Stress Test Model for Measuring the Effects of the Economic Crisis on the Capital Adequacy Ratio

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Abstract: The world economic crisis has to a great extent, affected the financial flow of business entities; the impact of the crisis has primarily affected the financial solvency of business entities. The effect of late payments caused by the financial crisis has also changed the bank portfolio structure of the banks involved in the financing in the corporate sector. The aim of this paper is to point out to what extent the effects of the crisis in the banking sector of one country impacted banks' portfolios, business stability and to identify sectors in which there was an increase of risk in loan offerings due to an increase in NPL. Moreover, the aim herein is to prove that regardless of banks' size, by assets, banks with fewer assets are not the only ones to suffer the consequences of the recession. Stress testing is used in this work to measure the impact of the effective NPL on the bank equity. Bank portfolio analysis performed according to the methodology described in this paper served to determine the effective NPL. As a result, the analysis shows the impact of NPL on the capital adequacy ratio of the banks. Summing up the results of individual analysis provides an overview of sectors which had an increase in risk, due to the financial crisis. The paper is organized as follows: The first part explains the NPL term in order to argue its significance in the analysis of the effects of the recession. The second part explains the methodology, i.e. the process of analysis and investigation, and in the third part presents the results that are interpreted to finally reach the conclusions and give suggestions for further research.

Keywords: Stress test; NPL; capital adequacy ratio; economic crisis

1   Introductory Considerations

During the past decade, the quality of loan portfolios in most countries in the world remained relatively stable until the financial crises hit the global economy in the period of 2007-2008. The phenomenon of NPL growth, as its consequence, was noticed in balance sheets of banks at the end of 2009. The biggest impact of

the crisis was reflected onto bank equity that was burdened by loans with an increasing risk. This increase of risk is the result of changed conditions brought about by the effects of the crisis. The impact of the crisis on the growth of the NPL can be observed in the following chart:
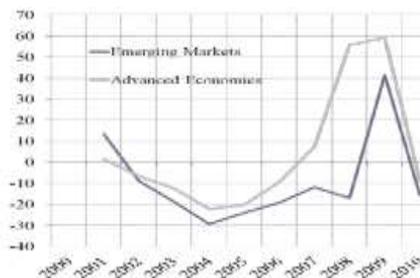

Figure 1
Growth of NPL ratio (%)

Source: European Central Bank [4]

The impact of the financial crisis on NPL is present in both advanced economies and emerging markets as shown in the chart. Research conducted by the European Central Bank [4] proves that GDP, as well as, share prices in different countries have a different effect on NPL in a given country. Hence, the difference in impact on advanced economies and emerging markets.

According to research data [12] for countries of CESEE region (Central, East and South Eastern Europe) the percentage of NPL rose from 3% in 2007 to an average of 11% in 2011. Far more dramatic is the data for the year 2009 which suggests that the asset quality in emerging markets deteriorated and that the growth of NPL ratio was about 40%, whereas in the advanced economies the average NPL ratio rose by 60% in 2009. Should we observe the amount of NPL in the past period in Russia we can see that the highest growth occurred in 2009, which is shown in the following charts.
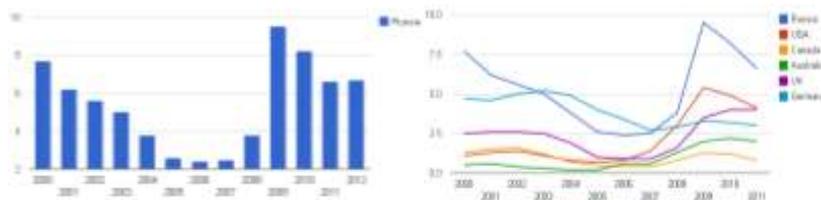

Figure 2
a) Russia Non-performing loans as percent of all bank loans[1]
b) Russia Non-performing loans: Compare to other countries [16]

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[1]   The percentage given in the graphics was calculated based on the data of the World Bank. In this analysis the percentage of NPL in total bank loans amounts to 8.8 % for the year 2009, which is shown in further analysis.

The percentage of Non-performing loans depicts the "health" of the banking system. Judging by the above chart a) the banking system of Russia was shaken to a great extent by the effects of the crisis. The biggest impact of the crisis occurred in 2009 when there was significant overdue debt (percentage of NPL doubled). Comparative analysis shown under b) indicates that in the same year, i.e. 2009 in comparison with USA, Canada, Australia, United Kingdom and Germany, the value of NPL in Russia rose to double the average in the given countries.

2   Literature Review

2.1   Treatment of Nonperforming Loans

Long discussion was held regarding measuring and definition of NPL in December of 2004 Advisory Expert Group (AEG) Meeting discussed the final report of the Nonperforming Loans Electronic Discussion Group (EDG). This report recommended the System of National Accounts 1993 (1993 SNA) rev. I continue to measure loans at nominal value, but show mandatory memorandum items on both the market-equivalent value of loans, and interest arrears on nonperforming loans (NPLs). It also recommended a future review – once accounting standards on fair valuation have stabilized – to decide if the accounts proper should also use the market-equivalent value of loans. The AEG agreed with the main proposals, but asked for clarification of some of the issues. However, in practice, the market-equivalent valuation of loans will be a mixture of various valuation methods since fair valuation recording of loans has not found general acceptance. Information on NPLs and loan impairment is, however, usually available. It is therefore suggested, as an alternative, to show nominal value minus expected losses as a memorandum item. [11]

The definition of NPLs – adapted from the one given in the Financial Soundness Indicators Guide – is: A loan is nonperforming when payments of interest and/or principal are past due by 90 days or more, or interest payments equal to 90 days or more have been capitalized, refinanced, or delayed by agreement, or payments are less than 90 days overdue, but there are other good reasons – such as a debtor filing for bankruptcy – to doubt that payments will be made in full. After a loan is classified as nonperforming, it (and, possibly, replacement loan(s)) should remain classified as such until written off or payments of interest and/or principal are received or subsequent loans that replace the original. [11]

The 90 days overdue criterion is commonly – but not universally – used. The second part of the definition ensures that NPLs cannot be reclassified as "performing" simply by replacing them with new loans. Because the 90-day

criterion is not universal, any international comparisons relating to NPLs require metadata relating to national practices.

Financial Times Lexicon [8] defines NPL as "A loan on which the borrower is not making any interest payments or repaying any principal. At what point the loan is classified as non-performing by the bank, and when it becomes bad debt, depends on local regulations."

The definition given by the Basel Committee on Banking Supervision-BCBS [3] can be used as reference definition, according to which NPL is defined as follows "a default occurs when the bank considers that the obligor is unlikely to repay its credit obligations to the banking group in full, without recourse by the bank to actions such as realizing security (if held); or the obligor is past due for more than 90 days on any material credit obligation to the banking group."

The standards on Non-Performing Exposures and Forbearance provide common definitions and reporting templates to allow supervisors to assess the level of forbearance activities and non-performing loans on a comparable basis across the EU. More harmonized asset quality reviews, based on more comparable data, will help address uncertainties around EU banks' asset quality in the current context, and will support on-going and future monitoring of levels and changes in asset quality. The proposed definitions of non-performing and forbearance exposures rely on the existing concepts of default and impairment but provide for specific harmonization features. In particular, the definition of non performing exposures focuses on a 90-day past due threshold, while the definition of forbearance focuses on concessions extended to debtors who face, or may face, difficulties in meeting payments. Forborne exposures, can be identified in both the non-performing and the performing portfolios. These definitions apply to all loans and debt securities that are on balance sheets, except for those held for trading, as well as to some off-balance sheet exposures. [7]

The World Bank defines NPL as follows: Bank nonperforming loans to total gross loans are the value of nonperforming loans divided by the total value of the loan portfolio (including nonperforming loans before the deduction of specific loan-loss provisions). The loan amount recorded as nonperforming should be the gross value of the loan as recorded on the balance sheet, not just the amount that is overdue. [16]

Owing to differences in definitions of NPL given by certain regulators, institutions and banks, this category of loans should be interpreted with caution. What all definitions have in common is the number of days overdue more than 90.

2.2   Factors Influencing Non Performing Loans

According to the findings in several analyses concerning the link between *NPLs – bank-specific factors – economic cycles*, there are macroeconomic and bank-specific factors which have significant impact on the NPL rate.[15] NPLs affect the business stability of banks, and in final instance the stability of the whole banking system. The aim of this paper is to point out to what extent and in what way NPLs, in conditions of the crisis, affect the capital adequacy ratio of banks as a main link in a financial system of developing countries.

Macroeconomic determinants [4] affecting the level of NPL are *(1) economic cycles* – slowing down of economic activities and effects of crisis, in these conditions slower growth of GDP drives an increase in NPLs on account of an increase in the unemployment rate leading to the deterioration of loan performances; increase in GDP leads to a decrease in NPL; *(2) exchange rate depreciation* as a generator of an increase in NPLs is characteristic for countries with a high degree of lending in foreign currencies (CHF, USD, EUR); *(3) an increase in lending interest rates* – it can reflect on an increase in NPLs through channels of loans with a variable interest rate; *(4) specific features of certain countries* – banking system and regulation.[2]

Determinants affecting the NPL which are linked directly to the conditions within the bank are *(1) bad management* – founders of this hypothesis are Berger and De Young [5] who made a correlation between NPL growth and poor loan granting policies, monitoring and control; *(2) skimping* – associates high level of cost efficiency with NPL through insufficiently allocated resources of the credit risk that leads to an increase of NPLs in the future; *(3) moral hazard* – hypothesis given by Keeton and Morris [17] links low bank capital, to readiness to take on higher risks, resulting in future higher NPLs; *(4) excess lending* – continuance of the prior hypothesis that argues that banks taking on more risks eventually absorb higher losses. Many studies [6], [9], [13] have dealt with the stress test at the macro level, but a small number of studies dealt with the impact of changed factors at the level of financial institutions.

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[2]   Using data from Argentina, Australia, Colombia, El Salvador, Peru, and the United States Gasha and Morales [10] identified tree types of effects between GDP growth and value of NPL. Namely, their study shows that at relatively low levels of NPLs, there is a self correcting mechanism once nonperforming loans reach a level of between 1-1.5 percent of total loans (or assets). This is amplified by a closer relation between current and lagged values of NPLs. At higher levels of nonperforming loans, there is a magnifying effect resulting from crossing that threshold, when NPLs reach between 8-10 percent of total loans. This is also reinforced by increased volatility in this indicator after a threshold level is surpassed. Finally, GDP growth also shows evidence of a more significant impact on NPLs below a threshold of about 1-2 percent of GDP growth.

Both groups of the determinants, point to the complex and interwoven impact of real and financial sectors on the performance of NPLs. Bearing this in mind, it is important to highlight the impact of the crisis on the existing loans given prior to the onset of the crisis. Wave of financial changes brought about by the financial crisis has greatly affected the stability of the banks' activities in the financial system of every country.

The initial problem is that the financial crisis found many financial systems of various countries unprepared. Had it been possible to foresee the crisis many countries would have had stricter criteria in granting loans to certain industries.

Many developed countries direct their loans to developing countries, which in itself marks them as higher risk loans. In addition to higher economic and political risk, the effect of the recession makes these loans even more risky. In light of that information, the aim of this paper is to show how the crisis, through NPL – impacted the capital adequacy of the banks in the banking system of Russia and what sectors suffered the biggest changes. Analysis of loan portfolio is performed on the concrete example of 30 banks and Stress test is used to predict the effect on the capital adequacy ratio. This study analyses bank level data (Financial statement data) unlike many other studies which analyze macro level data.

3   Data and Methodology

As previously stated, the aim of this paper is to determine the effect of the overdue debt onto the stability of the bank's activity, on the basis of the bank loan portfolio analysis. Stress test should serve for the analysis of NPL – individual banks' portfolios and its impact on the capital adequacy. By using three possible scenarios, we will forecast the effect of losses due to overdue debt, on the bank equity. There are three possible scenarios for assessing losses due to NPLs which will be taken into consideration, those being the pessimistic scenario, scenario by the central Bank and optimistic scenario, where the estimate of impairment on loans for each of the scenarios is 75%, 50% and 25%, respectively.

Stress testing is an important risk management tool that is used by banks as part of their internal risk management and, through the Basel II capital adequacy framework, is promoted by supervisors. Stress testing alerts bank management to adverse unexpected outcomes related to a variety of risks and provides an indication of how much capital might be needed to absorb losses should large shocks occur. Moreover, stress testing is a tool that supplements other risk management approaches and measures. It plays a particularly important role in:

• Providing forward-looking assessments of risk
• Overcoming limitations of models and historical data

- Supporting internal and external communication
- Feeding into capital and liquidity planning procedures
- Informing the setting of a banks' risk tolerance
- Facilitating the development of risk mitigation or contingency plans across a

  range of stressed conditions [3]

The analysis included 30 banks in the banking system of Russia[3]; data used for the bank analysis is retrieved from reviewed financial statements of the banks which are in accordance with IFRS. Namely, the disaggregation of portfolio per corresponding industries for the purpose of calculating NPL is taken from the reviewed financial statements. Possible debt overdue of banks is calculated on the basis of weighted probability of overdue debt per industry sectors. Thus, effective NPL is calculated by applying the percentage of the estimated overdue debt (Appendix 1.) to the value of loans in the current year (in this case we observe the year in which the effects of the crisis are reflected on the balance sheets, i.e. year 2009). Data provided by the Central Bank of Russia was used as source for determining weighted probability of overdue debt per industries. Descriptive statistical method is used for determining the effect of the crisis on the bank loans.

In order to make the analysis clearer, what follows is the explanation of indicators used to determine the impact of the NPL on the capital adequacy ratio.

1. Loss-Quote – share of problem loans that are effectively overdue, loans that undoubtedly will not be repaid. The higher the value of the securities for a certain loan the less this quote will be. (On the basis of the analysis by CB of Russia the quote is estimated at 50%)

2. Effective NPL – amount of problem loans considering the Loss-Quote.

3. Provision for loan impairment (from balance sheet) – amount of reserves set aside for the case of certain loans becoming overdue. In the analysis, the amount of provision for loan impairment is subtracted from the calculated NPL. This way double burden of the capital adequacy ratio is avoided.

4. E-Quote (NPL) – ratio takes into consideration the effective NPL and equity in the current year. It should be kept in mind that due to inflow of fresh equity in some situations this ratio may happen to be higher than the capital adequacy ratio (E-Quote).

5. Scenarios for calculating NPL – Recommendations of the Central Bank were used for the calculation of NPL per investing sectors (Appendix no. 1).

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[3] The analyzed banks were chosen based on the criteria of their business activities (most presence on European market)

6. Change of E-Quote – shows changes in percentage of the capital adequacy ratio over E-Quote (NPL). The ratio offers the basis for the analysis of risk concentration in the loan portfolio and indicates the degree of the diversification of the loan portfolio.

4 Results of the Data Analysis

On the basis of the previously described proceeding of the analysis of banks' indicators using reviewed financial statements it can be observed that the results of the Stress test suggest that certain industries were hit worse by the effects of the crisis than others. Moreover, it shows that the crisis did not affect all banks equally. Average values of the variation of the capital adequacy ratio in the banking sector are given in the following table:

Table 1

Total values for the banking system (author's calculation based on data from financial statements of the analyzed banks) [1]

E-Quote	13.21%
E-Quote (NPL)	11.23%
ef. NPL / KV	8.8%
ef. NPL / E	46.4%
Change of E-Quote %	15.80%

The average value of capital adequacy for the banking sector of Russia is 13.21%, 18 of 30 analyzed banks, or 60%, have a value of capital adequacy ratio below the average for the banking system of the country, while remaining 12 banks or 40% have a value of capital adequacy ratio above the banking sector's average. Observing the adequacy ratio calculated on the basis of the estimate of the overdue debt in the amount of 50% (application of weight recommended by the Central Bank), it can be seen that the ratio of the banking system amounted to 11. 23%. Out of 30 banks 16 thereof (53% of analyzed banks) have a value below the average, and 14 out of 30 banks (47% of analyzed banks) have a value above the average for the sector. Average values of the effective NPL related to the loan portfolio (credit volume) and bank equity are 8.8%, 46.39%, respectively. Indicator of change of E-Quote shows the change of capital adequacy ratio under the influence of NPL. It is important to point out that 13 banks, or about 43%, had significant changes of capital adequacy ratio due to an increase in NPL, which is highlighted in the table no. 2.[4] If the banks followed a secure principle, every change higher than 10% would be significant, thus changes in about 73% of banks

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4   These are changes of the indicator which are above the average.

would be significant and worthy of closer monitoring. Detailed overview of the indicators per banks divided in groups according to the amount of the bank equity is provided in table no. 2.

Table 2

Overview of balance sheet totals, bank equity with indicators and analysis of NPL of the analyzed banks

Source: author's calculation based on data from financial statements of the analyzed banks [1], [2][5]

Bank[****]	BS (000). EUR	E (000).. EUR	KV (000). EUR	NPL (000). EUR	E-Quote (FI)	E-Quote (NPL)	ef. NPL / KV	ef. NPL / E	Change of E-Quote in %
PEER 1[*]	4	0.48	2	0.47	13.00%	10.30%	9.00%	49.00%	20.60%
	5	1	3	1	10.00%	11.30%	9.10%	57.10%	-12.80%
	193	31	132	29	16.10%	13.50%	11.10%	47.10%	16.50%
	372	59	274	54	15.90%	16.70%	9.90%	45.90%	-4.90%
	966	227	755	77	23.50%	22.80%	5.10%	16.90%	2.90%
	1.069	117	573	130	10.90%	7.90%	11.30%	55.80%	27.20%
	1.096	232	846	177	21.20%	19.70%	10.50%	38.20%	6.90%
PEER 1[*]	1.337	191	803	139	14.30%	12.00%	8.60%	36.30%	16.30%
	1.413	261	1.037	139	18.50%	17.70%	6.70%	26.60%	4.10%
	1.528	163	1.012	157	10.60%	6.60%	7.80%	48.40%	37.80%
	1.863	231	1.188	258	12.40%	8.30%	10.90%	55.80%	33.20%
	1.913	283	1.183	262	14.80%	13.20%	11.10%	46.20%	10.50%
	2.061	236	1.289	182	11.50%	13.00%	7.10%	38.60%	-13.70%
	4.395	487	2.724	403	11.10%	8.90%	7.40%	41.30%	19.90%
	5.065	652	3.458	634	12.90%	11.00%	9.20%	48.60%	14.80%
	5.512	808	3.716	570	14.70%	12.80%	7.70%	35.30%	12.70%
	6.448	636	3.833	671	9.90%	7.90%	8.80%	52.80%	19.70%
PEER 2[**]	7.330	1.113	5.262	1.219	15.20%	13.20%	11.60%	54.80%	13.40%
	8.684	1.115	5.462	994	12.80%	7.60%	9.10%	60.30%	40.80%
	11.775	1.596	7.335	1.307	13.60%	11.80%	8.90%	41.00%	12.90%
	12.185	1.041	8.415	1.516	8.50%	7.30%	9.00%	72.80%	14.60%
	15.719	1.718	10.729	1.638	10.90%	7.20%	7.60%	47.70%	33.90%

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[5]   BS – balance sheet total in 2009; E (Equity); KV – credit volume; NPL-Non performing loans; E-Quote – capital adequacy ratio (calculated on the basis of data from financial statement); E-Quote (NPL) – capital adequacy ratio calculated on the basis of effective NPL; ef. NPL / KV – effective NPL brought in relation to the value of credit volume; ef. NPL / E - effective NPL put into correlation with the equity; Change of E-Quote – change of capital adequacy ratio relative to capital adequacy ratio calculated on the basis of effective NPL.
[*]banks whose amount of equity is up to 1.000 mil EUR (exchange rate 1 EUR=37.90 RUB); [**]banks whose amount of equity is between 1000-10.000 EUR; [***]banks whose equity amount is over 10.000 EUR. [****]Values given in the table refer to the year 2009.

	18.816	2.989	12.371	1.122	**15.90%**	**15.30%**	4.50%	18.80%	3.50%
	20.115	1.942	14.246	2.994	**9.70%**	**8.00%**	10.50%	77.10%	16.90%
	21.145	1.776	13.970	2.280	**8.40%**	**7.20%**	8.20%	64.20%	14.20%
	43.397	5.639	19.459	3.830	**13.00%**	**9.70%**	9.80%	34.00%	25.70%
	48.870	2.721	17.252	1.853	**5.60%**	**5.80%**	5.40%	34.00%	-3.40%
PEER 3****	93.574	10.558	67.074	11.781	**11.30%**	**7.80%**	8.80%	55.80%	30.50%
	160.395	17.796	112.071	26.072	**11.10%**	**6.00%**	11.60%	73.30%	45.80%
	177.744	33.900	139.319	21.659	**19.10%**	**16.50%**	7.80%	31.90%	13.50%

Applying Stress test on the NPL with the consideration of the scenario given by the Central Bank (applying write-off of non-performing loans of 50 %) leads to a conclusion that the impact of the crises reflected significantly onto the capital adequacy ratio. Almost half of the banks in the banking sector experienced a significant decrease of the indicator of capital adequacy, what in the final instance may lead to insolvency of the mentioned banks in the future due to recession.
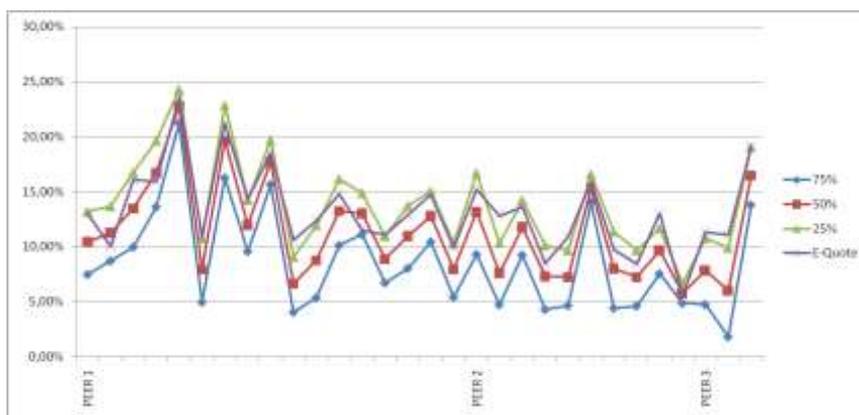
Figure 3

Overview of the impact of all scenarios on the indicator of capital adequacy

Source: Author's calculation based on the application of Stress test onto data from balance sheet positions of banks[6]

Figure no. 3 shows that overdue debt leads to significant changes in the indicator of capital adequacy, especially with the pessimistic scenario according to which banks would have overdue debt amounting to 75% of granted loans. As the chart shows, banks with lower amount of equity (peer1) are not the only ones having a

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[6] * Peer 1-banks whose amount of equity is up to 1.000 mil EUR (exchange rate 1 EUR=37.90 RUB)-it includes between 17 of 30 analyzed banks; ** Peer 2-banks whose amount of equity is between 1000-10.000 EUR – it includes 10 of 30 analyzed banks; *** Peer 3-banks whose equity is over 10.000 EUR it includes 3 of 30 analyzed banks.

problem with decreased indicator, as so do banks with higher amount of equity. In some situations we notice that the optimistic scenario's quote is better than the current indicator value. This situation is a result of provision for loan impairment by certain banks, which suggests that there were predictions of some overdue debt.

Bearing in mind the aforesaid, as well as the significance of the provision for loan impairment in case of risk, it is evident that banks in banking system of Russia lowered the impact of crisis on the indicator of capital adequacy through the increase in provision for loan impairment in case of risk.

Appendix no. 2 gives percentage values of changes in provision for loan impairment in case of risk in 2009 compared to 2008. Analyzed banks increased their provision for loan impairment by an average of 105.60% compared to the previous time period. It should also be kept in mind that bank loans increased by about 40%, which indicates a significant percentage increase in provisions for loan impairment compared to percentage increase of bank loans. Owing to this fact, as well as the fact that in some banks there was an inflow of fresh equity (evident on the basis of certain analysis), the effects of the crisis on the indicator of capital adequacy were buffered. In the case of one bank it is particularly noticeable, that the effect of the capital inflow had a significant influence on the capital adequacy ratio calculated on the basis of effective NPL. In this case the indicator marks had an increase in value form 5.6% to 5.8%.

Through the analysis of NPL in different industries, based on loan concentrations per sectors, higher risk loans within each bank can be observed individually.

If we look at loan portfolio diversification, every concentration of loans in a certain sector up to 15% can be considered as low risk, loan concentrations between 16-25% can be considered tolerable. The latter should be monitored to avoid an increase in default on loans i.e. an increase in NPL in the future. Loan concentrations exceeding 25% can be considered as high risk, and due to them banks can expect higher losses because of an increase in value of NPL in the circumstances of unfavorable economic movements in the given sector. Bank portfolio is considered diversified when there is no significant concentration of loans within one particular industry.

On the basis of the prior analyses by Central Bank of Russia, bank loans in sectors of civil engineering/real estate, transport, metallurgy, and trade are considered risky, thus in the circumstances of crisis they were initially awarded higher weight value (40%, 30%, 30%, 30% respectively)[7] for calculation of the effective NPL.

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[7]   Appendix no. 1.

The following illustration sums up the results of the analysis of loans of individual banks with the aim to determine the concentration of credit volume in certain sectors, as well as to determine different sectors in the banking system of Russia.

Table 3

Overview of loan concentrations per sector in percentage

Source: author's calculation on the basis of individual analysis of banks' portfolios [1]

Table no. 3 shows five sectors with highest concentration of loans per banks. Loan concentrations above average value for the sector are highlighted in red. Each of these highlighted concentrations could be considered risky since the diversification of portfolio was not performed.

The overview shows sectors having the highest bank loan concentration in Russia. The means of banks mostly flow into four sectors, those being civil engineering/real estate, trade, mechanical engineering and processing industry (classified under the same category), and retail. Two sectors thereof, civil engineering/real estate and trade had the highest percentage of the overdue debt (higher values of NPLs), thus they can be considered as sectors with high risk for the investments.

If we observe the concentration of loans of individual banks in so-to-say top four investment sectors, we can notice that certain banks have higher concentration of loans in the retail sector, followed by trade and civil engineering/real estate sectors.

In regard to the retail sector, it should be kept in mind that it implies loans granted to a large number of individuals. Thus, despite high concentration of bank loans, it can be considered diversified and low risk. Risk arising from this sector can be considered bearable, under the condition that parties are not related (since no suggestions thereof were made by auditors, this was not the case). After retail, the trade sector is the one with the highest concentration of loans. Average value for the sector compared to the whole system was about 20%. Civil engineering and real estate sector is close to the trade sector and has an average loan concentration of 17%, whereas mechanical engineering and processing industry has an average of 14.4%. Since these three sectors, based on the analysis of the Central Bank of Russia, marked a large number of non-performing loans in the period from 2006, they are considered especially risky regardless of high concentration of loans in them.

Thus, on the basis of the aforesaid, we can distinguish two sectors that can be considered to be especially risky and they are on the basis of the NPL analysis the ones that have suffered the greatest impact of the financial crisis. One of those two sectors is civil engineering and real estate, which is non-coincidently put in the first place. Namely, this sector is characterized by high value investments since those are long term capital investments, so variations in prices on the financial market as well as variation of interest rates can greatly affect the stability of this sector, and bearing in mind the prior analysis, significant amount of bank loans in Russia is linked to this sector. The next sector to stand out as risky is the sector of mechanical engineering and processing industry, but due to the value of investments in this sector compared to the previous one it has taken the second place. In this sector, taking into account the value of NLP in the past period and concentration of bank loans, it can be considered as risky even though individual banks have a higher concentration in it. Here we should point out that the trade sector, even though included in sectors with high percentage of overdue debt and high concentration of loans can be considered less risky, than the other two sectors. This conclusion is based on the bank loan value and its structure, consisting of a large number of companies.

Conclusions

Banks are significant intermediaries in the financing of the corporate sector in post-socialist countries, where financial markets are less developed. Since financing business entities depends on bank loans, bank stability (i.e. stability of banking system) is of crucial importance for the economy of any country. Financial crisis that hit most developed countries during 2008 pointed once again

to the close relationship between financial and commercial sector. Example of bankruptcy of many companies and banks proves that insolvency of one entity brings about difficulties in others and leading finally to their insolvency.

In order to avoid significant impact of the variable economic movements, due to the effects of the crisis, it is necessary to act proactively. In the case of banking systems, that means analyzing total bank loans and putting aside a greater provision for loan impairment, so that in case of default losses that they cause, can be covered. Observing banks that operate in the conditions of relatively underdeveloped financial market, as is the case with Russia, we can see that majority of balance sheet total accounts for the bank loans. For that reason, analysis of bank loans and bank loan risks are the most significant for determining their stability.

For the purpose of determining business stability and the impact of the crisis on the banking sector, the analysis of bank loans was performed to determine risk sectors for the investments, i.e. sectors with high loan risk and banks that might have difficulties in operating due to financial crisis.

Stress testing showed that 14 of 30 analyzed banks had above average variations in the capital adequacy ratio, considering the scenario of the Central Bank, that implies that 50% of problem loans will not be repaid. Bearing in mind that that represents 47% of analyzed banks we can conclude that it is necessary to take significant measures, regarding an increase in provision for loan impairment in following years, in order to cover this risk and avoid endangering operation of banks exposed to the effects of the financial crisis. Also, banks should lower the amount of loans in sectors marked as risky. However, should they approve loans to such sectors, they ought to be careful and not exceed 10% of the total bank loan portfolio and to insure reserves for such loans.

In Table 2, in the last column, we can see percentage changes of capital adequacy ratio due to staging loan impairment by an application of Stress test (50% of NPL through Stress test was put into relation with the bank equity and compared to the capital adequacy ratio). We can notice that with this scenario, certain banks would suffer significant percentage changes of capital adequacy ratio and, thus, should this scenario really take place, their operating stability would be jeopardized. These banks with a high percentage of change, should in future, be monitored and their operations tracked to avoid the worst case scenario.

Through bank analysis, more precisely, through analysis of bank loans, we determined sectors that can be considered as risky due to the financial crisis impact on the economic and financial systems.

Sectors that have proven to be risky due to high concentration of individual bank loans in them are civil engineering and real estate, mechanical engineering and processing industry, and trade (Table 3).

By analysis, with the consideration of the recommendation by the Central Bank, it can be stated that two sectors stand out as particularly risky: sector of civil engineering and real estate, and sector of mechanical engineering and processing industry. Sector of civil engineering and real estate is characterized by investments of high value, since those are long-term capital investments. This sector has the highest investment risk due to fluctuation in prices on the financial market within the timeframe that the investment refers to, especially in a country where financial market does not show steady movement.

In view of risk, sector of mechanical engineering and processing industry can be put in the second place in Russian economy in which analyzed banks invest due to small number of operating companies and value of investments. According to the analysis of Central Bank, the trade sector belongs among sectors with high rate of impairment loans. However, it can be put in the third place, in view of total risk due to the large number of companies operating in the sector. Retail sector can be considered low risk due to high return rate, even though it is frequently present among analyzed banks, with very high loan concentrations On the basis of the aforesaid, high loan concentration of the analyzed banks in the retail sector and thus the emerging risk can be considered bearable.

Analysis of NPLs is significant for understanding bank loan quality and is a useful indicator for the assessment of the direction of bank exercise movements. Analysis of factors affecting the NPL change, can be a suggestion for further analysis. At this point, especially in post-socialist countries such as Russia, it is of great importance for future research to determine the effect of ownership structure of the banks on the NPL, and on the indicator of capital adequacy. On the basis of such analysis, it is possible to determine a relationship between business entities and financial institutions and, in that way, lower the values of NPLs, which are often the result of inadequate preparation, pre-analysis and investment in related areas.

Appendix no. 1

Shares of problematic loans given in percentage in total loans per sector according to the analysis of the Central bank of Russia in 2009 [18]

Table 4

Overview of share of problematic loans given in percentage in total loans per sector

Source: Recommendation based on the analysis of the Central Bank of Russia

Food industry	**5%**
Civil engineering/Real estate	**40%**
Metallurgy	**30%**
Transport	**30%**
Public sector	**0%**

Telecommunications	**0%**
Trade	**30%**
Mechanical engineering and processing industry	**10%**
Energy and Water Utility industry	**0%**
Chemical Industry	**10%**
Textile industry	**10%**
Financial institutions and insurance	**10%**
Mining	**10%**
Other	**10%**
Mortgage	**5%**
Auto	**15%**
Consumer credit	**15%**
Credit cards	**5%**
Other	**5%**
Retail (if there is no loan classification)	**8%**
Loss – Quote (recommended)	**50%**

Appendix no. 2

Percentage change in reserves in 2009 compared to the year before [1], [2]

Table 5

Overview of percentage changes in provision for loan impairment in observed years (2008-2009)

Source: author's calculation based in financial statements

Bank	Change in provision for loan impairment 2008/2009
	69.77%
	n.a.
	71.31%
	45.04%
	91.67%
	57.72%
	135.51%
	101.27%
	82.45%
	92.14%
	32.20%
	97.78%
	140.09%
	32.89%
PEER 1	117.17%

	18.82%
	190.74%
PEER 2	76.28%
	41.41%
	54.24%
	260.29%
	65.21%
	133.15%
	212.65%
	184.85%
	256.06%
	75.81%
	119.02%
	125.31%
PEER 3	81.44%
TOTAL	**106.46%**

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