The Impact of Economic Downturn on Banks' Loan Portfolio Profitability

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The difference of financial institutions from other firms is the wide range of risks that these institutions meet with and must be able to manage. The macroeconomic environment undoubtedly has the impact on banks' performance results. This research analyzes the impact of the country's economic downturn on banks' loan portfolio profitability. The Lithuanian economic downturn in 2009–2010 negatively affected the banks' debtors abilities to repay their debts increasing the proportion of non-performing loans (NPLs) and reducing the banks' loan portfolio. Also the changes in the interbank interest rates and credit margins had the impact on the banks' interest income and expenses. The statistical analysis techniques allowed to characterize the dependence between macroeconomic indicators and the bank's loan portfolio profitability. Afterwards the factorial regression model was developed to predict the Lithuanian commercial banks' loan portfolio to GDP ratio according to the country's macroeconomic indicators. To assess the consistent patterns of loan portfolio profitability that are typical for the banking systems, the macroeconomic and banks' data of other EU countries was analyzed. Because the proportion of non-performing loans in banks is one of the main factors of their loan portfolio profitability, the association rules network was developed to visualize the dependence between NPLs and macroeconomic indicators. The analysis results affirmed the high sensitivity of NPLs ratio to the economic downturn in the EU countries with the imperfect macroeconomic indicators. It follows that banks in these countries assessing the credit risk of loan applicants must consider the possible changes in the macroeconomy, because they have the significant impact on banks' loan portfolio profitability in future periods.

Keywords: *bank, business cycle, loan portfolio, macroeconomics, statistical analysis.*

Introduction

The loan portfolio is defined as the total bank's loans with the purpose to receive profit in the form of interest. In the traditional banking the loan interest income makes a significant share of banks' total income. The inappropriate loan portfolio management may have the negative impact not only on a commercial bank's performance, but also on the overall banking system, and the economic growth of the country (Macerinskiene & Ivaskeviciute, 2008). So, it is very important for banks to measure various efficiency ratios and make proper decisions to keep the bank profitable.

In the lending practice the banks' ability to perform efficiently mostly depends on the credit risk assessment quality concerning customer's financial prospects and writting effective debt contracts. The aggressive risk-preference behaviour by banks may reduce efficiency and endanger the entire banking system (Gardener *et al.,* 2011). This is because the efficiency level of a financial institution is an important barometer of its financial health and profitability. If a bank has profit inefficiency, it is implied that resources are not optimally used and the profit-enhancing opportunities are not fully utilised by the bank (Vu & Nahm, 2013). The regular monitoring of the various bank's efficiency ratios is the very important activity in all banks because it helps better assure the bank's performance over time. The *object* of this research is the loan portfolio profitability. *The aim of this research* is to evaluate the impact of economic downturn on the banks' loan portfolio profitability.

The methods of this research:

1. The analysis of scientific publications about the macroeconomic factors influencing the loan portfolio profitability.

2. The cluster analysis, polynomial regression, factorial regression and association rules methods were applied for the statistical data analysis to ascertain the dependence between macroeconomic factors and banks' loan portfolio profitability.

According to (Mamatzakis *et al.,* 2013), a number of control variables are used to evaluate the loan portfolio characteristics: the ratio of loans to assets indicates the percentage of loans in the assets of a bank, the loan loss provisions as a share of total loans measures the quality of the credit portfolio, the proportion of non-performing loans (NPLs) and other. This research characterizes the loan portfolio profitability as its ability to earn the interest income. Thus, further calculating this rate the banks' interest income is divided by the total loan portfolio. Also the loan portfolio net profitability is analyzed based on the definition of (Lee *et al.,* 2010) as the net profit is derived deducting the costs of the resources consumed (the interest expenses for the depositors) from the incomes of customers during a certain period of time and dividing this deduction by the total banks' loan portfolio. Similarly, (Gounder & Sharma, 2012) measured the loan portfolio efficiency by the the net interest margin, defined as the difference of total interest income and interest expense to total assets.

Literature Review

The banks form their loan portfolios in the lending process and the ability to earn the interest income highly depends on the quality of the loans. Aiming to lend only for creditworthy applicants the banks assess their credit risk level. The credit risk is defined as the potential that a bank borrower will fail to meet its obligations in accordance with agreed terms. For the loan portfolio this definition can be enlarged including the reduction of creditworthiness. Even this reduction does not automatically translate into insolvency, however, it can increase the probability of insolvency. The payment may ultimately be made, but the delay in receiving payments is costly for banks (Scannella, 2013). In such a context, banks became increasingly concerned about controlling and analysing their costs and revenues, as well as measuring the risks taken to produce acceptable returns. The banks need to evaluate their ability to use resources effectively (cost efficiency) and generate income from the services (profitability). On the earnings side, the advantages held by the most efficient banks seems to relate to their income generating capacity and, as expected, expenses control (Girardone *et al.,* 2004). The banks must be able to sort the borrowers from information they have on their quality: individual audits, recurrent meetings and scoring methods are powerful tools that banks regularly use to screen their customers. As a result, they charge riskier borrowers with higher loan rates and require higher collateral from these borrowers (Blazy & Weill, 2013). Models constructed on the basis of financial reporting information assume that accounting statements give an objective view of the financial standing of firms and their credit risk. However, the non-financial information can play an important role not only explaining the changes of financial reporting information, but also in understanding other factors driving default. Criticisms of the sole use of financial information in predicting default have led to the use of non-financial information such as the industry sector, size and other that is associated with stable cash flow streams. The non-financial information is important assessing the credit risk of new companies for which financial reporting information, especially in the start-up phase, may altogether not be available (Bhimani *et al.,* 2013). In case of long-term debts, the adverse macro-economic conditions in a country can increase the riskiness of the previously accepted debtors and lead to a substantial increase in non-performing loans decreasing the loan portfolio profitability. So, the consideration of macro-economic conditions is also very important in credit risk assessment process. The bank's ability to compound the loan portfolio and manage it related risks enables to improve the financial indicators of loan portfolio (NPLs, interest income, etc.) and the overall bank efficiency.

Considering that the loan portfolio of banks is their investment instrument to earn the interest, the general rule of the investment states that investor always prefers investment portfolio with a risk that gives the higher level of expected return. Also the investors often are ready to invest into risky assets and expect higher level of the profit (Bartkus & Paleviciene, 2013). A large and rapidly increasing loan portfolio in the context of a liberalized financial sector also can signal the weaker corporate governance mechanisms, as the incentives for excessive risk taking in the pursuit of profits are not balanced with internal controls to ensure prudent processing of loan applications. In the absence of controls on lending associated with weak corporate governance, a rapidly increasing loan portfolio places pressure on commercial bank officers and managers and allows loan applicants that are not creditworthy to be issued loans (Tennant & Tracey, 2013). Regarding the relationship between bank risk-taking and efficiency, cross-country studies in Europe show that more efficient banks tend to take on higher levels of risk, measured by loan-to-asset ratios or loan-loss reserves. However, in some countries the higher risk-taking banks, measured by loan-loss provisions and the loan-to-asset ratio, are less efficient (Gardener *et al.,* 2011).

The high risk taking in banks is not acceptable due to the possible losses and damage to the other members of the financial system. The formation of financial infrastructure has been a cornerstone in all EU countries, which includes the establishment of a sound, stable and efficient banking system. So, the supervision of banks plays the very important role on the risks management in banks and their efficiency ratios. Significant efforts are directed towards improving the banking supervision regulative framework within the EU regulative system and the international standards of effective supervisions (Kasman *et al.,* 2013). According to (Pouw & Kakes, 2013) increasing the bank profitability it is necessary to take into account the reduction of the vulnerability and procyclicality. In that context the global capital standards of Basel III include incentives for banks to use their earnings to build extra buffers in good times when earnings are high, which can be drawn down in crises to absorb losses. (Sharma, *et al.,* 2013) maintain that profit persistence in banking appears to be temporary, not permanent. Further, profit persistence may depend on the performance distribution of a bank and may strongly be related to impediments to competition, regulatory policies and macroeconomic variables. The authors also found that strong regulatory practices may contribute to greater profit persistence.

Monitoring the general banks' performance it can be measured not only in the volume of profits but the relative indicators of the efficiency are very important. Among various types of efficiencies, profit efficiency is the most important, which concerns both cost and revenue management efficiencies in banks and measures how the actual financial performance compares to the best-practice frontier. Inefficient and uncompetitive financial institutions can increase the costs of capital in the country's economy, and consequently, financing of projects in such economy would be more expensive (Reddy & Nirmala, 2013).

(Vu & Nahm, 2013) highlighted the effects of four groups of variables on the degree of banks' profit efficiency:
1. Bank-specific characteristics;
2. Ownership features;
3. Transitional indicators;
4. Environmental factors.

According to these researchers, the main bank-specific characteristics of the profit efficiency include the bank size, bank capitalisation, asset quality, the ability to manage the credit and liquidity risk. The equity over total

assets, return on assets or equity, loans-to-total assets, non-performing loans, costs over income and costs over total assets are the important banks' efficiency indicators. The main environmental factors include the growth rate of real GDP per capita, the annual inflation rate, the interest-rate margin and the stock-market development. (Sufian, 2012) divided the banks' profitability determinants in two main categories: internal and external determinants. The main internal determinants are the liquidity, capital adequacy, and expenses management. The findings have indicated that the efficient expenses management is especially significant in explaining the high bank profitability. The economic conditions of a country were also denoted as the main external profitability determinants. (Tan & Floros, 2012) have pointed three groups of the main bank's profitability factors. The first group of bank-specific determinants of profitability involves the bank size, credit and liquidity risk management, cost efficiency and labour productivity. The second group of determinants describes industry-structure factors that affect bank profitability: the concentration ratio, banking sector development and stock market development. The third group relates profitability to the macroeconomic environment within which the banking system operates.

Analyzing the internal banks' profitability determinants (Miller & Noulas, 1997) statistically modelled the banks' performance efficiency by the return on assets (ROA) ratio as the dependent variable and the set of its determinants: the natural logarithm of total assets, total securities, loans and deposits to total assets, debt to equity, loan loss provisions to total loans, and other. These researchers found the strong negative effects on bank profitability from loan loss provisions to total loans and non-interest expense to total expense. The increase in loan loss provisions reduces the bank's return on assets, as expected. They also discovered the strong positive effects on bank profitability from salaries and benefits per employee, non-interest income to total income, consumer loans to total loans, total deposits to total assets, and total transactions deposits to total deposits. (Shehzad *et al.,* 2013) were also interested in the internal banks' profitability factors and analyzed the relationship between bank growth and profitability. They found that these two indicators of bank performance are related. The retained earnings are the principal source of capital and as the regulatory system requires banks to meet the capital adequacy restrictions, the profit therefore enables the expansion of a bank's loan portfolio. The big banks may be more profitable than small banks and the big banks may have more stable profits due to more diversification. Also these researchers found some adverse effect of bank size on bank performance, reporting that small banks are better suited to allocate capital and to collect and act on the „soft" information regarding their borrowers than large banks. (Sharma *et al.,* 2013) assert that the high profits will be earned only by banks with large market shares and well differentiated loan portfolios. Their studies show the causal relationship between market concentration and performance of banks. The evidence of banks' concentration may be observed by higher interest rates on loans, lower rates on deposits and higher fees and charges.

The research results of (Reddy & Nirmala, 2013) allowed to affirm that the size of bank, higher ratio of

equity to assets, larger proportion of loans and advances to assets, higher proportion of non-interest income activities, and larger ratio of demand deposits over total deposits affect profit performance of commercial banks positively, while higher proportion of loans and advances to deposits and larger non-performing loans negatively affect bank performance. (Girardone *et al.,* 2004) with regard to the level of NPLs also proved that it is always positively related to bank inefficiency. In fact, higher efficiency is expected to be correlated with better credit risk evaluation. As NPLs have an adverse effect on the profitability of a bank, many studies report a negative relationship between the proportion of NPLs and bank efficiency. (Vu & Nahm, 2013) found that banks with a higher ratio of loans to total assets are more profit efficient in the US banking sector. This might reflect the fact that banks' loan products are more highly valued than securities, or it could reflect the higher market power that exists in loan markets compared to the other product markets in which banks operate. Regarding liquidity risk the negative relationship between the ratio of liquid-to-total assets and bank efficiency was found. The coefficient for the ratio of loans to deposits is significantly positive for the profit efficiency of banks, suggesting that more aggressive banks make greater efforts to capitalise on purchased funds, which in turn increases the efficiency.

In addition to the internal banks' profitability factors the corporate governance standards within a commercial bank also impacts on the allocation of its loan portfolio. Strong corporate governance mechanisms ensure that managers are relatively unaffected by conflicts of interest, which will in turn motivate the efficient allocation of loans. The corporate governance also impacts the effectiveness with which banks perform their corporate control function, wherein they are required to monitor firms that have been allocated credit to ensure that they remain productive and maintain their ability to repay debt. A large proportion of non-performing loans to total loans is indicative of a bank that it is either not efficiently allocating resources or not effectively monitoring borrowers, or both. This is symptomatic of weak corporate governance, as it represents a breakdown of basic internal control mechanisms (Tennant & Tracey, 2013).

Considering the banks' environmental factors (Miller & Noulas, 1997) affirmed that the phase of the business cycle is an important determinant of bank profitability. Assessing the credit risk of loan applicants many statistical tools can be used to identify country's economical cycle periods, that help to get non-linear graphical sequence in the analysis of sensibility of periodical fluctuations in short and long terms (Adamauskas & Krusinskas, 2012). However, the interaction between financial and business cycles is not fully revealed and differs in different countries. In case of Lithuania the credit volume and business activeness cyclic interaction can be also named as specific, reflected in GDP and credit volume fluctuations. Though the question of business and credit volume cycles is very actual, because knowing credit market dynamics indications and synchronization level between credit and economic cycles different financial stability implementation politics measures can be developed (Lakstutiene *et al.,* 2011).

(Caprio *et al.,* 2014) investigated the financial crises in different countries and found that the recent crisis has four

major features similar to the earlier ones: in most countries, the asset prices grew significantly before the crisis; the several key economies experienced the credit booms in the pre-crisis period; there was a high expansion in a variety of marginal loans; the regulation and the supervision of financial institutions failed to keep up with developments. These researchers also found that the recent crisis differs from the previous in four main aspects: there was a widespread use of complex and opaque financial instruments; the interconnectedness among financial markets nationally and internationally had increased in a short time period; the financial institutions' leverage accelerated sharply; the households played a central role.

The economic and financial development of a country has the direct implications for banks' profitability. During the recession, the demand for loans declines together with the demand for investments. At the same time, the decline in asset prices and the sharp increase in unemployment leads to more loan delinquencies, charge-offs, and loan-loss provisions, directly reducing banks' profits. When the economic recovery gains traction, the loan demand strengthens, albeit moderately. At the same time, better economic conditions and balance-sheet repair improves the borrowers' credit quality, allowing banks to release loan reserves and boost earnings (Federal Reserve Bank of Chicago, 2014). As the profitability of banks and the credit risk parameters of the debtors are highly related, (Castro, 2013) has shown that the credit risk of banks' loan portfolio depends especially on the economic environment (employment and unemployment), long-term interest rates and on the value of the stock exchange index. The research results highlighted the importance of economic growth and interest rates to the soundness of the banking system. Respectively it was pointed out that the GDP growth and interest rates are the main macroeconomic factors affecting the credit risk. The business cycle plays an important role in the evolution of the credit risk: the statistics shows that in OECD countries, banks tend to hold higher capital ratios during business cycle highs; in non-OECD countries, periods of higher economic growth are associated with lower capital ratios (pro-cyclical behaviour). Thus, banks accumulate risks more rapidly in economically good times and some of these risks materialize as asset quality deteriorates during subsequent recessions (Castro, 2013). The adverse link between the macroeconomic development and bank profitability was also analyzed by (Fitzpatrick and McQuinn, 2008). These researchers proved that an increase in the GDP growth rate for a particular country decreases the profit inefficiency of a credit institution. Conversely, an increase in the unemployment rate in a country increases the level of inefficiency. The credit institutions in one country may have a relatively greater inefficiency level than in another country because of the factors specific to the local economy and to the credit institution itself.

Taking into account the national economic features, the variables used by (Gardener *et al.,* 2011) are credits for the private sector and deposit money in banks as a share of GDP – these are simply measures of domestic banking sector development. The GDP growth (per capita) is expected to be positively related to the efficiency because the higher economic development is likely to be associated with more deposits and greater loan growth to finance the economy. On the other hand, the regulatory restrictions are expected to hinder efficiency improvements since restricted banking systems tend to be less competitive. According to (Haq *et al.,* 2014) a number of additional country-level factors are also important to bank risk taking and efficiency such as bank concentration ratio, explicit deposit insurance, economic freedom index, stock market turnover, real gross domestic product (GDP) growth rate and gross national income (GNI) per capita. (Milne, 2014) the banks' performance related to the stock market and found that banks whose share prices rose the most prior to the crisis also suffered the largest falls during the crisis. The interpretation of this situation is that many banks were encouraged by shareholders to pursue business models that performed well during the prior period of rapid credit expansion, but were then revealed to be flawed in the crisis.

Bank revenues as one of the profitability factors have a definite time variation pattern over the business cycle. Since revenues are a major determinant of bank capital and lending capacity, the time variation may have an impact on the real economy and may potentially amplify the business cycle (Andersen *et al.,* 2012). The banks' profits are also procyclical and are particularly affected by severe recessions. (Pouw & Kakes, 2013) analyzed the impact of the GDP growth, unemployment, interest rates and inflation on the banks' profitability. They confirmed that the GDP and unemployment have a procyclical effect, reflected by a positive correlation for GDP and a negative correlation for unemployment. (Vu & Nahm, 2013) also have shown that the higher growth rates of real GDP allow the EU banks to achieve the higher levels of profit efficiency. The net effect of inflation on the profitability is a priori ambiguous. The inflation is expected to increase realized interest margins but also entails higher transaction costs. On the other hand, the inflation undermines profitability through banks' maturity mismatch. Inflation shocks are likely to trigger immediate interest rate adjustments for short-term funding exposures, while the long-term income only rises gradually (Pouw & Kakes, 2013).

According to (Sufian, 2012), among the macro indicators, the high interest rates are associated with low bank profitability, while inflation seems to exert positive impact on bank performance. By 1989, the combination of high interest rates, corporate financial distress and a softening property market exposed the poor credit quality of the loan portfolio of Australian banks. The Australian banks have significantly diversified their asset and liability portfolios after the early 1990s and increased their reliance on non-interest income (Shamsuddin & Xiang, 2012). The significant positive relationship was found between return on equity (ROE) and the level of interest rates in each country, bank concentration, and government ownership. The banks with high amount of capital and overhead expenses tend to exhibit the higher net interest margin and profitability levels, while the size is negatively related to the bank profitability. The profitability of both domestic and foreign banks is affected not only by a bank's specific characteristics, but also by financial market structure and macroeconomic conditions (Sufian, 2012). (Andersen *et al.,* 2012) found the cyclical pattern of banks' net interest margin: margins tend to be higher during recessions and lower during booms. The possible explanation for this

counter-cyclicality of net interest margins is that banks may have a preference for smoothing total income and thus compensate for lower volumes by charging higher margins during recessions. Also, the loan markets may be less contestable during recessions, meaning that incumbents who resort to limit pricing may maintain higher margins without encouraging potential entrants. All of these explanations rely on banks having some market power, and that market power may itself be stronger during recessions. The countercyclical behavior of margins acts as a financial accelerator, amplifying the effects of any shocks on the macroeconomy.

Banks are vulnerable to external shocks because they finance illiquid assets with liquid liabilities and these shocks are the main driver of financial crises. With the unfolding of economic recessions, the value of bank assets is reduced and the value of the collateral that is pledged by borrowers may also be impaired, thereby increasing the likelihood of a banking crisis. The empirical literature similarly provides evidence on the linkages between business cycles and the performance of banks. In the booming economies, the revenues of households and enterprises grow what increase the ability to service the debt payments. Having the aim to increase the market share during a credit boom period, banks extend their lending activities often reaching out for lower credit quality borrowers. However, the extension of credit to these borrowers inevitably increases the non-performing loans when the economic recession begins and the asset prices fall. Thus, macroeconomic shocks are inevitably transmitted to banks' balance-sheets through a worsening of their credit portfolio (Love & Ariss, 2014). (Nikolaidou & Vogiazas, 2014) also maintain that the macroeconomic environment significantly affects the banks' credit risk. The authors found a substantial increase in credit risk during the recent financial crisis period and documented the impact of GDP growth, share price indices, unemployment rate, interest rates, credit growth and the real exchange rate. Their results support the proposition that the sudden growth of credits harms banking performance and deteriorates NPLs dynamics due to the overheating of the economies. These authors claim a role of large current account deficits in financial instability.

(Tan & Floros, 2012) examined the relationship between bank profitability of Chinese banks and GDP using recent data. They tested if poor profitability is explained by the large volume of NPLs and if banks with higher capital levels show high probability. The research has shown that the higher GDP growth leads to lower bank profitability in China. Furthermore, the profitability in the Chinese banking industry is significantly affected by the level of NPLs. In addition, the Chinese banks with higher levels of capital have the lower profitability.

The scientific literature analysis results allow to maintain that the commercial banks' profitability factors mostly are classified into the banks' internal and environmental. The most important internal profitability determinant is the ability to manage the credit risk in bank. In the loan portfolio formation process the proper assessment of loan applicants' credit risk allows to reduce the non-performing loans in future that reduce the banks' loan portfolio profitability. The macroeconomic environment also has the very important impact on the

NPLs growth in banks, so the credit risk assessment analyzing the borrowers' specific factors together with macroeconomic rates can increase the loan portfolio quality and profitability in the context of business cycles. Mostly the reviewed scientific publications analyze the overall banks' performance efficiency while this further empirical research aims to evaluate the macroeconomic impact on the loan portfolio profitability in banks of Lithuania and other EU countries. According to the literature review results it can be hypothesized that the recent economic downturn in Lithuania and other countries had the negative impact on banks' profitability, so the empirical research aims to measure these interrelations quantitatively. The statistical data of Statistics Lithuania, Bank of Lithuania, EUROSTAT, European Central Bank and World Bank will be analyzed in the empirical research.

Changes of Banks' Loan Portfolio Profitability

In recent years the macroeconomic environment of commercial banks in Lithuania has changed significantly. The fluctuation of macroeconomic indicators show the changing stages of current business cycle in Lithuanian economy that can be visible in Figure 1.
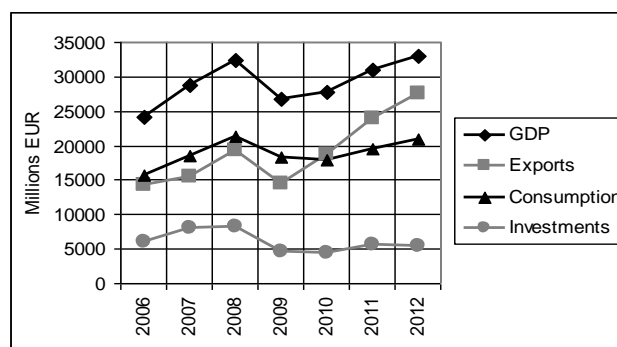

Figure 1. Business cycle in Lithuanian economy

In 2009 year's economic downturn the GDP decreased by 17,8 % to 26,7 from 32,4 billions EUR in 2008. The downfall of exports was 25,2 %, the consumption expenditures of households decreased by 14,1 %, the gross capital formation (investments) fell down by 44,3 %. Since 2010 the recovering Lithuanian economy characterize the constant growth of GDP and exports, because the annual average GDP growth rate is 7,3 %, the exports in 2010–2012 was growing with average 24,1 % annual increase rate. The worse situation is in the investments that grow very slowly, so in 2012 the investments have reached only 66,7 % of pre-crisis level. The consumption expenditures of households also deteriorated until 2010, but in 2012 they were 98,1 % as before crisis.

Together with the Lithuanian macroeconomic rates, the sample of Lithuanian banking data was analyzed which consists of the consolidated financial reports and other aggregated indicators related to the banking sector of the country. The impact of economic downturn in Lithuania on banks' loan portfolio is evident, because in 2004–2008 the loan portfolio grew with the average 43,4 % annual increase rate until it reached 20,6 billions EUR. When the Lithuanian economy deteriorated, since 2009 the loan portfolio decreased by 17 % to 17,1 billions EUR in 2012

(Figure 2). Since 2008 in Lithuanian banks the dominating demand was for loans in EUR, so in 2012 these credits were 68,7 %, LTL – 28,7 %, other currencies – 2,6 % of total loan portfolio.
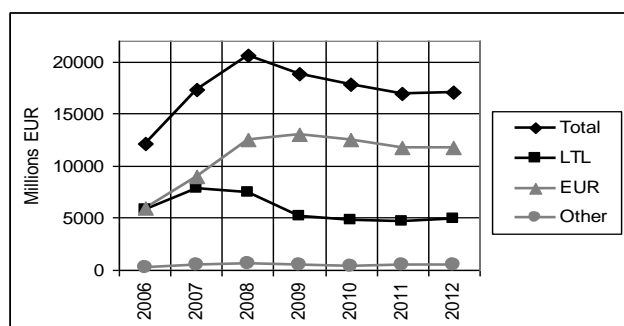

Figure 2. Loan portfolio of Lithuanian commercial banks

The profitability of consolidated loan portfolio in Lithuanian banks was estimated in Table 1, the loan interest income and the net interest income dividing by the total loan portfolio. Before economic downturn in 2008 the banks' loan portfolio profitability was 6,32 %, while in 2012 it remained only 3,12%. The net profitability decreased from 4,53 % to 2,58 %.

Table 1

The profitability of Lithuanian banks' loan portfolio (%)

	2008	2009	2010	2011	2012
Profitability	6,32	5,77	4,25	3,85	3,12
Net profit.	4,53	3,39	2,79	3,13	2,58

The decreasing interest income in Lithuanian banks has changed their cost-to-income ratio which shows that the proportion of operating expenses in operating income increased from -48,4 % to -59,7 % in 2010. That caused the fall in banks' profitability, because the operating profits to total assets (TA) decreased from 1,6 % to 1,03 %. The return on equity and return on assets ratios in economic downturn became negative (Table 2).

Table 2

The Lithuanian commercial banks' efficiency ratios (%)

	2008	2009	2010	2011	2012
Cost-to-income	-48,4	-54	-59,7	-54,9	-56,5
Oper. profits / TA	1,6	1,2	1,03	1,17	1,11
Return on equity	11,4	-70,1	-3,93	17,03	9,66
Return on assets	0,8	-3,9	-0,28	1,51	0,95
Cash / TA	6,1	16,1	16,85	10,8	18,75

Further analysis aims to ascertain the main factors that influenced the decrease of banks' loan portfolio profitability in economic downturn of 2009–2010.

Banks' Loan Portfolio Profitability Factors

When the macroeconomic indicators of Lithuania deteriorated, the Lithuanian banks met the problem of high proportion of non-performing loans (NPLs) in their loan portfolio. Before economic downturn in 2008 the proportion of NPLs was 4,6 %, while in 2009 this rate increased to 19,3 % and remained very high level of 18 % until 2012 (Figure 3).
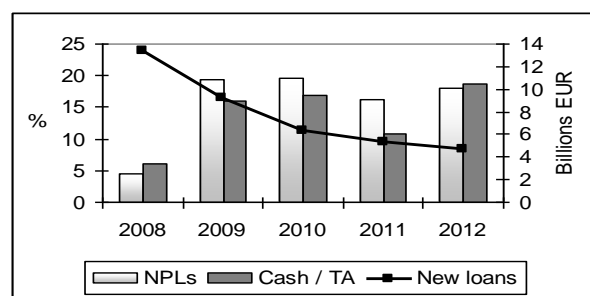

Figure 3. The proportion of non-performing loans, cash to total assets ratio and new loans in Lithuanian banks

The problems of loan portfolio quality and credit risk management principles required banks to reduce lending in order to meet the capital adequacy and liquidity requirements of central bank. The amount of new credits for non-financial companies and households constantly decreased from 13,3 billions EUR in 2008 to 4,6 billions EUR in 2012. So, in this period the average annual lending decrease rate was -23,3 %. The lending restriction significantly increased the quantity of money in Lithuanian banks (Figure 3). Their cash to total assets ratio in 2008 was only 6,1 %, while in years 2009–2012 this ratio was in range [10,8 %; 18,75 %]. The frozen money did not earn the interest for banks and reduced their profitability keeping the liquidity in high level.

The interest income of Lithuanian banks in 2008–2012 decreased by 59 % from 1 301 millions EUR to 533,5 millions EUR. While the decrease of net interest income was more slight – 52,7 % (Figure 4). This was positively affected by the reducing of deposits interest rate when the banks accumulated the excess reserves. The restricted lending and growing amount of deposits reduced the demand of money in banks, so the average deposit interest rate (LTL) was reduced from 6,5 % in 2009 to 1,1 % in 2012. The average interest rates of deposits in EUR were reduced from 2,3 % to 0,8 % accordingly. So, despite the growing deposits from 11,4 billions EUR in 2009 to 13,4 billions EUR in 2012, the interest expenses in this period were reduced by 79,3 %. This factor allowed to lower the relative decrease in Lithuanian banks' loan portfolio net profitability compared to its profitability slump as was shown in Table 1.
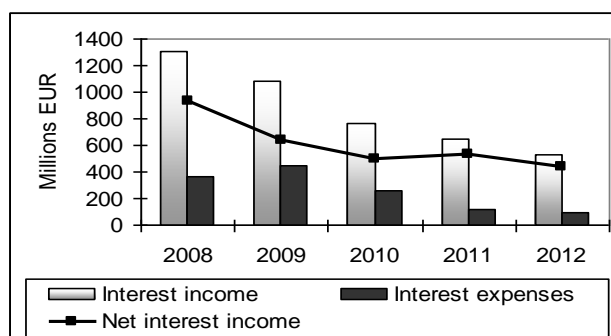

Figure 4. The interest income and expenses of Lithuanian banks

The another factor of banks' loan portfolio profitability is the interest rates of credits. The growing demand of credits until the end of 2008 stimulated the growth of VILIBOR which reached the highest value of 10,44 % (Figure 5).
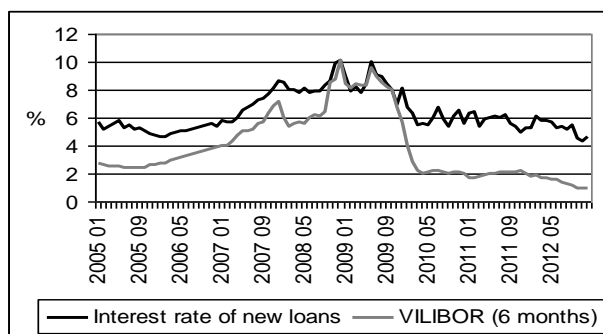
Figure 5. The average interest rates of new loans (LTL) and VILIBOR

Before the economic downturn the average credit margin (the difference between loan interest rate and VILIBOR) was 2,03 %. But in 2009 the demand of credits in LTL currency decreased (Figure 2). Also because the lending in economic downturn was restricted and banks accumulated high quantity of money (cash to total assets in Figure 3), the VILIBOR suddenly decreased to 0,91 % in the end of 2012. The decrease of VILIBOR together with the problem of NPLs that required new borrowers to compensate the loss in banks' loan portfolio and the increased credit risk level due to imperfect macroeconomic conditions of the country forced banks to raise the margin of new loans. As the result, the average credit margin for the loans in LTL in 2010–2012 increased to 3,74 %.
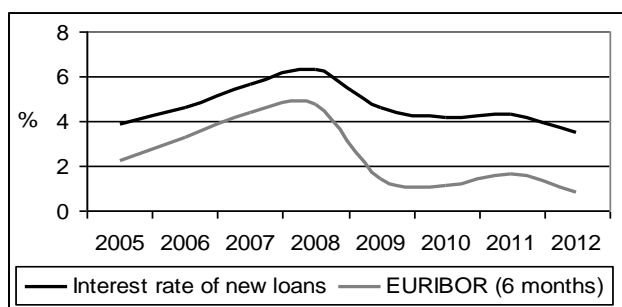

Figure 6. The average interest rates of new loans (EUR) and EURIBOR

The similar situation was lending the loans in EUR currency. In next chapter of this research will be analyzed the loan portfolio growth in other EU countries which also was observed until 2008. The growing demand of loans increased the EURIBOR to 5,45 %, while the economic downturn in almost all EU countries reduced this rate to 1% in the end of 2009 (Figure 6). The loan portfolio profitability in Lithuanian banks was increased raising the average margin of new loans in EUR from 1,46 % (2005–2008) to 2,87 % (2009–2012).

The analysis results of banks' loan portfolio profitability factors allow to conclude that the loan profitability and other efficiency ratios of commercial banks were significantly affected by economic downturn in 2009 – 2010. The deteriorating Lithuanian macroeconomic indicators were the main factors of high non-performing loans proportion in banks that afterwards restricted lending according to the regulatory requirements. Also the decreased economic activity in the country that can be seen from the slump of GDP, exports, investments,

consumption expenditures, the increased number of bankrupted companies, high unemployment rate significantly reduced the amount of loan portfolio in commercial banks. The fall in demand of money in banks reduced the interbank interest rates, that together with previously mentioned reasons decreased the banks' interest income and loan portfolio profitability. It can be suggested, that the main cause of such situation is high proportion of NPLs in banks' loan portfolio which is the result not only of macroeconomic changes, but also of improper credit risk management in pre-crisis period and irresponsible borrowing. The banks have not considered enough the macroeconomic factors in loan applicants' credit risk assessment in pre-crisis period and the borrowers overleaped their abilities to repay debts. The reverse causality of analyzed processes either interrelates the NPLs and the macroeconomics, because the restricted lending in banks does not allow to grow for the investments into the business development in the country. That slows the growth of loan portfolio, the solving of NPLs problem and the growth of interest rates slowly improving the loan portfolio quality and profitability.

The statistical analysis techniques were applied for the modeling of Lithuanian banks' loan portfolio growth perspectives in regard to macroeconomic conditions. The dependence of the relative indicator of loan portfolio to GDP (LP to GDP) on the GDP to 1 inhabitant ratio was estimated in Figure 7. The *x* axis in this figure indicates the growth of GDP to 1 inhabitant (EUR) and the *y* axis measures the expected loan portfolio to GDP indicator.
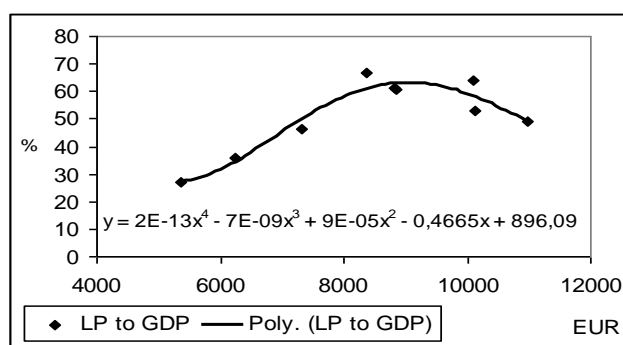

Figure 7. The relation between the GDP to 1 inhabitant (EUR) with the loan portfolio to GDP ratio (%)

The polynomial regression model is:
$$Y = 2 \cdot 10^{-13} \cdot GDP_1^4 - 7 \cdot 10^{-9} \cdot GDP_1^3 + 9 \cdot 10^{-5} \cdot GDP_1^2 - 0,4665 \cdot GDP_1 + 896,09 \qquad (1)$$

where *Y* is the loan portfolio to GDP ratio, GDP_1 is the GDP to 1 inhabitant ratio.

The imperfection of this model is the consideration of only one independent variable *GDP*, that can be in the same level in economic growth period and in its downturn. Also the Figure 1 has shown that GDP indicator in Lithuania started to recover after 1 year of downturn. The additional variable of non-performing loans percentage helped to solve this problem, because this rate in the loan portfolio growth period was low and after economic downturn it remained high.

The polynomial regression with two explanatory variables:

$$Y = 0{,}00125 \cdot GDP_1 + 0{,}02398 \cdot NPL - 0{,}00107 \cdot NPL^2 - 1{,}5149 \qquad (2)$$

where Y is the loan portfolio to GDP ratio, GDP_1 is the GDP to 1 inhabitant ratio, NPL is the NPLs ratio.

The model's prediction accuracy was measured by the mean absolute percentage error (MAPE):

$$MAPE = \left(\frac{1}{n} \cdot \sum \left| \frac{Y(t) - Y}{Y} \right| \right) \times 100\% \qquad (3)$$

where $Y(t)$ are the predicted values, Y are the observed values and n is the number of years analyzed.

The MAPE of developed polynomial regression model with two independent variables is 5,25%. To improve the Y prediction accuracy in addition to the analyzed variables the investments to GDP (INV_{GDP}, %), compensation of employees to 1 inhabitant (COM_1, EUR) and unemployment rate (UNE, %) were included into the statistical model's development. These variables were selected because their values in the pre-crisis period and after crisis significantly differ.

The factorial regression model for the prediction of loan portfolio to GDP ratio (Y) is:

$$Y = 0{,}001435 \cdot GDP_1 + 0{,}469502 \cdot NPL - 0{,}030306 \cdot INV_{GDP} - 0{,}001894 \cdot COM_1 - 0{,}111516 \cdot UNE - 0{,}000056 \cdot GDP_1 \cdot NPL - 0{,}00001 \cdot GDP_1 \cdot INV_{GDP} + 0{,}001447 \cdot NPL \cdot INV_{GDP} + 2{,}348871 \qquad (4)$$

The MAPE of developed factorial regression model is 0%, so it highly characterizes the dependency between the banks' loan portfolio and macroeconomic variables.

The analyzed statistical dependency between GDP to 1 inhabitant ratio (EUR), NPLs and loan portfolio to GDP ratio (LP, %) is visualized in Figure 8.
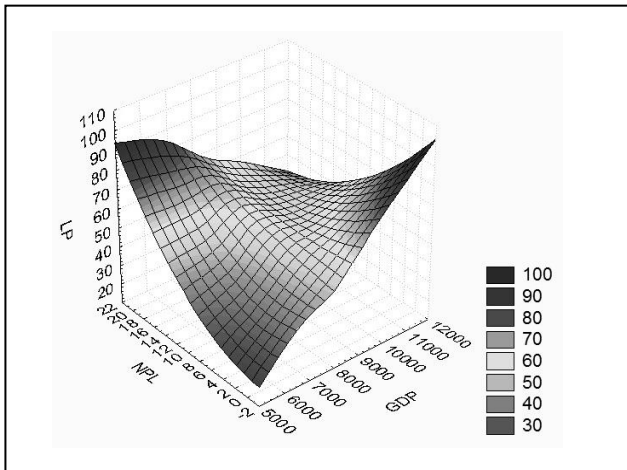

Figure 8. The dependency between GDP to 1 inhabitant ratio, NPLs and loan portfolio to GDP ratio

The rising shape to the highest point of LP axis in the right side of the graph shows the tendency of loan portfolio growth when the GDP to 1 inhabitant is growing and the proportion of NPLs in the country's banking system is low. The falling shape to the near lowest point of LP axis characterizes the prevailing low banks' loan portfolio if the GDP indicator is low, despite the low proportion of NPLs. The falling shape to the furthermost lowest point of LP

axis shows the current situation in Lithuanian banks, when the economics is in the recovery (GDP is growing), but due to the high proportion of NPLs the banks' loan portfolio is decreasing. Finally, the rising shape to the highest point of LP axis in the left side of the graph visualizes the relation in economic downturn beginning period, when the banks have the high loan portfolio, but the decreasing GDP ratio causes the increase of NPLs.

The next chapter of this research aims to ascertain the similarities of estimated relations between macroeconomic factors and banks' loan portfolio profitability in other EU countries. The EU macroeconomic and banking data will be analyzed from the EUROSTAT and European Central bank databases. The data sample of the aggregated EU banks statistics will be used.

Similarities in Other EU Countries

In other EU countries the years 2000–2008 were also the period of loan portfolio growth in commercial banks. Like in Lithuania, the banks of other EU countries met the problem of loan portfolio decrease in 2009. The average increase rates of loan portfolio in the EU banks are given in Table 3.

Table 3

The average change of loan portfolio in the EU (%)

Year	2000	2001	2002	2003	2004
ΔLP	+12,75	+7,35	+5,65	+7,62	+10,34
Year	2005	2006	2007	2008	2009
ΔLP	+21,29	+16,92	+19,76	+11,57	-4,36

Since 2009 the average profitability of loan portfolio in banks of the EU countries decreased from 5,57 % to 4,13 % in 2012 (Table 4). Unlike the slump of loan portfolio net profitability in Lithuania (Table 1), in average all banks of the EU countries have kept this rate stable in range [2,79 %; 3 %].

Table 4

The average loan portfolio profitability in the EU (%)

	2008	2009	2010	2011	2012
Profitability	5,57	5,01	4,15	4,11	4,13
Net profitability	2,79	2,82	2,85	3,00	2,86

Because the economic systems of the EU countries have differences, the analysis results of the average indicators of all EU can be not typical for some countries. For this reason the EU countries were grouped into 3 clusters by the cluster analysis method of *k*-means. The GDP, exports (EXP), investments (INV), compensation of employees (COM) and consumption expenditures of households (CEH) to 1 inhabitant rates of the year 2012 were involved into the cluster analysis. The average values of these rates in 4 clusters are given in Table 5.

The countries of cluster 1 are: BG, HR, LV, LT, HU, PL, RO. The 2nd cluster consists of CZ, EE, GR, ES, IT, CY, MT, PT, SI, SK. The countries of 3rd cluster are: BE, DK, DE, IE, FR, NL, AT, FI, SE, UK. The cluster 4 consists only of Luxembourg (LU) which has the highest macroeconomic rates and this cluster was not included into the further analysis.

Table 5

Means of macroeconomic indicators (EUR) and NPLs (%) in clusters

Cluster	I	II	III	IV
GDP	9 106	17 631	35 928	81 736
EXP	5 779	10 058	21 490	144 970
INV	1 814	3 134	6 381	15 767
COM	3 728	7 752	18 563	39 422
CEH	5 559	10 745	19 097	26 243
NPLs	13,5	8,3	4,7	0,4

The members of cluster 1 have the least macroeconomic rates that in clusters 2 and 3 constantly increase. In the last row of Table 5 the average proportion of NPLs in clusters were calculated and the analysis results affirmed, that countries with imperfect macroeconomic conditions have the highest problems of NPLs in their banking systems.

Likewise in Lithuania, the economic downturn in 2009 was in all analyzed countries. The average GDP to 1 inhabitant level compared to 2008 as the basis year in clusters is calculated in Table 6. The countries of cluster 1 have the worst macroeconomic rates, also the deterioration of their economies in 2009 was the highest. Since 2010 in all clusters the recovering economies were typical.

Table 6

The average GDP level compared to 2008 (%)

	2009	2010	2011	2012
Cluster 1	88,0	92,1	98,5	102,1
Cluster 2	95,1	96,9	98,9	98,5
Cluster 3	93,3	97,6	101,1	103,7

The Figure 9 shows the impact of macroeconomic conditions and their deterioration on the loan portfolio quality in banks. In pre-crisis period (year 2008) all countries had in average 2 % – 3,6 % of NPLs in their banks' loan portfolios. But when the economies deteriorated, the differences in clusters occurred. The banking systems of cluster 1 countries mostly suffered from the NPLs growth, because this rate increased to 13,3 % in 2010. The proportion of NPLs in cluster 2 grew more slightly – to 5,3 %, but in 2012 the average value in this cluster increased to 8,8% due to the public debt and other economic problems in Greece and Italy. While the growth of NPLs in countries with strong economies in cluster 3 was not significant.
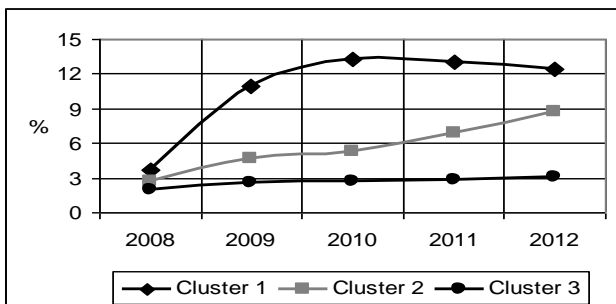

Figure 9. The averages of non-performing loans in clusters

The impact of macroeconomic conditions and NPLs changes on the loan portfolio profitability in the commercial banks is visible in Table 7.

Table 7

The loan portfolio profitability in clusters (%)

Year	LP profitability			LP net profitability		
	C1	C2	C3	C1	C2	C3
2008	7,79	5,87	5,19	4,08	2,77	2,01
2009	7,43	4,78	3,72	3,81	2,71	2,21
2010	6,41	4,22	3,28	3,86	2,74	2,25
2011	6,05	4,23	3,35	3,96	3,08	2,25
2012	5,80	4,50	3,34	3,72	2,81	2,25

The economic downturn decreased the profitability of loan portfolio in all clusters by 1,37 % – 1,99 %. The changes of loan portfolio net profitability only in cluster 1 resemble the situation in Lithuanian banking system. The banks in countries of higher economic indicators are able to ensure the stability of net profitability, which in all periods is relatively lower due to the better loan portfolio quality and lower NPLs. These banks can set the lower credit margins for the debtors, because they do not have the necessity to compensate losses of NPLs compared to the banks in the countries with imperfect macroeconomic rates.

The association rules network was developed to estimate the dependence between the countries' clusters (CL), GDP decrease rate (GDP_d) and NPLs (Figure 10).
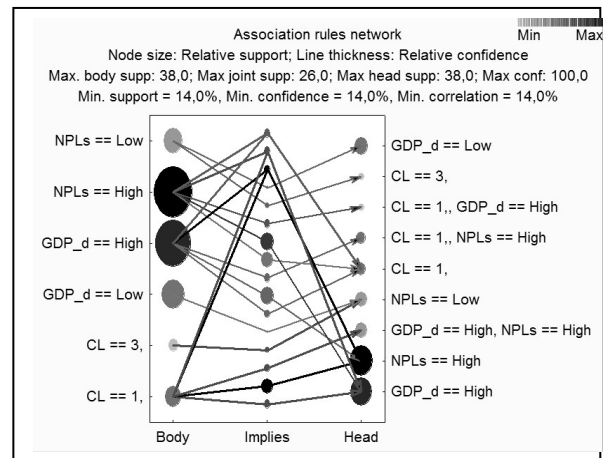

Figure 10. The association rules network

The summary of association rules is given in Table 8.

Table 8

The summary of association rules

No.	Body		Head
1.	NPLs = High	=>	CL = 1,
2.	NPLs = High	=>	GDP_d = High
3.	NPLs = High	=>	CL=1, GDP_d = High
4.	NPLs = Low	=>	CL = 3,
5.	NPLs = Low	=>	GDP_d = Low

No.	Support (%)	Conf. (%)	Correlation (%)
1.	24,0	63,2	79,5
2.	26,0	68,4	70,3
3.	20,0	52,6	72,5
4.	18,0	69,2	78,9
5.	16,0	61,5	59,3

The categorical measure of analyzed variables classifies the countries into high and low indicators groups. The medians of 2009 year's rates were calculated that are the thresholds of analyzed variables in groups. The analysis results show that high proportion of non-performing loans in banks is typical in countries of cluster 1 where the macroeconomic indicators are the least in the EU. Also these countries have the highest GDP decrease rate. Conversely, the countries with low percentage of NPLs in banks mostly belong to cluster 3 where the macroeconomic indicators are the highest and the deterioration of economics in 2009 was not so significant.

The research has proved that the macroeconomic downturn in EU countries affect the profitability of banks' loan portfolio which highly depends on the lending amount, credit interest rates and the proportion of non-performing loans. The deterioration in the loan portfolio quality is typical in economic downturn that restricts the further lending and interest income. The banks in countries with imperfect macroeconomic indicators have to foresee the sudden expansion of banks' loan portfolio as the warning of the potential its quality and profitability deterioration.

Conclusions

1. The scientific literature analysis and the empirical research results have shown the significant dependency between macroeconomic factors and the loan portfolio profitability in banks. The hypothesis that was raised after the scientific publications analysis was affirmed and the dependency of macroeconomic factors and banks' profitability changes was quantitatively measured. It can be concluded that the consideration of macroeconomic factors in banks' loan portfolio management is very important, so this research results allow to conceive the consistent patterns of the relations between loan portfolio

profitability indicators and economic conditions of a country.

2. The banks' ability to earn interest income depends on credit risk management quality in different stages of business cycle that is highly related to the non-performing loans problem. The necessity to assess the not only debtor's specific but also external factors is evident according to the quantitative results of this empirical research.

3. The analysis of Lithuanian banks statistical data has shown that the banks' loan portfolio profitability was negatively affected by the downturn of the country's economy in 2009–2010. The main problem in banks was the sudden growth of non-performing loans that reduced the further lending decreasing the loan portfolio quality and amount. The demand for money in banks became low and the interbank interest rates started to fall. All these factors reduced the banks' interest income and relatively the loan portfolio profitability declined. The polynomial and factorial regression models allowed to characterize statistically the loan portfolio's amount dependency on the macroeconomic indicators.

4. The EU statistical data analysis has shown the similarities of loan portfolio amount and its profitability changes in 2009 that were influenced by the economic downturns in these countries. The cluster analysis allowed to assess these processes in more detailed way dividing the EU countries into three clusters according to the macroeconomic indicators. The results indicated the dependence of macroeconomic rates and non-performing loans in banks that is the very important factor of banks' loan portfolio quality, growth perspectives and profitability. The banks performing in the EU countries with the lowest macroeconomic indicators undoubtedly must consider and predict the macroeconomic changes assessing the credit risk of loan applicants and managing the loan portfolio.

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