The impact‘s of loan‘s portfolio concentration and diversification to the banking sector

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Abstract: **Banks are one of the most important financial institutions. Bank credits directly influence economical development of the country. The aim of the paper is to investigate interdependence between the level‘s of concentration and diversification of the loan‘s portfolio and amount of problem loans in commercial banks. The investigation was carried out on the basis of commercial banks operating in Lithuania in 2004 – 2010 years.**

Keywords - **Commercial banks, bank loans portfolio, concentration, diversification, credit risk, provisions.**

I. Introduction

Banks are one of the most important financial institutions. Bank credits directly influence economical development of the country. Financial turmoil in Ireland , Cyprus and other countries has demonstrated the relationship between stability of the banking system and the opportunities for economic growth of the countries. On the other hand, the stability of banks, to a large extent determined by the state and the quality of the loan portfolio of the banks. Loans portfolio represent 70 - 80 % of the assets of commercial banks. Providing loans, banks are exposed with many threats: credit risk, liquidity risk, market risk, operational risk and others. Usually, the most important risk is credit risk. Credit risk refers to the borrower default on the bank, causing the total loan portfolio yield risk. Often it comes from undue concentration and lack of diversification of loan portfolios. Carried out historical statistical analysis of Lithuanian banking sector showed that most banks have a high concentration of loan portfolios. During financial crisis amount of problematic loans increased significantly, resulting in formation of large provisions for problem loans.

The aim of the paper is to investigate interdependence between the levels of concentration and diversification of the loan portfolio and amount of problem loans.

The assumption was made that loan portfolio credit risk measurement and management techniques used by banks were not effective.

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The research of the loan portfolio diversification and its impact on commercial banks results has been carried out based on correlation and statistical analysis. The investigation was carried out on the basis of commercial banks operating in Lithuania in 2004 – 2010 years. The period of 2004 - 2010 was selected to evaluate the trends in the banking sector, which began after the country's integration into the European Union in 2004, formed in a period of successful economic development up to 2008 and resulted in decline of Lithuanian economy, which constituted 15% of GDP in 2009.

II. Concentration and Diversification Risks and Influencing Factors

Basel Committee for the Supervision of Banks considers that main purpose of the loan portfolio risk management is acceptable bank risk - weighted yield of the entire portfolio of loans [1]. Credit risk management techniques have been quite a long way from the risk assessments of individual loans up to join them in a group on the grounds of the level of risk and risk assessment of the loan portfolio [2]. The current understanding of effective risk management of loans portfolio pays great attention to the diversification of loans. Diversification is treated as the main tool which allows to avoid the risks associated with excessive lending to certain sectors of economic activity or concentration of loans [3].

The idea of diversification of the investment portfolio was formulated by H. Markowitz in the modern theory of a portfolio of securities. H. Markowitz portfolio selection approach assumes that the investor tries to solve two problems: to maximize returns for a given level of risk and minimize risk for a given level of expected return. This goal can be achieved through the formation of a specific, diversified portfolio of investments which is shaped according to expected return , covariance and correlation. The main objective of diversification of the loan portfolio is also a desire to reduce non-system risks associated with certain economic sectors, regions or individual borrowers. Trends in the development of a well-diversified portfolio of loans should coincide with the market trends that to have an almost perfect correlation with the market [4]. Diversification leads to homogenization of market risk. Moreover , it is assumed that the more diversified portfolio , the less the risk of their own portfolio and , therefore , the overall risk of the portfolio. On the other hand excessive diversification of the loan portfolio can cause problems related to difficulties in assessing the creditworthiness of companies engaged in entirely different fields of activity or monitoring of loans granted to a large number of small customers [5]. Concentration risk in bank loan portfolios appears as a value of credits provided for a single borrower or a group of borrowers is rather high and thus, the risk of loss arises to the bank. The main reasons of credit concentration are specialisation of banks seeking for higher profit and other reasons outside the control of the bank. A number of sources of concentration risk may be high but the main source remains large credit for separate borrowers, related borrowers of the same sector, loans of the same foreign currency etc. To sum up, all sources of the risk can be divided into two main groups: the risk of one relatively large credit and sectoral concentration risk. One of the loan portfolio credit risk mitigation techniques is portfolio diversification. Diversification allows reducing risk of sectoral concentration by spreading a portfolio of loans over many investments in order to avoid excessive exposure to any one source of risk. There are various reasons for the appearance of credit concentration risk: [6]

- The specialization of the banks. Some banks specialize in certain areas of activities with the aim of the leader of the market.
- Seeking for higher profit. Sometimes credit concentration risk appears when a rapidly increasing economic activity comes into being. Banks positively measure its perspectives and expect higher then the average profits.
- The reasons otside the control of the bank (e.g. small-size market in which the bank is operating).

According to J. York [7], Deutsche Bundesbank [8] credit concentration is one of the main reasons for banks to undergo loss. Moreover, a lot of bank crises appeared because of inappropriate control of concentration risk during the last 25 years. A financial crisis in 2008 may also be related with concentration risk.

III. MEASUREMENT OF PORTFOLIO CONCENTRATION AND DIVERSIFICATION

Although large loans remain the main reason of concentration risk, sectoral concentration becomes more frequent. The essential measurement point of sectoral concentration risk is the distribution of analysed sectors. Ideally, the classification of sectors should allow distributing all risk factors affecting every sector. Moreover, the asset correlation should be large in one sector, but it should remain small in separate sectors. However, this distribution is often simplified to the distinction of sectors by economic activities while measuring concentration in the bank loan portfolio. Although this classification was not set up for this aim, it could be observed that a separate sector of economic activities is influenced by another risk [8].

To measure sectoral concentration risk were used these models:

The Herfindahl-Hirschman index (HHI) is best – known one of the most used measure among accumulative indicators of concentration. HHI is calculated by the following formula:

$$HHI = (\%S_{1)})^2 + (\%S_{2)})^2 + \ldots + (\%S_{n)})^2$$

where: %S – a percentage of every loan of loan portfolio in decreasing order.

A well - diversified portfolio with a great number of small loans has an HHI value close to zero and a high concentrated portfolio can have HHI value close to one [8]. In practice, higher than the 0.18 Herfindahl-Hirschman index value usually indicates high concentration.

The Gini coefficient. This coefficient may be used as the concentration index. The Gini coefficient is estimated as follows:

$$\text{G(b)=} \frac{2}{n}\sum_{j=1}^{n} \upsilon_j^b - \frac{1}{2}, when\, \upsilon_j^b = \sum_{i=1}^{j} \overset{\cup b}{x}_i$$

where: υ_j^b - the cumulative total of loans, provided for several kinds of least credited economic activities j, parts b in the bank loan portfolio;

$\overset{\cup b}{x_i}$ - parts of loans b provided for economic activity I in ascending order of bank loan portfolio.

The Gini index value varies from zero to one. The closer to zero, the more equal distribution of loans in the portfolio is. The closer to one - the less equal distribution of loans in the portfolio. Hence, the coefficient close to zero defines the portfolio in which loans are well diversified. The coefficient close to one defines a high concentrated portfolio. In practice , when Gini coefficient value is higher than 0,300 it could be stated that inequality of loan distribution exists [9].

The main disadvantage of usage of the Gini coefficient for measurement of loan concentration is that the coefficient does not pay attention to the value of loan portfolio. It means that portfolio which consists of several sectors of the same size will be of a smaller coefficient than a larger, better diversified portfolio which possesses loans of different values. Another point is that the Gini coefficient can increase if another, comparatively small, loan for another sector is included despite the fact that it reduces concentration [8].

To assess the diversification was used Berry index, which "derivable" from the index Herfindahl - Hirschman (HHI). Berry D_B index is calculated by the formula:

$$D_B = 1 - \sum_{i=1}^{n} (x_i^b)^2 = 1 - HHI .$$

where: b - Bank; n - the number of branches of economic activity; i - kind of economic activity; x_i^b - the proportion of loans granted for the kind of economic activity i in the structure of the loan portfolio of the bank b; HHI - index Herfindahl – Hirschman. Gini coefficient values in the range of $0 \leq HHI \leq (n-1) / n$. As calculated Herfindahl-Hirschman index of the minimum value is when the entire structure of the components are equal (simple diversification), while the largest - in any one component of the investigated structure consists of 100 percent.

IV. THE ANALYSIS OF INDTERDEPENDENCE BETWEEN THE LEVELS OF CONCENTRATION AND DIVERSIFICATION OF THE LOAN PORTFOLIO AND AMOUNT OF PROBLEM LOANS

Development of Lithuanian banking sector loan portfolio in 2004-2010 can be divided into two phases. In the first stage , that is to say the period 2004-2007 loan portfolio grew rapidly and 2008 reached the greatest value of the portfolio, which amounted to 71,440.9 million LTL . Loan growth was quite high, in the period 2004-2007 when portfolio has been growing at about 48 percent annually. In 2008 growth decreased slightly, but remained positive. In 2009 the loan portfolio already decreased noticeable 14 percent compared with 2008. The same trend continued in 2010 when the loan portfolio decreased by 5.23 percent . compared with the previous year.

TABLE I.

THE HHI, GINI AND BERRY COEFFICIENTS AND PROVISIONS FOR BAD LOANS IN LITHUANIAN BANKING SECTOR

Years	2004	2005	2006	2007	2008	2009	2010
HHI	0,137	0,149	0,195	0,240	0,212	0,233	0,230
Gini	0,600	0,620	0,674	0,714	0,690	0,707	0,699
Berry	0,863	0,851	0,805	0,760	0,788	0,767	0,771
Provisions*	0,71	1,04	0,97	0,74	1,20	7,16	7,92

*Provisions for bad loans as a % of all loans portfolio

According to the Herfindahl-Hirschman index value Lithuanian banking loan portfolio in 2010 was much more concentrated than in 2004.

Analysis based on the Gini coefficient values shows that the loan portfolio by economic activities have been distributed unevenly, since the analyzed period the Gini coefficient values were always greater than 0,300. This indicates a high enough Lithuanian banking sector loan portfolio concentration. As the HHI index, the lowest Gini coefficient was in 2004 and up to 2007 increased significantly. This means that in 2007 Lithuanian banking sector loan portfolio was most concentrated. In the period of 2008-2010 Gini coefficient values remained relatively high, although showed some slight decline in the loan portfolio concentration.

Analysis based on the Berry index values shows that the loan portfolio by economic activities have been distributed unevenly, since the analyzed period the Berry index values were always greater than 0,760. This indicates a high enough Lithuanian banking sector loan portfolio concentration too. Most loans concentrated in loans not included in the economic sector group , and from economic activities concentrated in loans to the most real estate and rental sector. Lithuanian banks are dependent on real estate development and rental sector. Significant part of the loans portfolio was lent to the manufacturing industry, wholesale and retail trade and financial intermediation. However, these sectors compared to the value of loans in 2004 . to 2010 . decreases, thus reducing the risk arising from these economic sectors.

So it can be said that all the banking sector loan concentration and diversification indicators (HHI, Gini, Berry) showed that during the period of investigation Lithuanian banking sector loan portfolio was highly concentrated and insufficiently diversified. It was no problem to the country's rapid economic growth, but in the face of the global financial crisis triggered a huge growth off special provisions for bad loans need which in 2008 - 2010 increased by almost 11 times.

IV. CONCLUSIONS

1. Loan portfolio concentration level analysis showed that the Lithuanian banking sector concentration in the period 2004 - 2007 increased and in the period 2008-2010 slightly decreased.
2. Herfindahl-Hirschman index of portfolio concentration shows no significant only for the period 2004-2006. During the analyzed period the concentration increased the most real estate development and rental sector.
3. Gini index shows that Lithuania banks total loans over the period analyzed was unevenly distributed, reflecting the high level of concentration.
4. Lithuanian commercial banks tend to take excessive loan portfolio concentration risk. Gini coefficient and the Herfindahl-Hirschman index exceeds acceptable limits.

Banks also do not cover concentration risk management opportunities arising from banking activities latitudes. For this reason, in any economic downturn, Lithuanian banks are at risk of suffering significant losses. Managing loan portfolios, such commercial banks should collect far more economic capital than under normal conditions, which reduces banks' profits and operational safety.

5. Evaluation of loan portfolio diversification showed that loan portfolio at the end of the period was less diversified than at the beginning of the period. In certain economic activities existing borrowers default risk has increased and banks have become more vulnerable in the economic downturn. It could be stated that the loan portfolio of Lithuanian banking sector became more concentrated and dependent on the housing sector and real estate renting during the period concerned.

6. After examination of the banks 'loan portfolio diversification coefficient values and problem loan portfolio size, it is noted that during financial crisis, the banks' loan portfolio quality deteriorated. However, the portfolio was least diversified and the least diversified portfolio banks problematic loans in the financial crisis was the largest. Most loans concentrated in loans not included in the economic sector group , and from economic activities concentrated in loans to the most real estate and rental sector. So it can be said that the Lithuanian banks are dependent on real estate development and rental sector . It is also a significant part of the portfolio of loans to the manufacturing industry , wholesale and retail trade and financial intermediation . However, these sectors compared to the value of loans in 2004 to 2010 decreases, thus reducing the risk arising from these economic sectors.

7. All the banking sector loan concentration and diversification indicators (HHI, Gini, Berry) showed that during the period of investigation Lithuanian banking sector loan portfolio was highly concentrated and insufficiently diversified. It was no problem to the country's rapid economic growth, but in the face of the global financial crisis triggered a huge growth off special provisions for bad loans need which in 2008 - 2010 increased by almost 11 times.

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