

## Economic Cycle and Credit Volume Interaction: Case of Lithuania

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*Economic (sometimes called “business”) cycle research is one of the most popular topics of scientific literature discussions over the last years encompassing global economy long-term grow and recession starting from 2007. Such cycles can also be observed in banking activities – decreasing crediting volumes can be noticed in the majority of countries. However, the interaction between financial and business cycles is not fully revealed and differs in different countries. In the case of Lithuania credit volume and business activeness cyclic interaction can be also named as specific, reflected in gross domestic product (GDP) and credit volume fluctuations. Based on various economic cycle stages identification methodologies, not every single fluctuations can be assigned as an economic cycle stage: some of them are not identified as significant and are not recognised as economic cycles, the others match an economic cycle stage and time criterions and can be recognized as economic cycles. In the current situation, when global economy and the situation in Lithuania show recovery signs from recession to growth, credit market reacts respectively. 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. The importance of business and credit volume cycles interaction research is also evident from the number of theoretic studies, however, to investigate interaction between an economic cycle and crediting activities in Lithuania banks there was adopted methodology developed by Kress (2004) and Avouyi-Dovi et al. (2006), including these main stages: 1) identification of turning points according to Avouyi-Dovi et al. (2006) adopted Harding and Pagan methodology, identifying peaks and troughs when two different economic cycle indicators are selected (Industrial production (Lt) and GDP (Lt)) with three credit cycle indicators (Total loans (Lt); Household loans (Lt); Loans to non-financial corporations (Lt)); 2) Calculation of concordance index between economic cycle and banks provided credit volume using business and credit cycle indicators; 3) Valuation of dependence between economic indicators and banks credit activities ratios using correlation function; 4) Conclusions delivering. Research methodology consists of separate independent stages, what makes possible to compare the results in separate stages and deliver more comprehensive conclusions. Obtained results revealed that peak in Total loans indicator converge with the peak in economic cycle indicators, but the peak in Household loans is accessed*

*earlier than the peak in economic cycle indicators. These tendencies were also approved by the correlation analysis and calculation of a conformity indicator. The results allow to deliver significant conclusions about government monetary political decisions influencing the country’s economic cycle fluctuations and determining financial stability.*

**Keywords:** *economic cycle, credit cycle, bank credit activities, turning points, economic cycle indicators, credit cycle indicators.*

### Introduction

Influence of financial intermediaries (including banks) on economy, the interrelation between financial development and economy growth are frequent and relevant topics of scientific research. Especially huge interest of researchers, financial experts in this field can be noticed in the last decade. Plenty of discussions in the field were organized and are currently further proceeding where new ideas about financial intermediaries role in economic cycle development are discussed. Lakstutiene (2007) systemized empirical research encompassing relation between economy and financial sector growth, revealing that there is much more empirical research on the evidence that the financial sector influences economic growth, and very little economic growth influences the financial sector. There is quite a small number of researchers maintaining the idea that economy growth drives financial sector for further development (Lakstutiene, 2007). This allows to predict that interaction causality research between the financial sector and economy growth should be further developed. However, in the current years the scientific research by Lithuania’s authors is mainly focused on one of the main financial intermediaries activity – crediting interaction with economic processes valuation. Banks crediting activities influencing macroeconomic processes in Lithuania were analyzed by Ramanauskas (2005, 2006). Peculiarities of financial sector development and interaction with economy processes were also presented in the research of Dudzeviciute (2006), Lakstutiene (2008), Lakstutiene et. al. (2006, 2009), Boguslauskas, Mileris (2009), Zukauskas, Neverauskas (2008), Strumickas, Valanciene (2006), Macerinskiene, Ivaskeviciute (2008), Leika (2008), Racickas, Vasiliauskaite (2010), Ginevicius, Podvezko (2008). However, scientific research analyzing credit cycle convergence or divergence with economic cycles in Lithuania is missing, though it is not a very new research field in the world. Probably the main problem is

that a common idea in this field of researchers is hardly found. Valuating interaction between an economic cycle and a bank credit volume can be found in many studies using different methodologies, but the results obtained are very contradictory: one group of authors states that interaction between economic cycle and credit volume is very strong (Bikker and Hu (2002), Cappiello et al. (2010), Igan et al. (2009), Kress (2004), King and Levine (1999), Avouyi-Dovi et al. (2006), Pojatina (2008), whereas the other group discusses about weak interaction, found in the research of Uuskula et al. (2005), Gugliermo et al. (2009), Berglof and Bolton (2002), or denied by Koivu (2002).

As it has been previously mentioned, the majority of this research was based on a selected group of countries data. For such evaluation countries with available appropriate statistical long-term historical data were selected: USA, EU old members, separate European regions (Bikker and Hu, 2002; Igan et al., 2009; Cappiello et al., 2010; King and Levine, 1999; Avouyi-Dovi et al., 2006; Uuskula et al., 2005; Gugliermo et al., 2009; Koivu, 2002; Berglof and Bolton, 2002; Krainer, 2001). Empirical research on separate countries credit volume and economic cycle interaction is rather rare (Kress, 2004; Pojatina, 2008; Tsouma, 2010). The main attribute in such research is usually a shorter period than in the countries group research. According to the authors mentioned last separate countries research can provide more comprehensive data, because in the group research countries with a different development level and size can be included without attitude to their specifics, and these results can discover only general tendencies but not the separate country's situation.

In the mentioned interaction scientific research studies different models and methodologies are applied: USA National Bureau of Economic Research (NBER) applies Bry and Boschan (1971) (BB) methodology, Harding and Pagan (2003) (BBQ) methodology; parametric Markov-switching model (MS, DFMS) applied by Tsouma (2010), Kress (2004), Zarnowitz (1992), Chauvet (2007). Mostly applied Harding and Pagan methodology, having several varieties and adopted by Avouyi-Dovi et al. (2006), Tsouma (2010), according to available static data batch.

Whereas the discussion about an available empirical research supports the idea that there is no common position about interaction between economic cycles and credit volume in a separate country (including Lithuania), it cannot be argued on the specific case. This forms the main **aim of the article** – to evaluate interaction and interrelation between Lithuania economic cycle and country's banks crediting activities.

**Research methods** – systematic literature analysis, logical comparative and generalization analysis, mathematical statistics methods.

**Economic cycle and credit volume interaction research methodology**

Kress (2004) and Avouyi-Dovi et al. (2006) adopted methodologies for Lithuania case research were selected as the mostly corresponding to the research idea and needs. The research methodology consists these main stages:

**1. Identification of turning points according to Avouyi-Dovi et al. (2006) adopted Harding and Pagan methodology**, presented in Table 1.

Table 1

**Sanvi Avouyi-Dovi et al. (2006) methodology steps (rules)**

Steps (rules)	Operations
1.	A peak (trough) is reached at $t$ if the value of the series at date $t$ is superior (inferior) to the previous $k$ values ( $k=5$ )
2.	A procedure is implemented to ensure that peaks and troughs alternate, by selecting the highest (lowest) of two consecutive peaks (troughs)
3.	Cycles whose duration is shorter than the minimum time $m$ ( $m=5$ ) are stripped out
4.	Cycles whose complete recurrence period (number of periods separating a peak from a peak or a trough from a trough) is lower than the pre-specified number of $M$ periods ( $M=15$ ) are stripped out.
<b>Complementary rules</b>	
1.	The first peak (trough) cannot be lower (higher) than the first point in the series, and the last peak (trough) cannot be lower (higher) than the last point in the series
2.	The first (last) peak or trough cannot be positioned at less than $e$ periods from the first (last) point in the series studied ( $e=6$ )

**2. Calculation of concordance index (indicator) between the economic cycle and banks credit volume.**

This index analyzes the concordance between two variables and is defined as the average number of periods in which two variables coincide at the same phase (peak or trough) of the cycle (Avouyi-Dovi et al., 2006), calculated using formula below:

$$c_{xy} = 1 / T \sum [s_{x,t} s_{y,t} + (1 - s_{x,t})(1 - s_{y,t})] \quad (1)$$

where:

$T$ - number of periods analyzed;

$s_{x,t}$  – industrial production over period  $t$ ;

$s_{y,t}$  – loans to nonfinancial corporations over period  $t$ ;

$s_{y,t}$  ir  $s_{x,t}=1$ , if volume is growing over period  $t$ , compared to previous period;

$s_{y,t}$  ir  $s_{x,t}=0$ , if volume is decreasing over period  $t$ , compared to previous period;

Index is equal to 1, if all  $x$  and  $y$  are always at the same phase, i.e. both variables coincide, peaks and troughs are adjacent. If the index is equal to 0, variables  $x$  and  $y$  are always in the different phases, i.e. with either a pronounced lag or a total contrast in phase. If the index value is closer to 1, it shows better coincidence of variables.

In the paper the index is calculated between these indicators:

- loans to nonfinancial corporations and industrial production, using monthly data;
- household loans and industrial production, using monthly data;

- loans to nonfinancial corporations and GDP, using quarter data;
- household loans and GDP, using quarter data;

**3. Valuation of the dependence between economic indicators and banks credit activities ratios using correlation function.** This part of research can confirm or deny results obtained and conclusions delivered in the previous stages. Correlation is calculated between these indicators:

- industrial production and total loans, using monthly data;
- industrial production and household loans, using monthly data;
- loans to nonfinancial corporations and industrial production, using monthly data;
- GDP and total loans, using quarter data;
- household loans and GDP, using quarter data;
- loans to nonfinancial corporations and GDP, using quarter data.

In order to estimate whether changes in loan volumes and economic activeness are corresponding or having time lag, based on Kress (2004) and Avouyi-Dovi et al. (2006) methodologies correlation is calculated not only with the same period adequate data (when  $k=0$ ), but also with loan volume data with period  $t$  and economic activeness period with period  $t \pm k$ , when:

- $k=12$  for monthly data,
- $k=4$  for quarterly data.

Kress (2004) and Avouyi-Dovi et al. (2006) research methodologies were selected because: 1) Kress (2004) and Avouyi-Dovi et al. (2006) studies were encompassing similar length time periods (about 10 year statistic research data). The majority of other researchers requires longer period data; 2) Other methodologies mainly were using monthly GDP data, but in the case of Lithuania Department of Statistics does not provide such data; 3) Application of selected methodology does not require specific software; 4) research methodology stages are independent from each other, that is why it is possible to analyze, compare and comment the obtained results of different stages; 5) For results accuracy and comparability data of different periodicity can be used with various economic cycle indicators.

*Selection of a research period and data series.* Avouyi-Dovi et al. (2006) research analyzed the interaction between loans to nonfinancial corporations and industrial production. In Kress (2004) research the analysis was made on the interaction between separate loan types (loans to privates and loans to nonfinancial corporations) and two different macroeconomic indicators- GDP and industrial production. Combination of the mentioned research and different indicators interaction can be the issue to confirm or deny the results of previous studies. That is why in this paper there will be used indicators applied in Kress (2004) research for bank credit volume estimation: total loans, household loans, loans to nonfinancial corporations. For economic activeness evaluation selected indicators are: industrial production and GDP.

Data series used in research encompasses period from January 2001 to September 2010. It was influenced by data availability (The Bank of Lithuania provides data about

new issued loans in monthly series from this period, up to this period only annual data is available). The research using only annual data will not correspond data series relevance requirements.

For bank credit activity and industrial production interaction research monthly data is used because it is available in such format in the Department of Statistics database. For bank credit activity and GDP interaction research quarterly data is used because GDP is provided on such format. The same principles are applied by Kress (2004).

### **Identification of Lithuania economic activeness and bank credit activity indicators turning points**

At the first research stage turning points are identified for:

1. Economic activeness indicator - industrial production (Lt), credit activity indicators - total loans (Lt); household loans (Lt); loans to non-financial corporations (Lt), using monthly data.

2. Economic activeness indicator – GDP (Lt), credit activity indicators - Total loans (Lt); Household loans (Lt); Loans to non-financial corporations (Lt), using quarterly data.

Turning points are identified according to Avouyi-Dovi et al. (2006) adopted Harding and Pagan methodology, identifying peaks and troughs containing methodology steps (rules) described in Table 1.

**Turning point identification when an economic cycle indicator is industrial production (Lt).** Applying the first rule, peaks and troughs were identified. Mostly nonconformities between turning points were identified for industrial production and loans peaks in 2009 and 2010. During other years, these nonconformities are marginally small, eg. one or two months precedence or slippage, or peaks concur only with one loan indicator (eg. household loans), but varies with other loan indicator's peak. It should be noticed, that more peaks were identified than troughs. It can be observed in industrial production and household loans indicators. It can be explained by arguing that Lithuania' economy grew fast up to 2008, the same process was in bank crediting activities growth, especially in a household loans sector. A big number of turning points can be explained by data series used of monthly data with more than 100 values. Smaller number of turning points is identified analyzing total loans and loans to nonfinancial corporations indicators, but there is no such big difference in the number of peaks and troughs (it was not noticed such long-term continuous growth as in household loans or industrial production indicators, but bigger number of short-term fluctuations (no longer than 5 months period consecutively) was identified).

After the first rule application, according to the second rule, the highest (lowest) turning points are picked from subsequently following peaks (troughs). According to the second rule, subsequently following peaks or troughs are eliminated by extracting those with the highest or lowest values. After applying this rule the number of turning points noticeably decreased – in this case they can be calculated as one or two over 1 year period. Specifically

the number of turning points decreased for household loans and industrial production indicators, what had continuous growth over analyzed period. It also reduced earlier noticed difference in number of peaks and troughs (31 and 23).

According to the third rule, cycles with a shorter period than the minimum number of months defined ( $m=5$ ) are eliminated. After this procedure, when periods between peaks and troughs shorter than 5 months are eliminated, turning points are re-identified. Application of this rule decreases the number of peaks up to 11 and the number of troughs up to 14. For each analyzed indicator the number

of identified peaks reached 2-4, the number of identified troughs 2-3. Exception was noticed with an industrial production indicator where the number of identified peaks is 6. This rule eliminates seasonal fluctuations, what according methodology authors cannot be claimed as a cycle phase.

In the last stage, the fourth rule is applied when cycles with a full recurrence period – the number of periods from peak to peak or from trough to trough is lower than the minimum number of periods predefined ( $M=15$ ) and final turning points are characterized (Table 2).

Table 2

**Identified peaks and troughs**

<i>Industrial production</i>		<i>Total loans</i>		<i>Household loans</i>		<i>Loans to nonfinancial corporations</i>	
<b>Peak</b>	<b>Trough</b>	<b>Peak</b>	<b>Trough</b>	<b>Peak</b>	<b>Trough</b>	<b>Peak</b>	<b>Trough</b>
2006 05	2002 02	2003 07	2002 11	2007 08	2003 01	2002 12	2004 02
2008 07	2006 12	2008 04	2006 07		2010 01	2008 09	2010 01
	2009 04		2008 11				

Table 2 indicates, that there is one identified peak in household loans and it was reached 11 months before the peak in industrial production. It can be explained that the peak in household loans was not reached in previous years (the same tendency for industrial production) because the loan portfolio started to grow in 2003 and this tendency remained until the second half of 2007. Situation with identified troughs is different – the first trough in household loans was identified 11 months later than trough in industrial production. There was no identified peaks or troughs in household loans for the year 2006, when it was identified in an industrial production case. These variances can be explained by slow household crediting up to 2002. High unemployment rate, Russian financial crisis consequences and other macroeconomic tendencies influenced low demand for this kind of banking products. From information about credit amounts up to 2002 it is difficult to make conclusions about credit periodicity and country's economic activeness. Turning points for loans to nonfinancial corporations do not match turning points of industrial production in the earlier research period. However, for the later period peak and trough is identified later than a corresponding turning point for industrial production – peak 2 months later, trough – 9 months later. Analyzing turning points for total loans connections with industrial production turning points can be also discovered. Trough in total loans is identified already in 2002

November, that is 3 months earlier than trough in industrial production, other troughs are also identified earlier respectively 5 months in 2006 and 5 months in 2008. Peak is identified 3 months earlier in 2008. These analysis results can conclude, that turning points in total loans are identified earlier than in industrial production, that is why changes in total loans can foresee alterations in industrial production after 3-5 months period.

**Turning point identification when economic cycle indicator is GDP (Lt).** Economic cycle indicator is selected GDP when it quarterly data is used. Credit indicators for analysis are the same: *Total loans (Lt)*; *Household loans (Lt)*; *Loans to non-financial corporations (Lt)*. According to the defined rules, in Table 1, turning points are identified. Analysis showed the same tendency as using monthly data – an identified number of peaks is higher than the identified number of troughs. The main difference is that using monthly data peaks and troughs are identified continuously for all the period examined, but for quarterly data there is an exception – there are very few troughs up to 2008 but the majority off peaks are identified up to 2008. Also after quarterly data analysis is noticed, that there is more indicators with peaks adequate for all periods analyzed. When monthly data was analysed the number of such adequate peaks was lower, though the total number of peaks analyzing monthly data is higher.

Table 3

**Identified turning points using quarterly data**

<i>GDP</i>		<i>Total loans</i>		<i>Household loans</i>		<i>Loans to nonfinancial corporations</i>	
<b>Peak</b>	<b>Trough</b>	<b>Peak</b>	<b>Trough</b>	<b>Peak</b>	<b>Trough</b>	<b>Peak</b>	<b>Trough</b>
2008 Q 3	2010 Q 1		2010 Q 1	2007 Q 3	2010 Q 1	2008 Q 3	

Analyzing quarterly data the number of turning points is higher after applying the first and the second rules in comparison to monthly data. The main cause for it is that quarterly data is not so volatile (data seasonality is excluded from this analysis) and it better reflects general tendencies. One more important issue should be mentioned – number of peaks is noticeably higher than the number of troughs identified.

After applying the third and the fourth rules (and complementary rules after), the number of turning points identified decreases if analyzing industrial production data (see Table 3). For the second complementary rule  $e$  value is selected to be equal to 2, not the same as in Harding and Pagan methodology, because Avouyi – Dovi et al. (2006) were not using quarterly data in their research. Also, corresponding to rather short research period, to use

parameter  $e$  equal to 6 is not purposive. Peaks identified at the same quarter in GDP, total loans and loans to nonfinancial corporation amounts are varying only in few months period analysing monthly data, what allows to derive conclusion that growth of these indicators is synchronized – growing credit volume is reflected in growing economic indicators.

Comparing monthly and quarterly data, it can be noticed that:

- During an economic activity period the peak was identified the same, however, analyzing quarterly data different trough is defined – for 2010 1<sup>st</sup> quarter. Other troughs analyzing quarterly data were not defined. The same situation is with total loans indicators.

- Analyzing household loans indicators, in the same periodicity data, the same peaks and troughs are identified. Exception is with January 2003 trough, what was not identified with quarterly data.

- Identified peak in 2008 matched also analyzing loans to nonfinancial corporations. At the same time trough was not identified using quarterly data (after applying 3 rules it was identified in the 3<sup>rd</sup> quarter of 2010, to confirm that further data of 3 following quarters is necessary), but analyzing monthly data there were identified 2 troughs – February 2004 and January 2010.

- Analyzing synchronization between an economic cycle and credit volume periodicity it can be noticed that the peaks for the same quarter are identified in GDP, total loans and loans to nonfinancial corporation indicators, and analyzing monthly data they do not match only with several months lag. It allows to define that for the period analyzed (01.2001-09.2010) credit volume indicators and

economic cycle indicators were synchronized. Peak in the household loans was reached 4 quarters earlier (very similar result was obtained using monthly data – 11 months earlier). But this first stage of research cannot confirm that increasing household loans amounts influenced economic growth, additional research is needed.

- Troughs match in GDP, total loans and household loans indicators. Because of the lack of data it cannot be confirmed that trough for loans to nonfinancial corporations is identified for the 3<sup>rd</sup> quarter of 2010 and the synchronization of these indicators exists. Analyzing monthly data troughs also vary, what requires further research for concordance index calculation and correlation analysis.

### Concordance index (indicator) calculation and correlation analysis

At the second stage of the research relation between the credit volume and economic cycle is evaluated calculating the concordance index (indicator) according to the formula 1 and has the value equal to 1 if credit volume and economic activity indicators are always at the same cycle stage, i.e. corresponding data for peaks and troughs contiguous. If the index is equal to 0, economic activeness and credit volume indicators are at different stages – i.e. a contrastive stage or with long time lag. Closer index value to 1 depicts a stronger relation between the indicators analyzed. Index values, calculated for corresponding periodicity data are presented in Table 4.

Table 4

Concordance index values

Between loans to nonfinancial corporations and industrial production	Between loans to nonfinancial corporations and GDP	Between household loans and industrial production	Between household loans and GDP	Between total loans and industrial production	Between total loans and GDP
0.55	0.8	0.60	0.69	0.58	0.75

The closer concordance index value to 1 describes stronger relation between analyzed indicators, what in this research is revealed between GDP and loans to nonfinancial corporations, GDP and total loans, GDP and household loans. Concordance index evaluated for industrial production and loans' indicators are lower. These results only affirm previous research results – turning points of GDP and loans to nonfinancial institutions are coincident, and the analysis of an industrial production indicator reveals time lags in turning points of loans indicators.

In order to confirm or deny these results the third research step is performed – calculation of correlation coefficients. In order to evaluate the same periodicity or time lags in loans and economic activeness indicators dynamics, correlation calculations are performed not only for the same periods (when  $k=0$ ), but also for other loans indicators periods  $t$  and economic activeness indicators periods when  $t \pm k$ . In calculations:

- $k=12$  for monthly data (correlation between industrial production and total loans; industrial production and household loans; industrial production and loans to

nonfinancial corporations) (see Table 5);

- $k=4$  for quarterly data (correlation between GDP and total loans, GDP and household loans, GDP and loans to nonfinancial corporations) (see Table 5).

According to the obtained results, it can be noticed that between newly issued loans (total loans indicator) and industrial production there is a strong liner correlation (coefficient value - 0.729). This result for period  $k = 0$  means strong relation in a corresponding time interval, i.e. growing industrial production volume and loan volume have the same tendency of growing or vice versa. Also, a relatively strong correlation is observed for periods from  $k=1$  to  $k=3$ , i.e. changes in loan volume can influence changes in industrial production after 1 – 3 months.

In the analysis the highest correlation coefficient value (0.739601) was obtained for the period  $k=8$  analyzing household loans. Relatively strong linear correlation is also observed for periods from  $k=5$  to  $k=9$ .

Analysis of relationship between loans to nonfinancial corporations and industrial production, the highest coefficient value was obtained for period  $k=0$ , i.e. growing industrial production volume corresponds to growing loan

volume to nonfinancial corporations and vice versa. Also strong correlation for periods  $k=+1$  and  $k=-1$ , what shows that loan volume reacts to changes in industrial production with 1 month lag.

From the results of correlation coefficients calculated using quarterly data (see Table 5), calculated values depict possible changes in household loans and changes in GDP for one quarter. Changes in total loans volume and loans to

nonfinancial corporations volume do not correspond to changes in GDP, the tendencies of these indicators are the same without time lags. These results just conform the same tendencies described previously.

Obtained results can be compared to similar research performed in Estonia, Czech Republic, Hungary and Poland where similarities and differences can be found.

Table 5

**Correlation results between total loans, loans to nonfinancial corporations, household loans (t) and industrial production (t +/- k)**

Correlation results between economic activeness and credit volume indicators							
k	Correlation between total loans (t) and economic indicator (t +/- k)	Correlation between household loans (t) and economic indicator (t +/- k)	Correlation between loans to nonfinancial corporations (t) and economic indicator (t +/- k)	k	Correlation between total loans (t) and industrial production (t +/- k)	Correlation between household loans (t) and industrial production (t +/- k)	Correlation between loans to nonfinancial corporations (t) and industrial production (t +/- k)
<b>Economic activeness indicator – Industrial production</b>							
k=0	<b>0.729434</b>	<b>0.352217</b>	<b>0.744485</b>				
k=-1	0.604675	0.174752	<b>0.67004</b>	k=1	0.669966	0.419714	0.640383
k=-2	0.511897	0.023111	0.623552	k=2	0.659091	0.532271	0.576132
k=-3	0.479123	-0.08013	0.629539	k=3	0.696562	0.621574	0.582249
k=-4	0.356708	-0.19138	0.528124	k=4	0.572305	0.634844	0.422371
k=-5	0.260902	-0.26839	0.444212	k=5	0.566869	0.684711	0.39314
k=-6	0.255339	-0.26655	0.43649	k=6	0.504521	0.696306	0.310693
k=-7	0.173652	-0.30716	0.353648	k=7	0.96471	0.697033	0.176546
k=-8	0.192212	-0.28373	0.366063	k=8	0.353269	<b>0.739601</b>	0.103836
k=-9	0.265851	-0.20463	0.421578	k=9	0.350407	0.736999	0.101464
k=-10	0.201433	-0.19204	0.336116	k=10	0.226994	0.690301	-0.03031
k=-11	0.240797	-0.1214	0.352995	k=11	0.2027	0.656159	-0.045
k=-12	0.36593	-0.0226	0.463395	k=12	0.12237	0.591411	-0.11527
<b>Economic activeness indicator – GDP</b>							
k=0	0.334595	<b>0.372313</b>	<b>0.462602</b>				
k=-1	-0.29147	-0.06283	-0.15153	k=1	<b>0.483019</b>	0.166965	0.245498
k=-2	-0.08188	0.074617	0.04323	k=2	0.083562	-0.28485	-0.15438
k=-3	0.272786	-0.01807	0.272786	k=3	-0.22032	0.020214	-0.05697
k=-4	0.164129	0.263457	0.315649	k=4	0.320058	0.198657	0.319872

Concordance index between household loans and industrial production in Estonia according Kress (2004) research was reaching - 0.9706 (in Lithuania case - 0.596). In Poland, Hungary and Czech Republic this index was not calculated. Concordance index between loans to nonfinancial corporations and industrial production are similar to the results in Euro zone countries or Poland, but lower than in Estonia.

Correlation analysis results using monthly data (similar to Kress (2004) Estonia's case methodology), analogous results were obtained only between industrial production and total loans indicators. In Lithuania's case the strongest correlation results are obtained when  $k=0$  and 1-3, in Estonia - for period  $k=3$ . Analyzing correlation between industrial production and loans' indicators results are different. In Lithuania the highest correlation is obtained for period  $k=8$  ( for households) and  $k=0-2$  (for nonfinancial corporations), in Estonia correspondingly  $k=-2$  and 6. Similarity is in relatively strong and linear relation

using quarterly data in Lithuania and Estonia. In this situation also even there is a small lag when relation is strong: for household loans in Lithuania strongest correlation is for period  $k=1$  (in Estonia -1), for loans to nonfinancial institutions and total loans in Lithuania and in Estonia when  $k=0$ .

As it was mentioned, in Poland Hungary and Czech Republic relation between loans to nonfinancial corporations and industrial production was identified as weak, exception was noticed for Euro zone countries indicator, which is relatively strong for period  $k=0$ . However here is identified inverse correlation as in Lithuania's and Estonia's case.

Different methods for the analysis used in research is explained not only by the availability of different statistical indicators for different countries, but also with different research period duration. According to this factor research period in all case was similar for about 10 years but in different artificial years (research in Estonia, Hungary,

Czech Republic, Poland was performed for period up to 2004, and no new research was found for recent years periodicity influence analysis).

## Conclusions

1. Performed research for the interrelation analysis of economic cycle and credit volume indicators, including economic growth and recession periods, confirmed close interaction for credit institutions activities and their influence to country's macroeconomic indicators. This interaction is also reflected in other academic research results, however, it was fairly little analyzed for young market economy countries in which group is Lithuania.

2. Identified turning points in economic activeness and credit volume indicators using monthly or quarterly data revealed that the peak in total loans and the peak in loans to nonfinancial corporations are coincident with the peak in economic activeness indicators. These tendencies were also confirmed by the correlation analysis and concordance index calculations. These findings allow to make forecasts about the country's economic tendencies in the future and to prepare measures for avoiding possible economic recession consequences.

3. Concordance index calculation results for economic cycle indicators and credit volume indicators revealed the highest interaction between loans to nonfinancial corporations and GDP (0.8), also for household loans and GDP (0.69). Concordance index between industrial production and total loans is identified as lower than for GDP and total loans.

4. According to the correlation between industrial production and credit volume indicators results, it was

identified that the changes in total loans correspond to the changes in industrial production at the same period. Also, the correlation results obtained allow to anticipate possible changes in industrial production influenced by total loans indicators which will occur after 1 – 3 months.

5. Correlation analysis results between GDP and credit volume indicators reveal that the changes in household loans correspond to the changes in GDP with 1 period (quarter) lag, changes in total loans and loans to nonfinancial corporations indicators react with GDP changes for the same periodicity. According to the correlation analysis, the changes in household loans are also reflected in the changes of country's economic activeness, what is obtained in the first research stage identifying peaks.

6. Using industrial productions as economic cycle indicator, its interrelation defined during correlation analysis with credit volume indicators is stronger than using GDP as an indicator. The highest correlation coefficient value was calculated for the total loans and loans to nonfinancial corporations indicators.

7. This research results presenting interrelation and synchronicity between economic activeness and credit market indicators will allow to make insights for future and making the decisions influencing countries economic and financial stability. Because in the majority of European countries the economic cycle changes can be observed (transition from the crisis period to growth with anticipated second wave of stagnation) for a current period, for accuracy of research results this analysis can be repeated continuously with a longer period and encompassing other economic cycle stages.

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#### **Ekonominio ciklo ir kredito apimtys sąveikos tyrimas Lietuvoje**

Santrauka

Pastaraisiais metais ekonomikos cikliškumas tapo viena pagrindinių temų mokslinėje literatūroje. Tuo metu pasaulio ekonomikos plėtra, ilgą laiką augusi, 2007 m. pastebimai sumažėjo. Cikliškumas pastebimas ir bankų veikloje – kreditavimo apimtys mažėja daugelyje pasaulio valstybių. Tačiau nepaisant tai, priežastinis ryšys tarp finansinio ir ekonominio ciklo nėra iki galo aiškus ir kiekvienoje šalyje skirtingas. Kalbant apie kreditavimo apimtį ir ekonomikos aktyvumą Lietuvoje taip pat gali būti tam tikrų cikliškumų, kurie pastebimi svyruojant bendrajam vidaus produktui (BVP) ir kredito apimtims. Remiantis įvairiomis verslo ciklo fazių identifikavimo metodologijomis, ne kiekvienas toks svyravimas gali būti laikomas ekonomikos ciklu: vieni šių svyravimų nėra identifikuojami kaip dideli ir negali būti laikomi ekonomikos ciklu, kiti atitinka ciklo fazės ir trukmės kriterijus ir identifikuojami kaip ekonomikos ciklai. Atsižauant pasaulio ekonomikai ir esant atitinkamai situacijai Lietuvoje, kai ne tik šalies ekonomika 2011 m. pereina iš recesijos etapo į augimo etapą, bet ir atsigauna kredito rinka, kredito ciklo procikliškumo problema, palyginti su ekonomikos ciklu, tampa



labai aktuali, nes žinant ciklinius kredito ciklo požymius ir sinchronizacijos tarp ekonominio ir kredito ciklą laipsnį galima numatyti vienokias ar kitokias finansinio stabilumo įgyvendinimo politikos gaires. Todėl pastaruoju metu mokslinėje literatūroje ypač daug dėmesio skiriama vienos iš finansinių tarpininkų veiklos – kreditavimo – sąsajoms su ekonominiais procesais vertinti. Vienas pirmųjų autorių, nagrinėjęs bankų kreditavimo veiklos poveikį makroekonomikai Lietuvoje, buvo Ramanauskas (2005, 2006). Finansų sektoriaus veiklos ypatumus ir sąryšį su ekonominiais procesais analizavo Dudzevičiūtė (2006), Lakštutienė (2008), Lakstutiene et. al. (2006, 2009); Boguslauskas, Mileris (2009); Žukauskas, Neverauskas (2008); Strumickas, Valančienė (2006); Mačerinskienė, Ivaškevičiūtė (2008); Leika (2008), Račickas, Vasiliauskaitė (2010) Ginevičius, Podvezko (2008). Tačiau mokslinių tyrimų, analizuojančių kredito cikliškumo sąsajas su ekonominiais ciklais Lietuvoje, pasigendama. Tačiau ekonominio ciklo ir bankų kreditavimo veiklos tarpusavyje sąveika nėra nauja tema mokslinėje literatūroje. Problema ta, kad kol kas šiuo klausimu nėra vieningos mokslininkų nuomonės. Vertinant priklausomybę tarp ekonominio ciklo ir bankų kreditavimo apimčių, atlikta daugybė tyrimų. Tam taikomos įvairios metodikos, tačiau rezultatai gaunami gana prieštaringi: vieni mokslininkų nuomone, tarp ekonomikos ciklo ir kreditavimo apimčių yra stipri priklausomybė (Bikker ir Hu (2002) Cappelio ir kt. (2010), Igan ir kt. (2009), Kress (2004), King ir Levine (1999), Avouyi-Dovi S. ir kt. (2006), Pojatina (2008)), kiti mokslininkai įžvelgia tik silpną ryšį (Uuskula ir kt. (2005) Gugliemo ir kt. (2009), Berglof ir Bolton (2002)), arba atliktų tyrimų rezultatais jį paneigia (Koivu (2002)).

Moksliniuose tyrimuose, kuriuose aptariamas šis ryšys, taikomi skirtingi modeliai ir metodikos. Dažniausiai minimos ir autorių tyrimuose plačiausiai taikomos šios metodikos: JAV nacionalinio ekonominių tyrimų biuro (NBER) taikoma metodologija Bry ir Boschan (BB) metodologija, Harding ir Pagan (BBQ) metodologija ir Markov (MS, DFMS) metodologija (Tsouma, 2010, Kress (2004), Zarnowitz (1992), Chauvet, 2007). Plačiausiai taikoma BBQ metodologija, kuri turi keletą skirtingų atmainų, taip pat yra adaptuota skirtingų autorių (Avouyi-Dovi S. ir kt. (2006), Tsouma (2010)), atsižvelgiant į turimus statistinius duomenis. Daugelis autorių, tirdami kredito ir ekonomikos ciklo sąveiką, tiria ne atskirų šalių, o jų grupių duomenis. Apibendrina rezultatus, gautus tiriant dažnai gana skirtingo išsivystymo šalių grupių duomenis.

Kadangi atlikus šiuos empirinius tyrimus patvirtinama, kad vieningos autorių nuomonės šiuo klausimu nėra, kalbant apie atskiras šalis, tarp jų ir Lietuvą, negalima vienareikšmiškai atsakyti, koks ryšys yra tarp bankų kredito veiklos apimčių ir ekonomikos ciklo joje. Taigi svarbu atlikti analizę, kaip susijusios bankų kredito veiklos apimtys ir ekonomikos ciklai Lietuvoje. Todėl šio **straipsnio tikslas** – įvertinti Lietuvos ekonomikos ciklo ir Lietuvos bankų kredito veiklos ryšį ir priklausomybę.

**Tyrimo metodika** - sisteminė mokslinė literatūros analizė, loginės lyginamosios ir matematinės – statistinės analizės metodai.

Ekonominio ciklo ir kredito apimtys sąveikos tyrimo svarbą rodo ir teorinių tyrimų gausa. Todėl vertinant Lietuvos ekonomikos ciklo ir Lietuvos bankų kredito veiklos ryšį ir priklausomybę buvo pasirinkta ir adaptuota Kress (2004) ir Avouyi-Dovi ir kt. (2006) taikyta metodologija, kurią sudaro šie pagrindiniai etapai: 1. *Posūkio taškų identifikavimas pagal autorių Avouyi-Dovi ir kt. (2006) adaptuotą Harding ir Pagan metodiką, nustatant piko ir nuosmukio taškus, kai pasirinkti du skirtingi ekonomikos ciklo indikatoriai* (Pramonės produkcija, Lt ir BVP, Lt.) ir *trys kredito ciklo indikatoriai* (Paskolos iš viso, Lt; Paskolos namų ūkiams, Lt; Paskolos nefinansinėms įmonėms, Lt). 2. *Atitikimo tarp ekonomikos ciklo ir bankų suteikto kredito apimtys indekso (indikatoriaus) apskaičiavimas, taikant ekonomikos ir kredito ciklų indikatorius*. 3. *Priklausomybės tarp ekonomikos indikatorių ir bankų kredito veiklos rodiklių vertinimas, apskaičiuojant koreliacijos koeficientus*. 4. *Išvadų pateikimas*. Tyrimo metodologija susideda iš atskirų vienas nuo kito nepriklausomų etapų, todėl atskiruose etapuose gautus rezultatus galima palyginti, apibendrinti ir taip pateikti tikslesnes galutines išvadas. Tyrimo naudojami Lietuvos duomenys nuo 2001 m. sausio mėn. iki 2010 m. 9 mėn. Toks laikotarpis pasirinktas dėl duomenų prieinamumo – Lietuvos bankas informaciją apie naujai suteiktas paskolas ir jų likučius mėnesio periodiškumu pradėjo teikti nuo šio laikotarpio; iki 2001 metų buvo pateikiami tik metiniai duomenys. Metinių duomenų tyrimas Lietuvos atveju nėra priimtinas dėl per trumpo imties laikotarpio.

Pirmajame tyrimo etape nustatyta, kad naudojant tiek mėnesio, tiek ketvirčio duomenis visų paskolų ir paskolų namų ūkiams pakilimas sutampa su ekonominio aktyvumo rodiklių pakilimu. Paskolų namų ūkiams pakilimas pasiekiamas anksčiau nei ekonominio aktyvumo rodiklių pakilimas. Antrasis tyrimo etapas parodė, kad yra stiprus ryšys tarp pokyčių ekonomikos aktyvumo ir kredito rodiklių esamuoju laikotarpiu. Apskaičiavus atitikimo indeksą tarp ekonominio ciklo indikatoriaus ir kredito veiklos rodiklių, didžiausia priklausomybė nustatyta tarp paskolų verslo įmonėms ir BVP (0,8) bei paskolų namų ūkiams ir BVP (0,69). Atitikimo indeksas tarp pramonės produkcijos ir paskolų nustatytas gerokai mažesnis nei tarp BVP ir paskolų. Pagal koreliacinės analizės tarp pramonės produkcijos ir kredito rodiklių rezultatus nustatyta, kad didžiausia koreliacija yra esant laikotarpiui  $k=0$ , todėl ryšys tarp naujai suteiktų paskolų ir pramonės produkcijos stiprus esamuoju laikotarpiu (kintant paskolų apimtims, tą patį laikotarpį pastebimi pokyčiai ir pramonės produkcijoje). Tačiau nustatyta stipri koreliacija tarp pramonės produkcijos ir išduotų paskolų laikotarpiu  $k=1,2,3$  rodo, kad esant pokyčiams visose paskolose numatomi pramonės produkcijos pokyčiai, įvyksiantys po 1–3 mėnesių. Nustatyta maksimali koreliacija, esant laikotarpiui  $k=8$ , tiriant ryšį tarp namų ūkiams išduotų paskolų ir pramonės produkcijos rodo, kad naujai suteiktos paskolos esamąjį mėnesį labiausiai susijusios su pagamintos produkcijos apimtimi po 8 mėnesių. Didelis tiesioginis ryšys stebimas ir nuo  $k=5$  iki  $k=9$  laikotarpiu, t. y. didėjant išduotų paskolų apimčiai galima tikėtis ir pramonės produkcijos augimo po 5–9 mėnesių. remiantis koreliacinės analizės tarp BVP ir kredito rodiklių rezultatais nustatyta, kad namų ūkiams išduotų paskolų pokyčiai rodo BVP vieno ketvirčio pokyčius. Visų paskolų ir nefinansinių korporacijų paskolų pokyčių BVP nenumato, bet keičiasi kartu su BVP be didelio laiko skirtumo. Paskolos įmonėms priklauso nuo ekonominio aktyvumo esamuoju laikotarpiu, t. y. reaguoja į pokyčius sparčiai, o, esant paskolų, išduotų namų ūkiams pokyčiams, atsiranda ekonomikos aktyvumo pokyčių. Koreliacinė analizė neparodė, kad yra ryšys tarp ekonominio aktyvumo rodiklių ir paskolų namų ūkiams esamuoju laikotarpiu. Remiantis koreliacinės analizės rezultatais, esant paskolų namų ūkiams pokyčiams atsiranda ekonomikos aktyvumo pokyčių. Prie tokios išvados buvo prieita ir pirmajame tyrimo etape, nustatant pakilimo taškus. Atliekant koreliacinę analizę, ekonominio ciklo indikatoriumi pasirinkus pramonės produkciją, ryšys nustatytas gerokai stipresnis nei indikatoriumi pasirinkus BVP. Tačiau visų paskolų ir paskolų įmonėms laikotarpiai, kuriais šie koeficientai nustatyti didžiausi, sutapo.

Apibendrinus tyrimo rezultatus, galima teigti, kad visų paskolų ir paskolų įmonėms pakilimas sutampa su ekonominio aktyvumo rodiklių pakilimu, o paskolų namų ūkiams pakilimas pasiekiamas anksčiau nei ekonominio aktyvumo rodiklių pakilimas. Tokias tendencijas parodė ir atlikta koreliacinė analizė bei apskaičiuotas atitikimo indikatorius.

Raktažodžiai: *ekonomikos ciklai, kredito ciklai, bankų kredito veikla, verslo ciklo posūkio (lūžio) taškai, ekonominio aktyvumo rodikliai, kredito ciklo indikatoriai, Lietuva.*

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