COMENIUS UNIVERSITY IN BRATISLAVA
Faculty of Mathematics, Physics and Informatics

FINANCIAL ACCELERATOR AND CORPORATE INTEREST RATE IN SELECTED COUNTRIES

Bratislava 2010

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UNIVERZITA KOMENSKÉHO V BRATISLAVE
FAKULTA MATEMATIKY, FYZIKY A INFORMATIKY

FINANČNÝ AKCELERÁTOR A ÚROKOVÁ MIERA PRE PODNIKY VO VYBRANÝCH KRAJINÁCH

Diplomová práca

Študijný odbor:	9.1.9 Aplikovaná matematika
Študijný program:	Ekonomická a finančná matematika
Vedúci práce:	Prof. Dr. Jarko Fidrmuc

BRATISLAVA 2010 Andrej Arady

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FINANCIAL ACCELERATOR AND CORPORATE INTEREST RATE IN SELECTED COUNTRIES

Master Thesis

Branch of study:	9.1.9 Applied Mathematics
Study programme:	Economic and Financial Mathematics
Supervisor:	Prof. Dr. Jarko Fidrmuc

BRATISLAVA 2010 Andrej Arady

DECLARATION ON WORD OF HONOUR

I declare this thesis was written on my own, with the only help provided by my supervisor and reffered- to literature.

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Andrej Arady

ACKNOWLEDGMENT

I would like to express special thanks to my supervisor Prof. Dr. Jarko Fidrmuc for all of the support and guidiance he offered throughout the elaboration of this thesis.

ABSTRACT

ARADY, Andrej: *Financial Accelerator and Corporate Interest Rate in Selected Countries* [Master thesis] – Department of Applied Mathematics and Statistics. Faculty of Mathematics, Physics and Informatics. Comenius Unversity, Bratislava. Branch of study: Applied Mathematicas – Economic and Financial Mathematics. – Supervisor: Prof. Dr. Fidrmuc, Jarko – Bratislava: 2010. – 54p

The aim of this master thesis is to analyze the determinants of corporate interest rate in selected countries on basis of balance sheet items and income statements items of the firm. Moreover, we examine the impact of monetary policy through the balance sheet channel of transmission mechanism and the heterogeneity of this impact, given the size of the firm and the phase of the business cycle. We use a panel data for four countries, but during the analysis, we limited further study to Slovakia, Poland and Bulgaria. The sample period for individual countries vary in the range from 1998 to 2005. We find that the selected balance sheet and income statements indicators significantly affect the corporate interest rate. Our results rejected the heterogeneity of the impact of monetary policy in these selected countries.

Keywords: monetary transmission, corporate interest rate, financial accelerator, balance sheet channel

ABSTRAKT

ARADY, Andrej: *Finančný akcelerátor a úroková miera pre podniky vo vybraných krajinách* [Diplomová práca] – Katedra aplikovanej matematiky a štatistiky. Fakulta matematiky, fyziky a informatiky. Univerzita Komenského v Bratislave. Magisterský študijný odbor: aplikovaná matematika – ekonomická a finančná matematika. – Vedúci diplomovej práce: Prof. Dr. Jarko Fidrmuc – Bratislava: FMFI UK, 2010. – 54s

Cieľom práce je analyzovať determinanty úrokovej miery pre podniky vo vybraných krajinách na základe súvahových položiek a položiek z výkazu ziskov a strát podniku. Navyše v práci skúmame vplyv monetárnej politiky prostredníctvom kanálu súvahových položiek transmisného mechanizmu a heterogenitu tohto vplyvu vzhľadom na veľkosť podniku a fázu hospodárskeho cyklu. V práci pracujeme s panelovými dátami pre štyri krajiny, avšak v priebehu analýzy sme pozorovania obmedzili na Slovensko, Poľsko a Bulharsko. Pozorované obdobia sa u jednotlivých krajín líšia v rozmedzí rokov 1998 až 2005. Ukázali sme, že vybrané súvahové položky významne ovplyvňujú úrokovú mieru podnikov. Heterogenita vplyvu monetárnej politiky prostredníctvom repo sadzieb sa na základe našich výsledkov nedokázala.

Kľúčové slová: Transmisný mechanizmus, úroková miera, finančný akcelerátor, súvahový kanál

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INTRODUCTION

Even thought that the monetary policy is a powerful tool, it has sometimes an unexpected effect. To successfully conduct monetary policy is important the proper timing and careful assessments of its impact on the economy. This requires a thorough understanding of the mechanisms by which monetary policy affects the economy. Especially, it is necessary to know this mechanism in countries that are preparing to enter the euro area such as Poland or Bulgaria to the correct stance of monetary policy for convergence. But also for the countries that entered into euro area recently, such as Slovenia in 2007 or Slovakia in 2009, for the proper stance of monetary policy according to the euro zone. The chain of economic ties, which allows the changes in settings of the operational objective to have led to the expected change in inflation, is called the transmission mechanism (see Jilek, [16]). This mechanism together with a short review on monetary policy is described in Chapter 1. In this chapter, we also present short review on financial accelerator based on available literature.

Moreover, we present impact of monetary policy in selected countries over the business cycle. This is necessarily to know especially in time of financial crisis. We also estimate weather the monetary policy has heterogeneous effect according to the firm size, because banks tend to worsen credit conditions for small firms. Such knowledge enables us to predict the impact of economic crisis with respect to different groups of companies according to their size.

In Chapter 2, we present the description of our dataset and short review on corporate implicit interest rate. In chapter 3 we present regression analysis on determinants of corporate interest rate according to balance sheet and income statements indicators. We also present descriptive statistics for selected variables. In Chapter 4 we extend regression analysis to be able to examine the impact of monetary policy and test the presence of the financial accelerator. In next chapter we conclude. Finally, the Appendix contains list of available information from our dataset and source codes for STATA used in our analysis.

1 MONETARY POLICY

Monetary policy is a regulation of operational objectives (usually short term interest rate) by central bank via monetary policy tools for achieving the intermediate goal and finally the final objective that is usually the inflation. According to the settings of operational objectives, we distinguish the expansionary monetary policy and the tight monetary policy. During the expansionary monetary policy reduces central bank the short term interest rate, reducing the rate on other interest rates in economy. Commercial banks are likely to provide credits during this period and borrowers are likely to accept new credits. In addition, households and businesses increasing the circulation of money, which stimulates the economy. This does increase the inflation, hence as soon as the interest rate is reduced on the desired level, the central bank again keep inflation under the control and initiate a tight monetary policy. Contrary, during restrictive monetary policy, central bank increases the market short-term rate, increasing the rate on other rates in economy. This reduces the volume of borrowing and provided credits. In addition, households and businesses decreasing the circulation of money. The tight monetary policy is used in the inflation threat. The final objective of monetary policy, which affects through the tools of monetary policy, is price stability, i.e. low inflation. It turn out that price stability contributes to the maximum GDP, to employment and long-term low interest rate. Contrary highly instable inflation has negative consequences for economic dynamics (Jílek, [16]).

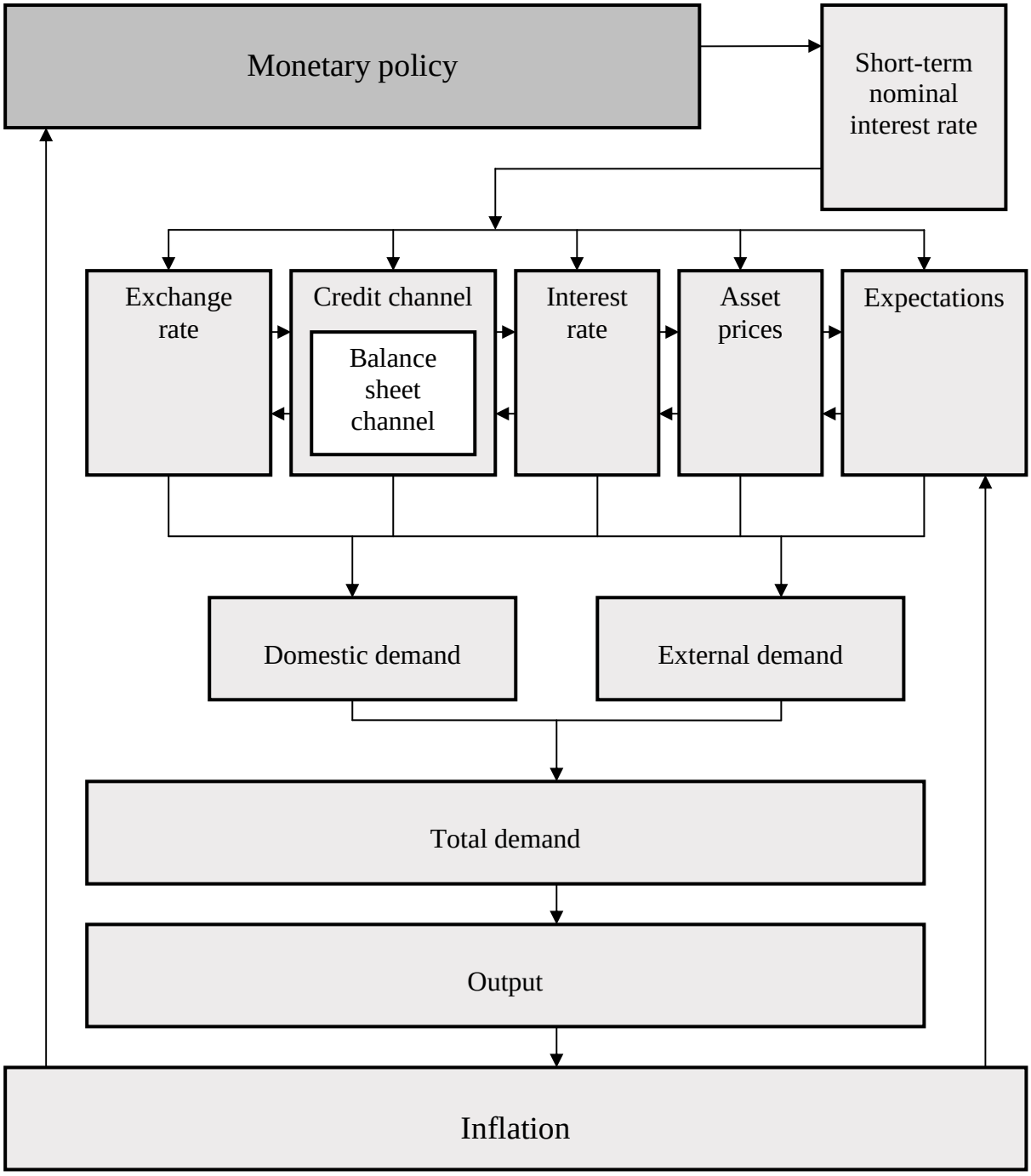
Delay in the Monetary Policy

There is a lag in monetary policy; because today's monetary policy decisions affect the inflation and GDP during year and two. Therefore, if the central bank responds to unwanted developments in inflation or GDP at the time, when this is evident, it will be probably too late. According to developed economies, it takes about one year, while the changes in monetary policy have the greatest impact on demand and next one year, until these changes have the greatest impact on inflation. Therefore, the central bank pays close attention to forecast of economic development, under which implements the decisions.

1.1 The Transmission Mechanism of Monetary Policy

The transmission mechanism is a chain of economic links through which monetary policy decisions affect the economy as a whole and the price level. These objectives may be achieved only indirectly and with some delays. Bernanke and Gertler [3] identified this process as a "black box". Nevertheless, we know different ways, called channels of transmission mechanism through which these objectives can be achieved. However, they are characterized by different time shifts and versatility. Therefore it is difficult to predict the real impact of monetary policy on the economy and the price level. Individual channels of transmission mechanism are shown in Figure 1.1. For simplicity, there are not shown all relationships between the variables, but these may be also important. There are many studies of transmission mechanism, but we have drawn from the scheme providing (Égert and MacDonald [10]), which provides a comprehensive look at the issue and from Bank of England study, presented at the Transmission Mechanism of Monetary Policy [22] .

Figure 1.1.: Overview of the Transmission Mechanism



Interest rate channel is the basic mechanism of the traditional Keynesian model. The transmission mechanism of monetary policy in the real economy, we can illustrate the following schematic diagram (Mishkin, [18])

$$M\downarrow \Rightarrow i\uparrow \Rightarrow I\downarrow \Rightarrow Y\downarrow;$$

where $M\downarrow$ denotes a restrictive monetary policy, leading to increase in real interest rates, resulting in an increase in the cost of capital. By this caused a decrease in investments $I\downarrow$ leads to a drop in global demand and a decline in production $Y\downarrow$. This is the basic mechanism of the traditional IS curve of IS-LM model.

Monetary policy is also effective in influencing the market value of securities such as bonds, stocks and equities. Expansionary monetary policy increases the money supply causes the growth of liquidity levels above the desired level. This leads to a reduction of available market liquidity by purchasing of assets, causing an increase in their prices. Increasing the price of the bonds influences inversely to the amount of interest rates. Reduced interest rate applied to increase the attractiveness of shares by enhancing their purchase, which is another reason for increasing their prices. This channel of transmission mechanism in known as ***asset price channel.*** However, (Égert and MacDonald [10]) indicate that the reaction of asset prices in monetary policy may be asymmetrical.

In open macroeconomic models is also an important channel an ***exchange rate channel.*** Understanding the function of this channel in the transmission mechanism of monetary policy is important because the timing and magnitude of the impact of interest rate changes on output and inflation may be significantly different. The exchange rate is the relative price of domestic and foreign currency, so it depends also on domestic and foreign monetary conditions. The chain of transmission mechanism from interest rates to exchange rate describes the theory of uncovered interest parity. Increase of domestic interest rate over the foreign interest rate leads to inflow of foreign capital and thus strengthens the currency. This has the effect of reducing net exports and the total amount of aggregate demand. On the other hand, a change in the exchange rate has a significant balance effect. In the case of foreign indebtedness of domestic economic entities it influences the net wealth of companies. By appreciation of exchange rate is the domestic economy experiencing an improvement in firms' balance sheets, which can lead to increasing of domestic demand. But this two effects may be eliminated each other.

Undoubtly an important part of the transmission mechanism of monetary policy is also the ***expectation channel***. The impact of monetary policy through this channel is the most uncertain of all the channels. Changes in monetary policy may affect the public's expectations on inflation, employment, economic growth and future income and profit / losses. The

consequences and delays of impacts of these changes in expectations can vary greatly. For example, interest rate decline may lead the public to expect higher economic growth in the future and therefore a greater tendency in consumption and investment. On the other hand, the public can lead to the conclusion that the growth in interest rate will lead to future inevitable slowdown in economic growth under inflation targeting strategies and decrease confidence and thus then consumption and investment.

1.1.1 Credit channel of transmission mechanism

According to literature credit channel is closely linked to the interest rate channel and amplify its effects. This channel affects the objectives of monetary policy through supply of loans from the bank and demand by consumers. Businesses decide whether they take credit for the projects. Banks assesses the business on the basis of perceived ability to repay the loan. Key criteria for the assessment of the company are balance sheet indicators of a firm, while the bank considerate expected development of the economy. This channel thus influences the growth or stagnation of the volume of loans, i.e. money supply, which has a long-term undeniable impact on inflation (Jílek, [16]).

This channel can be decomposed into two different channels: 1) the **bank lending channel** and 2) the **balance sheet channel** (Égert and MacDonald [10]). Bank lending channel focuses on the monetary policy effects given to supply of credits by the banking system. Balance sheet channel focuses on borrower's the balance sheet indicators.

In case of contractionary monetary policy, banks do not react only in increasing the interest rate, but also in the overall reduction of supply. This effect of monetary policy decisions can be systematically shown as follows:

$$M \downarrow \;\Rightarrow\; \textit{bank deposits} \downarrow \;\Rightarrow\; \textit{bank loans} \downarrow \;\Rightarrow\; I \downarrow \;\Rightarrow\; Y \downarrow$$

Thus, contractionary monetary policy leads to a fall in bank reserves and bank deposit, subsequently these results in a decline in bank loans, in turn leading to a decline in investment spending and fall in output. (Azali M. [1])

But there are also other ways how monetary policy can affect its objectives through this channel. Monetary policy affects the net worth of firms, which is an important factor on credit market. Lower net worth of business firms also increases the moral hazard problem

because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Since taking on riskier investment projects makes it more likely that lenders will not be paid back, a decrease in business firms' net worth leads to a decrease in lending and hence in investment spending. (Mishkin, [18]). Expansionary monetary policy affect stock prices increase, leading to increase in net wealth of companies, reducing moral hazard and lead to higher investment spending and aggregate demand. Expansionary policy may also lead to a decline in interest rates, increasing the company's cash flow and reduce the risk of moral hazard (Dovčiak, [7]).

1.2 Financial Accelerator

The asymmetries between information of borrowers and lenders, due to better information of borrowers about his situation lead lenders to request a higher premium for all forms of financing borrowers‘ projects. The borrower better knows his situation and chance for success of his projects. He can also impact success of his projects by his behavior. This gives rise to the usual problems of “adverse selection” and “moral hazard”, which drive a wedge between the cost of external and internal funds. Financing an investment project from external funds is more expensive than financing it from retained profits. The difference reflects the premium for external financing (Zurlinden, [23]).

According to literature (Horvath, [13]) and (Bernanke et al. [4]), firms‘ internal sources of funding worsen during the downturns and firms are more dependent on external financing. But at the same time the cost of external financing increases. Greater dependence on external financing during the time when this financing is more expensive is called „ financial accelerator“.

Financial accelerator might have stronger effect during the periods of credit rationing. Also is expected asymmetric effect of monetary policy over the business cycle and growing during the downturns. Moreover monetary policy might have the strongest effect during the shocks on small firms as a result of deterioration of access of small firms to external financing (Horvath, [13]).

2 THE DATA

2.1 The Amadeus Database

The data used in this thesis come from the Amadeus database. This database includes yearly aggregated balance sheet and income statements information. Our analysis in this thesis focuses on 4 countries: Bulgaria, Poland, Slovakia and Slovenia. This dataset includes information on over 55 000 non-financial firms. The number of firms for which are available data differs in each year and country. Also the length of the sample differs across countries. Due to a lack of key information (interest paid) for our analysis is not available in Slovenian database, we had omitted this country from further analysis. A list of available information is provided in Appendix 1. For the purposes of our analysis, we converted the original data to panel data. Procedure with the source code is provided in Appendix 2.

2.2 The Implicit Interest Rate

From the original database we excluded the firms that included incomplete information about the liabilities of a firm, because these firms could affect the quality of results. From the available data, we compute the implicit interest rate for the *i*-th firm at time *t* as

$$IR_{it} = \frac{INPAID_{it}}{CDEBT_{it}};$$

where $INPAID_{it}$ denotes interest paid and $CDEBT_{it}$ denotes the sum of current liabilities: creditors and other current liabilities of the *i*-th firm at time *t*. From the calculated data, we excluded the outliers defined as upper and lower decil of the data. For the data from Slovakia was necessarily to modify this definition (for details see next subchapter). In order to prevent removing the data which are not the true outliers for variable that could rise or fall in time, we excluded the outliers in each year separately.

2.2.1 The implicit Interest Rate, Slovakia

Given that the calculated implicit interest rate in the Slovak data, despite the elimination of outliers according to previous definition contained too many values that were not in match with reality, we excluded upper 25% and lower 25% of the data. Since in the sample period of 1994 – 1999 is a small number of available data in further analysis we used only the period of 2000 – 2005, which contains 65, 120, 533, 1167, 1257, 444 observations.

Comparison of the calculated implicit interest rate and the average interest rate of commercial banks to businesses are reported in Figure 2.2.1.

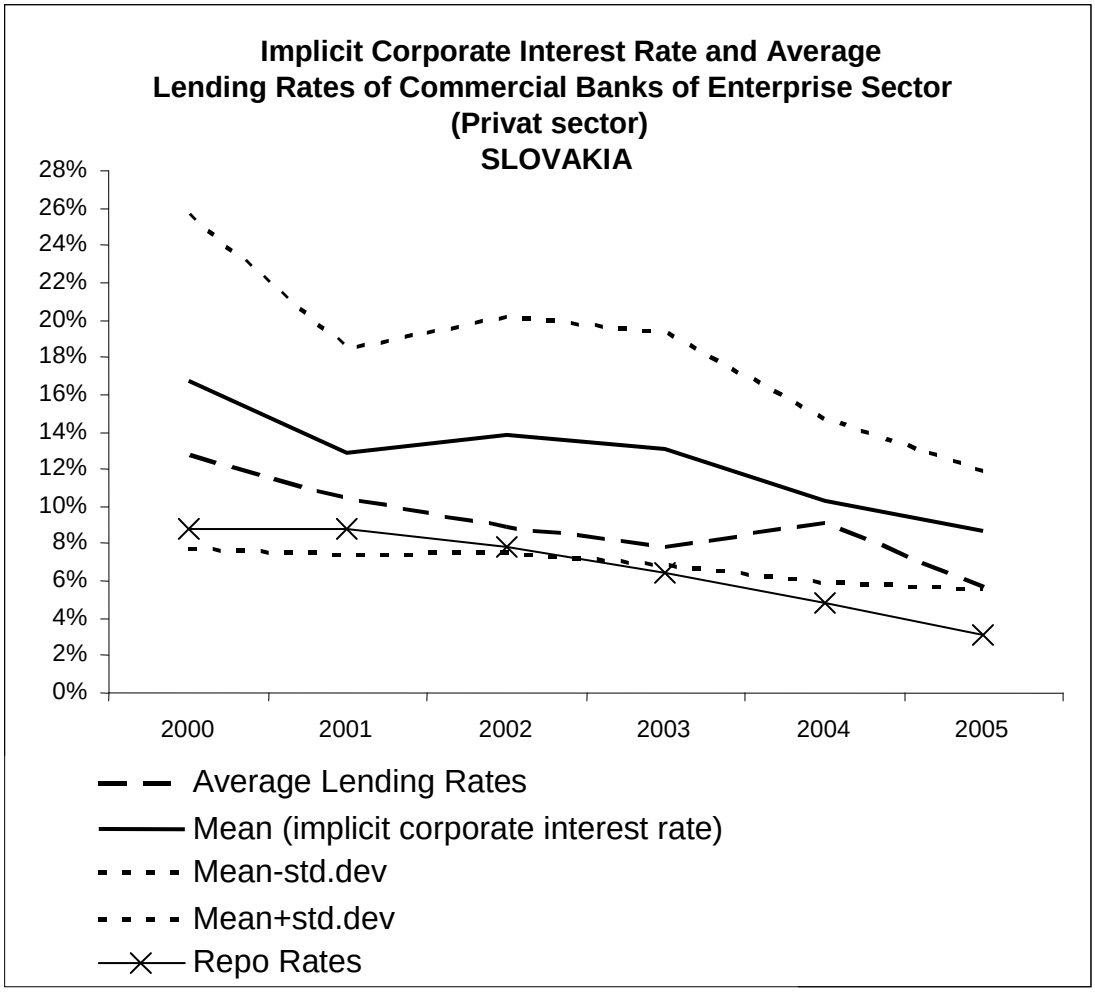


Figure 2.2.1: Implicit Corporate Interest Rate and Average Lending Rates of Commercial Banks of Enterprise Sector, Slovakia

For the comparison of implicit interest rate and average interest rate of commercial banks to businesses we used the data from National Bank of Slovakia. In the Figure 2.2.1 is displayed for comparison also repo rate.

2.2.2 The implicit Interest Rate, Bulgaria

After removing outliers of the implicit interest rate for the Bulgarian data, is in the sample period of 1994 – 1997 small numbers of available data. Therefore, for further analysis we used only the period of 1998 – 2005, which contains 932, 2593, 3550, 4563, 2575, 3158, 3176, 3063 observations.

Comparison of the calculated implicit interest rate and the average interest rate of commercial banks to businesses are reported in Figure 2.2.2.

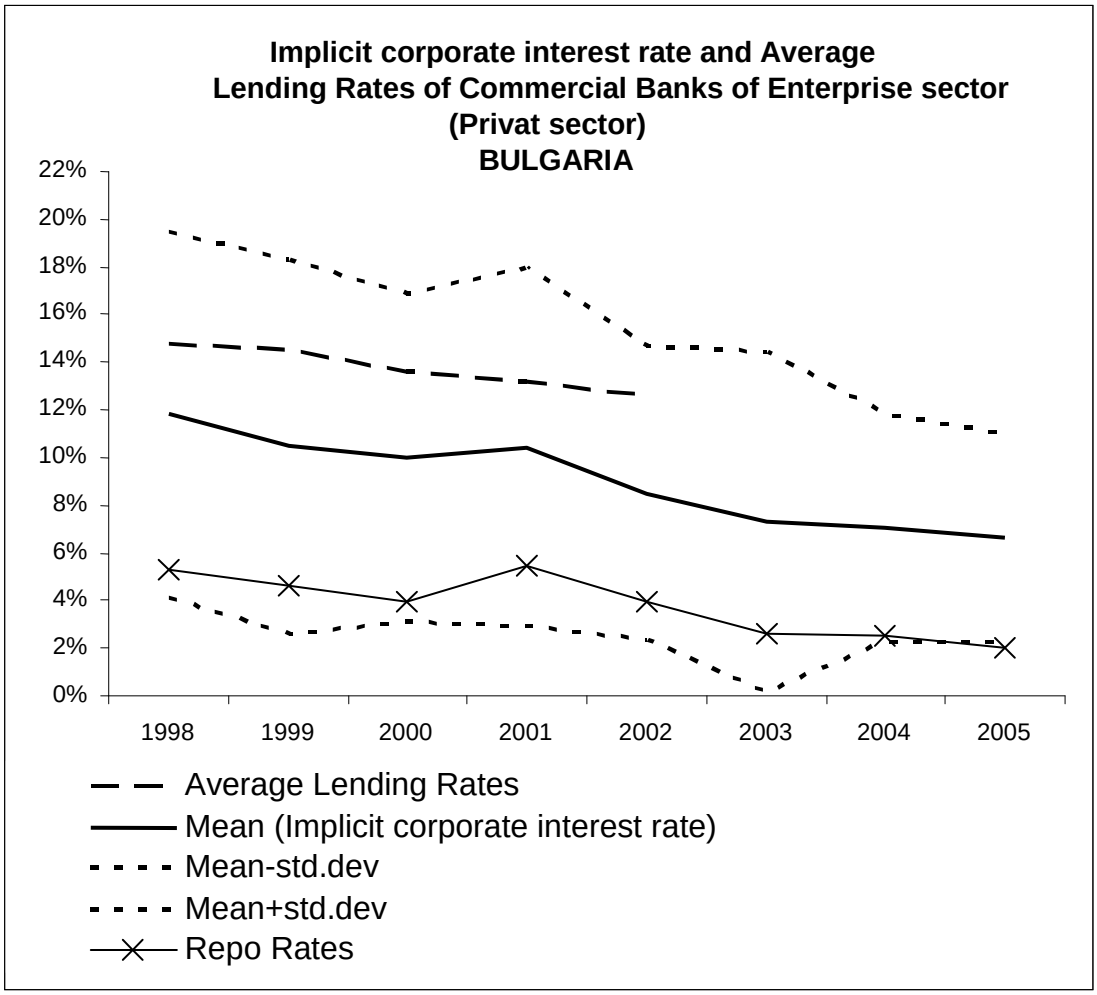


Figure 2.2.2: Implicit Corporate Interest Rate and Average Lending Rates of Commercial Banks of Enterprise Sector, Bulgaria

For the comparison of implicit interest rate and average interest rate of commercial banks to businesses we used the data from Eurostat. Since the year 2002 are the data for average lending rates of commercial banks of enterprise sector not available. In the Figure 2.2.2 is displayed for comparison also repo rate.

2.2.3 The implicit Interest Rate, Poland

After removing outliers of the implicit interest rate for the Polish data is in the year 1994 small number of available data. Therefore, for further analysis we used only the period of 1995 – 2005, which contains 240, 244, 529, 764, 1164, 2143, 2543, 2532, 4491, 5307 observations.

Comparison of the calculated implicit interest rate and the average interest rate of commercial banks to businesses are reported in Figure 2.2.3.

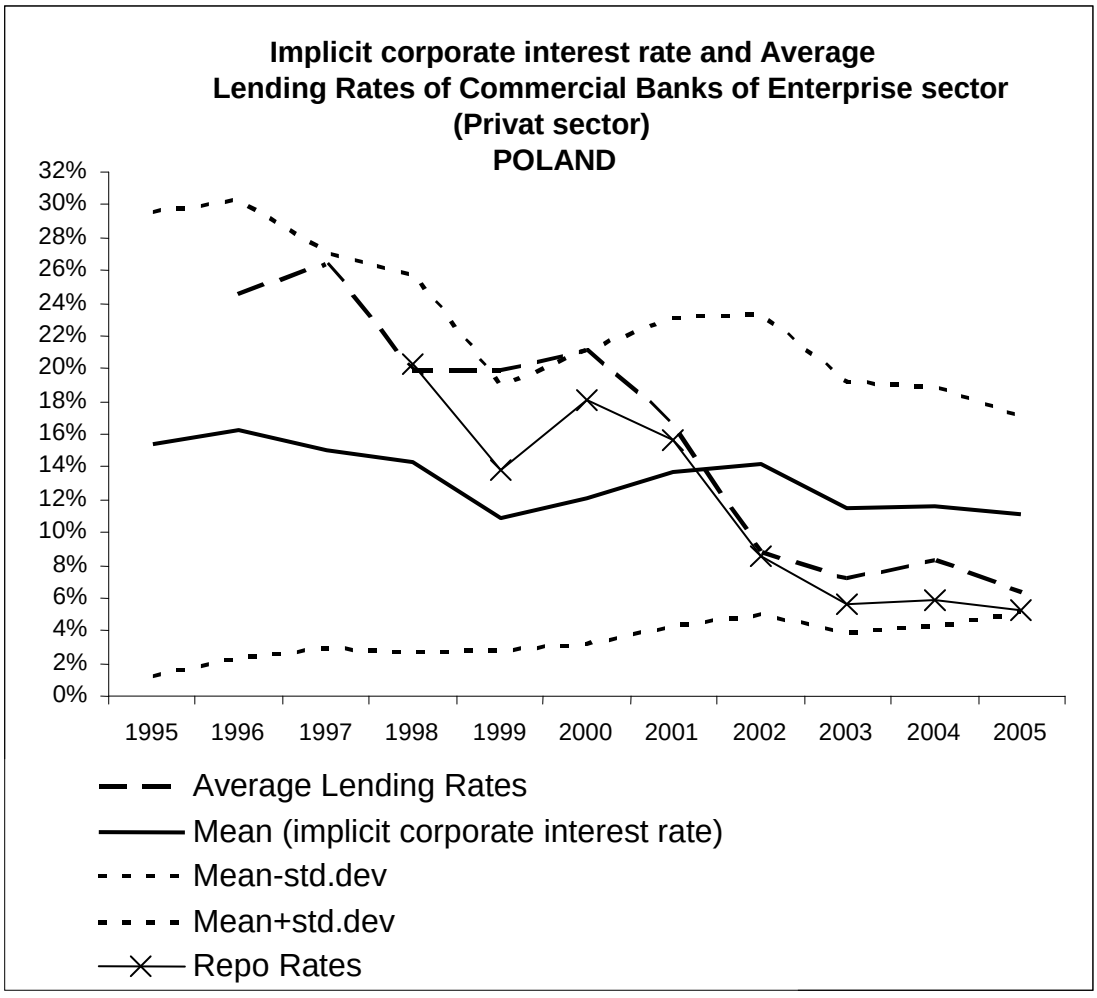


Figure 2.2.3: Implicit Corporate Interest Rate and Average Lending Rates of Commercial Banks of Enterprise Sector, Poland

For the comparison of implicit interest rate and average interest rate of commercial banks to businesses we used the data from National Bank of Poland. The average interest rate of commercial banks to businesses is in the year 1994 not available. In the Figure 3 is displayed for comparison also repo rate which is not available until 1998. As can be seen on this figure, the mean of implicit interest rate is until the year 2002 lower than the average lending rate of commercial banks of enterprise sector and repo rates. Because this is not in match with theoretical expectations, it could affect the quality of estimated results. Therefore, for further analysis we use only the sample period of data since the year 2002.

2.3 Dummy variables

2.3.1 The definition of small, medium and large enterprises

(Extract of Article of the Annex of Recommendation 2003/361/EC)

'The category of micro, small and medium- sized enterprises (SMEs) is made up of enterprises which employ fewer than 250 persons and which have an annual turnover not exceeding 50 million euro, and/ or an annual balance sheet total not exceeding 43 million euro.'

Within this category:

‚Small enterprises are defined as enterprises which employ fewer than 50 persons and whose annual turnover or annual balance sheet total does not exceed 10 million euro.'

Enterprise category	Headcount: Annual Work unit (AWU)	Annual turnover	Annual balance sheet total
Medium	< 250	≤ €50 million	≤ €43 million
Small	< 50	≤ €10 million	≤ €10 million

Figure 2.3.1: Classification of Companies by Size

2.3.2 Business cycle

Business cycle denotes fluctuations in production and economic activity over several months. This cycle has 4 major phases:

- Bottom
- Recovery
- Top
- Recession

This fluctuation is often measured by rate of growth of gross domestic product. Given that in our sample period in all observed countries showed the economy only positive growth rate, we supersede the definition of recession (which has been described as a decline in GDP of at least two consecutive quarters) fall below the average GDP growth rate in the country in the sample period. Dummy variable DOWN then express GDP growth to fall below the average growth rate and the dummy variable BOOM increase over the average of GDP growth.

Development of GDP growth rates across countries can be seen in the following Figures 2.3.2.1 - 3.

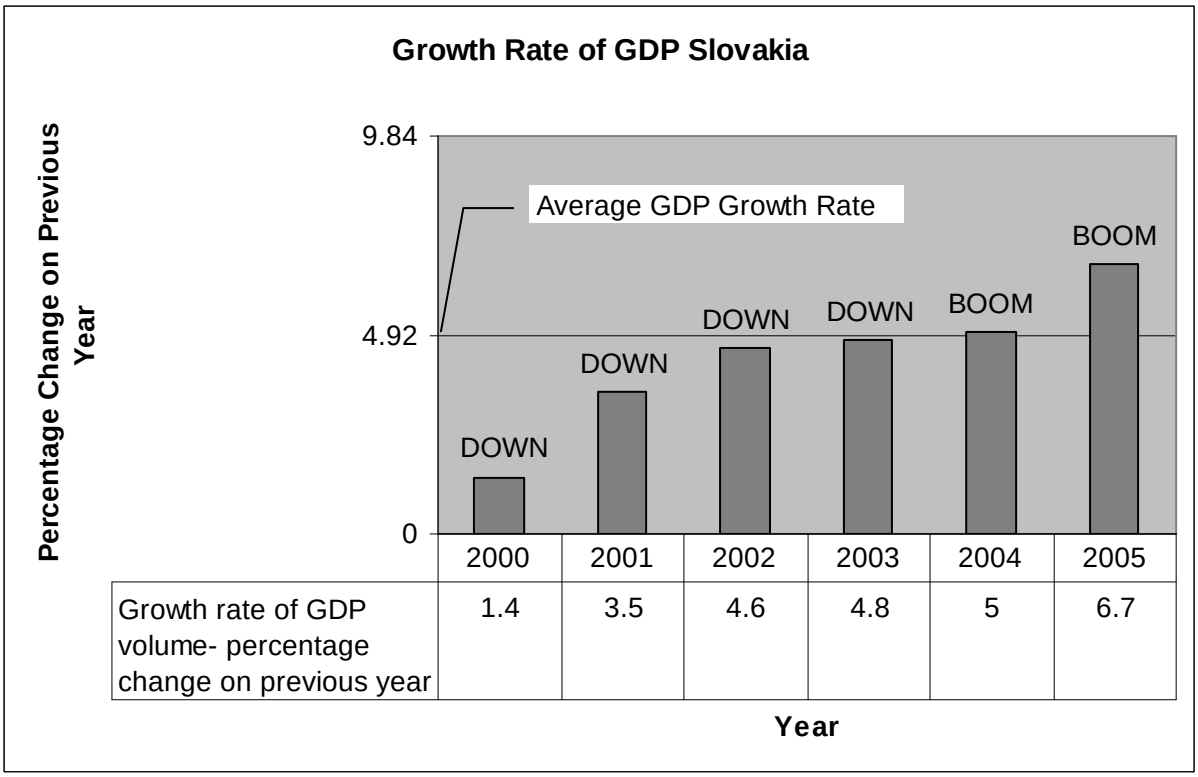


Figure 2.3.2.1: Growth Rate of GDP, Slovakia

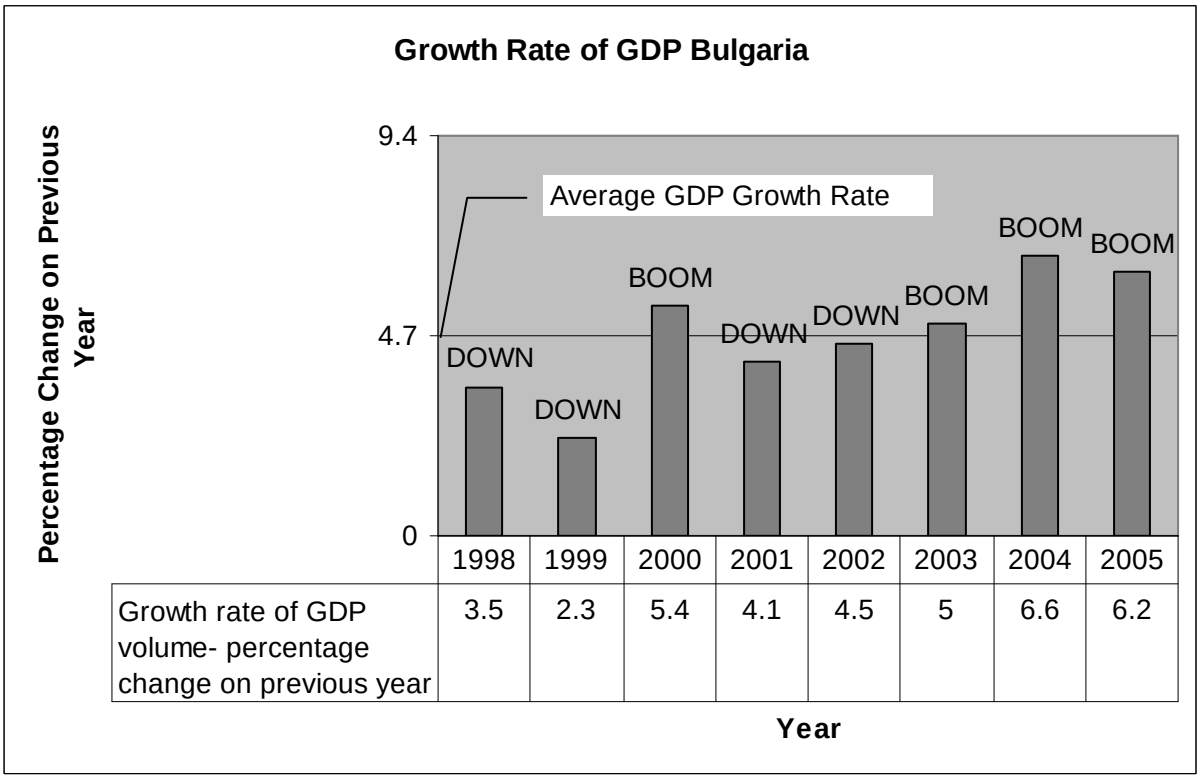


Figure 2.3.2.2: Growth Rate of GDP, Bulgaria

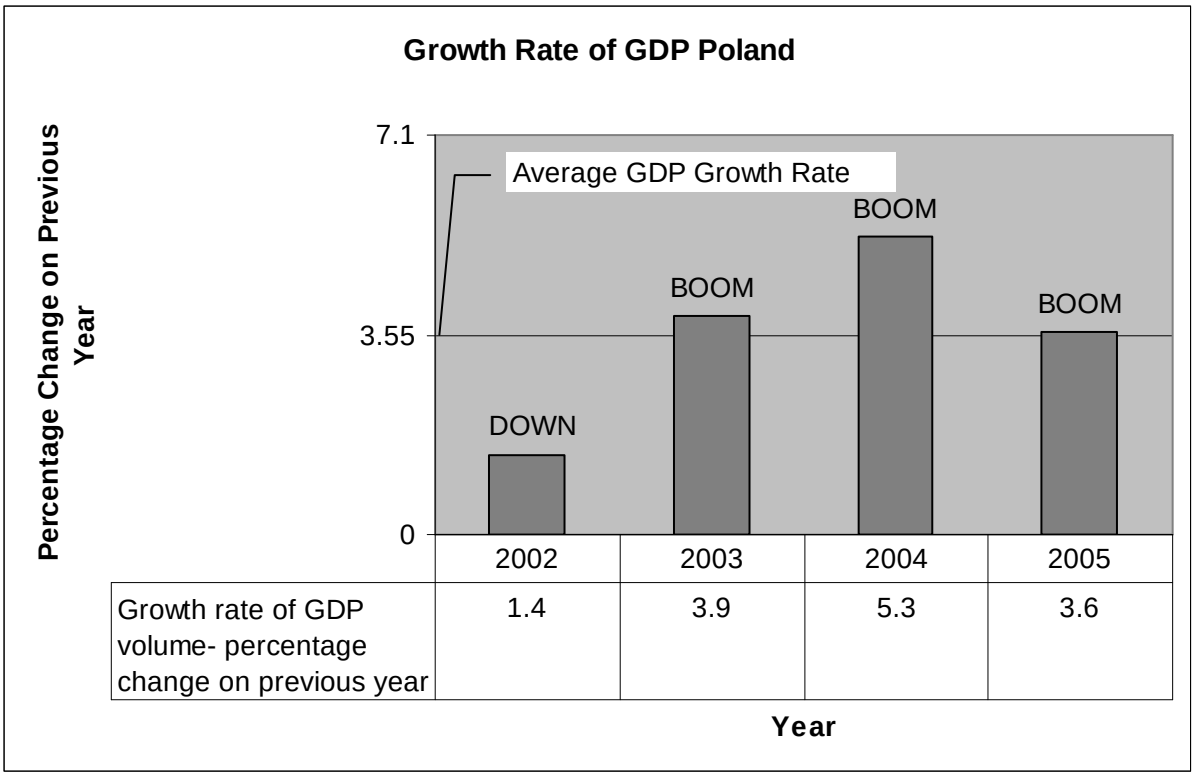


Figure 2.3.2.3: Growth Rate of GDP, Poland

2.4 Construction of explanatory variables

DEBT - denotes the total debt which is the sum of current liabilities: creditors, current liabilities: loans, other current liabilities, non current liabilities and other non-current liabilities

ASSETS - denotes total assets

DSTR - denotes variables to express the debt structure, calculated as one minus ratio short term liabilities to long term liabilities, where short term liabilities are the sum of current liabilities: creditors, current liabilities: loans and other current liabilities. Long term liabilities are the sum of non current liabilities and other non current liabilities. DSTR then express the proportion of long term debt to short term debt

OR - denotes variable for operating revenue

DOWN - dummy variable which has value 1 if the country's economic growth in the sample period was less than the calculated average growth rate, zero otherwise

S - dummy variable which has value 1 for small firms, zero otherwise

M - dummy variable which has value 1 for medium firms, zero otherwise

SME - dummy variable which has value 1 for small or medium firms, zero otherwise

3 ESTIMATED EQUATIONS

In the first estimated equation, we have observed the impact of selected balance sheet and income statements indicators on the amount of implicit interest rate. These indicators reflect the financial situation of the firm, which is a vital source of information for decision making for the bank that provides credit. We have also included in estimated equation the dummy variable *DOWN* reflecting changes in implicit interest rate view of economic situation in the country and dummy variable for small firms. The first estimated equation can be expressed follows:

$$IR_{it} = \alpha_1 \frac{DEBT_{it-1}}{ASSETS_{it-1}} + \alpha_2 DSTR_{it} + \alpha_3 \frac{OR_{it-1}}{ASSETS_{it-1}} + \alpha_4 DOWN_t + \alpha_5 S_{it} + \alpha_6 M_{it} + c + u_i + e_{it}, \tag{3.1}$$

where $DEBT_{it-1}$ is the sum of total short- term and total long- term liabilities of the *i*- th firm at time *t-1*. $\frac{DEBT_{it-1}}{ASSETS_{it-1}}$ is then the variable, which expresses a debt burden on firm. This is an important information and decision- making criterion for the bank that provides credit. OR_{it-1} is the variable for operating revenue, which is the sum of net sales revenue and other revenue amounts accruing from the business operations of the *i*- th firm at time *t-1* . $\frac{OR_{it-1}}{ASSETS_{it-1}}$ then number of turnovers, which is the number of times the total assets turned over a period of one year. Proffered are higher values, pointing to higher use of total assets.

Most of the implicit interest rates of the *i*-th firm, were previously set at the time *t-1*, so we have used the lagged values for the indicators of $\frac{DEBT_{it-1}}{ASSETS_{it-1}}$ and $\frac{OR_{it-1}}{ASSETS_{it-1}}$, which are considered at a time when granting credit in the time *t-1*. Because of the fact that information on the structure of the debt from which firm pays interest is included in balance sheet at the time *t*, we used in the estimated model not lagged variable $DSTR_{it}$, which denotes the debt structure of the *i*- th firm at the time *t*. Given that monetary policy responds to the development of the economic situation based on expectations (as described in Chapter 1), we

take in to the estimated model the dummy variable $DOWN_t$ in the time *t*. Variable S_{it} is a dummy variable for small firms, which are generally more inclined to risk (see Cressy and Olofsson, [6]) and variable M_{it} is a dummy variable for medium firms. It is also pre supposed that these firms have a greater risk to the lender. *c* is then constant, *u* is an unobserved firm fixed effect and *e* is the error term.

Descriptive statistics for selected balance sheet and income statements indicators for individual countries are reported in Tables 3.1 - 3 below.

Descriptive Statistics for Selected Balance Sheet Indicators, Slovakia

	Small firms	*Medium firms*	*Large firms*	*Downturns*	*Booms*	*Total*
Corporate interest rate	11.19 (5.39)	12.02 (5.85)	12.26 (5.98)	13.47 (6.42)	9.89 (4.19)	11.84 (5.79)
Debt to assets	0.63 (0.21)	0.52 (0.24)	0.50 (0.19)	0.56 (0.22)	0.55 (0.23)	0.55 (0.22)
Debt Structure	0.20 (0.21)	0.22 (0.19)	0.23 (0.19)	0.22 (0.19)	0.21 (0.19)	0.21 (0.20)
Operating revenue to assets	3.42 (2.85)	2.00 (1.49)	2.00 (1.49)	2.55 (2.73)	2.48 (2.12)	2.51 (2.47)
Number of observations	781	1227	555	1774	1485	3259

Table 3.1: Descriptive Statistics for Selected Balance Sheet Indicators, Slovakia

Descriptive Statistics for Selected Balance Sheet Indicators, Bulgaria						
	Small firms	*Medium firms*	*Large firms*	*Downturns*	*Booms*	*Total*
Corporate interest rate	8.95 (6.76)	9.05 (7.48)	8.52 (6.14)	10.15 (7.40)	7.90 (6.29)	8.95 (6.92)
Debt to assets	0.67 (0.24)	0.62 (0.24)	0.54 (0.23)	0.60 (0.25)	0.66 (0.24)	0.64 (0.24)
Debt Structure	0.28 (0.30)	0.25 (0.26)	0.25 (0.24)	0.24 (0.28)	0.30 (0.30)	0.27 (0.29)
Operating revenue to assets	2.08 (2.97)	1.57 (1.22)	1.28 (0.85)	1.90 (2.41)	1.84 (2.55)	1.87 (2.49)
Number of observations	11337	5514	1896	9183	10556	19740

Table 3.2: Descriptive Statistics for Selected Balance Sheet Indicators, Bulgaria

Descriptive Statistics for Selected Balance Sheet Indicators, Poland						
	Small firms	*Medium firms*	*Large firms*	*Downturns*	*Booms*	*Total*
Corporate interest rate	12.34 (7.91)	12.47 (8.22)	12.50 (8.45)	14.16 (9.17)	11.57 (7.48)	12.43 (8.18)
Debt to assets	0.66 (0.19)	0.62 (0.19)	0.59 (0.19)	0.00* (0.00)	0.63 (0.19)	0.63 (0.19)
Debt Structure	0.24 (0.23)	0.19 (0.18)	0.17 (0.16)	0.22 (0.22)	0.20 (0.19)	0.20 (0.20)
Operating revenue to assets	2.33 (1.95)	2.10 (2.02)	1.83 (1.23)	2.13 (2.67)	2.15 (1.49)	2.14 (1.94)
Number of observations	3384	5991	2482	4491	8963	13454

Note: * caused due to a lack of information about debt burden during the downturn period

Table 3.3: Descriptive Statistics for Selected Balance Sheet Indicators, Poland

Generally, the corporate interest rate is higher during the downturn periods than during the boom periods, but differs variable across the firm size in each country. The debt burden of the firm is related with the firm size. Small firms have the higher degree of indebtedness. The other balance sheet and income statements differs variable across the firm size and business cycle.

3.1 Estimation Results

Given that the higher level of the company debt is a higher risk for the lender, we expect the positive sign of α_1. The sign of α_2 is according to (Bougheas et al., [5]) expected to be negative, because the risky projects have less chance to get long- term loans. Companies with better use of assets which have a higher share of operating revenue for the bank's assets are less risky. Therefore we are expecting the sign of α_3 to be negative. During the recession rises the risk for the firms and for the banks and therefore tend to increase bank interest rate. It is therefore expected, that the sign of α_4 will be positive. Given that small and medium firms are risky, they presented a bigger risk for the bank that provides credit. Hence, the sign of α_5 and α_6 is expected to be also negative. Furthermore we expect $\alpha_5 > \alpha_6$.

Estimated results for individual countries are reported in next sub-chapters.

3.1.1 Estimation Results for Slovakia

Estimation Results for Slovakia are reported in Table 3.1.1.1 below.

Determinants of Corporate Interest Rates SK					
Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets	9.068*** (3.387)	9.389*** (3.425)	5.775* (3.197)	6.429* (3.855)	3.277 (3.603)
Debt structure		3.553 (2.210)	3.088 (2.043)	3.040 (2.357)	2.814 (2.186)
Operating revenue/Assets	-1.364** (0.568)	-1.275** (0.570)	-1.278** (0.526)	-0.850 (0.635)	-1.065* (0.590)
Downturn			2.872*** (0.363)		2.793*** (0.381)
Small firm				-5.453*** (1.774)	-3.456** (1.244)
Medium firms				-1.826 (1.163)	
Constant	8.898*** (2.453)	7.721*** (2.555)	8.894*** (2.365)	10.723*** (2.965)	10.636*** (2.633)
R2	0.041	0.048	0.190	0.051	0.184
Number of Observations	1126	1126	1126	967	967

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 3.1.1.1: Determinants of Corporate Interest Rate, Slovakia

During the sample period increased the degree of internal differentiation in individual sectors, increasing the pressure on differentiated approach to individual groups of subjects. Firms started broken down in the idea that if the large firms are inefficient, their breakdown to small and medium firms ensure the efficiency of the economy. However, the crucial part of SMEs was created as new entities. High vulnerability of enterprises especially in the initial period requires a combination of financial and non financial assistance instruments. General problems of recovery were the lack of capital resources and lack of credit. Repayment big

part of the projects for which were provided the loans was already problematic and slow and did not produce expected effects. But new loans were still needed. In addition to assessing the overall indebtedness of enterprises and the efficient use of total assets at the lending, requested the banks as one of the key criteria the quick return of 6 – 12 months. This has the consequence that the expected sign of α_2 is opposite compared to initial expectations. Long-term projects are too risky for investment banks, resulting in a rise in interest rates on long term loans. The banks approached more cautiously to provide lending to these entities, which resulted in that, the risky projects of SMEs had less chance to receive credit. This brought the total implicit interest rate for these companies are decreasing.

Financing small and medium enterprises is an important component encourages new businesses and growth of the country. This led to several financial support programs that provide assistance to small and medium enterprises. Program PHARE provided many support programs, which implemented the National Agency for Small and Medium Enterprises, Slovak Agency for Investment and Trade and others. Other support programs were state programs such as Support Loan Program and Micro Schema. Combination of factors described above, reduced the implicit interest rate for small firms comparison to others. Compared to initial expectations is therefore a negative sign of α_5.

The sign of α_4 is positive and this coefficient is significant. This implies, that commercial banks deteriorate credit conditions during downturn period.

In the following Estimated Equation (3.2), we replaced the dummy variable *S* and *M* for small and medium firms by dummy variable *SME*, which has value 1 if the firm falls within the small or medium enterprises.

$$IR_{it} = \alpha_1 \frac{DEBT_{it-1}}{ASSETS_{it-1}} + \alpha_2 DSTR_{it} + \alpha_3 \frac{OR_{it-1}}{ASSETS_{it-1}} + \alpha_4 DOWN_t + \alpha_5 SME_{it} + c + u_i + e_{it}, \quad (3.2)$$

The other variables remained unchanged compared to the previous specification. Estimation Results are reported in Table 3.1.1.2 below.

Determinants of Corporate Interest Rates SK - Modified equation for SMEs					
Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets	6.182 (3.893)	2.903 (3.637)			
Debt structure	3.313 (2.379)	3.121 (2.205)			
Operating revenue/Assets	-0.782 (0.641)	-0.993* (0.595)			
Downturn		2.788*** (0.385)			
Small and Medium firms	-1.833 (1.175)	-1.439 (1.090)			
Constant	9.814*** (2.976)	10.851*** (2.762)			
R2	0.029	0.201			
Number of Observations	967	967			

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 3.1.1.2: Determinants of Corporate Interest Rate, Modified Equation for SMEs, Slovakia

The introduction of criteria of quick return is again confirmed, demonstrating again the positive sign of α_2. The sign of α_5 is again negative, but this coefficient is not significant. It concluded from this, that support programs for small and medium enterprises are the most effective for small firms

3.1.2 Estimation Results for Bulgaria

The estimated coefficients for Bulgaria are presented in the Table 3.1.2.1 below.

Determinants of Corporate Interest Rates BG					
Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets	2.588*** (0.627)	2.729*** (0.601)	2.580*** (0.598)	2.731*** (0.606)	2.586*** (0.603)
Debt structure		-8.733*** (0.419)	-8.640*** (0.417)	-8.724*** (0.422)	-8.640*** (0.420)
Operating revenue/Assets	-0.560*** (0.145)	-0.787*** (0.139)	-0.912*** (0.139)	-0.781*** (0.141)	-0.904*** (0.141)
Downturn			0.901*** (0.128)		0.897*** (0.129)
Small firm				0.586 (0.555)	0.590* (0.304)
Medium firm				-0.117 (0.475)	
Constant	8.620*** (0.486)	11.339*** (0.483)	11.257*** (0.481)	11.063*** (0.657)	10.936*** (0.515)
R2	0.007	0.089	0.090	0.09	0.099
Number of Observations	9257	9257	9257	9169	9169

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 3.1.2.1: Determinants of Corporate Interest Rate, Bulgaria

All estimated coefficients for this country are significant and meet the theoretical expectations described above. Moreover, these results imply, that commercial banks deteriorate credit conditions for small firms (according to positive sign of α_5) and also generally to all businesses during the downturn period.

3.1.3 Estimation Results for Poland

Results for Poland are reported in Table 3.1.3.1 below.

Determinants of Corporate Interest Rates PL					
Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets	8.194*** (1.995)	8.825*** (1.988)		8.390*** (2.045)	
Debt structure		-6.143*** (1.381)	-6.392*** (0.790)	-6.762*** (1.433)	-6.775*** (0.842)
Operating revenue/Assets	-1.243*** (0.417)	-1.318*** (0.414)		-1.211*** (0.422)	
Downturn			1.899*** (0.139)		1.876*** (0.145)
Small firm				-1.230 (1.940)	-0.785 (0.569)
Medium firm				-0.225 (1.378)	
Constant	8.704*** (1.612)	9.655*** (1.617)	13.410*** (0.175)	10.229*** (1.959)	13.4111*** (0.248)
R2	0.019	0.031	0.041	0.031	0.044
Number of Observations	5188	5188	13454	4689	11858

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 3.1.3.1: Determinants of Corporate Interest Rate, Poland

Due to a lack of information about a debt burden on firm and operating revenue during the downturn period, we had to exclude from the (3) and (4) specification of estimated model variables $\frac{DEBT_{it-1}}{ASSETS_{it-1}}$ and $\frac{OR_{it-1}}{ASSETS_{it-1}}$. Similar to the estimated equations for the Slovak data, the coefficient α_5 differs from the theoretical expectations. With regard to that small firms are more inclined to risk, we expect that banks will request more interest rate on these subjects. However, the coefficient α_5 is again negative, meaning that smaller firms have lower implicit interest rate. But this effect is not as strong as in Slovakia, as the coefficient is not

significant. We expect that as Slovakia and Poland are countries with similar Economy, the reason for this phenomen is similar in Poland than in Slovakia. Differences compared with theoretical expectations are confirmed by the study (Klapper, Allende and Sulla, [17]), showing a sample of Eastern European countries that countries with transitional economy often behave differently.

The coefficient α_4 for the dummy variable DOWN is significant in both specifications. This implies, that commercial banks deteriorate credit conditions generally for all businesses during the downturn period.

4 AUGMENTED ESTIMATED EQUATION

In the next estimated equation we have examined the impact of monetary policy on the implicit interest rate according to the firm size with regard on selected balance sheet and income statements indicators. Original estimated equation (3.1) we have adjusted to the following form:

$$IR_{it} = \alpha_1 \frac{DEBT_{it-1}}{ASSETS_{it-1}} + \alpha_2 DSTR_{it} + \alpha_3 \frac{OR_{it-1}}{ASSETS_{it-1}} + \gamma_1 S_{it} REPO_t + \gamma_2 M_{it} REPO_t + \delta REPO + c + u_i + e_{it} \quad (4.1)$$

To be able to examine whether the impact of monetary policy is different according to the size of company we have added to original balance sheet and income statements indicators the product of annual average of two week purchase rate market with $REPO_{t-1}$ and the dummy variable *S* for small firms, *M* for medium firms. Based on studies (Mojon, Smets and Vermuelen, [19]) we expect that the coefficient γ_1 for small firms will be larger than γ_2 and therefore monetary policy will have the greatest impact on small firms. By contrast the least impact of monetary policy is expected by large companies and therefore the both signs of γ_1 and γ_1 are expected to be positive. In addition, we estimated the impact of monetary policy according to the economy trend in the country. Thus the following modification of equation

(3.1) observes whether the monetary policy has different effects during the downturn and during the boom. This estimated equation can be expressed as follows:

$$IR_{it} = \alpha_1 \frac{DEBT_{it-1}}{ASSETS_{it-1}} + \alpha_2 DSTR_{it} + \alpha_3 \frac{OR_{it-1}}{ASSETS_{it-1}} + \beta_1 DOWN_t \; REPO_t + \delta \, REPO_t + c + u_i + e_{it} \tag{4.2}$$

In this estimated equation, we have added to the original balance sheet and income indicators the product of annual average of two week purchase rate and the dummy variable *DOWN* for years with GDP growth rate below the average growth rate in the sample period. Given the empirical results of the paper (Fidrmuc, Horváth and Horváthová, [11]), we expect that $\beta_1 > 0$. Thus the impact of the monetary policy is stronger during a recession.

4.1 Augmented Estimation Results for Slovakia

Estimations results for the advanced estimated equations (4.1) and (4.2) for Slovak data are reported in Table 4.1.1 below.

Determinants of Corporate Interest Rates SK - Firm Size, Downturns and Monetary Policy					
Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets		2.442 (3.601)		4.920 (3.145)	2.501 (3.599)
Debt structure		3.502 (2.161)		3.097 (2.004)	3.414 (2.161)
Operating revenue/Assets		-1.023* (0.583)		-1.268** (0.516)	-1.042* (0.583)
Small firm*Repo Rate	-0.486** (0.206)	-0.534* (0.295)			-0.536* (0.296)
Medium firm*Repo Rate	-0.028 (0.142)	0.004 (0.179)			-0.009 (0.179)
Downturn*Repo Rate			0.139* (0.073)	0.124 (0.096)	0.126 (0.103)
Repo Rate	1.199*** (0.129)	1.216 (0.169)	0.793*** (0.174)	0.928*** (0.240)	0.960*** (0.270)
Constant	5.705*** (0.531)	5.309** (2.604)	6.685*** (0.782)	5.244** (2.504)	6.417** (2.757)
R2	0.142	0.206	0.137	0.222	0.210
Number of Observations	2563	967	3259	1126	967

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 4.1.1: Determinants of Corporate Interest Rate, Augmented Estimation, Slovakia

Theoretical expected impact of the monetary policy according to the firm size is again rejected, what is in respect of the estimated results of the estimated equation (3.1) in Table 3.1.1.1. The coefficients for the product of annual average of two week purchase rate and the dummy variable for firm size are arranged follows: $\gamma_1 < \gamma_2 < 0$. Monetary policy in Slovakia has during the sample period smallest impact on small firms, which may be due to support for small and medium firms as described in text above. However, it is confirmed the theoretical expected impact of monetary policy over the business cycle. Coefficient β_1 for the product of annual average of two week purchase rate and the dummy variable for business cycle are as we can see in specification (3) bigger than zero. Thus the impact of monetary policy is

stronger during the downturn period. But this effect is not so strong in combination of other indicators, while the coefficient in specification (5) is not significant.

4.2 Augmented Estimation Results for Bulgaria

Estimations results for the advanced estimated equations (4.1) and (4.2) for Bulgaria's data are reported in Table 4.2.1 below.

Determinants of Corporate Interest Rates BG - Firm Size, Downturns and Monetary Policy

Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets		2.512*** (0.603)		2.495*** (0.597)	2.514*** (0.603)
Debt structure		-8.405*** (0.421)		-8.424*** (0.419)	-8.419*** (0.422)
Operating revenue/Assets		-0.939*** (0.142)		-0.952*** (0.139)	-0.939*** (0.142)
Small firm*Repo Rate	0.031 (0.098)	0.048 (0.111)			0.048 (0.111)
Medium firm*Repo Rate	-0.034 (0.089)	-0.090 (0.101)			-0.091 (0.101)
Downturn*Repo Rate			-0.021 (0.046)	0.017 (0.052)	0.020 (0.053)
Repo Rate	0.501 (0.096)	0.515*** (0.104)	0.554*** (0.109)	0.471*** (0.124)	0.473*** (0.150)
Constant	7.018*** (0.210)	9.805*** (0.520)	6.895*** (0.330)	9.938*** (0.591)	9.174*** (0.525)
R2	0.009	0.102	0.008	0.102	0.103
Number of Observations	18748	9169	19740	9257	9169

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 4.2.1: Determinants of Corporate Interest Rate, Augmented Estimation, Bulgaria

In this augmented estimated equation is again confirmed the expected impact of the balance sheet and income statements indicators, which is consistent with the results of the estimated equation (3.1) in Table 3.1.2.1. However, the coefficient β_1 for the product of annual average of two week purchase rate and the dummy variable for business cycle are not significant in all specifications. Contrary to the findings reported in Slovakia this results do not imply that monetary policy has stronger effect during the downturn period. In addition, the theoretical expectations of the heterogeneous impact of the monetary policy according to the size of the firm have been rejected. Coefficients for the product of annual average of two week purchase rate and the dummy variable for firm size are not significant in all specifications. This results imply, that corporate implicit interest rate move around the average represented by constant and is affected by monetary policy through the repo rate and balance sheet and income statements indicators.

4.3 Augmented Estimation Results for Poland

Estimations results for the advanced estimated equations (4.1) and (4.2) for Polish data are reported in Table 4.3.1 below.

Determinants of Corporate Interest Rates PL - Firm Size, Downturns and Monetary Policy					
Variable	(1)	(2)	(3)	(4)	(5)
Debt/Assets		8.362*** (2.033)			
Debt structure		-6.073*** (1.434)		-6.281*** (0.790)	-6.559*** (0.843)
Operating revenue/Assets		-1.261*** (0.419)			
Small firm*Repo Rate	-0.188* (0.097)	-0.182 (0.332)			-0.173* (0.096)
Medium firm*Repo Rate	-0.143* (0.077)	0.008 (0.237)			-0.126* (0.076)
Downturn*Repo Rate			-0.438** (0.174)	-0.375** (0.173)	-0.431** (0.187)
Repo Rate	0.753*** (0.076)	2.731*** (0.645)	1.924*** (0.512)	1.760*** (0.512)	2.031*** (0.554)
Constant	8.254*** (0.341)	-5.537 (3.893)	0.897 (2.911)	3.115 (2.908)	2.239 (3.143)
R2	0.033	0.043	0.033	0.044	0.047
Number of Observations	11858	4689	13454	13454	11858

legend: * p<.1; ** p<.05; *** p<.01, standard errors are in parenthesis

Table 4.3.1: Determinants of Corporate Interest Rate, Augmented Estimation, Poland

Due to a lack of information about a debt burden on firm and operating revenue during the downturn period, we had to again exclude from the (3) and (4) specification of estimated model variables $\frac{DEBT_{it-1}}{ASSETS_{it-1}}$ and $\frac{OR_{it-1}}{ASSETS_{it-1}}$. In specification (3) can be seen, that expected impact of balance sheet and income statements indicators on corporate interest rate is again in accordance with the theoretical expectations. Which is also consistent with the results of estimated equation (3.1) showed in Table 3.1.3.1. Coefficients for these indicators have expected signs and are significant. Coefficient β_1 for the product of annual average of two week purchase rate and the dummy variable for business cycle are significant in all

specifications, but contrary to the theoretical expectations. These results suggest, that monetary policy has stronger effect during the boom period. Quality of these results can be affected by economic development in Poland. The sample period is short and GDP growth is just one year below the average level of the sample period. Therefore, we decline the heterogeneous impact of monetary policy during the business cycle.

Theoretical expected impact of the monetary policy according to the firm size is again rejected, what is in respect of the estimated results of the estimated equation (3.1) in Table 3.1.3.1. The coefficients for the product of annual average of two week purchase rate and the dummy variable for firm size are arranged follows: $\gamma_1 < \gamma_2 < 0$. And the both are significant. This implies that monetary policy in Poland has during the sample period smallest impact on small and medium firms, which may be due to support for this enterprises as it is described in text above. Moreover, the constant (which may represent the average corporate interest rate) is not significant in this model. The corporate interest rate is strongly influenced by repo rate.

4..4 Robustness Analysis

In further analysis, we examined the impact of changes in definition of dummy variables. In first step, we changed the definition of dummy variables for small and medium firms. We changed small firms for micro-firms and medium firms for small firms. Variable S than denoted micro-firms (firms with less than 10 employees) and variable M denoted small firms according to previous definition. This way, at the same time, we researched the impact of monetary policy on micro-firms. Heterogeneous impact of monetary policy on micro-firms for dataset for Slovakia was rejected. The coefficient for product of annual average of two week purchase rate and the dummy variable for micro-firms was insignificant. However, the impact on small firms has been confirmed, according to the previous specification. Change from the initial results occurred in the Bulgarian data. Our results after changing the definition of dummy variable S suggest that monetary policy have significant stronger impact on micro-firms. Results for this specification for Polish dataset rejected the heterogeneous impact of monetary policy according to firm size.

In next step we changed the definition of Small and Medium firms. We set small businesses as firms with less than 100 employees and Medium firms with less than 500 employees. Similar to the previous specification, by this definition of small and medium

firms, suggest our results that the impact of monetary policy was in the sample period in Slovakia and Poland homogeneous. However, results in Bulgarian dataset confirm again the presence of the financial accelerator. The results for this specification suggest a significant stronger impact of monetary policy for small firms.

In the last step we analyzed the change of impact of monetary policy across the business cycle, with regard to changing the definition of the downturn period. Because there was in all analyzed countries during the sample period positive growth in GDP, we set the downturn period as a year with the lowest growth rate in GDP in the country in sample period. However, the results for Bulgarian and Slovak dataset compared to the previous specification did not changed significantly. The heterogeneous impact of monetary policy over the business cycle was again confirmed. With regard of the economic development in Poland remained the definition of downturn period unchanged.

CONCLUSIONS

We examined the determinants of corporate interest rate in four selected countries and also the impact of monetary policy across the firm size and business cycle. We used the panel data, that contain balance sheet items and income statements from over 55 000 non-financial firms. The number of observations and the sample period differs in individual countries. After calculation of implicit interest rate for individual firms, we excluded, due to a lack of this key information, Slovenia from further analysis. The shortest sample period for analysis has Poland (between years 2002 – 2005). Sample period for Slovakia is between years 2000 – 2005 and the longest sample period has Bulgaria (between years 1998 – 2005). In addition to the whole sample, we also reported the sub-samples according to the firm size and the business cycle.

In the first estimated equation, we examined the determinants of interest rate according to balance sheet and income statements indicators. Moreover, we included in to the estimated equation the dummy variables for GDP growth and firm size. The results for all three countries confirmed the impact of the debt burden of a firm on corporate interest rate. Increasing debt burden of a firm raises corporate interest rate. The results also confirmed significant impact of size of operating revenue to total firm's assets. Higher share of operating revenue on the firm's assets, which mean better use of assets, decreases the corporate interest rate. Contrary to the theoretical expectations higher proportion of long-term liabilities on total liabilities advances price of the credit in Slovakia. This may be caused by the requirement from banks of quick return, because the firms in Slovakia were during the sample period too risky. Expectations, according to (Bougheas et al., [5]), that the higher proportion of long-term debt on total debt raises the corporate interest rate were confirmed in Bulgaria and Poland. Furthermore were in all three countries confirmed the expectations, that the corporate interest rate is higher during the downturn period. This implies that the commercial banks deteriorate credit conditions for firms during downturn period. The expectation that interest rate is higher for small firms were confirmed only in Bulgaria. Contrary to theoretical expectations was interest rate for small firms in Slovakia and Bulgaria lower than for medium and large firms. This may be caused due to several financial support programs for small and medium firms. Furthermore this results show, that this support programs are more effective for small firms. But the interest rate for small firms in Slovakia is too low compared to

theoretical expectations. This may be caused by data, since it is difficult to obtain high quality data on the companies' balance sheet items.

In next step, we extended first estimated equation for two shapes, to be able to examine the impact of monetary policy through the repo rate. Moreover we examined, whether the monetary policy has heterogeneous impact over the business cycle and according to firm size. Examining the heterogeneity of monetary policy effects allows us to asses the presence of financial effects in these selected economies. Although the results of the Slovak dataset suggest that monetary policy has heterogeneous impact according to firm size, this is not in accordance with theoretical expectations (because the impact is higher for large firms). This may be caused again due to a several financial support programs for small and medium firms. For Bulgaria and Poland we do not find any evidence that monetary policy has heterogeneous impact according to firm size. Moreover we do not find any evidence, that monetary policy has heterogeneous impact during the business cycle (we decline the heterogeneous impact of monetary policy in Poland due to the nature of the data). Taken together, our results suggest that balance sheet and income statements indicators are important determinants of corporate interest rate. Although the dummies for downturn periods are significant, further results do not support the presence of financial accelerator in our datasets of these countries.

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APPENDIX 1: LIST OF AVAILABLE INFORMATIONS

- Mark
- Company name
- NACE Rev.1.1
- NACE Rev description
- City
- Year
- Interest paid th EUR
- Current liabilities: creditors th EUR
- Current liabilities: loans th EUR
- Other currentl liabilities th EUR
- Non current liabilities: long term debt th EUR
- Other non-curren liabilities th EUR
- Employees
- Cost of employees th EUR
- Operating revenue / turnover th EUR
- Sales th EUR
- Profit margin th EUR
- Total assests th EUR
- EBIT Margin (%)
- EBITDA Margin (%)
- Return on capital employed
- Shareholders funds th EUR

APPENDIX 2: CONVERTING DATA TO PANEL DATA

To run this program is needed software STATA.

```
use "C:\DATA.dta"
save"C:\DATAtemp.dta", replace
gen year=1994
gen newINPAID=INPAID_1994
gen newCLC=CLC_1994
gen newCLL=CLL_1994
gen newOCL=OCL_1994
gen newNCL=NCL_1994
gen newONCL=ONCL_1994
gen newE=E_1994
gen newOR=OR_1994
gen newSALES=SALES_1994
gen newPM=PM_1994
gen newTASSET=TASSET_1994
gen newEBIT=EBIT_1994
gen newEBITDA=EBITDA_1994
gen newRCE=RCE_1994
gen newSF=SF_1994

save"C:\DATApanel.dta", replace

use "C:\DATA.dta"
gen year=1995

gen newINPAID=INPAID_1995
gen newCLC=CLC_1995
gen newCLL=CLL_1995
gen newOCL=OCL_1995
gen newNCL=NCL_1995
gen newONCL=ONCL_1995
gen newE=E_1995
gen newOR=OR_1995
gen newSALES=SALES_1995
gen newPM=PM_1995
gen newTASSET=TASSET_1995
gen newEBIT=EBIT_1995
gen newEBITDA=EBITDA_1995
gen newRCE=RCE_1995
gen newSF=SF_1995

save"C:\DATAtemp.dta", replace
use"C:\DATApanel.dta", replace
append using "C:\DATAtemp.dta"
save "C:\DATApanel.dta", replace

forval j=1996(1)2008 {
use "C:\DATA.dta"
gen year=`j'

gen newINPAID=INPAID_`j'
gen newCLC=CLC_`j'
```

```
gen newCLL=CLL_`j'
gen newOCL=OCL_`j'
gen newNCL=NCL_`j'
gen newONCL=ONCL_`j'
gen newE=E_`j'
gen newOR=OR_`j'
gen newSALES=SALES_`j'
gen newPM=PM_`j'
gen newTASSET=TASSET_`j'
gen newEBIT=EBIT_`j'
gen newEBITDA=EBITDA_`j'
gen newRCE=RCE_`j'
gen newSF=SF_`j'

save"C:\DATAtemp.dta", replace
use"C:\DATApanel.dta", replace
append using "C:\DATAtemp.dta"
save "C:\DATApanel.dta", replace
                  }
drop INPAID_* CLC_* CLL_* OCL_* NCL_* ONCL_* E_* OR_* SALES_* PM_* TASSET_*
EBIT_* EBITDA_* RCE_* SF_*
sort Mark year
rename newINPAID INPAID
label var INPAID "Interest paid th EUR"
rename newCLC CLC
label var CLC "Current Liabilities: creditors th EUR"
rename newCLL CLL
label var CLL "Current Liabilities: loans th EUR"
rename newOCL OCL
label var OCL "Other current liabilities th EUR"
rename newNCL NCL
label var NCL "Non current liabilities: long term debt th EUR "
rename newONCL ONCL
label var ONCL "Other non-current liabilities th EUR"
rename newE E
label var E "Employees"
rename newOR OR
label var OR "Operating revenue / turnover th EUR"
rename newSALES SALES
label var SALES "Sales th EUR"
rename newPM PM
label var PM "Profit margin"
rename newTASSET TASSET
label var TASSET "Total assets th EUR"
rename newEBIT EBIT
label var EBIT "EBIT Margin (%)"
rename newEBITDA EBITDA
label var EBITDA "EBITDA Margin (%)"
rename newRCE RCE
label var RCE "Return on capital employed in year"
rename newSF SF
label var SF "Shareholders funds th EUR"
save "C:\DATApanel.dta", replace
```

APPENDIX 3: STATA DO FILE

This cource code is just for data for Slovakia. For other countries are necesary some changes.

```
use "C:\SVKpanel.dta"
label data "Panel data Slovakia"

/*-------------------------------------------------------------------*/
/*----------------IMPLICIT CORPORATE INTEREST RATE----------------*/
/*-------------------------------------------------------------------*/

drop if NCL==. |ONCL==.| CLC==.| CLL==.|OCL==.
generate float IR = INPAID/(NCL+CLL)
label variable IR "Implicit corporate interest rate, Slovakia"
drop if IR==.|IR==0

/*------REMOVING YEARS WITH A SMALL NUMBER OF AVAILABLE DATA------*/
drop if year==1994|year==1995|year==1996|year==1997|year==1998|year==1999

/*-----------------------REMOVING OUTLIERS-----------------------*/

gen IR2000=IR if year==2000
gen IR2001=IR if year==2001
gen IR2002=IR if year==2002
gen IR2003=IR if year==2003
gen IR2004=IR if year==2004
gen IR2005=IR if year==2005

su IR2000, detail
drop if (year==2000 & IR2000>r(p75) |IR2000 <r(p25))
su IR2001, detail
drop if (year==2001 & IR2001>r(p75) |IR2001 <r(p25))
su IR2002, detail
drop if (year==2002 & IR2002>r(p75) |IR2002 <r(p25))
su IR2003, detail
drop if (year==2003 & IR2003>r(p75) |IR2003 <r(p25))
su IR2004, detail
drop if (year==2004 & IR2004>r(p75) |IR2004 <r(p25))
su IR2005, detail
drop if (year==2005 & IR2005>r(p75) |IR2005 <r(p25))

/*-------------AVERAGE IMPLICIT INTEREST RATE OUTPUT---------------*/

log using "C:\Diplomovka_EFM\AverageIR_SK.log",replace
su IR if year==2000
su IR if year==2001
su IR if year==2002
su IR if year==2003
su IR if year==2004
su IR if year==2005
log close


/*-------------------------------------------------------------------*/
/*-----------------DUMMY VARIABLE FOR FIRM SIZE-------------------*/
/*-------------------------------------------------------------------*/
```

```
gen S=1 if E <  50
replace S = 0 if E > 49
replace S = . if E == .

gen M=1 if E <250 & E > 49
replace M = 0 if E > 249 | E < 50
replace M = . if E == .

gen L=1 if E > 249
replace  L = 0 if E < 250 | E > 30000
replace L = . if E == .

gen MSP=1 if E < 250
replace MSP = 0 if E > 249
replace MSP = . if E == .
label var MSP "small firms under 250 employees"

/*-----------------------------------------------------------------*/
/*------------------DUMMY FOR BUSSINESS CYCLE--------------------*/
/*-----------------------------------------------------------------*/

gen DOWN=0
replace DOWN=1 if year==2000|year==2001 | year==2002 |year==2003

gen UP=0
replace UP=1 if year==2004|year==2005

/*-----------------------------------------------------------------*/
/*-------------------------REPO RATES-----------------------------*/
/*-----------------------------------------------------------------*/

gen RR=0
replace RR=8.8 if year==2000
replace RR=8.8 if year==2001
replace RR=7.81 if year==2002
replace RR=6.39 if year==2003
replace RR=4.83 if year==2004
replace RR=3.16 if year==2005

/*-----------------------------------------------------------------*/
/*-----------------VARIABLES FOR ESTIMATED EQUATION--------------*/
/*-----------------------------------------------------------------*/

tsset Mark year
gen IR100=IR*100
gen ZADLZENIE=(NCL+CLL+OCL+ONCL+CLC)/TASSET
gen LZADLZENIE=L.ZADLZENIE
gen DSTR=(1-(CLC+CLL+OCL)/(NCL+ONCL+CLC+CLL+OCL))
gen CF =OR/TASSET
gen LCF=L.CF
gen SRR=S*RR
gen MRR=M*RR
gen LRR=L*RR
gen DOWNRR=DOWN*RR
gen UPRR=UP*RR

/*--------------SELECTED FINANCIAL INDICATORS TESTS---------------*/

drop if (LZADLZENIE>1 & LZADLZENIE !=.)
su LCF, detail
```

```
drop if ( (LCF>r(p90)&LCF!=.) |LCF<r(p10))
drop if DSTR < 0 | DSTR >1
drop if S==1 & OR>10000000
drop if M==1 & OR>50000000

/*-----------------------------------------------------------------*/
/*----------------------------OUTPUTS------------------------------*/
/*-----------------------------------------------------------------*/

log using "C:\No_of_observations_SK.log", replace
su IR if year==2000
su IR if year==2001
su IR if year==2002
su IR if year==2003
su IR if year==2004
su IR if year==2005
log close

log using "C:\Descriptive_SK.log", replace

su IR100 if S==1
su IR100 if M==1
su IR100 if L==1
su IR100 if DOWN==1
su IR100 if UP==1
su IR100
su LZADLZENIE if S==1
su LZADLZENIE if M==1
su LZADLZENIE if L==1
su LZADLZENIE if DOWN==1
su LZADLZENIE if UP==1
su LZADLZENIE
su DSTR if S==1
su DSTR if M==1
su DSTR if L==1
su DSTR if DOWN==1
su DSTR if UP==1
su DSTR
su CF if S==1
su CF if M==1
su CF if L==1
su CF if DOWN==1
su CF if UP==1
su CF
log close

/*-----------------------------------------------------------------*/
/*----------------------------REGRESSIONS--------------------------*/
/*-----------------------------------------------------------------*/

xtreg IR100 LZADLZENIE DSTR,fe
est store tab_01
xtreg IR100 LZADLZENIE DSTR LCF,fe
est store tab_02
xtreg IR100 LZADLZENIE DSTR DOWN,fe
est store tab_03
xtreg IR100 LZADLZENIE DSTR LCF DOWN S RR,fe
est store tab_04
xtreg IR100 LZADLZENIE DSTR LCF DOWN MSP RR,fe

xtreg IR100 SRR MRR LRR, fe
```

```
est store tabag_01
xtreg IR100 LZADLZENIE DSTR LCF SRR MRR LRR, fe
est store tabag_02
xtreg IR100 DOWNRR UPRR, fe
est store tabag_03
xtreg IR100 LZADLZENIE DSTR LCF DOWNRR UPRR, fe
est store tabag_04
xtreg IR100 LZADLZENIE DSTR LCF DOWNRR UPRR SRR MRR, fe
est store tabag_05

log using "C:\Estimated_Results_SK.log", replace
est table tab_*, b(%9.3f) star(0.01 0.05 0.1) stat(r2, N)
est table tab_*, b(%9.3f) se(%9.3f)
est table tabag_*, b(%9.3f) star(0.01 0.05 0.1) stat(r2, N)
est table tabag_*, b(%9.3f) se(%9.3f)
log close
```