Credit Risk and the Czech Macroeconomy: The Response of Non-performing Loans to Macroeconomic Fundamentals

Melecky Ales, Sulganova Monika, Lelkova Petra
VSB - Technical University of Ostrava
Faculty of Economics, Department of Economics
Sokolska tr. 33,
701 21 Ostrava 1, Czech Republic
e-mail: ales.melecky@vsb.cz, monika.sulganova@vsb.cz, petra.lelkova@vsb.cz

Abstract
The Czech Republic has been one of the more resistant countries to the global financial crisis, at least at its onset. However, the ensuing global recession have increased credit risk in the Czech banking system as the Czech macroeconomic fundamentals weakened. This paper analyzes the sensitiveness of credit risk, measured by the ratio of non-performing loans to total loans (NPLR) of banks, to changes in macroeconomic fundamentals. The paper uses quarterly data on NPLR from 2002 to 2013 at the aggregate and sectoral levels. The main macroeconomic fundamentals considered are GDP growth, PPI inflation, lending interest rates, and the real effective exchange rate. The authors employ the autoregressive distributed lag (ARDL) approach to estimate the NPLR elasticity to macroeconomic fundamentals. The authors find that the elasticities of aggregate NPLR to macroeconomic fundamentals could be vastly different to the elasticities of sectoral NPLRs. For instance, the elasticity of NPLR to GDP growth is much stronger at the aggregate level than in any of the studied sectors. Further, the elasticity of NPLRs to the lending rate is several folds greater in the Industry and Construction sectors than analogous elasticity at the aggregate level. Moreover, the effect of the real exchange rate on NPLRs at the aggregate level and in the Industry sector indicate prevalence of the balance sheet effect of the real exchange rate on NPLR over the income effect. In contrast, the effect of the real exchange rate in the Agriculture, Construction, and Commercial Services sectors, indicates dominance of the income effect over the balance sheet effect.

Keywords: Non-performing loans, ARDL model, Macroeconomic fundamentals, Time lag structure, Czech Republic
JEL codes: E32, E58, G28

1. Introduction

The global financial crisis highlighted the need to improve the monitoring and assessment of credit risk in the economy. Although the Czech Republic has been one of the more resistant countries to the global financial crisis, the indirect effects from global recession have increased credit risk in the Czech financial system. Credit risk materialization manifests itself in a rise of credit losses, which negatively affect investment activity through the limited credit supply. Also the consumption of economic agents might decrease because of weaker stream of financial revenues and higher debt burden. As a result, economic activity is constrained on an aggregate level. In the empirical literature, non-performing loans are broadly used as an indicator of credit risk materialization; see e.g. Buncic and Melecký (2013), or Louzis et al. (2012), Festic et al. (2011) or Jimenéz and Saurina (2006).

The Czech banking system was only marginally hit by the crisis; there was no need for public assistance mainly for the following reasons: very few exotic "toxic assets", low exposure to Greek government bonds and focus on traditional conservative commercial banking concentrated on the domestic market (Proskurovska, 2012)

In this paper we focus on the non-financial companies in the Czech Republic at the aggregate and sectoral levesl. For the purpose of our analysis, the Czech non-financial companies are divided into six sectors: Agriculture, Industry, Construction, Transportation and Sale, Commercial Services and Other Services. Division to the sectors is based on the Czech Classification of Economic Activities (CZ-NACE); more details about economic activities included in each sector are available in appendix 1.

As can be seen from the figures 1 and 2 in the part A2 of the appendix, the percentage shares of the six sectors on the total loans granted are significantly different from the percentage shares of respective sectors on the total non-performing loans (NPLs). The largest percentage share of loans granted corresponds to Other Services (49%), however their share on NPLs is significantly smaller (34%). On the other side, e.g. Construction sector accounts for 2% of the granted loans but for 5% of total NPLs.

In the A3 part of appendix we capture dynamic development of the non-performing loans ratios (NPLRs), see figures 3 and 4. The figures show high dynamic in the NPLRs when there was a significant decrease in NPLRs in all sectors between 2002 and the end of 2007. Then with the impact of the global financial crisis NPLRs started to rise sharply, e.g. in 2002 the lowest NPLR was in the Other Services sector (7.76%) and the highest in Construction sector (30.6%). In the end of 2007 the lowest ratio was in Commercial Services sector (only 1.48%) and the highest in Construction sector (5.72%, which was more than five times less than in 2002). In the second quarter of 2013 the best values exhibited Agriculture sector (3.8%, with the lowest increase between 2007 and 2013) and the worst performed again Construction sector with 16.2% (almost three times as high NPLR as in 2007).

Boss et al. (2009) modeled credit risk through the Austrian business cycle and their results suggest that degree of impact, and sometimes even signs of macroeconomic factors (such as GDP), as well as other factors, could differ significantly across the sectors of the Austrian economy. Therefore, the goal of this paper is to estimate the sensitivity of the non-performing loans ratio to changes in macroeconomic fundamentals in the Czech Republic at the aggregate and sectoral level and to discuss the length of their transmissions to non-performing rate ratio.

2. Data and methodology

2.1 Data

In the empirical analysis we use quarterly data for the Czech Republic ranging from first quarter of 2002 to second quarter of 2013, which cover maximum publicly available data span. Basic characteristic of the data as well as their sources are described in Table 1.

Table 1: Data overview

Variable	Characteristic	Source
NPLs ratio	Calculated as a share of non-performing loans to total volume of nominal loans, calculated at the aggregate level and individually for each sector	ARAD, CNB
Lending rate - companies	Nominal lending interest rate for companies	ARAD, CNB
Real effective exchange rate	Real effective exchange rate of the Czech Crown	ARAD, CNB
Inflation	Calculated as annual percentage change of the PPI index (2005=100)	ARAD, CNB
Real GDP	Real gross domestic product, seasonally adjusted, in 2005 prices, calculated at aggregate level and individually for each sector	CSO

Source: Self-elaboration

For description of the potential credit risk we use the non-performing loans ratio (NPLR) calculated as a share of non-performing loans[1] to total loans granted either on aggregate level or in each sector. For the pricing of the lending we used companies´ lending rates. To describe an exchange rate development we chose real effective exchange rate as recommended by Mojon and Peersman

[1] According to IMF Financial Soundness Indicators the loan is classified as non–performing if (i) payments of principal and interest are past due by three months (90 days) or more; (ii) interest payments equal to three months (90 days) interest or more have been capitalized (re-invested into the principal amount), refinanced or rolled over (i.e. payment has been delayed by arrangement), see e.g. Barisitz (2011).

(2001) or Babouček and Jančar (2005). Because of higher volatility of the variables in the Czech Republic we calculated real GDP annual growth rates as suggested e.g. by Festić and Bekő (2008) or Buncic and Melecký (2013). To avoid potential stationarity issues of data series we use the first order differences of all selected variables. After this modification and based on stationarity and unit root testing we can conclude that all data series are stationary.

2.2 Model and estimation method

We used dynamic linear regression model of the Czech economy for the empirical analysis of the effects of macroeconomic determinants on NPLR and for identification of their lags effects. This model explains changes in NPLR by lagged values of the NPLR and by the main macroeconomic variables. The selection of the macroeconomic variables is motivated by the economic theory as well as findings of other authors it this research area. We focused only on the most important macroeconomic determinants, which impact was confirmed in the various empirical papers; see e.g. Babouček and Jančar (2005) or Festić and Bekő (2008) among others. Generally the following relation between NPLs ratio and main macroeconomic determinants can be described for the Czech economy as a whole and for each of the sectors:

$$\Delta NPLR_t = \alpha + \beta_{NPLR}\Delta NPLR_{t-X} + \beta_{REG}\Delta REG_{t-X} + \beta_{INFL}\Delta INFL_{t-X} + \beta_{ER}\Delta REER_{t-X} + \beta_{LRC}\Delta LRC_{t-X} + u_t \,. \quad (1)$$

Where α is a constant and parameters βxx denote values of coefficients of respective explanatory variables. Futher, ΔNPLR denotes change in NPLs ratio (aggregate or specific for each sector), ΔREG is change in annual real GDP growth (aggregate or specific for each sector), ΔINFL is change in annual inflation calculated from PPI index, ΔREER is change in real effective exchange rate of the Czech Crown, ΔLRC stands for changes in companies´ lending rate, and u_t is *i.i.d.* normally distributed shock with mean zero and variance σ. Because the lag structure is supposed to be different across the sectors and in the economy as a whole we use X to denote the lag length in the equation 1. For estimation of the parameters of the selected model we used ordinary least squares (OLS) method with empirically motivated lags. Lag length selection was based upon values of the information criterions (Akaike, Schwartz, HQ) and statistical significance of the model as well as t-statistics of the estimated coefficients and their significance.

3. Discussion of estimations results

At the aggregate level of the Czech Republic the impact of main macroeconomic fundamentals on the non-performing loans ratio is in line with the economic theory. At the sectoral level the majority of results imply the same. Table 1 in part A4 of appendix summarizes results of estimated ARDL models at the both selected levels. Specifically, it presents values of long run effects of macroeconomic variables, estimated coefficients, and their statistical significance, standard deviations and length of the time lags. Table 1 also shows results of adjusted coefficient of determination, Schwarz information criterion and constant.

At the aggregate level results showed that change (increase) in real economic growth (ΔREG) decreases the volume of ΔNPLR. Specifically, at the 1% level of statistical significance, if ΔREG increases by 1% then ΔNPLR decreases by 0.09 or 0.07% after 3 or 7 quarters, respectively. Impact of inflation (ΔINFL) on the ΔNPLR is not clear and statistically significant on the aggregate level. Its estimated value, which is close to zero, might be a result of different influence of inflation on the individual sectors. According to economic theory, inflation on the one hand decreases the real value of loans but on the other hand worsens an ability of economic agents to anticipate and make decisions to the future. Economic theory postulates that rise in lending interest rate increases debt burden of agents and result to rising loan losses. Our estimation results imply (at the 10% level of significance), that increase in ΔLRC by 1% leads to a rise of ΔNPLR by 0.34%. The estimated length of transmission, which affects the ΔNPLR is 7 quarters.

Value of estimated coefficient of ΔREER is positive and statistically significant at the 1% level of significance but however its value is close to zero. This value might be a result of two contrary

effects of the change in the exchange rate, which on the one hand cause changes in the international competitiveness of country (income effect) and on the other hand affect the value of unsecured loans in the foreign currencies (balance sheet effect). The results of the individual sectors imply that selected sectors react differently to the changes in exchange rate with the predominance of the "competitiveness" effect in the Agriculture, Construction and Commercial Services sectors. The balance sheet effect prevails at the aggregate level and in the Industry sector. Finally, results for aggregate level proved that non-performing loans show some persistence, i.e. they depend on their past values and do not perform a leap changes. At the sectoral level, results show different reactions of non-performing loans of selected sectors to the changes in main macroeconomic fundamentals. Despite this fact, we can observe similar patterns across some sectors.

In the Industry sector and Transportation and Sale sector ΔNPLR shows a statistically significant persistence with the estimated values of coefficients ranging from 0.21 to 0.30 and the time lags ranging from 1 to 4 quarters (see Table 1 in a part A4 in appendix). For Industry sector and Transportation and Sales sector 1% rise of ΔREG leads to the 0.02 and 0.03% decrease of ΔNPLR with a lag length of 2 and 5 quarters, respectively. These results are statistically significant at 1% level of significance and imply the shorter time of transmission in the Industry sector than in Transportation and Sale sector. Estimations results show that inflation is an important macroeconomic determinant for both sectors. If ΔINFL increases by 1% the ΔNPLR will decreases by 0.21% in Industry sector; in the case of Transportation and Sales the decline is 0.16% (both results are statistically significant at 1% level of significance). Similar reaction of both sectors is also in the case of lending interest rates where both estimated coefficients are positive and statistically significant and suggest that rise in the ΔLRC cause rise in the ΔNPLR. Values of respective coefficients are 0.71 for Industry and 0.84 for Transportation and Sales what imply that lending rates are important determinants of NPLs. In the case of ΔREER the reaction of ΔNPLR is statistically insignificant in the Transportation and Sales sector but exclusion of this variable does not affect estimation results significantly so we decided to keep this variable to compare results with other sectors. In the Industry sector the 1% rise of ΔREER leads to the 0.08% rise of ΔNPLR at the 5% level of significance.

In the Construction sector ΔNPLR shows higher rate of persistence (estimated coefficient is 0.6), which is actually the highest of all selected sectors of the Czech economy. The reaction of Construction sector to the changes in macroeconomic fundamentals differs from the reactions of abovementioned sectors, specifically the reaction to the changes in inflation and real effective exchange rate are different. Changes in REG are again in line with economic theory with the estimated coefficient of -0.06 (10% significance level) and lag length of 4 quarters. Inflation is also significant determinant and in this case the 1% rise in ΔINFL leads to the 0.27% increase of ΔNPLR. This result implies that Construction sector is sensitive to the acceleration of inflation in the sense of more complicated decision making of agents to the future. The most important determinant of ΔNPLR in the Construction sector is the lending interest rate. If the ΔLRC increases by 1% this will lead to the 2.21% rise in the ΔNPLR. This reaction is however quite tedious because the estimated lag length is 7 quarters. At the 10% level of significance, the 1% rise in ΔREER leads to the 0.1% decrease of ΔNPLR and the approximate transmission length is 4 quarters.

Commercial Services and other services sectors show similar results, although the results of Other Services are a bit mixed or contrainductive. Both sectors show statistically significant persistence of ΔNPLR with estimated coefficients of 0.23 and 0.30 in respective order for Commercial Services and Other Services. Results also suggest that rising economic growth leads to the decrease of loans losses; however the reaction of Other Services sector is statistically insignificant. In the case of Commercial Services sector 1% increase of ΔINFL leads to the 0.10% rise of the ΔNPLR (at the 1% level of significance). Reaction to the accelerating inflation in the case of Other Services sector is not statistically significant. Interest lending rate is an important determinant for Commercial Services because estimated value of ΔLRC is positive (0.75) and statistically significant on the 5% level and the length of transmission is 6 quarters, so these results are comparable with the reaction of Industry sector. In the case of Other Services results of the lending rates influence on ΔNPLR are mixed. Specifically, the values of estimated coefficients are -0.28 (at the 10% level of significance) and 0.48 (at the 1% level of significance). The estimated lag lengths are 4 and 7 quarters. Reactions of both sectors to rise in ΔREER are both negative with estimated coefficients -0.04 for Commercial Services and -0.01 for Other Services but the reaction in the Other Services sector is statistically insignificant.

In the Agriculture sector the 1% rise of ΔREG leads to the 0.02% increase of ΔNPLR after 4 quarters. However this reaction is not in line with economic theory, it is statistically significant at 10% level of significance. The reaction of ΔNPLR to ΔINFL is statistically insignificant and the reactions to ΔLRC and ΔREER are mixed and inconsistent (for more details see Table 1 in a part A4 in appendix). So we cannot conclude that the results in the case of Agricultural sector are robust with exception that ΔNPLR shows certain degree of persistence.

4. Conclusion

The empirical analysis presented in this paper showed that the response of non-performing loans ratio (NPLR) to macroeconomic fundamentals is in line with economic theory. At the sectoral level the majority of results imply the same. Moreover, the analysis confirmed that the elasticities of aggregate NPLR to macroeconomic fundamentals could be vastly different to the elasticities of sectoral NPLRs.

At the aggregate level and in the majority of the selected sectors (with exception of the Agriculture sector and Other Services sector) we confirmed that real economic growth leads to the decline in the non-performing loans ratio with the strongest reaction in the Industry sector. Furthermore, the elasticity of NPLR to GDP growth is much stronger at the aggregate level than in any of the studied sectors. The length of transmission when the changes in real economic growth affect the changes in NPLR ranges from 2 to 7 quarters across all sectors.

The overall influence of inflation is not clear because the coefficient of elasticity of NPLR to inflation is not statistically significant and its value is almost zero. On the other hand, the results at the sectoral level suggest that inflation is important macroeconomic determinant for non-performing loans ratio. In Industry sector and Transportation and Sales sector acceleration in inflation leads to the decline in ΔNPLR and in the Construction sector and Commercial Services sector causes an increase in ΔNPLR. Finally we can conclude that most sensitive sector to acceleration of inflation is Industry. The length of transmission of changes in inflation is shorter compared to the transmission of changes in real economic growth, specifically it ranges from 2 to 4 quarters (in the sectors with statistically significant reactions).

Companies´ lending interest rates (LRC) are also fundamental for the development of non-performing loans ratio. All reactions of ΔNPLR to ΔLRC are statistically significant and confirmed the economic premises that rise in the lending rates leads in an increase of debt burden and non-performing loans (with exception of Agricultural sector). Further, the elasticity of NPLRs to the lending rate is several folds greater in the Industry and Construction sectors than analogous elasticity at the aggregate level. According to estimation results the Construction sector is the most sensitive to the changes in lending rates and the length of transmission varies from 4 to 7 quarters among sectors.

The elasticity of non-performing loans ratio to the real effective exchange rate (REER) is rather small at the aggregate level. This small elasticity might be a result of contrary effects which affect the NPLR when the exchange rate changes. Concretely, the effect of the real exchange rate on NPLRs at the aggregate level and in the Industry sector indicate prevalence of the balance sheet effect of the real exchange rate on NPLR over the income effect. In contrast, the effect of the real exchange rate in the Agriculture, Construction, and Commercial Services sectors indicates dominance of the income effect over the balance sheet effect. The identified structure of time lags of changes in REER varies from 2 to 5 quarters.

These findings alert policymakers that monitoring purely aggregate indicators of credit risk, such as the aggregate non-performing loans, could leave them blindsided to pockets of significant credit risk forming in individual economic sectors, which could later spillover to the entire economy.

Acknowledgement

This article has been elaborated in the framework of the project Opportunity for young researchers, reg. no. CZ.1.07/2.3.00/30.0016, supported by Operational Programme Education for Competitiveness and co-financed by the European Social Fund and the state budget of the Czech Republic and as part of Student Grant Competition of Technical University of Ostrava (reg. no. 2013/123). We also thank Martin Melecký for useful comments.

References

BABOUČEK, I., JANČAR, M. (2005). *A VAR analysis of the effects of macroeconomic shocks to the quality of the aggregate loan portfolio on the Czech banking sector.* CNB Working Paper Series 1. Prague: Czech National Bank.

BARISITZ, S. (2011). *Nonperforming loans in CESEE – What do they comprise?* Focus On European Economic Integration Q4/2011. Vienna: Oesterreichische Nationalbank.

BOSS, M. et al. (2009). *Modeling Credit Risk through the Austrian Business Cycle: An Update of the OeNB Model*. Financial Stability Report 17. Vienna: Oesterreichische Nationalbank.

BUNCIC, D., MELECKÝ, M. (2013). Macroprudential stress testing of credit risk: a practical approach for policy makers. *Journal of Financial Stability,* vol. 9, no. 3, pp. 347-370.

FESTIĆ, M., BEKŐ, J. (2008). The banking sector and macroeconomic performance in Central European economies. *Czech Journal of Economics and Finance*, vol. 58, no. 3–4, pp. 131–151.

FESTIĆ, M. et al. (2011). The macroeconomic sources of systemic risk in the banking sectors of five new EU member states. *Journal of Finance and Banking,* vol. 35, no. 2, pp. 310–322.

JIMÉNEZ, G., SAURINA, J. (2006). Credit cycles, credit risk, and prudential regulation. *International Journal of Central Banking*, vol. 2, no. 2, pp. 65–98.

LOUZIS, D. P. et al. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Finance and Banking*, vol. 26, no. 4, pp. 1012–1027.

MOJON, B., PEERSMAN, G. (2001). *A VAR description of the effects of monetary policy in the individual countries of the Euroarea*. ECB Working Paper Series No. 92. Frankfurt am Main: European Central Bank.

PROSKUROVSKA, V. (2012). *European Banking Sector: Facts and Figures 2012.* Brussels: European Banking Federation.

Appendix

A1 Designation of the 6 Sectors[2]

1. AGRICULTURE
- A. Agriculture, forestry and fishing

2. INDUSTRY
- B. Mining and quarrying
- C. Manufacturing
- D, E. Electricity, gas, steam, water supply

3. CONSTRUCTION
- F. Construction

4. TRANSPORTATION and SALE
- G. Wholesale and retail trade; repair of motor vehicles and motorcycles
- H. Transportation and storage
- I. Accommodation and food service activities

[2] Based on the *Classification of Economic Activities (CZ-NACE).*

5. COMMERCIAL SERVICES

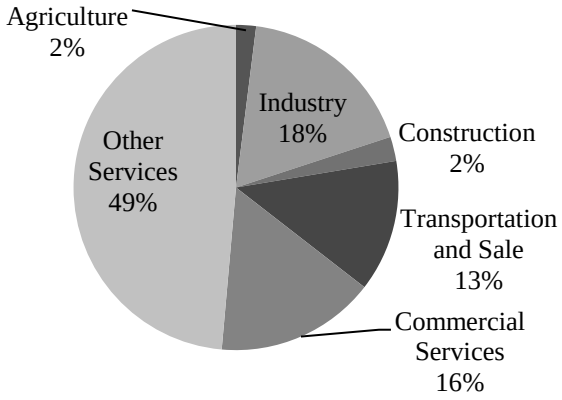
- L. Real estate activities
- M, N, J. Professional, scientific, information and administrative activities

6. OTHER SERVICES

- O. Public administration and defense; Compulsory social security
- P. Education
- Q. Human health and social work activities
- R, S. Arts, entertainment, recreation and other service activities
- T. Activities of households employers; undifferentiated goods and services producing activities of households for own use
- U. Activities of extraterritorial organizations and bodies

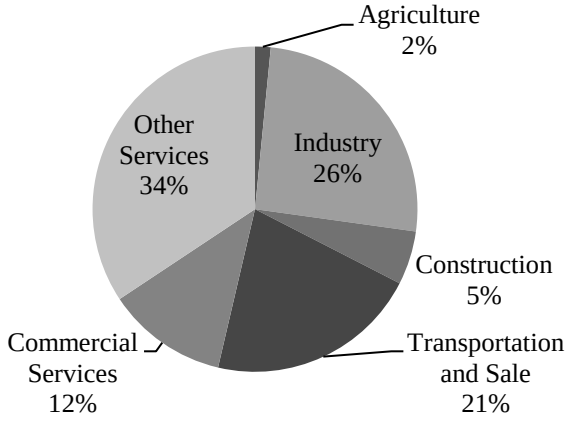
A2 Share of sectors with respect to total loans and NPLs in the 6 sectors

Figure 1: Average share of loans in sectors to total loans in 6 sectors (2002-2013)



Source: Self-elaboration based on CNB's data

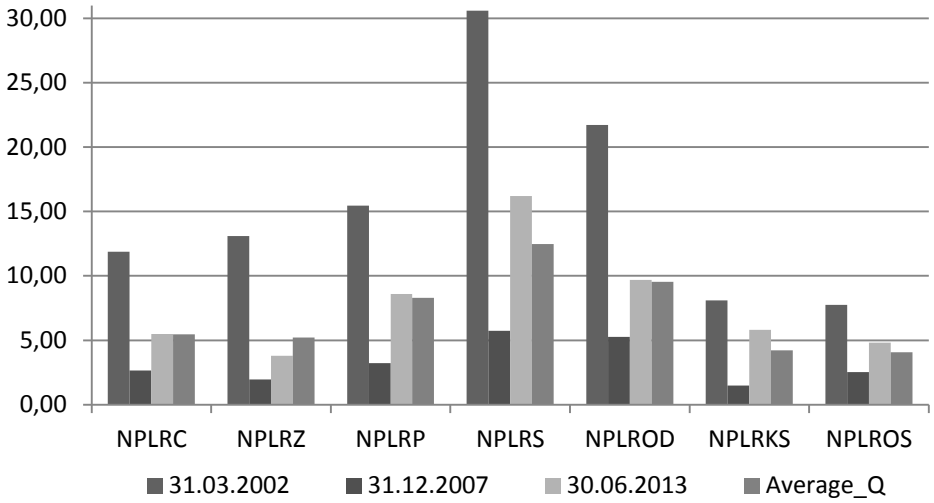
Figure 2: Average share of NPLs in sectors to total NPLs in 6 sectors (2002-2013)



Source: Self-elaboration based on CNB's data.

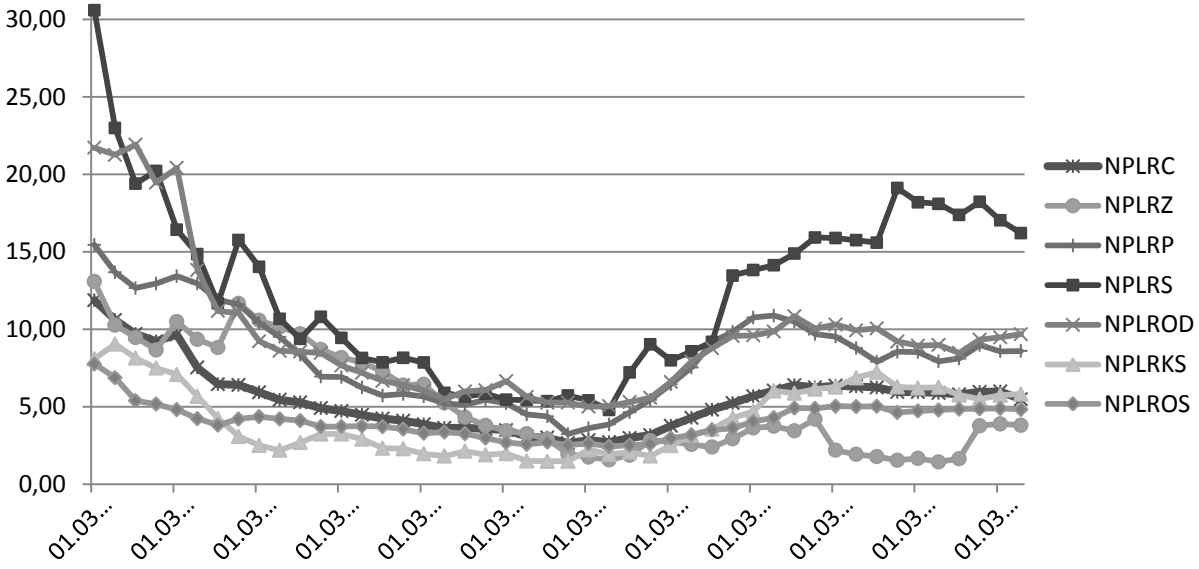
A3 Dynamic development of the non-performing loans ratios

Figure 3: Dynamic development of NPLRs in selected periods



Source: Self-elaboration based on CNB's data.

Figure 4: Dynamic development of NPLRs from 2002 to 2013



Source: Self-elaboration based on CNB's data

A4 Estimation results

Table 1: Estimation results of ARDL models at the aggregate and sectoral level

Dependent variable ΔNPLR							
		ΔNPLR	**ΔREG**	**ΔINFL**	**ΔLRC**	**ΔREER**	**Const.**
Aggregate level	LR c.	-	-0.33	-0.02	0.69	0.04	0.06
	Est. c.	0.40***; 0.11*	-0.09***; -0.07***	-0.01	0.34*	0.02***	0.03
	St.dev.	0.09; 0.05	0.02; 0.02	0.01	0.11	0.01	0.03
	Lag	2 ; 4	3; 7	5	7	3	-
Agriculture	LR c.	-	0.03	-0.16	-0.16	-0.03	-0.01
	Est. c.	0.38**	0.02*	-0.1	-1.12**; 1.02*	-0.08*; 0.06*	-0.06
	St.dev.	0.14	0.01	0.07	0.50; 0.57	0.04; 0.04	0.11
	Lag	3	4	5	1; 4	5; 6	-
Industry	LR c.	-	-0.04	-0.46	1.54	0.17	0.07
	Est. c.	0.24*; 0.30**	-0.02*	-0.21***	0.71*	0.08**	0.03
	St.dev.	0.14; 0.14	0.02	0.06	0.4	0.03	0.08
	Lag	1; 4	2	2	5	2	-
Construction	LR c.	-	-0.15	0.66	5.53	-0.25	0.3
	Est. c.	0.60***	-0.06*	0.27**	2.21**	-0.10*	0.12
	St.dev.	0.1	0.03	0.11	0.81	0.05	0.18
	Lag	4	4	3	7	4	-
Transportation and Sale	LR c.	-	-0.04	-0.20	1.06	-0.04	0.08
	Est. c.	0.21***	-0.03*	-0.16***	0.84**	-0.03	0.06
	St.dev.	0.06	0.02	0.05	0.36	0.02	0.08
	Lag	3	5	4	4	7	-
Commercial Services	LR c.	-	-0.04	0.13	0.97	-0.05	1.17
	Est. c.	0.23*	-0.03**	0.10***	0.75**	-0.04*	0.9
	St.dev.	0.13	0.01	0.04	0.31	0.02	0.6
	Lag	1	7	2	6	3	-
Other Services	LR c.	-	-0.01	-0.03	0.29	-0.01	0.04
	Est. c.	0.30**	-0.01	-0.02	-0.28*; 0.48***	-0.01	0.03
	St.dev.	0.14	0.01	0.02	0.14; 0.14	0.01	0.03
	Lag	1	7	6	4; 7	7	-

	R^2 adj.	**SIC**	**Obs.**
Aggregate level	0.75	-0.5	38
Agriculture	0.41	2.48	39
Industry	0.53	1.89	40
Construction	0.46	3.32	38
Transportation and Sale	0.46	1.73	38
Commercial Services	0.29	1.34	38
Other Services	0.31	-0.13	38

Source: Self-elaboration based on CNB's data.

Note: ΔNPLR = a change in a non-performing loans ratio, ΔREG = change in a real economic growth; ΔINFL = change in an inflation rate; ΔLRC = change in a lending interest rate of companies; ΔREER = change in a real effective exchange rate; Const = constant; LR c. = long-run coefficient; Est. c. = estimated coefficient; St.dev. = standard deviation; R^2 adj. = adjusted coefficient of determination; SIC = Schwarz information criterion; Obs. = number of observations.