COMMERCIAL BANKS'ACTIVITY DEPENDENCE ON MACROECONOMIC INDICATORS

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Abstract

The purpose of the article is to assess the existence of dependence between commercial banks activity and macroeconomic indicators in Lithuania. Methods used: correlation and regression analysis of Baltic States commercial banks dependent variables (net profit, return of assets (ROA), return of equity (ROE), net interest margin (NIM) and independent country's macroeconomic indicators (GDP growth, foreign direct investment, average monthly gross salary, foreign trade balance, state budget, government debt, inflation and unemployment rate). Equations of correlation and regression analysis can be useful tool for planning a follow-up of commercial banks activities in Baltic States in short-term period. Correlation regression analysis was completed 4 times with 4 different dependent variables of Baltic States commercial banks. It was found out that the activities of Baltic States commercial banks dependence on macroeconomic indicators during investigated period differs.

Keywords: Commercial banks dependent variables, macroeconomic indicators, correlation regression analysis

Introduction

Banks history counts for centuries – the first banking operations launched in ancient civilizations. Over the years, the functions of banks services grew, banks were developed while they have become what they are now. Nowadays commercial banks are very important for any state economic system as intermediates between the individual customers and the state's central bank to control money flows. The main feature that distinguishes commercial bank from other organizations, it is the only organization in country economic system whose sole activity and the final result is the same – money. And where the money is, there is huge risk to which commercial

banks are encountered. Therefore, a number of different operating restrictions, regulations and rules to ensure continuous supervision of commercial banks and performance analysis are established. However, risk is unavoidable even for the best protected organizations. Serious problems sometimes turn into a crisis of the whole sector, as a result of globalization can easily spread from one country to another. It happened in 2007, when the United States broke the banking crisis: promoting economic growth, the base rate has been reduced to a minimum and determined housing credits boom. Further increase of interest rates led to the reduction of the purchasing power of the U.S. population and decrease of GDP. The crisis began to spread throughout all US economic sectors bringing growing unemployment, rising inflation, private companies and some commercial bank failure. Most countries in the world are engaged in some kind of relationship (commercial, political, financial and etc.) with the United States, thus a sudden crisis has spread around the world and affected Baltic States as well: inflation and unemployment rate has grown extremely fast, GDP drastically fell, the bursting of the real estate price bubble led to a conditional suspension of the construction sector and commercial banks in all three countries experienced record losses due to customers insolvency.

The problem is insufficient analysis of the Baltic States commercial banking changes, their causes and dependence on the economic situation in the country. Object of research – Baltic States commercial banks activity indicators and their relationship with macroeconomic indicators. Purpose of research – based on the scientific literature and statistical analysis, to determine whether there is correlation between the Baltic States commercial banks and the country‘s macroeconomic indicators. Methods used in the research – secondary data and literature analysis; analysis of the primary data; graphical display; ratio analysis; correlation and regression analysis.

1 Interface of Commercial Bank Activities and Economic Situation of the Country

Commercial bank is financial intermediary characterized by its own specific activity as its main function to buy and to sell the same product – money. However, each organization whose main objective is profit has to face with higher or lower risk. Key principle of banking is to value the risk. Banking could be very profitable, but at the same time and risky. In order to maximize the security and reliability of commercial banking sector, it requires a continuous valuation of risk and problems management, because commercial banks every day expose to various risks, which can be separated into internal and external risk. Risk management measures are needed not only to maximize outcome of commercial banks, but also for the overall stability of economic system, because commercial banks contribute to the

overall economic situation as one and very important component of the country‘s economy.

As financial intermediaries, banks play a crucial role in the operation of most economies. The efficiency of financial intermediation can also affect economic growth. Besides, banks insolvencies can result in systemic crisis (Alper, Anbar, 2011). In addition, since a profitable sector is much better able to perform the function of lending, profitable banking sector is a significant contributor to the financial system stability (Dietrich, Wanzenried, 2010). Furthermore, commercial banks contribute significantly to the corporate capital structure and this process leads to profitability. Therefore, the more profitable companies operate, the more the development of activities is encouraged and this even led to employment and GDP growth. On the other hand, there is an inverse relationship – economic situation of the country also determines the activity of the banking sector, as one of the operating organizations in the country. And due to changing, becoming global economic conditions it is necessary to investigate the factors that affect the banking sector and to respond appropriately to changes in these factors, if it necessary.

Banking industry is one of the most important industries that support the development of a country. Like some other financial institutions and capital market, commercial banks are the institutions which are significantly needed by the real sector in doing their business (Anwar, Herwany, 2006). It is also important to mention, that banks are the most important country’s economic centres, which allow money to be engaged in production, they are brains of economy. Furthermore, the presence of strong financial sector ensures for domestic companies or individual entrepreneurs better opportunities to borrow for their activities or to start new projects. And this quickens the growth of economy. When the economic conditions for a certain period are stagnant, banking sector problems may lead only internal factors. However, if there appears even small deterioration of the economic situation, it will immediately affect even stable banking sector (Quagliariello, 2008). Many authors, who studied the performance of commercial banks dependence on different factors, separated those factors into two groups: 1) internal banks factors; 2) external (macroeconomic specific) factors. There is no doubt, that the investigation of the potential correlates with bank efficiency is important as it enables us to predict the effects brought about by macro-economic environment and regulatory changes on the efficiency of banks (Chan, Karim, 2010). In addition, the stability of the banking sector depends not only on country‘s economic situation, but on global economic and financial market conditions.

Probably it can be said that macroeconomic situation of the country affects both the activity of individual banks and along the entire banking

system. Among many causes of financial crises has been a combination of different factors, consisting of unsustainable macroeconomic policies, excessive credit booms, massive capital inflows, and balance sheet fragility, combined with policy paralysis due to a variety of political and economic constraints (Laeven, Valencia, 2008). Both Chan, Karim (2010) and Quagliariello (2008) unanimously agree that investigation of macroeconomic factors can serve bank managers, shareholders, law and related regulation developers as indicators that show potential hazards and assessing the state of banking. There were a number of authors who studied commercial banks dependence on the macroeconomic situation of the country: Derbali (2011), Alexiou, Sofoklis (2009), Alper, Anbar (2011), Dietrich, Wanzenried (2010), Chan, Karim (2010), Sufian, Habibulla (2010). They investigated various countries or even regions in different periods. As the main dependent variables for these investigations authors chose the following commercial banks indicators: return of assets (ROA), return of equity (ROE), and net interest margin (NIM). The independent variables were varied, but as key external indicators authors used the inflation rate, GDP. The results of researches were not similar, so it shows the importance of such kind of research in the Baltic countries.

2 The Methodology of the Research Commercial Bank Activity Dependence on Economy

For each organization it is very important to keep track of activity and indicators which express its performance. One of the best ways for this is analysis of financial statements, where potential troubles and problems are represented in numbers. This is becoming a strategic risk management tool. The most important sources of information for commercial banks activities analysis are balance sheet and profit (loss) statement. Using these reports one can calculate ratios, which help to assess objectively the activities of commercial banks and are the tool for analyzing the relative performance data. Using these ratios it is possible to compare easily activities effectiveness and efficiency of different commercial banks as well as to evaluate ratios of one or more commercial banks in different periods to determine their trends. The following ratios would be calculated: ROA, ROE, and NIM. A number of authors (Schoenholtz (2011), Sufian, Habibullah (2010), Alper, Anbar, (2011), Derbali (2011) state that these ratios are the key tool to record the commercial banks profitability. In addition net profit of Baltic States commercial banks will be included. Investigation of commercial banks activities and country's economic situation relationship usually was made by correlation regression analysis (Dudzeviciute, 2006, Tvaronaviciene, Tvaronavicius, 2008).

To assess influence of a number of key factors for investigating ratio it is necessary to use multivariate correlation and regression analysis, which is carried out in several stages:

1) paired correlation analysis, based on the calculation of correlation coefficients, indicates which independent factors affect dependent factor the most. Then some of the key factors are picked out;

2) paired regression analysis identifies the stochastic relationship between the variables of the previously selected factors. The multiple regression equations are found in form $\hat{y} = a_0 + a_1 x$, which can be used for the assessment of variation of investigating dependent factors when one of the selected factors is replaced;

3) multiple correlation regression analysis in form $\hat{y} = a_0 + a_1 x_1 + a_2 x_2 + \cdots + a_m x_m$ is set and this equation show the influence of independent variables for the dependent variable. Also, the multiple correlation coefficients are calculated, which show the strength of relationship between the independent and dependent factors.

Macroeconomic indicators of Baltic States are used in correlation regression analysis as independent variables, which are identified in Table 1. Also, the predictable relationship between independent and dependent variables is shown there.

Independent indicator	Description	Expected value
GDP growth	GDP percentage change compared to the previous year	+
Foreign direct investment	Capital investments of foreign entities in business entities of the analysed country, million EUR	?
Average monthly gross salary	The average monthly salary after taxes, EUR	?
Foreign trade balance	The subtraction of country‘s export and import, million EUR	-
The state budget	The subtraction of state revenues and expenditures, million EUR	-
Government debt	General government debt to entities, including foreign countries, at current prices, million EUR	+
Inflation	The general growth of price level compared to the previous year, %	+
Unemployment rate	The part of unemployed people of the number of all capable people, %	+

Table 1 ***The Indicators Used in Study and their Expected Values***

Where: + - positive relationship;
– - negative relationship;
? - unknown relationship.

Using the data in Table 1, the study seek to confirm the expected relationship between the Lithuanian bank's net profit, ROA, ROE, NIM indicators and macroeconomic indicators.

4 The Study of Dependence of Baltic Countries Commercial Banks Ratios from Macroeconomic Indicators

For evaluation of the dependence of Baltic States commercial banking ratios from macroeconomic indicators, the pared correlation, paired regression and multiple regression analyses are used, which will help to assess whether there is a relationship between Baltic States commercial banking and country‘s macroeconomic conditions. The study uses MS EXCEL. Indicators, which are used in the research of commercial banking dependence on country’s macroeconomic indicators, are identified in Table2.

	Dependent variable Y	Independent variable X
1.	Net profit of commercial banks, million EUR	GDP growth, %
2.	Return of assets ROA	Foreign direct investments, million EUR
3.	Return of equity ROE	Average monthly gross salary, EUR
4.	Net interest margin NIM	Foreign trade balance, million EUR
5.		The state budget, million EUR
6.		Government debt, million EUR
7.		Inflation, %
8.		Unemployment rate, %

Table 2 ***Dependent and Independent Variables Used in the Research***

Analysis was made using four different dependent variables and eight different independent variables in all three Baltic States: Lithuania, Latvia and Estonia. To estimate coherence between all these factors data of 2006-2012 were used. For better understanding and logical comparison the results are presented according each country.

Lithuanian case. After the paired correlation analysis of Lithuanian commercial bank performance ratios and macroeconomic indicators it emerged that many of the independent variables are completely irrelevant to the examined dependent variables. Correlation coefficients in bold are distinguished as the most important (Table 3). All bolded variables are statistically significant and they will be used in paired regression analysis. Following further analysis steps it was obtained, that Lithuanian commercial banks’ net profit (Y_1) and GDP growth (X_1) pair regression model is not adequate to the real situation. Furthermore, there are some of equations which are adequate to the real situation: ROA (Y_2) and GDP growth (X_1); ROE (Y_3) and GDP growth (X_1); NIM (Y_4) and foreign trade balance (X_4) and government debt (X_6), because their *F*-statistic values are greater than the *F* critical value. Equation with mentioned coefficients of paired regression can be used to show the variation of a single factor dependence on the other factor.

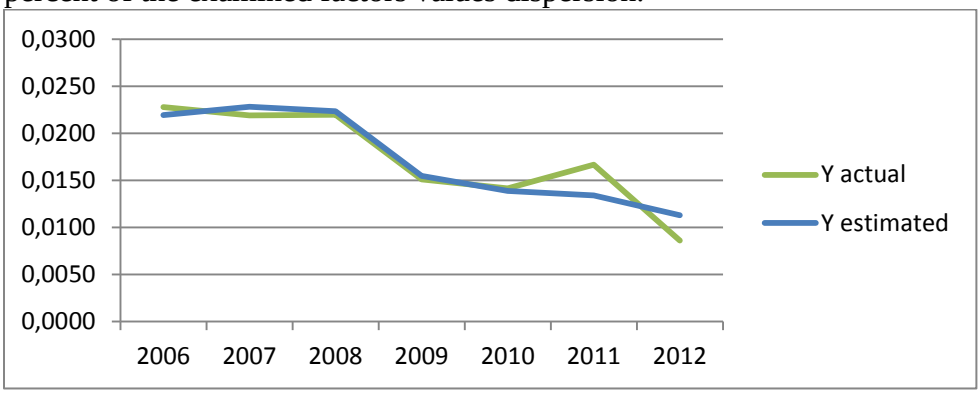
X / Y	GDP growth, %	Foreign direct investment, million EUR	Average monthly gross salary, EUR	Foreign trade balance, million EUR	The state budget, million EUR	Government debt, million EUR	Inflation, %	Unemployment rate, %
Net profit	**0,96**	0,32	-0,19	-0,64	0,72	-0,03	0,25	-0,40
ROA	**0,97**	0,30	-0,24	-0,64	0,75	-0,04	0,22	-0,41
ROE	**0,98**	0,26	-0,27	-0,65	0,76	-0,07	0,21	-0,42
NIM	0,37	-0,72	-0,58	**-0,84**	0,57	**-0,91**	0,57	-0,79

Table 3 Correlation Coefficients of Lithuanian Commercial Banks' and

Macroeconomic Indicators

However, ROA (Y_2) and ROE (Y_3) rate dependence on GDP growth (X_1) are not longer analysed, because the purpose of this analysis is to establish existence of a common link between the dependent variables and the independent variables (together). Therefore, analysis continues with the research of NIM (Y_4) dependence on foreign trade balance (X_4) and government debt (X_6).

The multiple regression analysis revealed that multiple regression equation is adequate for the actual situation, and it can be used for practical calculations and planning. The computed determination coefficient *R* is 0,929, which shows that the multiple regression equation explains nearly 93 percent of the examined factors values dispersion.



Picture 1 NIM Values of Lithuanian Commercial Banks' in Comparison with the Actual Dependent Variable (Y) Value Computed According to Multiple Regression Analysis

The comparison of actual and estimated by multiple regression analysis values are shown in Picture 1. Obviously, estimated values very little differ from the actual values, as the curves in graphics separates only in some places (2011). It is therefore concluded that the main county's macroeconomic ratios influencing Lithuanian commercial banks' net interest

margin NIM were included to the regression equation. NIM ratio of Lithuanian commercial banks increases, when Lithuanian foreign trade balance and government debt declines.

Latvian case. Contrary to the situation in Lithuania Latvian commercial banks' dependent and independent macroeconomic variables pair correlation analysis show that each dependent variable is related to at least some independent variables. Statistically significant independent variables were with correlation coefficients modules in the range 0.8 to 1. Interestingly is that commercial banks' net profit (Y_1), ROA (Y_2), ROE (Y_3), ratios and GDP growth (X_1), foreign trade balance(X_4), state budget (X_5), correlation coefficients are in practice the same. While NIM ratio depends on other variables. Significance of these ratios is tested calculating statistics of each variable *t* and comparing it with *t* critical value (with probability α=0.05 critical value *t* equals 2.57). The values of paired regression curve coefficients' are presented in Table 4.

	Coefficients	GDP growth, %	Foreign trade balance, million EUR	Government debt, million EUR	Inflation, %	Unemployment rate, %
Net profit	a0	**-172,28**	**-1155,22**	**456,50**		943,17
	a1	**50,23**	**-0,33**	**0,75**		-84,76
ROA	a0	**-0,0050**	**-0,03777**	**0,01612**		**0,0326**
	a1	**0,0017**	**-0,00001**	**0,00003**		**-0,0029**
ROE	a0	**-0,0736**	**-0,5113**	**0,2071**		**0,431**
	a1	**0,0226**	**-0,0001**	**0,0003**		**-0,038**
NIM	a0		**0,008467**		**0,0132**	**0,0287**
	a1		**-0,000003**		**0,0008**	**-0,0009**

Table 4 *Correlation Coefficients of Latvian Commercial Banks' and*

Macroeconomic Indicators

According to obtained coefficients Y values are calculated. Obtained and compared results permit to use in the future dependent Latvian commercial banks and independent macroeconomic variables reliance analysis all mentioned ratios except unemployment (X_8) values to banks net profit (Y_1), as statistic ratio of this variable *F* was less than critical *F* value. Values of equation coefficients in bold in Table 4 show that equations are adequate to the real situation.

Using LINEST function of MS EXCEL program coefficients needed for multiple regression equation were calculated. The multiple regression analysis revealed that multiple regression equation is also adequate for the actual situation Calculated determination coefficient *R* is equal 0,982 and this show that multiple regression equation explains nearly 98 percent of the examined factors values dispersion. Obtained results confirm that due

increase of GDP and government budget and decline of foreign trade balance net profit of Latvian commercial banks rise.

Accomplished multiple regression analysis of Latvian banks‘ ROA and macroeconomic ratios reflects the real situation by nearly 97 percent accuracy. The value of *F* statistic is higher than *F* critical, so the multiple regression equation is adequate to the real situation. Calculated determination coefficient *R* is equal 0.967 and shows that multiple regression analysis equation explains nearly 97 percent of analyzing factors values distribution. The conclusion is that increase of GDP and government debt and decline of unemployment determines higher commercial banks‘ ROA ratio.

Analysis of Latvian commercial banks ROE and macroeconomic indicators regression equations reflects the real situation by nearly 97 percent accuracy. The value of *F* statistic is higher than *F* critical, so the multiple regression equation is adequate to the real situation. Calculated determination coefficient *R* is equal 0,967 and this show that multiple regression equation explains nearly 97 percent of the examined factors values dispersion. Thus as in the case with ROA, increase of GDP and government debt and decline of unemployment determines higher commercial banks‘ ROE ratio.

Finally the importance of Latvian macroeconomic indicators and commercial banks net interest margin NIM is verified. The equation reflects the real situation only by 95 percent accuracy. The value of *F* statistic is higher than *F* critical, so the multiple regression equation is adequate to the real situation. Calculated determination coefficient *R* is equal 0,975 and this show that multiple regression equation explains nearly 98 percent of the examined factors values dispersion. According to get results Latvian commercial banks NIM ratio increase depends on inflation rise and foreign trade balance and unemployment rate decrease.

Comparing the values of multiple regression analysis with actual ones in the case of Latvia differs very little as in all four cases the determination coefficients equals either 97 or 98 percent. So it can be concluded that the main influencing macroeconomic variables: GDP growth, foreign trade balance, government budget, inflation and unemployment rate - were include into regression equation influencing four Latvian commercial banks dependent variables (net profit, ROA, ROE and NIM).

Estonian case. Correlation regression analysis in Estonia again differs from Lithuanian and Latvian cases, as only one independent variable (GDP growth) has a link with three form four dependent variables (net profit, ROA and ROE ratios).

X / Y	GDP growth, %	Foreign direct investment, million EUR	Average monthly gross salary, EUR	Foreign trade balance, million EUR	Government debt, million EUR	Government debt, million EUR	Inflation, %	Unemployment rate, %
Net profit	**0,84**	0,21	0,01	-0,31	-0,36	-0,16	0,63	-0,40
ROA	**0,86**	0,18	-0,02	-0,29	-0,34	-0,23	0,59	-0,38
ROE	**0,87**	0,11	-0,06	-0,35	-0,40	-0,24	0,62	-0,42
NIM	0,12	0,56	0,70	0,58	0,56	0,06	0,13	0,37

Table 5 ***Correlation Coefficients of Estonian Commercial Banks' and***

Macroeconomic Indicators

Statistically the most important ratios are marked in bold in Table 5. Significance of these coefficients is verified calculating statistics of each dependent variable *t* and comparing it with *t* critical value (with probability α=0,05 critical value *t* equals 2,57). Results show that all marked in bold variables are statistically significant and paired regression analysis is performed with them. The results of paired regression curves coefficients are presented in Table 6.

Y values were calculated using data from Table 6. Adequacy of each equation to the real situation is estimated according to proportion of regression and residual dispersion (*F* statistics) and compared this proportion to critical *F* value. Get and compared values show that Estonian commercial banks net profit (Y_1) and GDP growth (X_1), ROA ratio (Y_2) and GDP growth (X_1) and ROE ratio (Y_3) and GDP growth (X_1) paired regression models are adequate to the real situation, as *F* statistics value is higher than *F* critical value. Notwithstanding the investigation of Estonian commercial banks activities ratios dependence from macroeconomic indicators terminated at this point as there is no possibility to make multiple regression analysis having only one independent variable for each dependent variable.

	Coefficients	GDP growth, %
Net profit	a0	130,17
	a1	38,74
ROA	a0	0,0072
	a1	0,0020
ROE	a0	0,0709
	a1	0,0231

Table 6 *Estonian Commercial Banks' and Macroeconomic Indicators Regression Curve Coefficients*

Concluding, the accomplished paired correlation, paired regression and multiple regression analysis show that during the investigated period activities of Baltic States commercial banks dependence on macroeconomic ratios varies.

Conclusion

Commercial banking activities are closely related to both the country‘s macroeconomic situation and the economic processes taking place in the world. Therefore, banking activities dependence on macroeconomic indicators were studied in various countries and in some cases the results differs. This shows importance of research of dependence of macroeconomic indicators and commercial banks ratios in Baltic States. Theoretical analysis shows that the most effective method for finding the link between commercial banks‘ activities and macroeconomic factors is correlation and regression analysis.

After correlation regression analysis of Lithuanian commercial banks four dependent variables (net profit, ROA, ROE, NIM) and eight country‘s macroeconomic indicators (GDP growth, foreign direct investment, average monthly gross salary, foreign trade balance, state budget, government debt, inflation and unemployment rate) it was found out that the decline in Lithuanian foreign trade balance and government debt increases the NIM of Lithuanian banks.

Net profit of Latvian commercial banks was positively dependent on GDP growth and state budged and negatively reliant on foreign trade balance. ROA and ROE ratios positively depend on GDP growth and state budget and negatively reliant on foreign trade balance and unemployment rate. NIM ration in Latvia is directly dependent on inflation and indirectly on foreign trade balance and unemployment rate.

In Estonian case it is not possible to make any important conclusions as during accomplished investigation paired regression link between Estonian commercial banks net profit, ROA, ROE and GDP growth was found. The last one – independent variable positively influences dependent variables.

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