Regarding value added by SMEs, Ireland and Hungary are below the EU27 average. This difference is the most significant in micro segment which in Ireland generates only c. 13.1% of value added. Ireland, together with Romania, are the only countries in which value added by SMEs is approximately equal to the value added by large corporations. Noticeable is proportioning of value added in Latvia where the most value is created by medium market – 28.1%. That is 10% more than in the

[5] Latvia obtained financing in 2010 as well as Greece, however, we took into consideration geographical location of countries in the group.

European Union. Moreover, overall value added by SMEs in Latvia is 10% higher than in the EU27. (European Commission (2013)).

Considering distribution of SMEs by the industry sectors, the most Hungarian SMEs are in the retail trade and wholesale (26%). However, comparing to EU where 46% of value added by manufacturing is generated by SMEs, in Hungary it is less than 33%. In Ireland, the most SMEs are found in trade and services. On the other hand, SMEs are underrepresented in manufacturing sector. Similarly to Hungary, in Latvia SMEs are more prevalent in retail trade and wholesale. However, considerable part of SMEs is also in transportation and less in professional activities, accommodation and food services (European Commission (2013)). In Hungary, Ireland and Latvia value added by SMEs is comparable to value added by larger firms. This can be explained by the nature of the businesses. Whereas South Europe specializes more on the less knowledge-intensive services and tourism and low-tech firms, Ireland, Hungary and Latvia are more focused on high-tech and knowledge-based manufacturing and services. (European Commission (2013))

Development between 2008-2013

Graphs below show the trend of the discussed performance indicators over period between 2008 and 2013 in Hungary, Latvia and Ireland comparing to EU28. We took 2008 as the base year with index value set at 100. Figure 1 below illustrates that between 2008 and 2013 SMEs in given countries exhibited drastic decrease comparing to EU28 in every category (besides Latvia in case of number of enterprises from 2011). The most dramatic downturn was during 2009-2010, since then the countries are trying to recover to at least the 2008 levels. (European Commission (2013))

As it can be seen the most dramatic decrease was in value added by Latvian SMEs in 2009/2010. However, they almost managed to reach the 2008 values (growth rate in value added of approx. 45%). Figure 2 suggests that the positive break back to the growth happened in 2011 i.e. year after receiving the bailout. The worst performance in the group was achieved by Ireland. In 2009 and 2010, Irish SMEs' value added dropped by 10% and 12% respectively. Although the drop was followed by an increase of 10% from 2010 to 2013, Ireland ranked last in the group at the end of the monitored period in terms of SME value added.

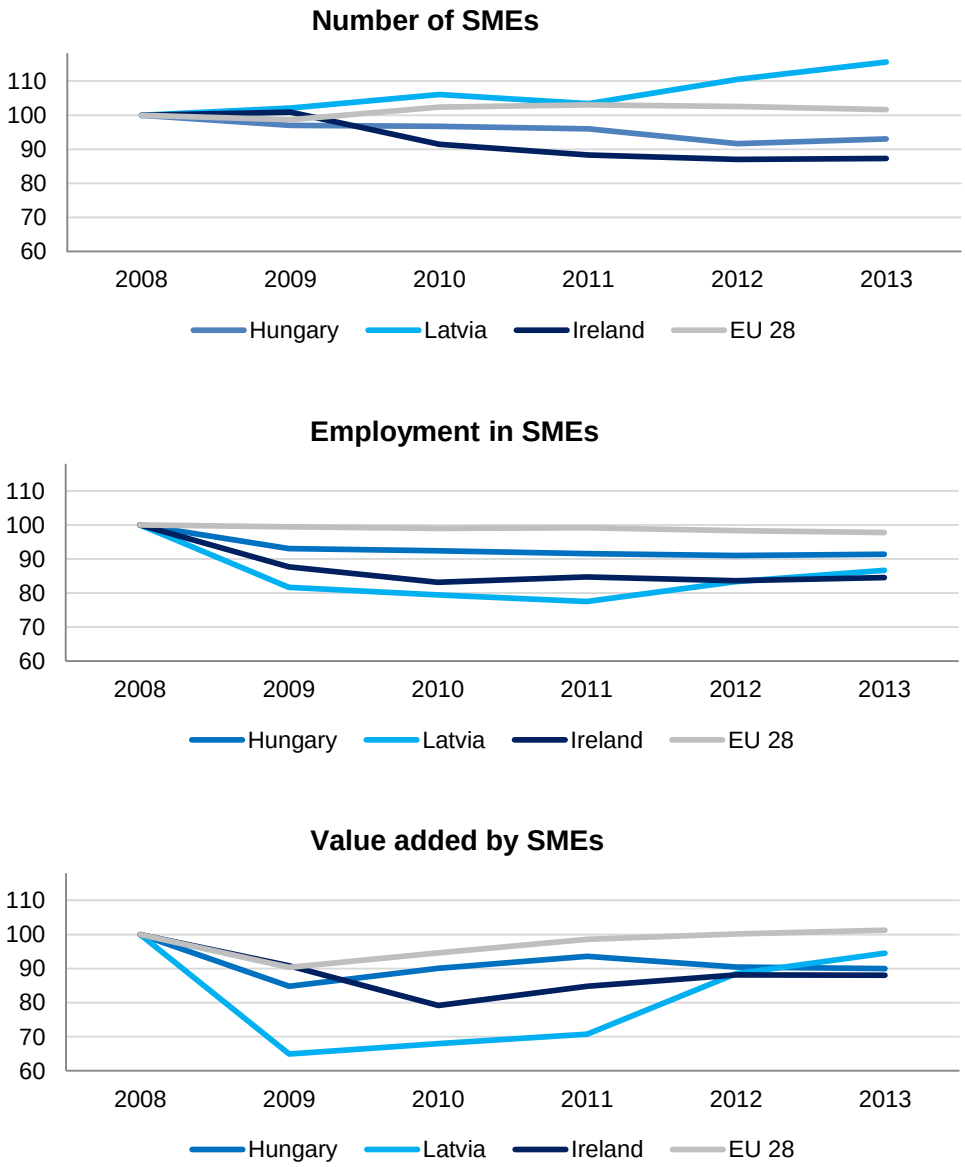

Figure 2: SMEs performance indicators – HUN, IRL, LAT, 2008-2013

Source: European Commission (2013)

2.2.1.2. Cyprus, Greece, Portugal and Romania

Situation in Southern Europe has been highly unstable as well what consequently led to bailout programs for Cyprus, Greece, Portugal and Romania. Table 2 below again shows the structure of SMEs sector in regard to number of enterprises, number of employees and value added to economy by SMEs.

	Number of enterprises (in %)					Number of employees (in %)					Value added				
	Cyprus	Greece	Portugal	Romania	EU27	Cyprus	Greece	Portugal	Romania	EU27	Cyprus	Greece	Portugal	Romania	EU27
Micro	92,7%	96,7%	94,8%	88,7%	92,2%	38,2%	54,5%	39,4%	23,1%	29,7%	27,7%	34,6%	22,8%	13,6%	21,5%
Small	6,0%	2,8%	4,5%	9,1%	6,5%	22,5%	16,8%	22,.3%	20,9%	20,6%	25,1%	18,1%	22,6%	16,9%	18,6%
Medium	1,1%	0,4%	0,7%	1,8%	1,1%	20,5%	13,6%	16,9%	21,5%	17,2%	22,2%	16,3%	23,0%	20,4%	18,3%
SMEs	99,8%	99,9%	99,9%	99,7%	99,8%	81,1%	84,8%	78,6%	65,6%	67,5%	75,0%	69,0%	68,4%	50,9%	58,4%
Large	0,2%	0,1%	0,1%	0,3%	0,2%	18,9%	15,2%	21,4%	34,4%	32,5%	25,0%	31,0%	31,6%	49,1%	41,6%

Table 2: SMEs segment statistics – Southern Europe

Source: European Commission (2013)

As

Table **2** above shows, the majority of businesses are Micro SMEs which except for Romania account for at least 92.7% of all businesses in the country (above EU27 average of 92.2%). Romania has slightly different structure of SMEs since the share of Small and Medium SMEs is higher (9.1% and 1.8% respectively) than in the benchmark countries and than the EU27 average (6.5% and 1.1%). However, this structure can be explained by the fact that Romanian SMEs are mainly present in wholesale, retail trade, manufacturing and construction industries. These are usually small and medium type companies specialized in low-tech manufacturing. (European Commission (2013))

In contrast to Romania and EU27, the Greek Micro SMEs segment accounts for almost 97%, however the share of companies in Small SMEs category is only 2.8%. This is also noticeable from the number of employees in SME sector where 54.5% of population is employed in Micro SMEs comparing to EU27 average of 29.7%. Generally, the whole SME sector in Cyprus, Portugal and Greece employs approx. 80% of population, comparing to EU27 average of 67.5%. This phenomenon can be explained by the nature of the business in these countries since majority of enterprises is focused on tourism or construction. (European Commission (2013))

Regarding the value added by SMEs, Cyprus has the highest proportion of value added of 75% comparing to EU27 average of 58.4%. Cyprus is followed by Greece (69%) and Portugal (68.4%). On the other hand, in Romania, even though SMEs account for 99.7% of all enterprises and employ 67.5% of population, the value added by SMEs is almost equal to the value added by large corporations. This was also visible in the Hungary and Ireland included in the previous sample.

Development between 2008-2013

The numbers representing structure of SMEs fluctuated significantly during the past years due to economic turmoil. Figure 3 below shows trends in development of individual performance indicators and compares them to the EU28.

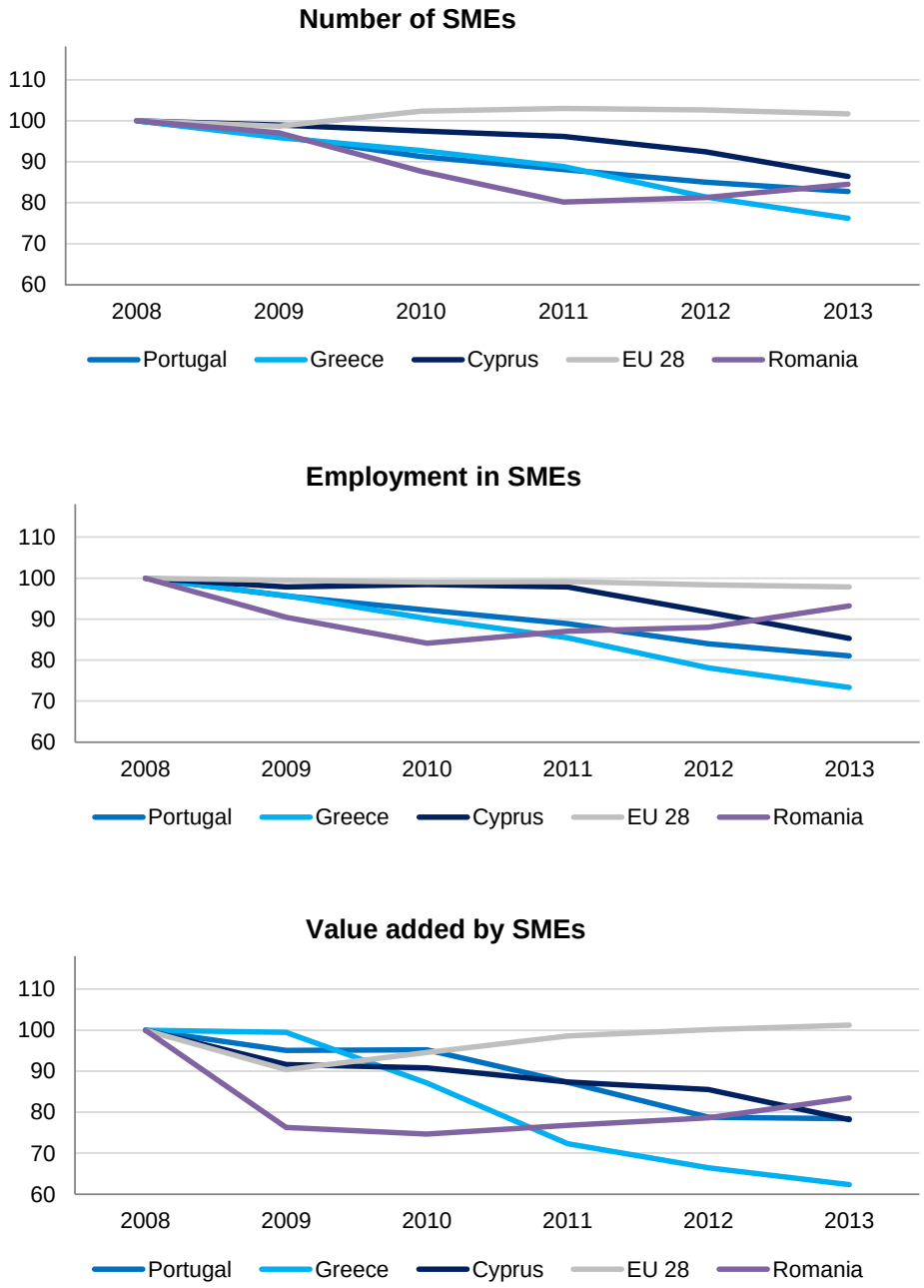

Figure 3: SMEs performance indicators – Eastern Europe, 2008-2013

Source: European Commission (2013)

SMEs business environment substantially deteriorated in the countries which have been more severely affected by the economic and sovereign debt crisis comparing to the EU28 average. In Portugal, Greece and Cyprus, all three performance indicators have not yet recovered to the 2008 level, they rather continue to fall. For instance, share of Portuguese SMEs with limited own financial resources and credit constrains decreased from 2008 to 2013 by almost 14% in employment and

value added dropped by 11%. In Greece, approx. 25% of SMEs that existed in 2008 defaulted or closed down until 2013 what reduced value added generated by Greek SMEs by a third of its 2008 levels and employment in SMEs decreased by 27%. Part of the negative development can be explained by the different austerity measures. On the other hand, the main problem of Cyprus is the nature of their businesses and recent business model changes which negatively affect Cypriot microfirms. The most of the microfirms and employment possibilities in Cyprus are in tourism/accommodation (approx. 42% higher than the EU average) and retail/wholesale trade. However, these small family-owned companies have been very negatively influenced by arrival of financially strong shopping malls and supermarket and hotel chains during past years. More specifically, number of microfirms dropped by 28%, employment by 15% and value added generated by these microfirms decreased 17% below 2008 values. (European Commission (2013))

Comparing both samples we see that from the second sample only Romania recorded similar, slowly increasing trend in the performance indicators of the SME segment with expectation of recovery to 2008 levels during next years. However for all countries we can conclude that the main trigger of these slowdowns was the problematic economic and financial situation in whole Europe and rapid decrease of GDP.

In the next section we focus more closely on the causes and developments of the financial crisis, bailouts and the sources of funding. Moreover, we discuss reasons and conditions of bailout programs received by countries in our sample.

2.3. Financial problems and Bailout programs in Europe

From 2008 onwards, Europe has been challenged by three interconnected crises. Firstly, there is a sovereign debt crisis marked by increasing bond yields and funding problems. Secondly, banking crisis signalized by severe liquidity problems and undercapitalization of banks. And finally, we are noticing growth crisis denoted by massive slowdown of economic growth and declines of GDPs. The main causes of the crisis however differ by country even though they are all characterized by extremely high Debt to GDP ratio, increased unemployment and very often also more frequent political power shifts. (Shambaugh J.C. (2012)).

In the most affected countries, public debt (government debt) dramatically increased what was not sustainable. Huge debt increases were noticed in Greece,

Italy, Belgium or Spain. Moreover, the trend was as well observable in countries, which do not have a history of debt problems i.e. France, Ireland, Portugal or UK. Nevertheless, the most affected countries consequently reached the point where they had been unable to repay their government debts without help (i.e. bailouts).

For financial help to be classified as a bailout we consider a structured financial help offered to the country under the specific conditions in order to prevent its default. The main sources of bailout funding typically are: International Monetary Fund (IMF), World Bank (WB), European Union (EU) and, in some cases, bilateral loans between countries. The EU provides for its member states the European Financial Stabilization Mechanism (EFSM) and European Financial Stability Facility (EFSF). Under EFSM, EU Commission is allowed to borrow up to EUR 60 billion in financial markets under specific EU budget guarantee in the form of loan or credit line. The EFSF are funds guaranteed by the Eurozone member states. Based on the EFSF and EFSM, European Union introduced in October 2012 the European Stability Mechanism (ESM), which focuses on improvement of enforcement measures, debt sustainability and prevention of further crisis (European Commission (2015)). However, these EU mechanisms are available only to Eurozone Member States. For non-euro area the EU provides Balance-of-Payments (BoP) available upon request and specific loan agreements (in line with Article 143 of the Treaty) when a non-euro area member state is in difficulties (or threatened with difficulties) regarding balance of payments. This assistance is structured in order to ease external financing constraints of the country, usually in the form of medium-term assistance. However, financial assistance provided by the European Union is linked to the macroeconomic conditionality. (European Commission (2015))

Hereafter, in Table 3 we present the summary of volume, duration and sources of individual bailouts received by European countries in our dataset.

Country	Time	Total Bail-out Received (in billion EUR)	Received From:
Greece	2010-2016	245.6	IMF, EFSF, GLF
Portugal	2011-2014	76.8	IMF, EFSM, EFSF
Ireland	2010-2013	68.2	IMF, EFSM, EFSF, Bilateral
Spain	2012-2013	41.3	ESM
Romania	2009-2015	23.3	IMF, WB, EIB, EU Balance of Payments
Hungary	2008-2010	15.6	IMF, World Bank, EU Balance of Payments
Cyprus	2011-2012	12.5	IMF, ESM, Russia
Latvia	2008-2011	4.5	IMF, World Bank, EIB, EU Balance of Payments

Table 3: Bailout overview by country

Source: author's representation

Note: The amounts in the table is total available financing, not actual received financing

The highest amount in total was provided to Greece – EUR 245.6 billion from which the biggest part (EUR 144.6 billion) was provided by EFSF. Below, we discuss the evolution of crisis and characteristics of bailouts in countries presented in the dataset.

Greece

After the Greek Euro-adoption, its economy was extremely strong and quickly growing – annual grow rate in period between 2000 and 2007 was approximately 4.2%. Moreover, due to falling bond yields Greek government could run substantial structural deficits and debt to GDP ratio stayed above 100%. However, start of financial crisis in 2008 very negatively affected the two largest Greek industries – shipping and tourism. During 2009 and 2010 Greek deficit increased to 12.7% and 13.6% respectively and reached one of the highest values in the world what, led to the new Economy Protection Bill. The aim of the bill included also public sector wage reductions what, however, caused number of public protests against the government and consequently led to Greek government request for bailout package. Without it, Greece would have very likely had to default on some of its debts. (European Commission (2015))

The Eurozone Member States and IMF have been financially supporting Greece through the „Economic Adjustment Programme" since May 2010 with the goal of implementing structural reforms and restore sustainability and economic growth. The financial help was provided under the First and Second Economic Adjustments Programme. Before every disbursement, the EC, the ECB and the IMF closely monitor the situation and compliance with the conditions of the Programme.

The disbursement has to be approved by the IMF's Executive Board and the Eurogroup. (European Commission (2015))

First Economic Adjustment Programme

The first adjustment programme was mainly in the form of the bilateral loans provided by the Eurozone Member States and pooled by the EC. The support was so-called „Greek Loan Facility" and amounted to c. 80 billion Euro. However, the amount was actually shortened by 2.7 billion Euro since Slovakia refused to participate and Portugal and Ireland had to request financial support themselves and were therefore not able to join. Additionally, IMF committed 30 billion Euro under the „stand-by-arrangement" (SBA). Collected support was distributed to Greece over the period between May 2010 and June 2013. (European Commission (2015))

The first economic adjustment programme brought mixed results and did not fully meet its objectives. The main reasons were much deeper recession than previously forecast, political turbulences and social unrest. Even though, Greece managed to reduce the general government deficit from 15.75% of GDP in 2009 to 9.25% in 2011. However, it missed important fiscal targets and had to adopt additional consolidation measures between 2010 and 2011 and consequently also the Second Economic Adjustment Programme (European Commission (2015))

Second Economic Adjustment Programme

The Second Economic Adjustment Programme was approved by Eurozone Member States and IMF on 14 March 2012. All participants agreed to provide 130 billion Euro plus the undisbursed amounts of the First Economic Adjustment Programme (total amount of 164.5 billion Euro) over the period from 2012 to 2014. Moreover, Eurozone members agreed that their part (144.7 billion Euro) will be financed through the EFSF. (European Commission (2015))

The unstable and tense political situation in the country was one of the main concerns for the Eurogroup and the IMF in connection to adjustment programme and its implementation in spring 2012. Situation stabilized after the elections in June, however the disbursements of the loans were delayed. Against this background, on November 2012 the Eurogroup and the IMF decided to approve extension of the fiscal adjustment by two years. Firstly they agreed to reduce the primary surplus target (from 4.5% to 1.5% of GDP in 2014 and annual adjustment of 1.5% until 2016 target of 4.5% is achieved). Plus, authorities approved measures in order to reduce Greek debt to GDP ratio to 124% by 2020. (European Commission (2015))

After the above discussed events, Greece is closely monitored by the ECB, the EC and the IMF teams in order to ensure satisfying implementation and successful achievement of the programme objectives. (European Commission (2015))

Latest Status

The review of the programme in 2014 showed possible future financing gaps, however the outlook of the economy still looked positive. But unsuccessful elections in December and January increased political uncertainty, also in connection to the planned Programme expiry in February 2015. Moreover, in the last quarter of 2014 the economic outlooks again showed starting recession. The elections were won by Syriza (opposition) whose newly-elected government was since than in negotiations concerning the extension of the Programme until June 2015. (European Commission (2015))

As of second half of June 2015, Greece similarly as in 2010 got close to the bankruptcy scenario, Greece was offered the extension of the Programme until November 2015 and help in amount of 16.3 billion of Euro from the EU. However, Greece argued that the amount is not satisfactory and questioned new terms and conditions of the 2nd bailout programme. To decide, the government announced referendum about acceptance/rejections of the renegotiated conditions. The crucial upcoming date is 30 June 2015 when Greece is supposed to pay the instalment of 1.5 billion of Euro. (Pravda (2015), iDnes (2015), European Commission (2015))

Ireland

The major cause of Irish financial crisis was, as opposed to Greece, real estate sector bubble and banking guarantees provided by the government. From approximately 1990 Ireland went through a sharp growth based on successful fiscal and industrial policies and broader European integration. However, this fast expansion in the start of the new millennium hid Ireland's strong dependency on domestic demand and construction industry as the main engines of growth. The boom continued until 2007 when investors started to have concerns regarding Irish real estate price bubble and oversupply. In late 2007 Ireland started to face two main issues. Firstly, construction industry, the leading driver of growth, entered the declining phase of its natural cycle. Secondly, Irish banking sector recorded substantial losses. (European Commission (2015))

From 2008 the government tried to stabilize the situation by new budgetary policies and fiscal consolidation. Moreover, the government agreed on several measures to support banking sector including capital injections and highly questioned guarantees to six Irish banks which financed the real estate bubble. Nevertheless, the new policies took place, by 2010 Irish GDP had decreased by 17% compared to the peak and at the same time, government deficit reached more than 11% of GDP. Consequently in the second half of 2010 Ireland lost confidence of the investors what triggered the main wave of the crisis. Ireland experienced run on the banks and government borrowings reached new highs. Moreover, in face of the guarantees to the banking sector, government had to deal with both the huge financial deficit and the collapsing banking sector. Based on these issues, Ireland was forced to request support from external sources. (European Commission (2015))

The Economic Adjustment Programme included financial package of 85 billion Euro provided by the EFSM (22.5 billion Euro), EFSF (17.7 billion Euro), bilateral support from the UK, Sweden and Denmark (4.8 billion Euro in total) and the IMF (22.5 billion Euro) for the period between December 2010 and 2013. Moreover, Ireland itself contributed 17.5 billion Euro through the National Pension Reserve Fund and Treasury. Same as in the case of other countries, the Economic Adjustment Programme is conditioned on certain objectives which have to be met in order to receive the disbursement. In case of Ireland, the objectives focused on fast strengthening of the banking sector (including overall shrinking of banking sector to be in line with Irish needs, decrease of the market risk and increase of capital adequacy standards), restoring fiscal sustainability (2015 deficit target of 3% of GDP) and returning to the sustainable growth through the wage and price adjustments, diversifying production and strategies to abscond from unemployment traps. (European Commission (2015))

At the end of 2013, majority of policy obligations had been met and investors regained the confidence. Therefore, Ireland could successfully exit the programme. Same as Portugal, Ireland is now under the PPS which will last approximately until 2031 when majority of the support will be repaid. (European Commission (2015))

Portugal

Unlike Ireland or Greece, Portugal did not experience problems with a real estate boom or toxic assets in the banking sector, therefore the first phase of the crisis did not hit Portugal very substantially. However, Portugal was struggling with low productivity and GDP growth for at least a decade. Moreover, Portugal had a high

level of external debt as a consequence of long lasting current account deficit what could not be handled when second phase of the crisis started. (European Commission (2015))

In 2010 and beginning of 2011 (prior to the financial support request) economic outlook of Portugal was very pessimistic with its still worsening confidence, public finance and increasing pressures on Portuguese debt. Influenced by sovereign bond market crisis in the Eurozone, Portuguese sovereign bonds rating had been downgraded. Consequently, banking sector was sheared away from funding from international markets and Portugal was unable to refinance its debts at rate compatible with the fiscal sustainability. (European Commission (2015))

Portugal requested financial support in April 2011 and final loan agreement was signed in May 2011. The agreement included financial assistance in amount of up to 78 billion Euro provided by the EFSM, the EFSF and the IMF (approximately equal parts). The support was in the form of 3-year police Programme starting in 2011 and ending in mid 2014. Except for financial aid, the Programme also includes reforms to support growth, regain lost competitiveness and boost jobs creation. Additionally, Programme includes strategies for financial sector and fiscal consolidation. The main objectives were to stabilize the growing debt to GDP ratio, decrease public deficit below 3% of GDP by 2014, foster deleveraging of financial sector, recapitalisation of banks and ensuring financing of the whole economy. (European Commission (2015))

Economic Adjustment Programme for Portugal ended in June 2014. However, at least until 2026 the country is under the post-Programme surveillance (PPS) which aim is to monitor and measure capacity of the country to repay the provided loans (Portugal will be under PPS until at least 75% of the financial support is repaid) (European Commission (2015))

Romania

Romania as all other European countries was negatively affected by the global financial crisis what mirrored in worsening economic and financial situation. Current account deficit reached 11.6% and budget deficit 5.7% of GDP what increased the concerns. Moreover, it led to sharp decrease of capital inflows and depreciation of RON against EUR by 30%. Based on these events, Romanian authorities decided to call international financial institutions for assistance. (European Commission (2015))

Since Romania is not part of the Eurozone it is eligible to receive support from EU only under the balance-of-payments programme. In May 2009 the EU

agreed to provide medium-term financial support to Romania in the amount of up to 5 billion Euro. Additionally, the IMF agreed to provide approximately 12.95 billion Euro through the Stand-by Arrangement and the WB, the EIIB and the European Bank for Reconstruction and Development (EBRD) agreed on another 2 billion Euro in total until 2011. (European Commission (2015))

The balance-of-payments programme was as well conditional upon the implementation of new policy programme. The programme included as in previous cases, financial sector measures and fiscal and structural reforms, in order to reduce spending in public enterprises and its subsidiaries, reduce public employment, increase public gross fixed capital formation and eliminate several allowances and tax deductions. Moreover, National Bank of Romania was ordered to undertake several stress tests to assess amount of additional own funds needed to keep capital adequacy ratios above 10%. (European Commission (2015))

In the following years Romania requested financial assistance two more times – in 2011 and 2013 in order to further support economic growth, structural reforms and financial sustainability and stability. International financial institutions made available precautionary medium-term assistance in form of credit lines. However, these were not used. Only assistance which Romania actually received was the development loan programme and social assistance and health reforms support provided by the WB. (European Commission (2015))

Hungary

Hungary was the first European country which requested financial assistance right at the start of the crisis in 2008. When financial crisis started to spread in Europe, Hungary had to deal with high debt levels, balance sheet mismatches, dried up secondary bond market, sharp increase of bond yields, decreasing stock market and depreciation of the currency. (European Commission (2015))

After the turbulences on the market and problems with refinancing its debts (both government and external), Hungary asked Troika for financial support. In November 2008, Troika decided to provide Hungary with facility in total amount of 20 billion Euro. Hungary's main objectives were to implement reforms to ensure decrease of debt-financing and to keep adequate liquidity and capital in the banking sector. (International Monetary Fund (2008))

Nevertheless, Hungary used only 14.2 billion Euro instead of the full 20 billion Euro and no support offered by the WB has been drawn. However, in November 2011 Hungary requested another – precautionary – financial help due to

the worsening financial conditions. But Hungary actually managed to obtain needed financing through the international markets and negotiations prematurely ended. (European Commission (2015))

Cyprus

Cyprus is one of the smallest economies in the European Union broadly known as a tax heaven for international corporations. Besides the typical effects of the crisis Cyprus heavily suffered due to the broad exposure of its banks to the Greek debt haircut. However, Cypriot problems started even sooner. After the years of strong growth, high employment, increasing real disposable income and overall economic boom, in 2010 the financial soundness indicators started to deteriorate. High current account deficit, capital shortfalls and increasing banking sector cut offs from funding from international markets led to severe crisis in Cyprus. Moreover, worsening loan portfolio quality and poor risk management and supervision in banking sector were responsible for the severe turbulences in the financial sector. Consequently, this negative development and exposure to Greek debt forced rating agencies to downgrade Cyprus to "junk" status (BBC (2012)). However, the situation in the banking sector further worsened in the beginning of the 2013. Confidence in Cypriot financial sector severely dropped and Cyprus experienced huge outflows of deposits. (European Commission (2015))

Before requesting financial help through the Economic Adjustment Programme, Cyprus received a bilateral loan from Russia in amount of 2.5 billion Euro in January 2012. According to the most financiers, Cyprus is a long-time Russian ally and most of the investment capital has Russian origin. However, Russian loan was not sufficient which had Cyprus turning to the international financial institutions and in June 2012 Cyprus requested financial assistance from Troika. The ESM together with the IMF agreed to provide financial package in total amount of 9 billion Euro for the period 2013-2016. (European Commission (2015))

The main objectives of the economic adjustment programme include mainly measures regarding improvement of Cypriot banking sector and increase of confidence by restructuring of financial institutions and supervision improvement. Additionally, programme also covers reduction of current primary expenditures and increase of efficiency of public spending and public sector as whole. Finally, reforms towards wage indexation and future sustainable growth path and competitiveness have to be implemented. (European Commission (2015))

Latvia

In the end of 2008 and 2009, Latvia's economy has waned the fastest rate since the split from the Soviet Union. Global financial crisis hit mainly the consumer demand which was driving the Latvian economy for several years. In the fourth quarter of 2008, GDP decreased by 10.5% comparing to the same period the year before. Manufacturing output fell down by 11.3% and retail trade plunged by 15.6%. Moreover, from December 2008 to January 2009, unemployment increased from 7% to 8.3% respectively. (BBC News (2009))

Generally, Latvia faced large external debt, external deficit, increased inflation and liquidity and confidence issues in banking sector. Due to the central bank interventions in order to preserve currency peg, the country also faced low level of foreign currency reserves. Moreover, financial and capital markets have been under pressure since the decrease in market sentiment and general health of the Latvian Economy. (European Commission (2015))

Due to the factors described above, Latvia was in need of external financing. Therefore, in the end of 2008, Latvia applied for the financial assistance from EU, IMF and neighbouring countries. After the negotiations Latvia was granted assistance in total amount of 7.5 billion Euro what was equal to the estimated external financing need until the first quarter of 2011. The provided assistance was as in the other cases subject to implementation of several reform programmes including financial, fiscal and structural reforms in order to restore the credibility of economic policy and stabilise the economy. (European Commission (2015))

In the end, the assistance was committed by the European Community (under balance-of-payments programme) – 3.1 billion Euro, IMF – 1.7 billion Euro, Nordic and Baltic countries (Denmark, Norway, Sweden, Estonia and Finland) – 1.9 billion Euro, the WB – 0.4 billion Euro and the European Bank for Reconstruction and Development, the Czech Republic and Poland – 0.4 billion Euro. The assistance was available for three years during which Latvia implemented the needed reforms and significantly improved the Economy as concluded by EU. As of the start of 2015, Latvia successfully repaid 75% of the loan in two tranches. The details on the disbursements will be provided in the data analysis chapter. (European Commission (2015))

2.4. Review of Credit Risk Models[6]

In previous chapters we have introduced SMEs, analyzed their structure and performance and discussed the financial crisis and bailout programs in the focus countries. Nevertheless the goal of this thesis is to research and analyse the impacts of the crisis and bailouts on probability of default (distress rate) of SMEs. Therefore, we need to establish a credit risk model suitable for modelling SMEs' distress rate including macro-economic variables. Unfortunately, in academic sphere there is still a noticeable lack of specific literature concerning SMEs credit risk.

The main issue with existing literature considering credit risk modelling is its main focus on large corporations. However, large companies differ substantially from SMEs since they are riskier and have lower asset correlation (Dietsch and Petey, 2004). Moreover, classic credit risk models (CreditMetrics, Merton's) are based on market asset values, therefore, directly expect that company is listed on the market. This condition is naturally not fulfilled for most of the SMEs (specifically, in this study we take into consideration only private SMEs). On the other hand, modelling SMEs based on the models applicable for retail segment is also not possible. Therefore, we still see an open room for discussion and further analyzes regarding the appropriate indicators and methodology for modelling probability of distress in case of private SMEs. As will be presented below, the question has not been completely answered and researchers differ in their opinions. Moreover, the gap in the discussion is even broader in case of using macroeconomic variables. (Tothova (2014))

In the following section we provide literature review and summary of developments from the first models introduced by Altman in 1968 until the most recent studies published during the 2014. For better understanding, we split the discussion into two parts. We first discuss the basic models using solely firm-specific indicators after which we review the models including additionally also macroeconomic variables, which are necessary for our research. (Tothova (2014))

[6] Author lately conducted also other research considering credit risk models and therefore section 2.4 may in some parts interact with study Tothova (2014). However, both studies were conducted independently from each other.

2.4.1. Review of Classic Default Prediction Models

The last decades produced main advancements in theoretical credit risk models concerning large corporations as well as SMEs. Until late 1960s mostly ratio analysis had been used to assess the probability of company default. Beaver (1966) constructed univariate prediction model to suggest that financial ratio analysis appears to be useful in the prediction of company failure at least 5 years before company default. The pioneer of more extensive credit risk models is Altman (1968). He successfully connected traditional (univariate) financial ratio analysis with more rigorous statistical technique by applying multiple discriminant methodology to investigation of bankruptcy predictions. Altman (1968) argues that classical ratio analysis is incoherent and prone to faulty interpretations. To overcome this issue he used multiple discriminant analysis (MDA) which allows analyzing combinations of ratios simultaneously instead of sequentially and therefore removed potential ambiguities and misinterpretations. Altman (1968) classified companies as bankrupt or non-bankrupt according to financial ratios based on working capital, earnings, sales and value of equity. Thereafter, using MDA Altman (1968) computed a so called "Z-score" – an overall index indicating bankruptcy. (Tothova (2014))

Later studies written between 1970s to late 1990s were mostly inspired by Altman (1968) and used MDA technique (Deakin, (1972), Taffler and Tisshaw (1977), Blum (1974)). These were conducted almost exclusively on corporate level data. However, as Eisenbeis (1977) pointed out, the MDA technique causes frequent statistical difficulties when applied on this data type. The most common problems concern the distribution of variables, equal versus unequal dispersions, interpretation of the significance of individual variables, dimension reduction or the definition of groups (Eisenbeis (1977)). Therefore researches started to apply different, more suitable statistical models. Ohlson (1980) took into account the above mentioned issues and was the first to use a conditional logit model to estimate a probability of default. Since the logit model may also capture information availability (the timing problem), Ohlson's research showed promising results. Comparably Zmijewski (1984) was first to apply probit model to default prediction. However, as pointed out by Altman and Sabato (2007), logit analyses give generally better results since they better capture the characteristics of the default prediction issues and were mostly used in the studies thereafter. (Tothova (2014))

The first study which dealt with the probability of default of SMEs was conducted by Edmister (1972). The study analyzed the usefulness of financial ratios

for predicting SME failure with positive results. However, there was not much focus on SMEs until the new Basel Accords (Basel II). Focus on SMEs was firstly directed to effects of Basel II on SMEs (Berger (2006)), financing of SMEs (Berger and Udell (2004)) and SMEs' risk scoring and credit availability (Frame et al. (2005)). Another question tackled by researchers concerns the impact of SME lending portfolios of banks on banks' performance. Kalori and Shin (2004) imply that specialization on SME lending has a positive effect on bank's ROA and increases bank's profitability. On the other hand Altman and Sabato (2007) conclude that SME lending is riskier for a bank comparing to a large corporate lending. (Tothova (2014))

Altman and Sabato (2007) also revealed substantial differences between SMEs and large corporations. They reported that banks should develop credit risk models specifically for SMEs in order to minimize expected losses. To demonstrate this hypothesis Altman and Sabato (2007) applied both the MDA model (the Z-score corporate model) and a specific SME logit model, both using firm-specific financial data (mostly accounting ratios) on US SMEs. As predicted, specific SME logit model which they used to estimate one-year SMEs probability of default has 30% higher prediction accuracy than a generic corporate model. It suggests that bank's SMEs profitability is higher when their credit risk is modelled separately from corporate segment credit risk. Altman et al. (2010) also applied the previous model on a UK SMEs sample and confirmed previous findings. Moreover, they expanded the research and have been the first who included also non-financial firm-specific indicators in the model whereby they managed to increase its default prediction power by 13%. Moreover, Altman et al. (2010) argue, that this qualitative information are even more valuable for SMEs comparing to large corporations since their financial data are scarce. (Tothova (2014))

2.4.2. Review of Default Prediction Models including Macroeconomic Indicators

Another literature stream focuses on connection between macroeconomic indicators and credit risk models. Unfortunately, macroeconomic indicators were mostly used on listed firms' data, not SMEs data. For example, Pesaran et al. (2006) showed how global macroeconomic models can be connected to firm-specific return processes what allowed them to research how changes in macroeconomic indicators affect the credit risk. Duffie et al. (2007) constructed a model which was able to estimate term structure of firm default probabilities across multiple future periods. The study

revealed that the term structures of individual corporations in industrial sector significantly depend on the current state of the economy. (Tothova (2014))

Considering the specific macroeconomic indicators used in previous studies, Altman (1968) included change in gross national product, S&P 500 returns and money supply M1. Rose et al. (1982) included large sample of macroeconomic indicators e.g. S&P 500 returns, 3-month T-bill rate, the prime interest rate etc. The significance level of these indicators was mixed in the early studies. Hol (2007) was the first one who, besides financial ratios, included also macroeconomic variables representing business cycles. On a sample of Norwegian non-listed companies she tested and proved significance of most of the indicators. Bonfim (2006) researched determinants of credit default in loans granted to firms by the Portuguese banks. She included both idiosyncratic (firm-specific) and systematic (macro-economic) indicators in the study. The study showed that when both macroeconomic variables and idiosyncratic variables were included in the model, the results improved considerably comparing to the model with only firm-specific variables. Bonfirm (2006) concluded that there are noticeable connections between default rates and overall macroeconomic situation. This was also confirmed by Carling et al. (2007) who estimated a duration model for the survival time of corporations' credit lines from a bank on Swedish bank data. According to their conclusions, macroeconomic indicators have very significant explanatory power for a corporate default risk. This study suggested that the yield curve, households' economy expectations and output gap are also important variables for default modelling. (Tothova (2014))

Research reviewed above clearly demonstrates that firm-specific (accounting and non-financial) as well as macroeconomic indicators are crucial for modelling of distress probability within a context of SMEs. Focusing on exchange rate volatility, Goudie and Meeks (1991) used macro-micro model of failure to assess the response of the potential failure rate to movements in the effective exchange rate. Their research showed that the impact is substantial. Similar results were concluded also by Nam et al. (2008) who used discrete-time duration model incorporating temporal and macroeconomic dependencies. In their model, the most crucial macroeconomic indicators are volatility of foreign exchange rate and change in interest rates. Bekeris (2012) studied impact of macroeconomic indicators on profitability of SME companies. He concluded that unemployment had the biggest impact on SME's default as it was negatively correlated with profitability. On the other hand, he concluded that imports have the smallest impact on the probability of distress. Basel I and Basel II accords suggest that SMEs are less sensitive to macroeconomic variables

than large corporations hence significantly decreasing the capital charges for lending to smaller firm segment. Laerkholm-Jensen et al. (2013) used Cox model to investigate whether there is an empirical support for this hypothesis. However, they did not find sufficient evidence to support the hypothesis that there is a different sensitivity to macroeconomic cycles for larger and smaller firms. (Tothova (2014))

One of the most recent studies on the topic was conducted by Michala et al. (2014). Authors forecast distress in European SME portfolios for period 2000-2009 using panel structure dataset, Shumway (2001) hazard model and three main groups of indicators – firm-specific, macroeconomic and industrial. Moreover, this study is unique in that it is the first to forecast distress not only on a single country dataset but on a sample of SME portfolios from nine EU countries. As suggested in the above discussed research, they confirmed that macroeconomic variables increase the prediction accuracy. Additionally, they also investigated the connection between firm size and its vulnerability to macroeconomic conditions and unlike Laerkholm-Jensen et al. (2013) the results showed that as SME firm becomes larger, it is less sensitive to the macroeconomic conditions. In this thesis we are motivated by the theoretical approach and variables used in Michala et al. (2014) which are discussed in the following chapter. (Tothova (2014))

3. Research Design

Previous chapters provided introduction to the SME topic and background to the theoretical framework. Hereafter, we build on the literature review in order to choose appropriate methodology and set up a model by which we will test our hypothesis that are outlined and discussed later in the chapter. The last part of this chapter introduces the main groups of the variables.

3.1. Methodology

3.1.1. Hazard Model

In the last chapter, review of credit risk models provided a summary of credit risk modelling developments and we have concluded that the most frequently used are various types of logit and probit ("static type") models. However, it was proven that the static types of models are not able to account for dynamics of company's financial structure and to integrate time-varying (macroeconomic) indicators. In order to overcome these issues Shumway (2001) showed that hazard type models are more suitable for this kind of research. Later studies of Nam et al. (2008) or Michala et al. (2014) also confirmed higher effectiveness of hazard models. Moreover, Shumway (2001) offered three reasons why to prefer hazard models for distress predictions. Firstly, in hazard model it is possible to include explanatory variables that change with time. Secondly, we can add macroeconomic indicators that are equal for all companies at a given point in time, therefore we can control for every firm's period at risk. Finally, hazard models are able to consider every firm-year observation separately what add to efficiency in case of out-of sample forecasts. (Tothova (2014))

Based on the arguments discussed above, we decided to use discrete-time hazard (duration) model with time-varying variables and macro-economic dependences which, as Shumway (2001) proved, is equivalent to multi-period logit model (based on the same likelihood function). Below we follow Michala et al. (2014), Shumway (2001), Tothova (2014) and Nam et al. (2008) in order to explain the research design.

The hazard model belongs to the group of survival models, in which variables are related to the time that passes before some specific event occur – company distress in this case. The time to firm distress is the "survival time" denoted as *t*. This

survival time t is a continues random variable and follows probability density function in the form of $f(t_i, x_i, \beta)$, where x_i stands for a vector of distress prediction variables (for company i = 1,2,…..N) and β is a vector of parameters. Moreover, it has some cumulative probability density function $F(t, x_1, \beta)$ which is defined as

$$F(t, x_i, \beta) = \sum_{j<t} f(j, x_i, \beta) \quad (1)$$

Cumulative probability density function is then used to define the probability that company survives until *t*. This probability is described by the survival function:

$$S(t_i, x_i, \beta) = 1 - F(t_i, x_i, \beta) = 1 - \sum_{j<t} f(j, x_i, \beta) \quad (2)$$

The hazard function, which is incorporated in the hazard model, can be measured as the conditional probability of bankruptcy at time *t* given survival to that time:

$$h(t_i, x_i, \beta) = \frac{f(t_i, x_i, \beta)}{S(t_i, x_i, \beta)} \quad (3)$$

The most often used is Cox's (1972) semi-parametric proportional hazard model which is expressed as:

$$h(t|x_i) = \exp(\beta x_i) * h(t|0) \quad (4)$$

However, as we mentioned, this model allow us to incorporate time-varying firm-specific variables, therefore we can re-write it in the form which accounts for time:

$$h(t|x_{i,t}) = \exp(\beta x_{i,t}) * h(t|0) \quad (5)$$

The first part of the equation stands for firm-specific variables where $x_{i,t}$ represents covariates composed of financial statements items of each firm *i = 1,2,…,N*. The second part of the equation is time dependent baseline hazard function. There are several ways how to specify hazard function. For example Shumway (2001) used the natural logarithm of the company's age. Carling et al. (2007) proxies the baseline hazard by time dummies. Since we are specifically focusing on macroeconomic variables in this thesis, we adopt approach used by Campbell et al. (2008), Nam et al. (2008), Michala et al. (2014) and propose using macroeconomic variables as baseline hazard function. (Michala et al. (2014), Shumway (2001), Tothova (2014) and Nam et al. (2008))

The parameter estimates of this model are obtained by maximizing following hazard model likelihood function:

$$L(\beta) = \prod_i h(t_i, x_i, \beta)^{y_i} S(t_i, x_i, \beta) \quad (6)$$

Since Shumway (2001) proved that discrete-time hazard model likelihood function expressed above is equal to multi-period logit model, we estimate hazard model by

using logit regression. Therefore following Shumway (2001), Nam et al. (2008) or Michala et al. (2014), we can express hazard rate over next year as a logistic distribution given in the form:

$$h(t|x_{i.t-1}) = P(Y_{i,t} = 1|x_{i.t-1}) = \frac{1}{1+e^{-(\beta x_{i,t-1}+\gamma_K t-1)}} \qquad (7)$$

$Y_{i,t}$ is a binary variable equal to 1 if company is distressed in year *t*, zero otherwise. The first part of the hazard function $\beta x_{i,t-1}$, is a function of firm-specific variables represented by financial ratios and other qualitative indicators, which are known at *t-1* (at the end of previous year). The second part is time-dependent baseline hazard function that in this case incorporates macro-economic variables and affects similarly all companies in the economy. Generally, the higher value of $\beta x_{i,t-1} + \gamma_K t-1$ entails higher distress probability. (Michala et al. (2014), Shumway (2001), Tothova (2014) and Nam et al. (2008))

3.2. Models and Hypotheses Introduction

The review of SMEs business environment suggests that macroeconomic conditions are important for their existence. This assumption was also outlined by researchers who already included macroeconomic indicators in credit risk models. It was shown, that macroeconomic variables are significant predictors of probability of SMEs distress. (Tothova (2014))

However, we did not find adequate research on the significance of these variables in the times of financial crisis. Therefore, this thesis investigates the impact of financial crisis and bailout programs on SMEs' distress rate in the most severely affected European countries i.e. the countries which had to request financial help from Troika, received in the form of so-called ''bailouts'' or Financial Assistance programmes. In order to do so we developed our model based on the theory described in the previous section. To provide framework to our research we introduce specific hypotheses based on our previous analyses and literature review. Below we present our hypotheses and proposed econometric models which will be used to test them.

1. Bailout Hypothesis

Our main hypothesis tests impact of bailouts on the probability of distress of the companies in our full sample using multi-period logit model (i.e. discrete-time

parametric hazard model). Our estimated regression equation is established as follows[7]:

$$PD_{i,t} = \alpha + \beta_1 * BO_{i,t} + \beta_2 * EURO_{i,t} + \beta_3(EURO_{i,t} * BO_{i,t}) + \\ + \beta_4 Crisis_{i,t} + \sum_n \beta_n FSControl_{i,t} + \sum_n \beta_n MEControl_{i,t} + \epsilon \quad (8)$$

PD is a probability of distress equal to 1 if firm *i* is distressed in year *t*. BO is a variable of bailouts (introduced and analyzed in Chapter 4). In order to investigate whether joining Eurozone had an impact on *PD* we included binary variable *EURO* for Eurozone members and interaction variable $EURO * BO$ through which we can compare impacts of bailouts in countries with and without Euro currency. Variable *Crisis* is equal to 1 if the observation is from the period after financial crisis started (i.e. from 2008 onwards) and zero otherwise. The EURO and Crisis variables will be further discussed under corresponding hypotheses. Finally, *FSControl*, is a group of firm-specific financial and non-financial control variables and *MEControl* includes macroeconomic control variables.

Based on the above, we assume that BO is a significant variable with positive impact (negative sign of the coefficient) on the probability of SMEs' distress.

2. Country Hypothesis

The model presented in Hypothesis 1 assumes that bailouts have the same impact on probability of SMEs distress in each country, as it does not include any country variables and country interaction terms. However, in order to deeper understand the relationship between the bailouts and probability of SME distress, we add an interaction term of country and bailout to the model. Naturally, we include only six countries and interaction terms so that we prevent the dummy variable trap. Revised regression equation looks as follows:

$$PD_{i,t} = \alpha + \beta_1 * BO_{i,t} + \beta_2 Crisis_{i,t} + \sum_n \beta_n Country_{i,t} + \\ n\beta n(BO*Country) \\ i,t+n\beta nFSControli,t+n\beta nMEControli,t+\epsilon \quad (9)$$

Based on the previous analyses of situation in individual countries, we assume that the impacts of bailouts in individual countries differ across the countries. More specifically, we assume that in Greece, bailouts have the smallest impact on probability of SMEs' distress compared to the rest of countries in our dataset.

[7] The equation is presented in the simplified form with focus on the included variables. However, during the regression analysis it will be used in the form of equation (7).

3. Eurozone hypothesis

To expand our research we include also hypothesis concerning the Eurozone. We expect that the probability of distress in the Eurozone countries is lower compared to non Eurozone countries. Moreover, we assume that the interaction variable between Euro and bailouts has a positive (decreasing) impact on probability of distress.

This hypothesis will be tested in two ways. Firstly, by equation (8) presented above, and secondly separately on the subsamples for Eurozone and non Eurozone countries. We also include country and country-bailout interaction variable as well as crisis variable. Below we present the exact equations for euro and non-euro subsamples:

Eurozone countries subsample equation (we omit Greece for dummy variable trap):

$$\begin{aligned} PD_{i,t} = {} & \alpha + \beta_1 * BO_{i,t} + \beta_2 Crisis_{i,t} + \beta_3 CY_{i,t} + \beta_4 IR_{i,t} + \beta_5 PR_{i,t} + \\ & \beta_6 (BO * CY)_{i,t} + \beta_7 (BO * IR)_{i,t} + \beta_8 (BO * PR)_{i,t} + \\ & \sum_n \beta_n FSControl_{i,t} + \sum_n \beta_n MEControl_{i,t} + \epsilon \end{aligned} \quad (10)$$

Non Eurozone countries subsample equation (we omit Latvia for dummy variable trap):

$$\begin{aligned} PD_{i,t} = {} & \alpha + \beta_1 * BO_{i,t} + \beta_2 Crisis_{i,t} + \beta_3 HU_{i,t} + \beta_4 RU_{i,t} + \beta_6 (BO * \\ & HU)_{i,t} + \beta_7 (BO * RU)_{i,t} + \sum_n \beta_n FSControl_{i,t} + \\ & \sum_n \beta_n MEControl_{i,t} + \epsilon \end{aligned} \quad (11)$$

The general research design which we presented at the beginning of this chapter still holds and we will estimate the subsample models by logistic regression. We assume that the results should be in line with the EURO and EURO * BailOut variable results of equation (8).

4. Crisis (Period) hypothesis

We also test the hypothesis that probability of SMEs' distress is smaller in the period before 2008 than after 2008 when the financial crisis was in full swing. The hypothesis is supported by the SME analysis discussed in Chapter 2 as well as the data analysis which will be presented in the following chapter. The hypothesis will be tested by all above discussed equations i.e. equation (8) – (11).

4. Data Analysis

The firm-specific data for non-listed companies used in this research have been obtained from the Amadeus database for period 2005-2013 (2014 data not available yet). We downloaded data for seven countries (Cyprus, Greece, Romania, Latvia, Hungary, Portugal and Ireland) individually and merged them into one dataset using STATA program. Amadeus database offers variable indicating size of the company, however, this variable is not fully comparable with the European Union definition of the SMEs (for the full EU SME definition see the Appendix). In order to overcome this difficulty we decided to omit the "very large" companies as indicated by the Amadeus and drop companies which have more than 250 employees (in line with the EU which define SME as company with less than 250 employees). Moreover, we excluded also companies which have 0 or 1 employee in order not to include contractors and self-employment in the sample which would distort the outcome. Additionally, we have omitted financial institutions from our dataset (identified by the NAICS code) due to their different structure as compared to classic (non-financial) companies. As a part of the data cleaning we have dropped observations where there was no information about total assets, current assets, current liabilities or there was missing information needed for calculation of Equity. To prevent outliers, we have winsorized accounting ratios used in the analysis. (Tothova (2014))

As discussed in the previous chapters we finally include country-specific macro-economic variables in our research. The macroeconomic data were collected from Moody's, World Bank and Eurostat databases and subsequently merged with the firm-specific observations by year and country. In total we collected 4,448,798 observations for the given period and sample of countries.

In following sections we will define and analyse main variables (groups of variables) used in our models - the financial distress indicator (dependent variable) and groups of predictors (independent variables – firm-specific and macroeconomic). The variable selection is based on the literature review analysed in the section 2.4., essentially Altman and Sabato (2007), Nam et al. (2008), Michala et al. (2014) and Shumway (2001).

4.1. Financial Distress Indicator

The dependent variable in our research is the ‘’Distress Indicator’’. The most challenging task is to indicate the real status of the company since the data are not always clear as SMEs often do no report much of the detail and therefore it is hard to differentiate between company distress and company closure due to other than bankruptcy factors. Cochran (1981), Ulmer and Nielsen (1974), Watson and Everett (1993), Altman (2007) or Michala et al. (2014) all used different approaches to define company failure. In this research we follow definition presented by Michala et al. (2014) and Tothova (2014) in order to identify distressed companies in our sample.

The financial distress indicator is a binary variable equal to 1 if company is ‘’distressed’’ in the given year. To be considered as distressed, the company -year observation needs to satisfy following conditions:

1) Equity < 0 or company status (as indicated by Amadeus database) is other than ‘’Active’’

2) It is the last firm-year observation for which we have information before the company leaves our dataset.

Based on above, we have constructed the distress variable. Table 4 below summarizes distress indicator:

Year	Healthy	Distressed	% of Distressed
2005	182,990	6,166	3.3%
2006	354,861	7,737	2.1%
2007	478,357	15,416	3.1%
2008	443,414	35,241	7.4%
2009	525,665	37,125	6.6%
2010	494,662	29,381	5.6%
2011	560,620	39,419	6.6%
2012	581,552	56,278	8.8%
2013	418,059	181,855	30.3%
TOTAL	**4,040,180**	**408,618**	**9.2%**

Table 4: Distress indicator overview, 2005-2013

Source: Author’s calculation

The sharp increase in number of distressed observations noticeable in 2013 is caused by the nature of the definition as year 2013 is the last firm-year in our database and therefore all the companies leave our sample afterwards (second condition). One way of solving this situation is to exclude year 2013 from out dataset. However, that

would cause a loss of crucial information needed for our analysis. Hence, we rather decided to include additional conditions into the definition which should help us to identify distressed companies in 2013. There are several additional identifiers which could be applied. Based on the data available and previous research, we consider the company to be distressed in 2013 if first condition holds and additionally EBIT margin is negative and return on assets is negative and company has a negative solvency ratio. After applying this condition, adjusted distressed variable statistics are as follows:

Year	Healthy	Distressed	% of Distressed
2005	182,990	6,166	3.3%
2006	354,861	7,737	2.1%
2007	478,357	15,416	3.1%
2008	443,414	35,241	7.4%
2009	525,665	37,125	6.6%
2010	494,662	29,381	5.6%
2011	560,620	39,419	6.6%
2012	581,552	56,278	8.8%
2013	535,892	64,022	10.7%
TOTAL	**4,158,013**	**290,785**	**6.5%**

Table 5: Adjusted distress indicator, 2005-2013

Source: Author's calculation

The adjusted statistics show that number of distresses increased from 2007 to 2008 when the financial crisis started (3.1% distressed firm-year observations compared to 7.4% in 2008). The % of distressed SMEs slightly decreased in 2010, however started to increase again since 2011. To have a closer look at the situation we also include country subsamples statistics:

	% of Distressed Companies in the Dataset						
Year	Greece	Hungary	Cyprus	Ireland	Latvia	Portugal	Romania
2005	0.0%	0.7%	0.0%	4.0%	0.0%	0.0%	3.7%
2006	0.0%	0.3%	0.0%	4.6%	0.0%	0.5%	4.0%
2007	0.0%	0.6%	0.0%	5.6%	0.1%	0.7%	6.0%
2008	0.1%	0.2%	4.1%	7.7%	1.7%	4.2%	10.8%
2009	0.1%	5.9%	6.6%	8.3%	2.1%	5.9%	8.0%
2010	0.1%	5.7%	2.7%	7.6%	0.6%	3.6%	8.0%
2011	2.0%	4.0%	3.6%	7.7%	3.1%	5.2%	9.7%
2012	3.4%	8.4%	4.8%	11.4%	4.4%	6.8%	11.8%
2013	5.0%	5.3%	3.0%	3.6%	7.2%	10.2%	14.9%

Table 6: Adjusted distress indicator by country, 2005-2013

Source: Author based on EFSF, IMF, WB and European Commission

The table above shows that the highest SME distress rates were observed in Ireland and Romania. In both cases some of the highest company distress rates were observed in 2008 and 2012. Number of distressed companies in 2012 also noticeably increased in Hungary and Portugal.

Additionally, we focused on the analysis of distressed companies by firm size. Table 7 below confirms the assumption that small companies are more liable to distress. Share of distressed companies in ‘’small’’ group increased from 3.9% in 2007 to 8.6% in 2008. In 2012 small SMEs distress reached 10.1% compared to 3.5% in Medium and Large group.

	% of Distressed Companies in the Dataset		
Year	**Small**	**Medium**	**Large**
2005	4.1%	0.1%	0.3%
2006	2.7%	0.1%	0.4%
2007	3.9%	0.2%	0.6%
2008	8.6%	2.7%	1.7%
2009	7.6%	2.9%	1.9%
2010	6.5%	2.5%	2.3%
2011	7.5%	3.0%	2.1%
2012	10.1%	3.5%	3.5%
2013	11.9%	5.9%	4.1%

Table 7: Distress indicator by type of SME, 2005-2013

Source: Author’s calculation

4.2. Bailout Variable

The Bailout variable was constructed from information collected from European Commission financial assistance programmes reviews, European Financial Stability (EFSF) facility agreements, IMF country’s’ transactions with the fund records, World Bank loans records and bilateral agreements records if available.

To be in line with our firm-specific data we recorded disbursements provided to the countries until year end 2013. The Table 8 below summarizes total disbursements received by countries during period from 2008 to 2013. It is important to notice, that we are considering only amounts actually disbursed to the countries, not total funds approved.

	Country							
Year	Romania	Hungary	Ireland	Portugal	Latvia	Greece	Cyprus	**Total**
2008	0.0	0.0	0.0	0.0	0.6	0.0	0.0	**0.6**
2009	8.5	0.0	0.0	0.0	2.4	0.0	0.0	**10.9**
2010	6.4	0.0	0.0	0.0	1.0	31.5	0.0	**38.9**
2011	2.5	31.2	34.1	34.1	0.1	41.4	0.6	**144.0**
2012	0.4	21.2	27.5	27.5	0.0	110.0	1.9	**188.6**
2013	0.0	10.9	11.2	11.2	0.0	31.9	4.8	**70.0**
TOTAL	**17.9**	**63.4**	**72.8**	**72.8**	**4.1**	**214.9**	**7.3**	**453.0**

Table 8: Annual bailout payments received by country, EUR bn, 2008-2013

Source: Author's calculation based on EFSF, IMF, WB and European Commission

Values collected were all changed to EUR currency. For USD a GBP conversions we have used historical midpoint year-averages taken from OANDA. IMF presents transaction amounts in SDRs (Special Drawing Rights). SDRs are international reserve assets which were created by the Fund in 1969 in order to supplement official reserves of its member countries' (International Monetary Fund (2015)). To convert SDR to EUR we calculated annual averages from SDR ''exchange rates'' available from IMF.

The Bailout variable was included in the form presented in the Table 8, however, we also considered normalizing the variable. Firstly we considered normalizing bailout amount by size of the population in order to receive bailout per capita. Secondly, we have considered accounting for size of the economy by normalizing Bailout by GDP per capita. Graphs of all three variables are presented below. Nevertheless, we decided to use the original variable (without normalizing). In order to confirm this, we have included all variables (one-by-one) in the regressions (presented in Chapter 5). Results supported our conclusions, that normalizing the variable did not substantially change regression results.

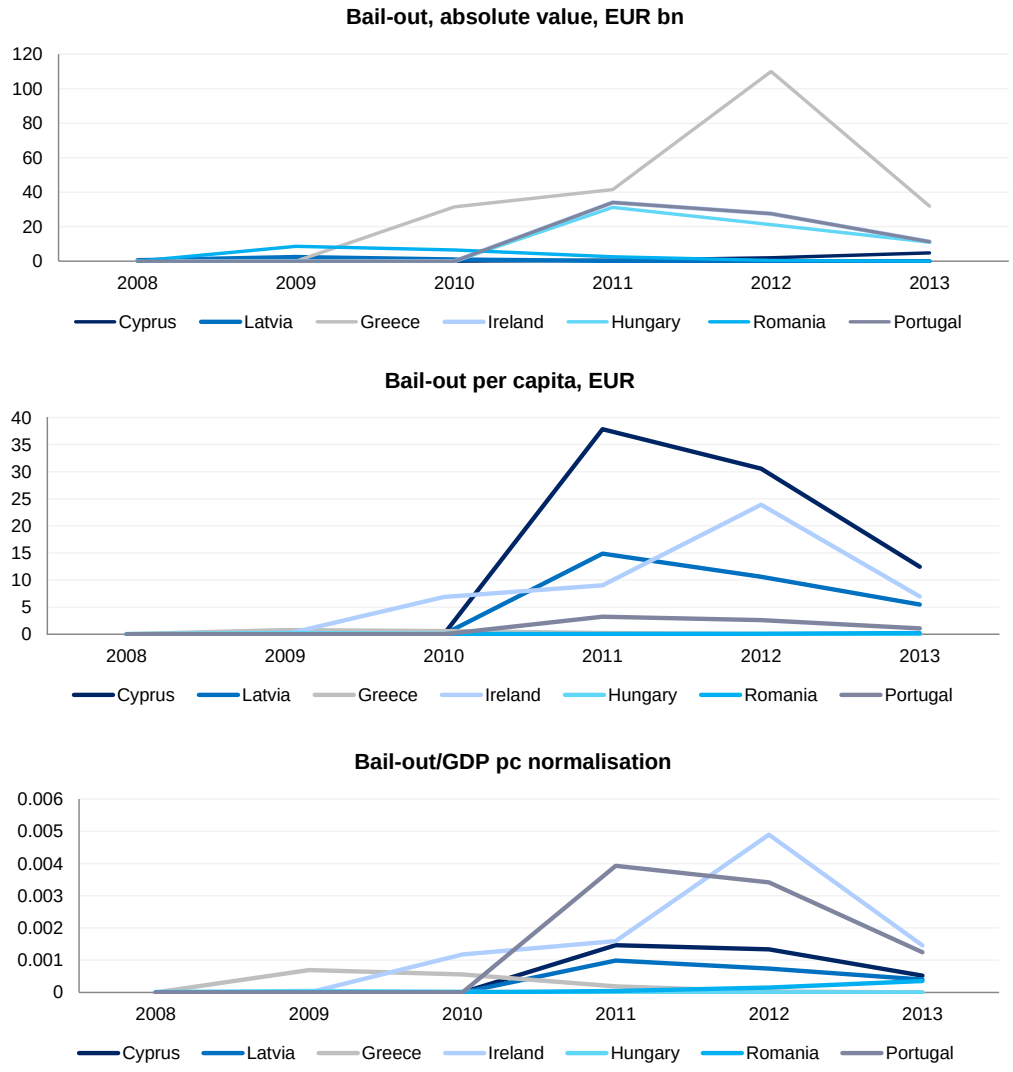

Figure 4: Bailout normalisation, 2008-2013

Source: European Commission (2013)

4.3. Firm-Specific Variables Selection

As previous research discussed in Chapter 2 showed, financial firm-specific variables are inseparable part of modern credit risk models for SMEs. However, what differ across researchers are actual financial indicators used in their models. When choosing financial variables for this research we took into consideration results and arguments presented in Michala et al. (2014), Altman and Sabato (2007), Altman et al. (2010) and Nam et al. (2008). (Tothova (2014))

Following Michala et al. (2014) we have omitted ratios including equity due to its possible correlation with the distress indicator. In the final round we have been considering 12 financial ratios. Following Altman and Sabato (2007), we have split

the ratios based on the firm's financial area they measure. In the second step we have calculated correlation matrix to re-assure that there is no multicollinearity in our data. To choose the final group we followed Altman and Sabato (2007), however we have also been taking into the consideration number of observations we have for a given ratio in order to receive the most accurate results. As opposed to Michala et al. (2014), we did not follow the ''standard three-step procedure'' including AUC calculations and trying out variables one-by-one in the model to detect their significance. To identify the final group of variables, we rather followed financial and economic argumentation. (Tothova (2014))

The final group of financial firm-specific variables chosen for our model looks as follows:

Profitability	Activity	Liquidity	Leverage	Coverage
Return on Assets	Collection period	Current Ratio	Total Liability / Total Assets	Interest Cover
		Cash / Total Assets		

Table 9: Financial firm-specific variables

Source: Author's representation

We have omitted the Interest cover ratio from the coverage group since during our further analysis we revealed that there are no interest coverage data included in Cyprus dataset. The full list of the variables considered and correlation matrices are included for further reference in Appendix B-C.

	Full Sample		Healthy		Distressed	
Financial Firm-Specific Ratios	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
ROA	2.2	25.6	3.4	24.9	-16.8	29.8
Collection Period	91.5	123.1	90.6	120.8	104.6	151.9
Current Ratio	2.8	5.1	2.8	5.1	1.8	4.4
Cash / Total Assets	0.2	0.2	0.2	0.2	0.2	0.2
Total Liabilities / Total Assets	1.1	1.8	1.1	1.7	2.4	3.1

Table 10: Financial firm-specific ratio variables

Source: Author's calculation

Table 10 summarizes main statistics of the final group of variables including also healthy and distressed company's subsamples. Returns on Assets clearly show the difference between distressed and healthy firms since the average profitability in distressed companies is significantly negative. The collection period is also slightly lower for distressed companies. We assume that this can be caused by decreasing sales in periods when company is in trouble. The current ratio shows that SME companies generally keep more short term liquid assets what is suggested by

generally higher liquidity of 2.76x. It can by explain by the nature of SMEs. In case of distressed companies, the liquidity ratio decreases to 1.81x. The decrease can be an outcome of decrease in actual current assets, including cash levels, due to general liquidity problem which are often the case for companies in difficulties or can suggest increased short-term borrowings. Cash to total assets ratio shows that companies in distress have smaller cash levels compared to the healthy ones.

Following the previous research, apart from the financial firm-specific variables we have included in the model also firm-specific but quantitative indicators. Mainly, we have included binary variables indicating size of the company – Small, Medium, Large and indicators for legal status of the company (Llc., Ltd., Partnership or other).

4.4. Macroeconomic Variables Selection

Given the main topic of this research, macroeconomic predictors are crucial control variable. Moreover, as Michala et al (2014) or Hol (2007) suggested, they seem to be generally very important for SME credit risk models.

For this study we have collected macroeconomic data from Moody's database. The final group of variables was chosen based on the economic implications, previous research and correlations. In the case of macroeconomic variables inspecting the correlation matrix is a crucial part of the analysis since macroeconomic variables tent to be very often correlated with each other. Detail on correlation matrices is included in Appendix C

Our final group of variables consists of macroeconomic indicators of economic structure and performance, government finance and external payments and debt as presented in the Table 11 below.

Economic Structure and Performance	Government Finance	External Payments and Debt
Real GDP (% change)	Gen. Gov. Debt/GDP	Real Eff. Exchange Rate (% change)
Inflation (CPI, % change Dec/Dec)		Current Account Balance/GDP
Unemployment Rate (%)		
Openness of the Economy		
Government Effectiveness		

Table 11: Macroeconomic variables

Source: Author's representation and Moody's

Except for common macroeconomic variables, we have included also indicators of the openness of the economy and government effectiveness. Openness of the economy was defined as a sum of total exports and imports of goods and services

normalized per GDP. Government effectiveness is a composite index with values ranging from -2.5 to 2.5 where higher values show greater maturity and responsiveness of government institutions. (Moody's database (2015))

Graphs of the historical development of the macroeconomic variables for period from 2004 to 2013 are displayed in the Figure 5 below:

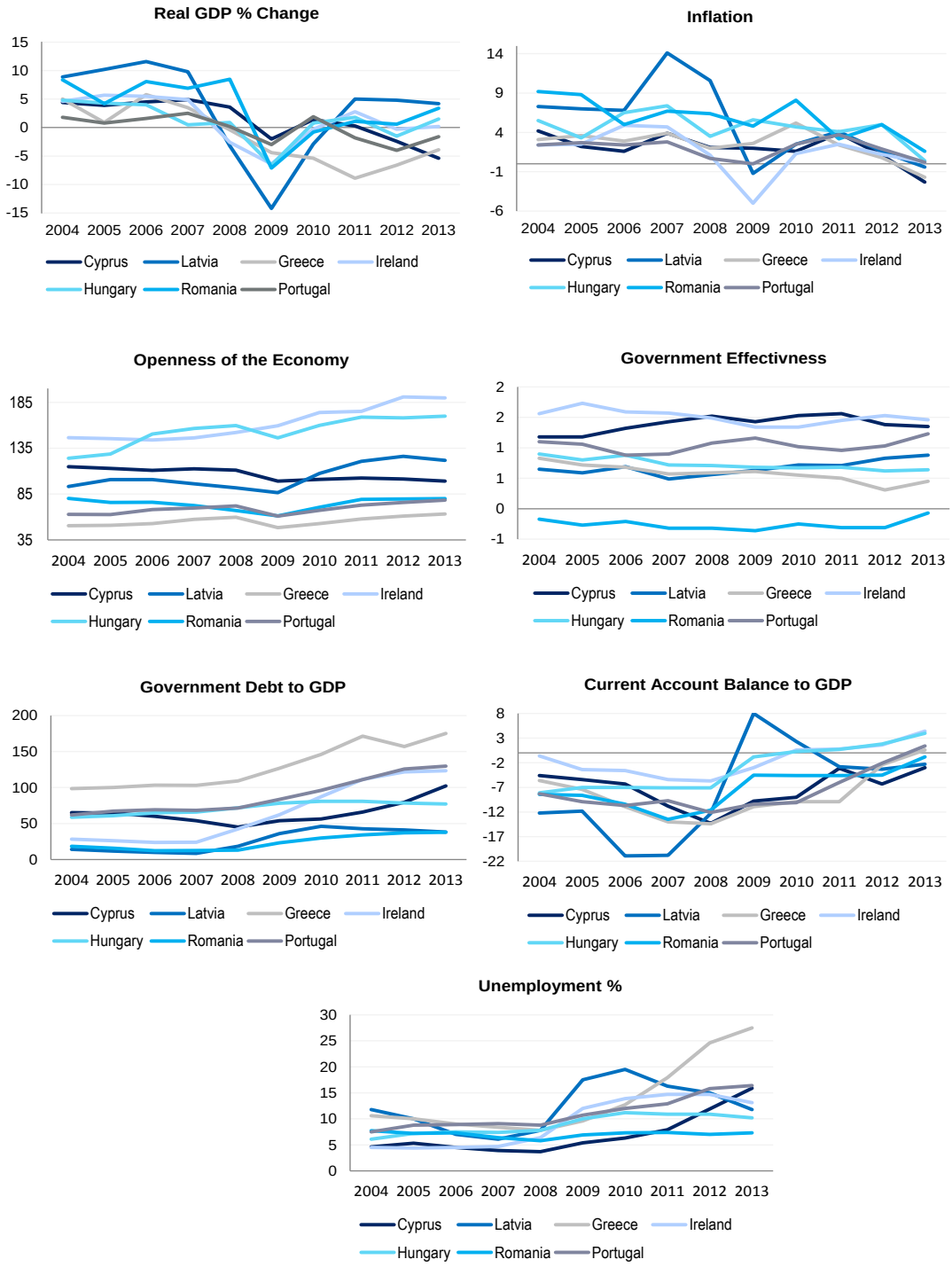

Figure 5: Macroeconomic development, 2004-2013

Source: Moody's database (2015)

Figure 5 paints the overall picture of the economic situation in the focus countries. All focus countries were enjoying pre-crisis growth of real GDP, with Latvia and Romania recording especially high levels of economic development. However, most countries faced slowing GDP growth already in 2008 (with the exception being Romania and Hungary[8]). In 2009 the full year impact of the slowdown can be seen in the data and the hardest hit countries were the pre-crisis stars – Romania declined by 7.1% year on year and Latvia by 14.2%. The development stabilized in majority of countries with only Greek economy plummeting over the whole period under observation.

Even though the individual economies are rather different in terms of openness there appears to be a common trend. During 2009, the first full year after the outbreak of the crisis, the openness indicator decreased across countries (except for Ireland) but returned to previous levels or above afterwards. Similarly the previously stable Government debt to GDP ratio increased after 2008. Although some countries managed to stabilize the indicator at a higher level return to pre crisis level has not been achieved by 2013.

From the remaining macroeconomic indicators inflation appears to be in line with the GDP development and government effectiveness fluctuates both before and after the onset of the crisis suggesting limited relation between this variable and other indicators. Unemployment similarly to the government debt realized growth in 2009 and onwards with various level of stabilization by 2013. Surprisingly the current account balance normalized to GDP improved in the focus countries after 2008 with the most open economies (i.e. Ireland and Hungary) faring the best and the remaining countries approaching values close to zero.

[8] In case of Hungary the increase in GDP growth in 2008 was rather caused by the low growth in previous year

5. Empirical Results

The aim of this thesis was to inspect the relationship between receiving a bailout and probability of SMEs distress on a country level. For this purpose we chose seven countries which have been hit the most by the financial crisis and had to ask Troika for external financial aid: Greece, Cyprus, Romania, Hungary, Portugal, Latvia and Ireland.

We used multi-period logistic regression which was proven by several authors to be the best for SME credit risk modelling. The regression equations were however adjusted in order to test our hypotheses. Moreover, we have also adjusted the model to take into consideration panel-structure of the data sample (number of firms). As Michala et al. (2014) and Shumway (2001) suggested, the model in the current form assumes that the number of the firm-years is the number of observation what gives incorrect test statistics. Therefore, we have used SE/Robust option in STATA which clusters/corrects standard errors using Huber/White sandwich estimator.

For all tested models we present also Akaike's Information Criterion (AIC), area under the ROC curve and pseudo R^2 as indicators of the accuracy of each model. These three criteria provide insight on which model is the best fit when multiple model variations are available. In case of the ROC curve, model is generally considered to be fair when the area is between 0.7-0.8 and good if between 0.8-0.9. Most of our models, as will be presented later in this chapter, have the ROC between 0.78-0.81 what is the lower bound of good models and can be considered as success of the study. On the other hand, in case of the AIC the lower the statistics the better the accuracy of the model.

This chapter discusses empirical results of our research. We present results by hypotheses (equations) tested and conclude the chapter by overall discussion.

5.1. Bailout Hypothesis Results

We have estimated three models for period from 2005 to 2013 including all seven countries in our dataset. Table 12 presents overall results. All three models include our main independent variables – Bailout, Euro, Euro interaction with Bailout and Crisis. However, Model 1 included only firm-specific financial control variables. In Model 2 we added also firm-specific qualitative variables and Model 3 incorporates both firm-specific and macroeconomic indicators. Both AIC and ROC accuracy

measures suggest that the best from the three models is the one including besides firm-specific also macroeconomic variables. The model therefore confirms that macroeconomic variables are valuable for SME credit risk models as was suggested by the previous academic research.

Distress Rate	Model 1	Model 2	Model 3
Variable	Coefficient	Coefficient	Coefficient
Bail-Out	-0.0764 ***	-0.0764 ***	-0.0088 ***
	(0.0011)	*(0.0011)*	*(0.0014)*
EURO	-0.8464 ***	-0.8935 ***	-0.7272 ***
	(0.0064)	*(0.0068)*	*(0.0425)*
Bail-Out * EURO	0.0770 ***	0.0781 ***	0.0151 ***
	(0.0011)	*(0.0011)*	*(0.0014)*
Crisis	1.1174 ***	1.1313 ***	1.0451 ***
	(0.0078)	*(0.0078)*	*(0.0124)*
ROA	-0.0222 ***	-0.0209 ***	-0.0214 ***
	(0.0001)	*(0.0001)*	*(0.0001)*
Collection Per.	0.0016 ***	0.0016 ***	0.0015 ***
	(0.0016)	*(0)*	*(0)*
Current Ratio	-0.0278 ***	-0.0312 ***	-0.0340 ***
	(0.0008)	*(0.0008)*	*(0.0009)*
Cash / Total Assets	0.2151 ***	0.1038 ***	0.1085 ***
	(0.0147)	*(0.0147)*	*(0.0149)*
Total Liab. / Total Assets	0.1410 ***	0.1236 ***	0.1125 ***
	(0.0021)	*(0.002)*	*(0.0022)*
Small		1.0721 ***	1.0195 ***
		(0.0262)	*(0.0263)*
Medium		0.2157 ***	0.1667 ***
		(0.0271)	*(0.0271)*
LLC		0.3718 ***	0.2758 ***
		(0.0192)	*(0.0189)*
Ltd.		0.6127 ***	0.5129 ***
		(0.0214)	*(0.0216)*
Partnership		0.3608 ***	0.2775 ***
		(0.0458)	*(0.046)*
Real GDP %			0.0764 ***
			(0.0012)
Inflation (CPI change)			-0.0510 ***
			(0.0017)
Unemployment %			-0.0812 ***
			(0.0019)
Openness of the Econ.			-0.0080 ***
			(0.0004)
Gov. Effectivness			0.0483 *
			(0.0258)
Real Effec. Exchange Rate			0.0195 ***
			(0.0007)
Gov. Debt % of GDP			0.0023 ***
			(0.0001)
Current Acc. Balance % GDP			0.0791 ***
			(0.0011)
Pseudo R squared	0.1087	0.1184	0.1325
Area under ROC curve	0.769	0.7766	0.7807
AIC	1341464	1326859	1305736

Table 12: Bailout hypothesis regression results

Source: Author's representation

All estimated coefficients are significant and signs of the coefficients do not change when adding additional group of variables. Our main variables suggest surprising results. The coefficient of bailout variable is in all three models negative as well as coefficient of the binary euro variable. However, the interaction term between the euro and bailout has positive sign. It suggest that bailout decreased the probability of SMEs default, however only in countries without the euro. Moreover, it suggests that euro countries had lower probability of SME distress than non-euro countries, but only in the periods when there was no bailouts. Results also show that as expected probability of SMEs distress was higher after the crisis started in 2008 comparing to period from 2005 to 2007.

Firms-specific financial variables have expected sign in all cases. Results suggest that increase in profitability measured by return on assets have decreasing impact on probability of distress. Also current ratio suggests that increase in liquidity should decrease probability of distress. On the other hand, increase in leverage proved to increase distress probability. As discussed, we included also quantitative variables for size and legal status. As expected, small and medium size SMEs have higher probability of default than larger ones since they may be more vulnerable to the external factors. Concerning the legal status, limited liability, limited and partnership type of companies have higher probability of SME's default than other legal types.

Results for macroeconomic variables included in the Model 3 are mixed and some of them not generally expected. Openness of the economy and government debt over GDP have the expected signs whereas the increase in openness of the economy seems to decrease distress probability and increase in government debt per GDP increases SME distress probability. However, Model 3 indicates that increase in real GDP should increase probability of distress. This result can be due to the fact that our GDP variable is in the form of % change and during the crisis most of our countries in the sample recorded negative growth what would cause a reverse effect on the coefficient sign. The unemployment coefficient is also negative what suggest that increase in unemployment decreases probability of SMEs distress. One of the possible explanations is that it the time of financial crisis and general company difficulty, firm is able to decrease number of employees in order to cut expenses and general business and possibly prevent bankruptcy. (Michala et.al (2014))

5.2. Country Hypothesis Results

To broaden our analysis and get deeper understanding about relationships between bailouts and probability of SMEs default, we have included country binary variables and interaction variables to our model. Table 13 presents results of 4 models: Model 4 to 7. We have however omitted EURO variable due to the collinearity and binary and interaction variables for Greece to avoid dummy variable trap.

Following the same logic as in the previous case, we have estimated three models where we have been adding firstly only firm specific financial variables then quantitative firm variables and in the end also macroeconomic indicators. AIC and area under the ROC curve statistics suggest that macroeconomic variables again added significant value to our model and are crucial for SMEs distress modelling.

Now let us look how bailouts impact probability of distress among countries in dataset and how do the effects differ. Firstly, the interaction of bailout and Cyprus is insignificant in all four models. Additionally Hungary interaction with bailout becomes insignificant when we include macroeconomic variables into the model. It suggests that bailout did not have any effect on probability of SME distress in these countries. In the rest of the countries, the bailout coefficient is negative comparing to the positive bailout coefficient for Greece. Thus, an increase in bailout is positively (increasingly) related to the probability of SMEs distress in Greece but negatively related (decreasingly) to the SME distress probability in Ireland, Latvia, Portugal and Romania.

All firm-specific (financial and quantitative) variables keep the same coefficient signs as in the previous case (Models 1-3) and are all significant. However, several macroeconomic variables have changed its sign when we included country indicators. According to Model 6 and 7, increase in unemployment increases probability of SMEs distress similarly to the results of Model 3. Additionally, increase in current account balance (as % of GDP) has positive (decreasing) impact on SME default probability.

Distress Rate	Model 4	Model 5	Model 6	Model 7
Variable	Coefficient	Coefficient	Coefficient	Coefficient
Bail-Out	0.0176 ***	0.0178 ***	0.0271 ***	0.0199 ***
	(0.0005)	*(0.0005)*	*(0.0009)*	*(0.0009)*
Cyprus	1.9505 ***	2.0002 ***	3.3239 ***	4.1058 ***
	(0.1407)	*(0.1408)*	*(0.205)*	*(0.2098)*
Hungary	1.7290 ***	2.0223 ***	7.0538 ***	7.1920 ***
	(0.0491)	*(0.05)*	*(0.144)*	*(0.1499)*
Ireland	2.2978 ***	2.8042 ***	4.5137 ***	5.5952 ***
	(0.0485)	*(0.0513)*	*(0.1642)*	*(0.1687)*
Latvia	2.0701 ***	2.0883 ***	6.1818 ***	5.9754 ***
	(0.0414)	*(0.0428)*	*(0.1513)*	*(0.1596)*
Portugal	1.8459 ***	1.7306 ***	1.7625 ***	2.1572 ***
	(0.0387)	*(0.0396)*	*(0.0905)*	*(0.0928)*
Romania	2.8150 ***	2.7816 ***	9.8491 ***	8.6283 ***
	(0.0385)	*(0.0399)*	*(0.1087)*	*(0.1213)*
Bail-Out * CY	0.0839	0.1324	0.0987	-0.0379
	(0.1343)	*(0.1298)*	*(0.1336)*	*(0.1386)*
Bail-Out * HU	-0.0073 ***	-0.0071 ***	0.0008	0.0025
	(0.0019)	*(0.0019)*	*(0.0019)*	*(0.0019)*
Bail-Out * IR	-0.0083 ***	-0.0059 ***	-0.0346 ***	-0.0273 ***
	(0.0016)	*(0.0016)*	*(0.0021)*	*(0.002)*
Bail-Out * LA	-2.7108 ***	-2.7108 ***	-2.4112 ***	-2.8604 ***
	(0.1312)	*(0.1315)*	*(0.1082)*	*(0.1239)*
Bail-Out * PR	-0.0032 ***	-0.0036 ***	-0.0107 ***	-0.0112 ***
	(0.0005)	*(0.0005)*	*(0.0009)*	*(0.0009)*
Bail-Out * RO	-0.0742 ***	-0.0743 ***	-0.0785 ***	-0.0880 ***
	(0.0012)	*(0.0012)*	*(0.0026)*	*(0.0025)*
Crisis				0.7103 ***
				(0.0164)
ROA	-0.0228 ***	-0.0218 ***	-0.0214 ***	-0.0213 ***
	(0.0001)	*(0.0001)*	*(0.0001)*	*(0.0001)*
Collection Per.	0.0017 ***	0.0017 ***	0.0016 ***	0.0016 ***
	(0)	*(0)*	*(0)*	*(0)*
Current Ratio	-0.0234 ***	-0.0256 ***	-0.0335 ***	-0.0338 ***
	(0.0008)	*(0.0008)*	*(0.0009)*	*(0.0009)*
Cash / Total Assets	0.2091 ***	0.1070 ***	0.0662 ***	0.0689 ***
	(0.0148)	*(0.0148)*	*(0.0149)*	*(0.0149)*
Total Liab. / Total Assets	0.1556 ***	0.1422 ***	0.1201 ***	0.1192 ***
	(0.0021)	*(0.0021)*	*(0.0022)*	*(0.0022)*
Small		0.9781 ***	0.9988 ***	0.9985 ***
		(0.0266)	*(0.0266)*	*(0.0266)*
Medium		0.2356 ***	0.2116 ***	0.2102 ***
		(0.0274)	*(0.0275)*	*(0.0275)*
LLC		0.6554 ***	0.6471 ***	0.6492 ***
		(0.0224)	*(0.0229)*	*(0.0229)*
Ltd.		1.0273 ***	0.9693 ***	0.9766 ***
		(0.0239)	*(0.0243)*	*(0.0244)*
Partnership		0.5365 ***	0.6132 ***	0.6161 ***
		(0.047)	*(0.0476)*	*(0.0477)*
Real GDP %			0.0088 ***	0.0122 ***
			(0.0015)	*(0.0015)*
Inflation (CPI change)			-0.0705 ***	-0.0606 ***
			(0.0022)	*(0.0021)*
Unemployment %			0.0221 ***	0.0648 ***
			(0.0035)	*(0.0035)*
Openness of the Econ.			-0.0251 ***	-0.0285 ***
			(0.0009)	*(0.0009)*
Gov. Effectivness			3.7521 ***	2.6673 ***
			(0.0556)	*(0.0627)*
Real Effec. Exchange Rate			-0.0359 ***	-0.0028 ***
			(0.0007)	*(0.001)*
Gov. Debt % of GDP			0.0081 ***	0.0065 ***
			(0.0003)	*(0.0003)*
Current Acc. Balance % GDP			-0.0200 ***	-0.0216 ***
			(0.0018)	*(0.002)*
Pseudo R squared	0.103	0.1112	0.1429	0.1441
Area under ROC curve	0.765	0.7713	0.7898	0.7914
AIC	1350135	1337723	1290112	1288724

Table 13: Country hypothesis regression results

Source: Author's representation

5.3. Eurozone Hypothesis Results

All countries in our dataset are members of the European Union, however some of them are not part of the Eurozone. Therefore they still keep their national currencies and face exchange rate risk. These countries are also eligible for support from EU, however in the form of so-called ‘’balance-of payments’’ program. Therefore, we investigate whether there are any differences in bailout’s effect when country is part of the Eurozone as compared to when it is not a member. For non-euro countries we included Romania, Hungary and Latvia, which became euro-member in 2014 what is beyond the scope of our dataset.

Firstly, we have included EURO binary variable and EURO interaction with bailout to the Model 3 which was briefly discussed in section 5.1.. Additionally we decided to also include models run on the subsamples of Eurozone and non Eurozone countries including also country and interaction variables. The results of the subsample analysis are presented in Table 14. Model 8 is based on the sample which included data for Cyprus, Greece, Ireland and Portugal (Eurozone sample) while Model 9 includes Romania, Hungary and Latvia (non Eurozone sample). In Models 8 and 9 we have omitted country and interaction variable for Greece and Latvia respectively in order to avoid dummy variable trap.

In the Eurozone subsample, the coefficient for bailout is negative only for Ireland suggesting that increase in bailout is decreasing the probability of SME distress comparing to the other countries in the sample which have a positive coefficient. Moreover, Ireland also has a lower probability of default than Greece in time when bailout variable is zero. In non Eurozone subsample (Model 9) Latvia has a negative bailout coefficient suggesting that increase in bailout has decreasing (positive) impact on SMEs default probability. And in both Romania and Hungary, bailout has either smaller decreasing effect on probability of distress than in Latvia or increasing impact.

Within the control variables we see several differences in the results. Firstly an increase in real GDP (% change) is decreasing probability of SME default only in non Eurozone countries. As Figure 5 showed, real GDP was slightly higher in these countries as compared to Eurozone what could have an implication to the results. Secondly, coefficient for unemployment also differs between Model 8 and 9. As we already discussed earlier, in case of non Eurozone members, the possibility is that the SMEs can more easily decrease the number of employees in order to prevent distress.

Distress Rate	Model 8	Model 9
Variable	Coefficient	Coefficient
Bail-Out	0,0259 ***	-2,0186 ***
	(0.0011)	*(0.1287)*
Cyprus	-1,3214 ***	
	(0.3211)	
Hungary		0,7540 ***
		(0.0606)
Ireland	-1,0316 ***	
	(0.3176)	
Latvia		
Portugal	0,0982	
	(0.1398)	
Romania		1,6625 ***
		(0.1512)
Bail-Out * CY	0,1384	
	(0.0985)	
Bail-Out * HU		2,0476 ***
		(0.1291)
Bail-Out * IR	-0,0861 ***	
	(0.0035)	
Bail-Out * LA		
Bail-Out * PR	0,0153 ***	
	(0.0018)	
Bail-Out * RO		1,9086 ***
		(0.1273)
Crisis	0,0208	0,8406 ***
	(0.0782)	*(0.0289)*
ROA	-0,0273 ***	-0,0197 ***
	(0.0002)	*(0.0001)*
Collection Per.	0,0014 ***	0,0017 ***
	(0)	*(0)*
Current Ratio	-0,0521 ***	-0,0264 ***
	(0.0021)	*(0.0009)*
Cash / Total Assets	-0,1069 ***	0,1375 ***
	(0.03)	*(0.0171)*
Total Liab. / Total Assets	0,1959 ***	0,0994 ***
	(0.0048)	*(0.0025)*
Small	0,7664 ***	1,1218 ***
	(0.038)	*(0.0377)*
Medium	0,3671 ***	0,1126 ***
	(0.039)	*(0.0389)*
LLC	0,1750 ***	0,7966 ***
	(0.0553)	*(0.0282)*
Ltd.	0,4948 ***	0,7848 ***
	(0.0546)	*(0.0746)*
Partnership	0,1467	0,7529 ***
	(0.8)	*(0.0498)*
Real GDP %	0,1087 ***	-0,0283 ***
	(0.0079)	*(0.0038)*
Inflation (CPI change)	-0,1432 ***	-0,0632 ***
	(0.0146)	*(0.0022)*
Unemployment %	0,4124 ***	-0,1273 ***
	(0.0153)	*(0.0083)*
Openness of the Econ.	0,0225 ***	-0,0241 ***
	(0.0022)	*(0.0014)*
Gov. Effectivness	7,5672 ***	2,4460 ***
	(0.2387)	*(0.1142)*
Real Effec. Exchange Rate	0,1162 ***	0,0066 ***
	(0.0064)	*(0.0012)*
Gov. Debt % of GDP	0,0037 ***	0,0002
	(0.0005)	*(0.0005)*
Current Acc. Balance % GDP	-0,2923 ***	-0,0039
	(0.014)	*(0.0057)*
Pseudo R squared	0,17	0,13
Area under ROC curve	0,81	0,77
AIC	396266	883137

Table 14: Euro subsample hypothesis regression results

Source: Author's representation

Additionally, Model 9 showed that for sample without euro currency, government debt (% of GDP) and current account balance (% of GDP) are insignificant for modelling SME distress.

To conclude, Model 3 suggests that for Eurozone countries increase in bailout is actually increasing probability of SME distress when compared to non Eurozone countries. This was also indicated by Models 8 and 9 when we performed our analysis on subsamples. One of the explanations which will be discussed further in this chapter would be the result of austerity versus growth measures implied by the governments in the individual countries.

5.4. Crisis Hypothesis Results

We have included Crisis variable in all final models discussed during the previous sections. As we presumed in our hypothesis financial crisis had also noticeable effect on probability of SME distress. All our models are in line with our previous analyses in chapters 2-4 which suggest that probability of SMEs distress was higher after the financial crisis started than before.

5.5. Summarizing Discussion

In this chapter we have presented empirical results of our analysis where we have been inspecting bailout impacts on SMEs distress probability. We have presented 9 models and discussed 4 hypotheses. To reach the main goal of this thesis we had to overcome several challenges. The main challenge was too chose the most suitable model for our analysis. As was discussed during the literature review, there is a lack of research studying SME credit risk modelling, specifically when including macroeconomic variables. Secondly, there is generally lack of the data for SME private companies. The data also needed to be cleaned, however even though we have in the end put together quite a large sample, there may be potential biases in the dataset.

According to the regressions outputs presented earlier in this chapter, we can confirm that macroeconomic variables are significant for modelling SME default as already suggested in academic research. We can also empirically confirm that financial crisis had negative impacts on SMEs as was theoretically discussed in chapter 2. The key question however was what the impact of bailouts on SMEs is and whether the fact that country has a euro currency brings any changes.

Looking at the whole picture, our research suggests that bailout decreases probability of default in non euro countries rather than in euro countries in our sample which may be due to the larger independence for countries without the currency peg during the financial crisis. However, the results very much depend on the individual countries as such. Each bailout is coming with the inevitable austerity measures. However, the question is how are these measures implemented and how successful they are. One of the good examples would be a comparison between Latvia and Greece. Based on our results, bailout has decreasing effect on SME probability of distress in Latvia, but increasing in Greece. Both Latvia and Greece are small economies which have been severely hit by the financial crisis. However, they have applied different economic policies. While Latvia pursued strict austerity measures, Greece rather applied fiscal stimulus or ‘’limited austerity’’. However, few years later, most of the Latvia’s macroeconomic indicators are the best in our sample with real GDP growth as opposed to Greece which still heavily suffers. (Aslund A. (2013))

To conclude, based on our research, we presume that impact of the bailout programmes on probability of SMEs distress rate widely depend on the success of the austerity measures. However, our research also suggests that these measures were more successful in non Eurozone countries in our sample. Some authors generally argue that financial problems of SMEs are actually caused by the austerity measures pursued (Collignon (2013)). However, we rather believe that challenge and main task is to find optimal degree of austerity measures and structural reforms (Mayer T. and Mobert J. (2012)).

6. Conclusion

This thesis empirically investigates impact of bailouts received by several European countries on probability of the SME distress. Our sample consists of seven countries (Cyprus, Greece, Latvia, Romania, Hungary, Portugal and Ireland) from which tree (Romania, Hungary and Latvia) have not been Eurozone members during our research period i.e. from 2005 until 2013. It is presumed that receiving bailout should generally improve macroeconomic conditions in the country and therefore have a decreasing effect on the probability of SME distress since SME segment is generally sensitive to macroeconomic situation. To test this hypothesis this work uniquely connects SMEs credit risk modeling with European sovereign debt crisis and bailout issues.

One of the main challenges of this research was to overcome the lack of literature dealing with credit risk models suitable for private SMEs. In this thesis we broadly followed previous research conducted by Altman and Sabato (2007), Nam et al. (2008), Shumway (2011), Michala et al. (2014) and Tothova (2014). To test our hypotheses we have used discrete-time hazard model with time-varying variables and macro-economic dependences which, as Shumway (2001) proved, is equivalent to multi-period logit model. Our dependent variable is distress rate as presented by Michala et al. (2014). The definition is based on several conditions which then specify when company is considered to be distressed. However, comparing to Michala et al. (2014) we have adjusted the definition by including more conditions in order to overcome uncovered difficulties. Following Altman and Sabato (2007) and Michala et al. we have included firm-specific financial and quantitative control variables as well as macroeconomic indicators which have so far been tested only by few researchers. In order to study impact of bailouts, we have constructed bailout variable including amounts of money received by individual countries.

Our empirical results suggest that all three categories of control variables are significant in SME distress modeling. Firm-specific financial ratios have already been broadly used by researchers. However, there is lack of studies including also qualitative and macroeconomic variables. We show that size and legal type of the company are significant. Based on our results, smaller SMEs have higher probability of default than the larger ones. Also companies with the limited, limited liability a partnership status has greater probability of distress than other types. We can also confirm that macroeconomic variables added significant value to our research what

was also shown by increased area under the ROC and smaller AIC once these variables were included.

Considering our hypotheses, we successfully confirmed basic hypothesis, that probability of SME default is higher during the crisis. Our research also suggest that euro hypothesis is not proven since empirical results rather suggest that bailouts have better impact on probability of SME distress in non Eurozone countries presumably caused by higher independence in monetary decisions. However, all bailouts or financial assistance programs primary come with the requirement for application of austerity measures. And, as our results suggest, bailout impact on SMEs probability of distress depend on the success of these measurements (as an example case of Latvia versus Greece).

This empirical research provided several contributions to existing academic discussions. Firstly, it is only second research which applied SME credit model on the sample of more than one country and confirmed the need of macroeconomic variables for this type of models. Secondly, it empirically touched question considering impacts of financial assistance programs provided on government level on the private SME sector. In this sense there is definitely broad room for further research since, as noticed, our results are not completely straight forward. Additionally, it would be definitely valuable to focus on actual austerity measures and their success in individual countries and the connection to SMEs. And finally, we would recommend testing our hypotheses once more extensive set of crisis / after crisis data is available.

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Bibliography

1. Altman, Edward I. (1968). “Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy.” The Journal of Finance 23(4), 589-609.
2. Altman, E.I. and G. Sabato (2005) Effects of the new Basel Capital Accord on Bank Capital Requirements for SMEs. Journal of Financial Services Research, Vol. 28 (1/3), pp. 15-42.
3. Altman, Edward I., and Gabriele Sabato. (2007). “Modelling Credit Risk for SMEs: Evidence from the U.S. Market.” Abacus 43(3), 332-357.
4. Altman, Edward I., Gabriele Sabato, and Nicholas Wilson. (2010). “The Value of Non-Financial Information in SME Risk Management.” Journal of Credit Risk 6(2), 95-127.
5. Beaver, W., (1966), “Financial ratios as predictors of failure.” Empirical research accounting: selected studies. Journal of Accounting Research (Supplement)5, 179-199
6. Berger, Allen N. (2006), “Potential Competitive Effects of Basel II on Banks in SME Credit Markets in the United States”, Journal of Financial Services Research, Vol.28, 2006.
7. Berger, Allen N. and Gregory F. Udell (2004), “A More Complete Conceptual Framework about SME Finance”, World Bank Conference an “SME: Overcoming Growth Constraints”, 14-15 October 2004.
8. Frame W. Scott and Berger, Allen N. (2005), “Small Business Credit Scoring and Credit Availability”, Federal Reserve Bank of Atlanta, Working Paper Series Nr. 10, 2005.
9. Berk J. and DeMarzo P. (1962). “Corporate Finance” Pearson, ISBN 978-0-13-299247-3
10. Blum, M., “Failing company discriminant analysis”, Journal of Accounting Research, Vol. 12, nr. 1, 1974.
11. Carling, K., Jacobson, T., Lindé, J., Roszbach, K. (2007). Corporate credit risk modeling and the macroeconomy. Journal of Banking and Finance, 31 (3). 845–868.

12. Cox, D. (1972). “Regression models and life tables.” Journal of the Royal Statistical Society, Series B, 34(2). 187-220.

13. Crouhy, M., Galai, D., 2000. A comparative analysis of current credit risk models. Journal of Banking and Finance, Special issue on credit risk modeling and regulatory issues 24, 59–117.

14. Deakin, E., “A discriminant analysis of predictors of business failure”, Journal of Accounting Research, Vol. 10, nr. 1, 1972.

15. Dietsch, M., and J. Petey, ‘Should SME Exposures Be Treated as Retail or as Corporate Exposures? A Comparative Analysis of Default Probabilities and Asset Correlation in French and German SMEs’, Journal of Banking and Finance, Vol. 28, No. 7, 2004.

16. Edmister, R., “An Empirical Test of Financial Ratio Analysis for Small Business Failure Prediction”, Journal of Financial and Quantitative Analysis, 1972.

17. Eisenbeis, 1977, Pitfalls in the application of discriminant analysis in business. Journal of Finance, Vol. 32, nr. 3, June 1977, p. 875-900

18. European Commission (2003), “Commission Recommendation 2003/361/EC.” Official Journal of the European Union L 124, p. 36 of 20 May 2003

19. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Portugal” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/portugal_en.pdf

20. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Romania” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/romania_en.pdf

21. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Latvia” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/latvia_en.pdf

22. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Ireland” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/ireland_en.pdf

23. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Cyprus” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/cyprus_en.pdf

24. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Hungary” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/hungary_en.pdf

25. European Commission (2013), “Enterprise and Industry 2013 SBA Fact Sheet Greece” http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/countries-sheets/2013/greece_en.pdf

26. European Commission (2015), ‘’Financial assistance in EU Member States” http://ec.europa.eu/economy_finance/assistance_eu_ms/index_en.htm

27. European Commission (2015), ‘Economic Adjustment Programme for Cyprus” http://ec.europa.eu/economy_finance/assistance_eu_ms/cyprus/index_en.htm

28. European Commission (2015), ‘Financial assistance to Greece” http://ec.europa.eu/economy_finance/assistance_eu_ms/greek_loan_facility/index_en.htm

29. European Commission (2015), “Balance-of-payments assistance to Hungary” http://ec.europa.eu/economy_finance/assistance_eu_ms/hungary/index_en.htm

30. European Commission (2015), “Post-Programme Surveillance for Ireland” http://ec.europa.eu/economy_finance/assistance_eu_ms/ireland/index_en.htm

31. European Commission (2015), “Post-Programme Surveillance for Latvia” http://ec.europa.eu/economy_finance/assistance_eu_ms/latvia/index_en.htm

32. European Commission (2015), “Post-Programme Surveillance for Portugal” http://ec.europa.eu/economy_finance/assistance_eu_ms/portugal/index_en.htm

33. European Commission (2015), “Balance-of-payments assistance to Romania” http://ec.europa.eu/economy_finance/assistance_eu_ms/romania/index_en.htm

34. European Commision (2014), “A partial and fragile recovery”, Annual Report on European SMEs 2013/2014, http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2014/annual-report-smes-2014_en.pdf

35. European Commision (2034), “A recovery on the horizon?”, Annual Report on European SMEs 2012/20143, http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/files/supporting-documents/2013/annual-report-smes-2013_en.pdf

36. Goudie A.W. and G. Meeks (1991), “The Exchange Rate and Company Failure in a Macro-Micro Model of the UK Company Sector.” The Economic Journal, Vol. 101, No. 406 (May, 1991), pp. 444-457

37. Hol Suzan (2007), “The influence of the business cycle on bankruptcy probability.” Intl. Trans. in Op. Res. 14 (2007) 75–90

38. Kolari, James W. and Hwan G. Shin, “Assessing the Profitability and Riskiness of Small Business Lenders in the U.S. Banking Industry”, www.sba.gov, 2004

39. Marianna Valentinyi-Endresz and Zoltan Vasary (2008), “Macro stress testing with sector specific bankruptcy models.” Magyar Nemzeti Bank, MNB Working Papers 2008/2, ISSN 1585 5600

40. Michala D., Grammatiko T. and Ferreira Filipe S. (2014). Forecasting Distress in European SME Portfolios. EIF Working Paper Series No 13-17, LSF Research Working Paper Series No 13-02.

41. Mejstrik M., Pecena M. and Teply P. (2008). “Basic principles of banking.” Univerzita Karlova v Prahe, Nakladatelstvi Karolinum 2009. ISBN 978-80-246-1500-4.

42. Nam, Chae Woo, Tong Suk Kim, Nam Jung Park, and Hoe Kyung Lee (2008). “Bankruptcy Prediction Using a Discrete-Time Duration Model Incorporating Temporal and Macroeconomic Dependencies.” Journal of Forecasting 27(6), 493–506.

43. Ohlson, J. (1980). “Financial ratios and the probabilistic prediction of bankruptcy”, Journal of Accounting Research, Vol. 18, nr. 1, 1980

44. Rose P., Andrews W., Giroux G. (1982). Predicting business failure: a macroeconomic perspective. Journal of Accounting, Auditing and Finance 6, 20–31

45. Jay C Shambaugh, Ricardo Reis, Hélène Rey (2012), “The Euro’s Three Crisis”, Brookings Papers on Economic Activity 157-231, Brookings Institution Press.

46. Shumway, Tyler. (2001). “Forecasting Bankruptcy More Accurately: A Simple Hazard Model.” Journal of Business 74(1), 101-124

47. Taffler, R.J. and Tisshaw H. (1977). “Going, Going, Gone - Four Factors Which Predict”, Accountancy, Vol. 88, 1977

48. Zmijewski, M.E. (1984). “Methodological issues related to the estimation of financial distress prediction models”, Journal of Accounting Research, Supplement to Vol. 22, 1984

49. Peseran, M. H., T. Schuermann, B.-J. Treutler, and S. M. Weiner (2006). Macroeconomic Dynamics and Credit Risk: A Global Perspective. Journal of Money, Credit, and Banking 38, 1211–1262.

50. Duffie, D., L. Saita, and K. Wang (2007). Multi-period corporate default prediction with stochastic covariates. Journal of Financial Economics 83, 635–665.

51. Bonfim, D. (2006). Credit risk drivers: Evaluating the contribution of firm level information and of macroeconomic dynamics. Financial Stability Report 2006, Banco de Portugal.

52. Carling, K., T. Jacobson, J. Linde, and K. Roszbach (2007). Corporate credit risk ´ modeling and the macroeconomy. Journal of Banking and Finance 31(3), 845– 868.

53. Fraser S. (2012), “The Impact of the financial crisis on bank lending to SMEs”, Department for Business Innovation & Skills, Warwick Business School, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/34739/12-949-impact-financial-crisis-on-bank-lending-to-smes.pdf

54. Laekholm-Jensen, Thais, David Lando, Mamdouh Medhat. 2013. “Cyclicality and Firm Size in Private Firm Defaults”. Working Paper

55. Cochran, A.B. (1981), ‘Small Business Mortality Rates: A Review of the Literature’, Journal of Small Business management, 19 (4), pp 50-59.

56. Ulmer, K. J., and Nielsen (1974), ‘Business Turnover and Causes of Failure’, Survey of Current business Research, pp10-16.

57. Watson, J., Everett, J. E. (1993). Defining small business failure. International Small Business Journal, 3(11).35–48.

58. Sputnik International (2012) , “Cyprus Gets Second 1.32Bln Euro Russian Loan Tranche”, http://sputniknews.com/business/20120126/170965548.html

59. EFSF (2015), Lending Operations, ‘’Facility Agreements’’ http://www.efsf.europa.eu/about/operations/index.htm

60. Collignon S. (2013), “Finance of small business firms in times of austerity”, Part of the compilation PE 507.469 for the Monetary Dialogue, European

Parliament, http://www.academia.edu/6286635/Finance_of_small_business_firms_in_times_of_austerity

61. Mayer T. and Mobert J. (2012), "Growth versus austerity in euroland", Research Briefing European integration, Deutsche Bank, DB Research, https://www.dbresearch.com/PROD/DBR_INTERNET_EN-PROD/PROD0000000000288303/Growth+versus+austerity+in+euroland.pdf

62. Aslund A. (2013), "Why Austerity Works and Stimulus Doesn't", BloombergView, http://www.bloombergview.com/articles/2013-01-07/why-austerity-works-and-fiscal-stimulus-doesn-t

63. Bekeris R. (2012), "The impact of macroeconomic indicators upon Sme's profitability", International Business School at Vilnius University, Lithuania, ISSN 1392-1258. EKONOMIKA 2012 Vol. 91(3)

64. BBC News (2009), "Latvia's economy shrinks rapidly", http://news.bbc.co.uk/2/hi/business/7879529.stm

65. International Monetary Fund (2015), "Special Drawing Rights (SDRs), Factsheet, http://www.imf.org/external/np/exr/facts/sdr.htm

66. International Monetary Fund (2008), "IMF Executive Board Approves €12.3 Billion Stand-By Arrangement for Hungary", Press Release No. 08/275 November 6, 2008, https://www.imf.org/external/np/sec/pr/2008/pr08275.htm

67. Buchlakova L. (2015), "Eurozóna nepredĺži Grécku program pomoci", Pravda, http://spravy.pravda.sk/ekonomika/clanok/359793-situacia-s-greckom-sa-vyhrotila-hrozi-mu-bankrot/

68. CTK, Reuter, iDnes (2015), "Tsipras vyhlásil referendum, Řekové rozhodnou o dohodě s věřiteli", iDnes, http://zpravy.idnes.cz/recko-bankrot-referendum-0h1-/zahranicni.aspx?c=A150627_002857_zahranicni_aha

69. D'Imperio R., "Growing the global economy through SMEs", Edinburgh Group, http://www.edinburgh-group.org/media/2776/edinburgh_group_research_-_growing_the_global_economy_through_smes.pdf

70. OECD (2009), "The Impact of the Global Crisis on SME and Entrepreneurship Financing and Policy Responses". Contribution to the OECD Strategic

Response to the Financial and Economic Crisis,
http://www.oecd.org/cfe/smes/43183090.pdf

71. BBC News (2012), "Cyprus's credit rating cut to junk status by Fitch",
http://www.bbc.com/news/business-18577983

72. Tothova S., (2014), "Impacts of Euro adoption on SME's distress rate", Master Thesis, University of Amsterdam

73. International Monetary Fund (2015), Country Info, ''Transactions with the fund'' http://www.imf.org/external/country/PRT/index.htm ,
http://www.imf.org/external/country/CYP/index.htm,
http://www.imf.org/external/country/GRC/index.htm,
http://www.imf.org/external/country/LVA/index.htm,
http://www.imf.org/external/country/PRT/index.htm,
http://www.imf.org/external/country/IRL/index.htm,
http://www.imf.org/external/country/ROU/index.htm,
http://www.imf.org/external/country/HUN/index.htm

International Statistical Databases

Eurostat
(http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/)

International Monetary Fund – exchange rates for SDR
(http://www.imf.org/external/np/fin/data/param_rms_mth.aspx)

World Bank

(http://www.worldbank.org/)

OANDA – exchange rates trading platform
(http://www.oanda.com/)

AMADEUS – private listed companies database. Accessed through UvA and WRDS
(http://wrds-web.wharton.upenn.edu/wrds/)

Moody's – rating agency and database.

(https://www.moodys.com/)

Software

STATA – Statistical Program.

Appendix

Appendix A – European Union Definition of SME

European SME definition was implemented on 1.1. 2005

Company category	Employees	Turnover	Balance Sheet Total
Medium-sized	<250	≤ € 50 m	≤ € 43 m
Small	<50	≤ € 10 m	≤ € 10 m
Micro	<10	≤ € 2 m	≤ € 2 m

Table 15: SME definition

Source: European Commission

Appendix B – Variables Description

- **Financial Variables**

Name	Formula
Sales to Working Capital	= turnover / (current assets – current liabilities)
Leverage 1	= Total Debt / EBIT
Leverage 2	= Total Debt / EBITDA
Long Term Liabilities to Working Capital	= net curretnt liabilities / (current assets – current liabilities)
Cash to Total Assets	= Cash / Total Assets
Working Capital to Total Assets	=(Current Assets – Current Liabilities) / Total Assets
Cash to Sales	= Cash / Tournover
Net Assets Turnover	= Turnover / Total Assests
Return on Assets	=Net Income/ Total Assets
Collection Period	= 365/ Receivables Turnover
Current Ratio	= Current Assets / Current Liabilities
Solvency Ratio	=(Net Income + Depreciation) / Total Liabilities
EbitDa Margin	= EBITDA / Turnover
Ebit Margin	= EBIT / Turnover
Profit Margin	= Net Income / Turnover
Interest Cover	= EBIT / Interest Expense
Total Liabilities to Total Assets	= Total Liabilities / Total Assets

Source: Amadeus Database and Author's computations

- **Qualitative Variables**

Variable Name	Definition
Ltd. / Llt. / Partnership	Equal to one if company is Limited, Limited Liability or Partnership Company, zero otherwise.
Small/Medium/Large	Equal to one if company is marked as Small/Medium/Large (Small/Medium Large distribution is approximately comparable to Micro/Small/ Medium as stated by EU SME definition), zero otherwise

Source: Amadeus Database and Author's Computations

- **Macroeconomic Variables**

Economic Structure and Performance
Nominal GDP (US$ Bil.)
Population (Mil.)
GDP per capita (US$)
GDP per capita (PPP basis, US$)
Nominal GDP (% change, local currency)
Real GDP (% change)
Inflation (CPI, % change Dec/Dec)
Unemployment Rate (%)
Gross Investment/GDP
Gross Domestic Saving/GDP
Nominal Exports of G & S (% change, US$ basis)
Nominal Imports of G & S (% change, US$ basis)
Real Exports of G & S (% change)
Real Imports of G & S (% change)
Net Exports of G & S/GDP
Openness of the Economy
Government Effectiveness

Government Finance
Gen. Gov. Revenue/GDP
Gen. Gov. Expenditures/GDP
Gen. Gov. Financial Balance/GDP
Gen. Gov. Primary Balance/GDP
Gen. Gov. Debt (US$ Bil.)
Gen. Gov. Debt/GDP
Gen. Gov. Debt/Gen. Gov. Revenue
Gen. Gov. Int. Pymt/Gen. Gov. Revenue

External Payments and Debt
Nominal Exchange Rate (local currency per US$, Dec)[3]
Real Eff. Exchange Rate (% change)
Relative Unit Labor Costs (2010 = 100)
Current Account Balance (US$ Bil.)
Current Account Balance/GDP
Net Foreign Direct Investment/GDP
Net International Investment Position/GDP
Official Forex Reserves (US$ Bil.)

Source: Moody's Statistics

Appendix C – Correlation Matrixes

1) Macroeconomic Variables

	BailOut	Popula~l	GDPper~S	RealGD~e	Inflat~c	Unempl~e	GrossI~P
BailOut	1.0000						
Population~l	-0.2415	1.0000					
GDPpercapi~S	0.2446	-0.6881	1.0000				
RealGDPcha~e	-0.4149	0.2673	-0.2828	1.0000			
InflationC~c	-0.1307	0.5170	-0.5784	0.2928	1.0000		
Unemployme~e	0.5861	-0.6941	0.4637	-0.4219	-0.5281	1.0000	
GrossInves~P	-0.5433	0.6232	-0.5422	0.5962	0.5712	-0.8119	1.0000
GrossDomes~P	-0.0779	0.0289	-0.1100	0.0150	0.1062	-0.2418	0.1474
Opennessof~1	0.1320	-0.4607	0.0951	-0.0454	-0.0301	0.1803	-0.2797
Government~2	0.2514	-0.9037	0.8232	-0.3261	-0.6443	0.6682	-0.7435
GenGovDebt~l	0.5084	-0.5031	0.7162	-0.4800	-0.5679	0.6670	-0.7650
GenGovDebt~P	0.5890	-0.6590	0.6679	-0.5375	-0.5811	0.7978	-0.8910
RealEffExc~g	-0.1981	0.3110	-0.2597	0.4454	0.3132	-0.2658	0.1515
CurrentAcc~l	0.2628	-0.0841	-0.2694	-0.2286	-0.0071	0.3060	-0.3294
CurrentAcc~P	0.3572	-0.2182	-0.0367	-0.4351	-0.2684	0.4430	-0.5471
NetForeign~D	-0.1600	0.3027	-0.3163	0.4281	0.2952	-0.1247	0.2885
NetInterna~s	-0.3876	0.6858	-0.5751	0.6080	0.5586	-0.6872	0.7779
OfficialFo~l	-0.1711	0.6422	-0.7348	0.1558	0.4771	-0.5701	0.4912

	GrossD~P	Openne~1	Govern~2	GenGov~l	GenGov~P	RealEf~g	Curren~l
GrossDomes~P	1.0000						
Opennessof~1	0.7356	1.0000					
Government~2	-0.1838	0.2690	1.0000				
GenGovDebt~l	-0.4481	-0.1430	0.7138	1.0000			
GenGovDebt~P	-0.2608	0.1449	0.7984	0.9381	1.0000		
RealEffExc~g	-0.2455	-0.1329	-0.2581	-0.2492	-0.3268	1.0000	
CurrentAcc~l	0.6015	0.5907	-0.0620	-0.1932	0.0633	-0.0622	1.0000
CurrentAcc~P	0.5814	0.5996	0.1371	0.0722	0.3197	-0.2814	0.8943
NetForeign~D	-0.0854	-0.1325	-0.3285	-0.2832	-0.3212	0.2597	-0.0204
NetInterna~s	0.0881	-0.2608	-0.7974	-0.7618	-0.8802	0.5149	-0.1006
OfficialFo~l	0.6488	0.2956	-0.7590	-0.6847	-0.5934	0.0199	0.4061

	Curren~P	NetFor~D	NetInt~s	Offici~l
CurrentAcc~P	1.0000			
NetForeign~D	-0.2271	1.0000		
NetInterna~s	-0.3523	0.3904	1.0000	
OfficialFo~l	0.3072	0.1036	0.4444	1.0000

2) Macroeconomic Variables Final Group

	RealGD~e	Inflat~c	Unempl~e	Openne~1	Govern~2	RealEf~g	GenGov~l	Curren~P
RealGDPcha~e	1.0000							
InflationC~c	0.2928	1.0000						
Unemployme~e	-0.4219	-0.5281	1.0000					
Opennessof~1	-0.0454	-0.0301	0.1803	1.0000				
Government~2	-0.3261	-0.6443	0.6682	0.2690	1.0000			
RealEffExc~g	0.4454	0.3132	-0.2658	-0.1329	-0.2581	1.0000		
GenGovDebt~l	-0.4800	-0.5679	0.6670	-0.1430	0.7138	-0.2492	1.0000	
CurrentAcc~P	-0.4351	-0.2684	0.4430	0.5996	0.1371	-0.2814	0.0722	1.0000

3) Financial Variables

	SalesWCw	rtasw	etmaw	icw	collw	currw	solrw
SalesWCw	1.0000						
rtasw	0.0435	1.0000					
etmaw	-0.0012	0.6412	1.0000				
icw	0.0177	0.3740	0.2445	1.0000			
collw	-0.0090	-0.0760	-0.0012	-0.0360	1.0000		
currw	0.0049	0.0788	0.0858	0.1115	0.0383	1.0000	
solrw	0.0418	0.3991	0.3200	0.2211	0.0144	0.3311	1.0000
LTliaw	0.4813	-0.0004	0.0074	-0.0116	0.0095	0.0417	-0.0155
CashTAw	0.0229	0.2148	0.1065	0.2074	-0.2107	0.2124	0.2550
WCtaw	0.0790	0.2758	0.1179	0.1712	0.1495	0.5064	0.6155
cashREVw	-0.0107	0.0626	0.1473	0.1155	0.0338	0.2677	0.2240
LiTaw	-0.0418	-0.3991	-0.3199	-0.2206	-0.0143	-0.3303	-0.9994
LevEBITw	0.0032	0.0265	0.0806	-0.0389	0.0499	-0.0629	-0.0036
LevEBITDAw	0.0027	0.0169	0.0886	-0.0509	0.0662	-0.0742	-0.0171
ebitmarginw	0.0175	0.6876	0.8543	0.2696	-0.0566	0.0833	0.3143

	LTliaw	CashTAw	WCtaw	cashREVw	LiTaw	LevEBITw	LevEB~Aw
LTliaw	1.0000						
CashTAw	-0.0137	1.0000					
WCtaw	0.0685	0.2827	1.0000				
cashREVw	0.0005	0.6604	0.2165	1.0000			
LiTaw	0.0154	-0.2542	-0.6154	-0.2234	1.0000		
LevEBITw	-0.0083	-0.0674	-0.0317	-0.0349	0.0035	1.0000	
LevEBITDAw	-0.0133	-0.0781	-0.0489	-0.0293	0.0170	0.4815	1.0000
ebitmarginw	0.0061	0.1414	0.2264	0.0614	-0.3142	0.1035	0.1040

	ebitma~w
ebitmarginw	1.0000

4) Financial Variables – Final Group

	rtasw	collw	currw	CashTAw	LiTaw
rtasw	1.0000				
collw	-0.0483	1.0000			
currw	0.1327	0.0485	1.0000		
CashTAw	0.2772	-0.1764	0.2407	1.0000	
LiTaw	-0.4143	-0.0624	-0.1986	-0.1419	1.0000

5) Final Control Variables Group

	rtasw	collw	currw	CashTAw	LiTaw	Small	Medium	LLC	Ltd	Partner	RealGD~e	Inflat~c	Unempl~e
rtasw	1.0000												
collw	-0.0483	1.0000											
currw	0.1327	0.0485	1.0000										
CashTAw	0.2772	-0.1764	0.2407	1.0000									
LiTaw	-0.4143	-0.0624	-0.1986	-0.1419	1.0000								
Small	-0.0641	-0.0366	0.0712	0.1056	0.1150	1.0000							
Medium	0.0591	0.0349	-0.0633	-0.0916	-0.1046	-0.9276	1.0000						
LLC	0.0171	-0.0821	0.0065	-0.0004	0.0823	0.2130	-0.1592	1.0000					
Ltd	-0.0238	0.1057	-0.0269	-0.0238	-0.0601	-0.1840	0.1363	-0.8670	1.0000				
Partner	-0.0021	-0.0269	-0.0015	-0.0051	0.0118	0.0130	-0.0136	-0.1341	-0.0210	1.0000			
RealGDPcha~e	0.1180	-0.1225	-0.0264	0.0119	0.0191	0.0679	-0.0571	0.1842	-0.2089	0.0124	1.0000		
InflationC~c	0.0788	-0.1257	-0.0391	-0.0500	0.0326	0.0440	-0.0364	0.2225	-0.2443	0.0355	0.3723	1.0000	
Unemployme~e	-0.0663	0.1045	0.0469	0.0245	-0.0568	-0.0962	0.0818	-0.2718	0.2985	-0.0252	-0.4492	-0.5554	1.0000
Opennessof~1	0.0241	-0.1298	0.0339	0.0628	-0.0050	-0.1112	0.0679	-0.0521	-0.1007	0.0573	0.1181	-0.0867	0.1904
Government~2	-0.0662	0.1293	0.0329	0.0506	-0.1005	-0.0837	0.0647	-0.3101	0.3277	-0.0306	-0.3286	-0.7043	0.6782
RealEffExc~g	0.1138	-0.0704	-0.0344	-0.0039	-0.0047	0.0352	-0.0289	0.0856	-0.0945	0.0155	0.4327	0.3555	-0.2511
GenGovDebt~l	-0.0857	0.2038	0.0327	0.0171	-0.0994	-0.1290	0.1109	-0.4142	0.4755	-0.0361	-0.5173	-0.5999	0.6936
CurrentAcc~P	-0.0704	-0.0074	0.0627	0.0215	0.0609	-0.0307	0.0198	-0.0090	-0.0371	0.0152	-0.4606	-0.2981	0.4573

	Openne~1	Govern~2	RealEf~g	GenGov~l	Curren~P
Opennessof~1	1.0000				
Government~2	0.1704	1.0000			
RealEffExc~g	-0.0173	-0.2490	1.0000		
GenGovDebt~l	-0.1866	0.7478	-0.2709	1.0000	
CurrentAcc~P	0.4205	0.0532	-0.2372	0.1148	1.0000