# INTEREST RATE PASS-THROUGH IN LITHUANIA

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***Abstract.*** *The paper considers the pass-through of the interbank and retail interest rates for the case of Lithuania. The need for the interest rate transmission analysis has grown during the volatile market period caused by the global financial crisis. The objective of the article is to check theoretical and statistical aspects of domestic currency (litas) interest rate pass-through from interbank to retail interest rates and, specifically, to determine whether the recent global financial crisis has affected this process. Methods used in the article include a systemic analysis of related studies, historical data analysis and statistical testing. The analysis is expanded to cover the alternative interest rate-related variables in order to check the consistency of the pass-through of the litas interest rate over the period from October 2004 to December 2010. Results of the research show that though the lending interest rates have increased and the interest rate relationship has transformed over this period, there is no proof that changes in the bank interest rate setting policy has led to abnormal profits for banks.*

***Key words****: interest rates, pass-through, VILIBOR, financial crisis*

## Introduction

Interest rates play a crucial role in nowadays' economy. They reflect the price of borrowing and lending money and directly affect saving, spending and investment decisions in real economy. In the long history of monetary policy, various instruments were used to manage the economy and seek policy targets, but over the last decades interest rates have become by far the main instrument in the developed countries. Central banks may have a direct impact on the interest rate set by them (the so-called "policy" or "base" interest rates), but their impact on market and retail interest rates applied to customers is much less straightforward. The situation gets even more complicated due to the fact that there is a number of different interest rates for different purposes and different interest groups.

The mechanism of monetary policy transmission refers to the process through which monetary policy decisions affect the economy in general and the level of prices in particular. It is of paramount importance to determine whether the pass-through from monetary policy rates to long-term market and retail rates is complete, as this is the first building block of the monetary transmission mechanism. Against this backdrop, it is not

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surprising that policy makers as well as academic people analyse this topic in a wide variety of works covering different sets of interest rates, as well as different countries and time periods. At the same time, in the author's knowledge, there are only few works focusing on or at least touching upon the analysis of Lithuanian interest rates. There may be several reasons for this. Firstly, Lithuania is a small economy, therefore it may take some time to get into the economic detail, while the results may be applicable only for a small area. Secondly, and more importantly, Lithuania, as well as the other Baltic states[1] and Bulgaria, are the only EU countries that have a fixed exchange rate. In a country having a fixed exchange rate (or currency board), the central bank by definition cannot implement an active monetary policy and, therefore, can only marginally influence domestic interest rates by administrative or technical measures.

The importance of interest rate pass-through analysis increases with the growth of market volatility during the crisis periods. The analysis may help to describe interest rate transmission for the implementation of monetary policy and explain interest rate movements to general public. Another important reason for analysing the interest rate relationship is Lithuania's aim to introduce the euro, as upon adopting the euro, the effective implementation of a single eurozone monetary policy will partly depend on the Lithuanian interest rate pass-through mechanism.

The main **objective** of the article is to check the theoretical and statistical aspects of domestic currency (litas) interest rate pass-through from interbank to retail interest rates and, specifically, to determine whether the recent global financial crisis has affected this process. An observational rather than statistical approach will be used in the article in order to find the explanations of interest rate setting behaviour over the recent years. Methods used in the article include a systemic analysis of related studies, historical data analysis and statistical testing. To restrict the scope of the paper, a number of important aspects of the interest rate pass-through will not be analysed in the work. They include foreign interest rate relationship, interrelationship between domestic and foreign (base) interest rates, and factors affecting the VILIBOR interest rates.

The article consists of four sections. Section 1 provides a review of the recent academic works mainly focussed on interest rates in the EU member-states. Section 2 describes the Lithuanian situation and the required adjustments to the standard interest pass-through mechanism. Section 3 analyses statistical data with the aim to provide a description of the interest rate pass-through, while Section 4 provides the conclusions.

## 1. Theoretical background

Transmission of the monetary policy interest rate to the market and retail interest rate is a very important area for policy makers. It is crucial to understand to what extent changes in

[1] Estonia until euro adoption (01.01.2011).

the monetary policy interest rates are reflected in the market (interbank) interest rates and the retail interest rates applied for the final customer. Only when this is realized, the impact of the monetary policy on real economic variables (GDP, inflation, unemployment) can be analysed. In some cases, it is also important to check whether the pass-through mechanisms work homogeneously in different countries (for the eurozone) or states (for the US).

The monetary policy transmission mechanism refers to the process through which monetary policy decisions affect the economy in general and the level of prices in particular (ECB, 2010). The most traditional channel of monetary transmission, embedded in macroeconomic models, is associated with the impact of interest rates on the cost of capital and hence on business and household investment spending. Standard neoclassical models of investment demonstrate that the user cost of capital is a key determinant of the demand for capital, be it investment goods, residential housing or consumer durables[2].

In a very simplified framework, monetary policy is transmitted, via the central bank's intervention in the money markets, to bank lending and deposit rates. The transition of interest rates from policy rates to market and, consequently, retail interest rates is analysed by interest rate pass-through. Subsequently, changes in these interest rates affect decisions on consumption and investment, which, in turn, ultimately determine the level of prices (ECB, 2009). The simplified picture of monetary policy rate changes in the eurozone is presented in Fig. 1.

The interest rate channel can be dissected into two distinct stages: (1) the transmission from short-term nominal interest rates to long-term real interest rates, and (2) the channel through which the aggregate demand and production are affected by real interest rate developments. At the first stage, a very important role is played by the term structure (or a yield curve). The slope and dynamics of the yield curve is usually determined by three main theories: expectations (long-term interest rates as an average of current and expected short-term interest rates), liquidity preference (investors may require liquidity premium for holding less liquid assets) and segmentation (interest rates for different term segments can be determined individually, according to specific demand and supply factors) (Coricelli et al., 2006).

In its simplest form, the relation between the market rates and bank lending rates may be described by a marginal cost pricing model in which the price, set by the bank ($i^B$), equals the marginal cost of funding approximated by a market interest rate $i^M$ and a constant mark-up $\mu$ (Rousseas, 1985):

$$i^B = \mu + \beta \cdot i^M. \tag{1}$$

The pass-through parameter $\beta$ is equal to 1 under conditions of a perfect competition

[2] A classical reference to interest rate-related channels can be found in the works of Jorgenson (1963) and Tobin (1969). For further discussions on the history and alternative channels of monetary transmission mechanism, see Mishkin et al. (2010).

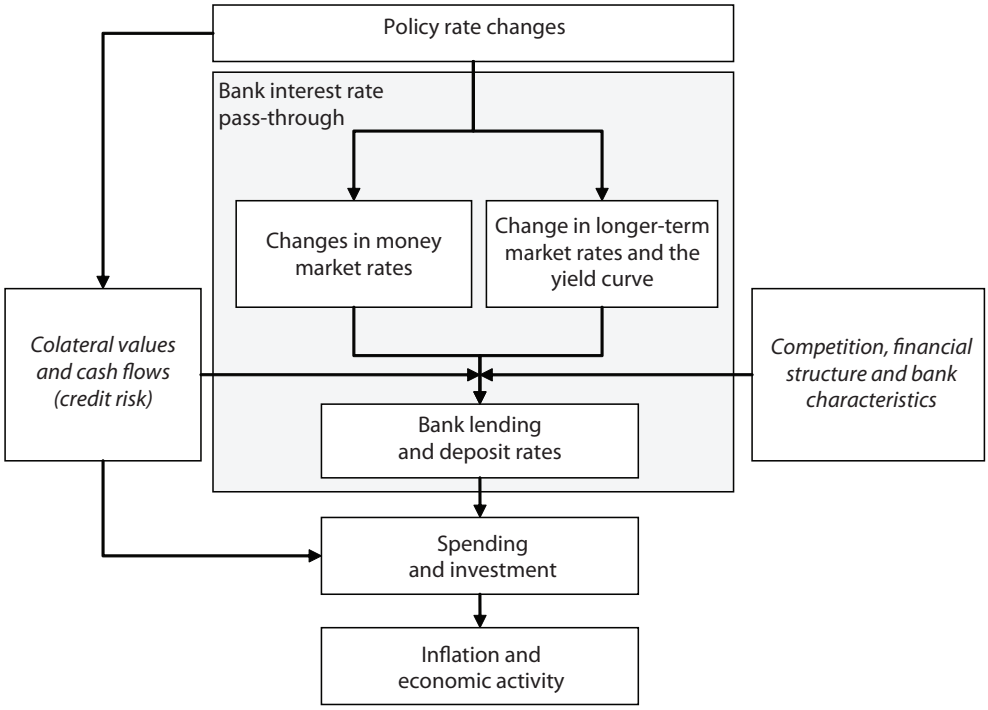


FIG. 1. **Transmission of policy rate changes to retail bank interest rates**

*Source:* ECB Monthly Bulletin, August 2009, p. 95.

and complete information. In reality, $\beta$ is not equal to 1. Therefore, the main task of empirical analysis is to determine $\beta$, as well as the factors influencing it.

The empirical implementation of this kind of research is associated with several practical problems:

- there is a great variety of interest rates set for different purposes; therefore, it is important to define what particular interest rates should be examined. Some researchers use aggregated average interest rates, while others consider very specific segments of interest rates.
- different interest rates are set for instruments of different maturity. Therefore, to check the relationship between short-term and long-term interest rates, assumptions on the yield curve should be made. The fact that the yield curve itself may change due to changes in the monetary policy rate or public perceptions should also be taken into account;
- there are many other important factors affecting interest rate pass-through, including liquidity risk, credit risk, legal and administrative regulations, bank competition, differences in bank operation models, etc.

In practice, the scope of research is narrowed to a particular group of countries or to specific interest rates in order to focus on specified issues only and to distance from problematic areas. In this section, the latest research into the interest rate pass-through, carried out for the eurozone and Central and Eastern European (CEE) countries, is briefly overviewed. In general, the works may be subdivided into three main groups. The works of the first group analyse similarities and differences of the interest rate pass-through in particular countries (Coricelli, 2006; Crespo-Cuaresma et al., 2006). This is especially important in the case of the eurozone which implements a common monetary policy for 17 different countries. One of the works presented by Soresen and Werner (2006) analyses data obtained for eurozone countries in the period from January 1999 to June 2004. It shows that a considerable heterogeneity across the eurozone countries and bank products still remains. The study suggests that the rates on loans to enterprises and the rates on time deposits adjust relatively quickly, while the rates on loans to households and rates on overnight and saving deposits are relatively stickier.

In the recent decade, research into interest rate pass-through in CEE countries has been gaining more popularity as well. There are several reasons for the development of this trend: first, the increased number of countries explicitly targeting inflation requires a precise understanding of the operation of the monetary transmission mechanism in these countries. Second, given the foreseen participation of these countries in the eurozone, it is of paramount importance to determine whether monetary transmission differs from other eurozone countries, and whether monetary policy in a single eurozone could be used without a compromise. Crespo-Cuaresma et al. (2006) made a research on the interest rate pass-through in five CEE countries (Czech Republic, Hungary, Poland, Slovakia and Slovenia), comparing them to Austria, Germany and Spain. Their results confirmed the earlier findings that the pass-through is generally very low for retail overnight rates, increasing considerably for short- to long-term deposit rates. At the same time, corporate lending rates are much more responsive to changes in the policy rate than the deposit or household loan rates. The authors emphasize that, due to a wide range of results, the findings should be generalized only with caution. In addition, it is noted that in analysing the developing markets in which the financial system is evolving, changes in the external factors, such as financial market integration, competition and the investor knowledge may have a major impact on the interest rate pass-through channel and cannot be easily captured using the statistical models. In another research (Coricelli et al., 2006), the whole monetary transmission mechanism was analysed including interest rate, exchange rate, asset price and credit channels as well as their interrelations. It was mentioned that regressions run for first-differenced interest rate data indicate lower pass-through coefficients. The authors also presented the results of the aggregated interest rate pass-through research from the previous works, which may be used as a benchmark and an indicator of general trends (see Table 1).

TABLE 1. **Long-run interest rate pass-through estimates for CEECs**

| Type of rate | Average long-run pass-through |
|---|---|
| Money market rate | 1.01 |
| Short-term deposit rate | 0.72 |
| Long-term deposit rates | 0.69 |
| Short-term lending rate | 1.01 |
| Long-term lending rates | 0.91 |
| Consumer lending rate | 0.51 |
| Housing/ mortgage lending rate | 0.73 |
| Government security yields | 0.92 |

*Source*: Coricelli et al. (2006).

The second group of works analyses the problem of heterogeneity in a single class of interest rates across countries or banking institutions. Mortgage interest rates across the eurozone were analysed by Sorensen and Lichtenberg (2007). They have found that mortgage rates are rather heterogeneous across the eurozone countries, both in terms of levels and changes. About 40 percent of differences may be explained by specific demand and supply factors, such as economic growth, residential property prices, household debt, bank liquidity and capital ratios, as well as competition. The remaining percent of heterogeneity may exist due to specific institutional aspects of a country. In another work, Fuertes A. and Heffernan S. (2006) were examining intra- and inter-bank heterogeneities in the UK interest rate transmission mechanism. Using a large disaggregated sample of monthly deposit and loan rates in 1993–2004, the authors found that the financial institutions adjusted their rates in significantly different ways.

The third group of investigations analyses factors affecting various interest rates (Hempel and Soresen, 2010; Kwan, 2010; Hopkins et al., 2009). This latest group is getting more pronounced currently, as the financial crisis has affected some interest rates in an unusual manner. Hopkins et al. (2009) analysed the factors behind a steep rise in the spread between interbank interest rates and treasury bill rate from mid-2007 to beginning of 2009 in Sweden. They have found that interbank rates rose substantially compared with the repo rate and treasury bill rates, and this increase was mainly related to international factors. At the same time, they have proven that the Swedish monetary policy has still a great effect on interest rates in the interbank market and hence on other market rates, acknowledging that it is difficult to reduce interest rate spreads using only Swedish monetary policy measures.

In the author's knowledge, just a few papers specifically analyse interest rate pass-through in Lithuania or other countries having the fixed exchange rate regime[3]. Gar-

[3] It should be emphasized that the institutional aspect of fixed exchange rate and currency board arrangements will not be dealt with in this article. More information on this issue in Lithuania may be found in Šiaudinis (2003) or Nenovsky et al. (2001).

baravicius and Kuodis (2002) reviewed the structure and functioning of the Lithuanian financial system. Their analysis was partly devoted to a comparison of Lithuanian and US (as the anchor currency country) interest rates. As expected, a close relationship was found for the US interbank interest rates and VILIBOR, but the relationship was much weaker for interbank and retail (loan and deposit) interest rates. Vetlov (2003) described and estimated the full monetary transmission mechanism in Lithuania, including the interest rate pass-through, using data from 1995:1 to 2001:4. In a related research, Jasienė and Paškevičius (2009) analysed the interrelationship of the money and capital market by comparing different regions, namely East Europe, Western Europe, the US and Pacific countries. In another work related to the currency board system, Chobanov and Nenovski (2004) analysed the dynamics of the Bulgarian interbank interest rate and found (and empirically tested) the main factors affecting the interest rates, including excess reserves, the impact of government operations, seasonal factors and the euro interbank interest rate (Eonia).

## 2. The Lithuanian setting

As mentioned in the previous section, in the author's knowledge, only few works focus on or at least consider Lithuanian interest rates pass-through. There may be several reasons for this. Firstly, Lithuania is a small economy; therefore, although it may take much effort to collect and analyse the data and specific features of economic development, the results obtained may be applicable only to a small area. Secondly, and maybe more importantly, Lithuania, as well as Latvia and Bulgaria, are the only EU countries which have a fixed exchange rate. In a country having fixed exchange rate (or currency board) arrangements, the central bank by definition cannot implement an active monetary policy or independently set monetary policy interest rates. Hence, the standard interest rate transmission channel cannot be used and the policy should be adapted accordingly. However, the interest rate pass-through channel should not be forgotten. A central bank can still affect domestic and foreign retail interest rates, at least to some extent, by administrative measures or technical requirements (reserve requirements, bank supervision regulations and restrictions). It is also important to know the pass-through in order to be able to explain the retail interest rate movements to general public. In particular, the public interest in this relationship is increasing during the volatile periods of economic disturbance. Another important reason for interest rate pass-through analysis is Lithuania's aim to introduce the euro, as after the introduction of euro the interest rate pass-through mechanism may change, but the main channels and relationships should remain.

The general methodology of interest rate pass-through, described in the previous part of this article, will be applied to the analysis of the Lithuanian data set. The analysis will be expanded to include several related indicators.

The Lithuanian currency (litas) is pegged to the anchor currency: initially (from April 1994) to the US dollar and later (from February 2002) to the euro. In this respect, the Lithuanian monetary policy is restricted and interest rates cannot be set independently. The litas interest rates usually fluctuate with respect to the anchor currency interest rates, but they should not necessarily be at the same level. A chart of three-month interbank interest rates for the US dollar, euro and litas is given in Fig. 2.

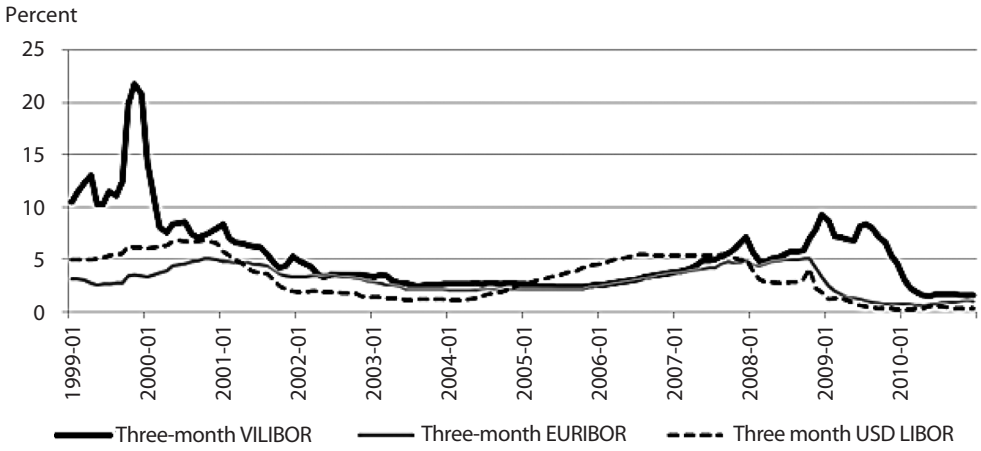


FIG. 2. **Long-term dynamics of three-month VILIBOR, USD LIBOR and EURIBOR**

*Source:* Lietuvos bankas, Bloomberg.

One can see that after a sharp rise in VILIBOR, induced by the Russian crisis at the end of 1999, Lithuanian interest rates tended to move in the same direction with anchor currency interbank interest rates. The Interbank interest rates for litas and euro were almost identical in the period from the last quarter of 2005 to mid-2007, because the positive economic development and hopes for a rapid and easy introduction of euro created self-sustained optimism in the market. The general public appeared to take it for granted that domestic and euro interest rates would and should be at the same level. Unfortunately, convergence and the positive market development discontinued when Lithuania failed to introduce euro in 2007, and widened further in the mid-2007 when the international financial crisis broke out. Moreover, interest rates even moved in the opposite directions at the end of 2008. As an increase in domestic interest rates matched the decrease in euro interest rates, this sharp divergence gave rise to discussions about the health and effectiveness of the Lithuanian banking system. One of the main issues discussed concerned the idea that banks possibly set interbank interest rates artificially high in order to adjust the lending rates accordingly and earn an above-normal profit from lending operations. The answer to this question is not straightforward and decisive,

but clarification of several issues may give more ground for, or against, this hypothesis and will be disused in the remaining part of the article.

First, it is crucial to adopt a theoretical interest rate transmission channel (Fig. 1) for the Lithuanian fixed exchange rate regime. One of the features of a fixed exchange rate system is the existence of two simultaneous markets: base currency and domestic currency. In the case of Lithuania, they are euro and litas interest rate markets. Policy interest rates of the anchor currency country (ECB policy rate in the case of Lithuania) have a direct effect on short-term interbank interest rates (EURIBOR) and an almost direct effect on the Lithuanian interbank euro market. The litas interbank interest rates may be only partially explained by euro interest rate developments, as additional factors such as exchange rate risk, possible administrative measures may also have a very strong effect. A simplified interest rate pass-through structure in the case of Lithuania is presented in Fig. 3.

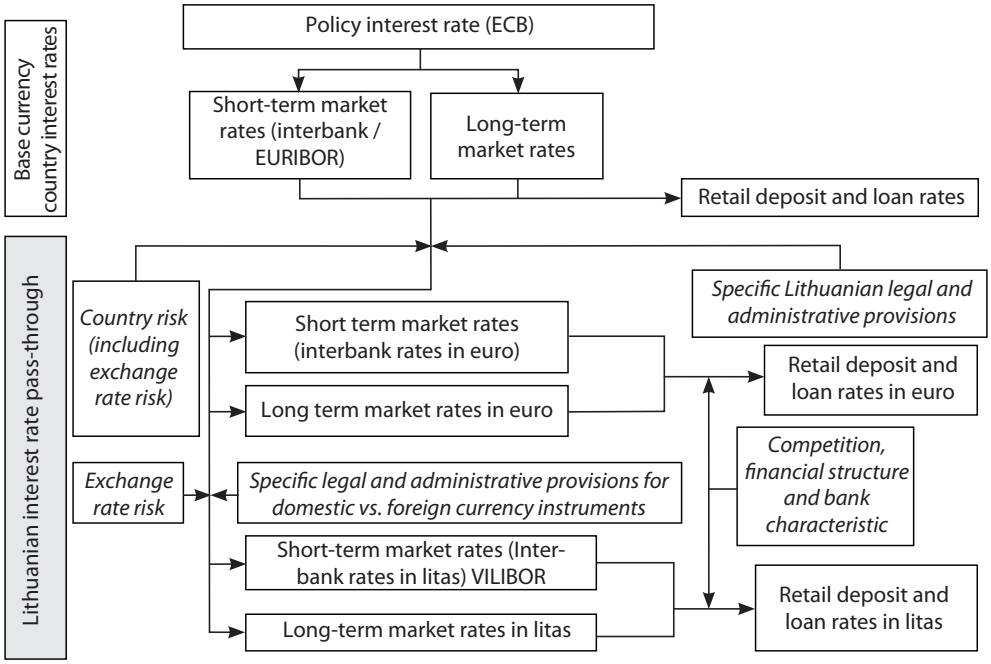


FIG. 3. **Interest rate transmission channel structure for Lithuania**

*Source*: compiled by author.

A thorough analysis of the interest rate pass-through requires a deeper insight into the Lithuanian financial system and banking sector in particular. As a starting point, it should be acknowledged that the Lithuanian financial system is based mainly on the banking sector comprising almost 83%. Other financial sectors, which are rapidly developing, still cover a relatively small part of the whole Lithuanian financial system. The structure of the Lithuanian financial system is presented in Table 2.

TABLE 2. **Assets and participants of Lithuanian financial system (end of 2009)**

| Sector | Size (assets in percent) | Number |
|---|---|---|
| Banks | 82.5 | 17 |
| Leasing companies | 10.4 | 11 |
| Insurance | 3.2 | 17 |
| Credit unions (including Central Credit Union) | 0.8 | 68 |
| Pension funds | 2.1 | 38 |
| Capital market participants | 0.9 | 124 |
| | | |

*Source:* Financial stability review 2010. Lietuvos bankas.

Banking comprises by far the biggest part of the Lithuanian financial system; therefore, the policy of commercial banks is most important for economic development. To get a deeper insight into the bank loans and deposits for determining their possible relationship with the interbank market, it is necessary to review the balance sheet data of banking institutions. A snapshot of the aggregated balance sheet of the Lithuanian Monetary Financial Institutions (MFIs) (excluding central bank) is presented in Table 3.

TABLE 3. **Aggregated balance sheet of other MFIs (in percentage, end of December 2010)**

| Assets | | Liabilities | |
|---|---|---|---|
| Domestic Interbank loans | 0.8% | Domestic Interbank deposits | 1.1% |
| Loans to residents (excl. CB, CG, Interbank) | 66.9% | Resident deposits (excl. CB,CG, Interbank) | 45.5% |
| | | *Of which demand deposits* | *22.1%* |
| *Of which denominated in LTL* | *18.1%* | *Of which term deposits denominated in LTL* | *14.3%* |
| *Of which denominated in EUR* | *47.3%* | *Of which term deposits denominated in EUR* | *7.0%* |
| Foreign assets | 15.6% | Foreign liabilities | 33.0% |
| Other assets | 16.7% | Other liabilities and capital | 20.4% |
| Total | 100% | Total | 100% |

*Source*: Lietuvos bankas: http://www.lb.lt/statistical_data_tree, author's calculations.

Several facts could be pointed out. Firstly, interbank loans (among the domestic MFIs) comprise only a very negligible part of the overall balance sheet (around 1%), while litas-denominated loans to residents and resident term deposits make a much bigger part and are comparable in size (18% and 14%, respectively). For the euro financing, a different picture can be clearly seen: term deposits in euro comprise only 7 percent of the balance sheet, while loans to residents in euro are much bigger, making about 47 percent. A considerable part of euro assets is financed by foreign liabilities (33%). This brief analysis shows that almost all retail loans in litas may be financed by term deposits in litas, while retail loans to residents in euro may be financed by term deposits in foreign currency and foreign liabilities. Since the structure of financing differs considerably for litas and euro currencies, this work will be restricted to litas interest rate developments only.

Litas deposits seem to be a natural source of funding for litas loans for banks; therefore, the relationship of their interest rates should hold if the financial institutions work consistently. A plot of deposit and loan interest rates spread shows that the spread was comparatively stable until the last quarter of 2008 and much more volatile afterwards (see Fig. 4). Interest rate spread has increased above the average level observed over the period at the end of 2009, but it decreased at the end of 2010 in the case of the household interest rates.

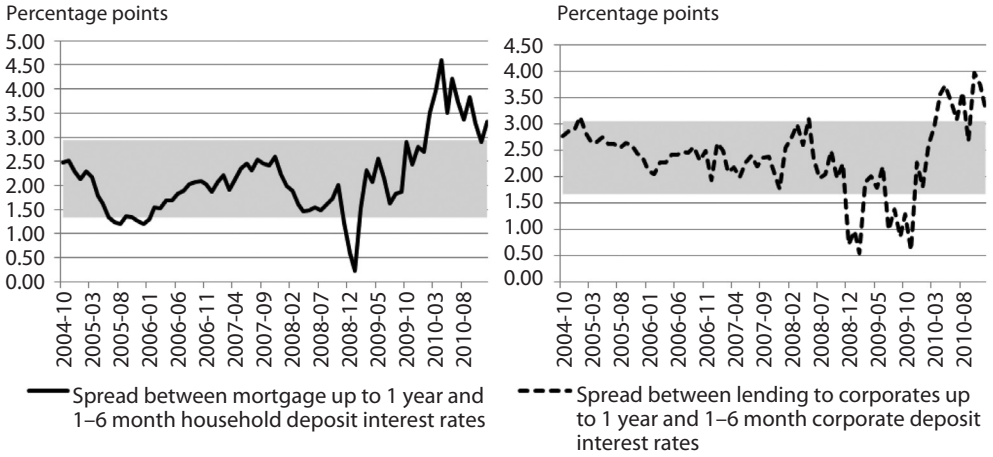


FIG. 4. **Spread dynamics between lending and deposit interest rates in litas**

*Shaded area shows average spread ± 1 standard deviation.

*Source*: Lietuvos bankas, author's calculations.

The statistical data analysis presented in the next section will be limited to interest rate pass-through from VILIBOR to retail loans and term deposit rates in litas. The following very important questions, not covered by this analysis, still remain:

- What is the interest rate pass-through from the ECB policy rate and EURIBOR to Lithuanian retail rates in litas and euro?
- Does the widening gap between EURIBOR and VILIBOR (beginning early in 2007 and growing more extensively at the end of 2008) have any economical or statistical explanation? Can individual banks discretionarily affect VILIBOR?
- Is VILIBOR a reflection of the interbank market or an instrument for setting the retail interest rates?

## 3. Empirical analysis of Lithuanian interest rate pass-through

The statistical analysis of the litas interest rate interaction is made using the interest rate data for new deposits and loans for non-financial corporations and households provided

by Lietuvos Bankas[4]. The data set contains the interest rate data for various subsectors over the period starting from October 2004 until December 2010. The interest rate data for new loans and deposits were chosen because the rate for new transactions represents a marginal rate which should have a more direct effect on marginal spending and investment decisions.

To further restrict a possible detractional impact of the yield curve (i.e. term structure of interest rates), only interest rate segments with the closest possible term are included into the analysis. This decreases to some extent the scope of analysis and the applicability of results to economy as a whole; therefore, to make the analysis more efficient, the interest rate segments having the highest volume of transactions were chosen (Table 4).

TABLE 4. **Deposits / loan proportions in the same segment for new loans and deposits**

| | Percent of … | |
|---|---|---|
| Loans to households for house purchase (with initial rate fixation up to 1 year) | Total mortgage loans to households | 86.2% |
| Loans to nonfinancial corporations (with initial rate fixation up to 1 year) | Total loans to non-financial corporations | 94.4% |
| Deposits from households (1–6 months) | Total deposits from households | 46.2% |
| Deposits from non-financial corporations (1–6 months) | Total deposits from non-financial corporations | 37.6% (58.8% for deposits issued in 2010) |

*Source:* Lietuvos bankas, author's calculations.

The retail interest rates chosen will represent bank interest rates and their relationship with market interest rates (presented in terms of 6 month VILIBOR[5]) will be estimated. The use of formula (1) presented in the previous section allows a simple and clear decomposition of interest rate transmission channel into a fixed part and a relative part with respect to base rates; therefore a similar form will be used for estimating the statistical interest rate relationship. As a precondition for a correct estimation of coefficients by the Ordinary Least Square (OLS) methods, all individual interest rate series should be tested for non-stationarity. This was accomplished by running the augmented Dickey–Fuller regression tests using Eviews software. The results showed that all analysed data series were non-stationary. In order to get the statistically robust results, the pass-through formula was adapted to estimate the equation, using the first differentials of interest rates instead of levels, which leads to some loss of simplicity of the explanatory power, but provides a stronger statistical backing. As all first differenced data series is stationary, to estimate the relationship, the following formula was applied:

[4] http://www.lb.lt/monetary_financial_institutions_loans_and_deposits_statistics

[5] Six-month VILIBOR was chosen arbitrarily as having the strongest correlation with the specified retail interest rate categories. The substitution of the three-month VILIBOR produces very similar results.

$$\Delta i^B = \mu + \beta \cdot \Delta i^M, \quad (2)$$

where $i^B$ denotes the retail interest rates and $i^M$ is the six-month VILIBOR.

To test the robustness of the results and a possible structural shift, a similar estimation was carried out for the whole analysed period and two subperiods (2004:11 to 2007:10 and 2007:11 to 2010:12). The results for the estimated equations for different categories of new loans and deposit interest rate, using the first differenced data, are provided in Table 5.

TABLE 5. **Estimated coefficients* for different categories of new loans and deposits**

| | Overall period 2004:11–2010:12 | Subperiod one 2004:11–2007:10 | Subperiod two 2007:11–2010:12 |
|---|---|---|---|
| Loans to households for house purchase (with initial rate fixation up to 1 year). | 0.51 (0.33; 6.07) | 1.01 (0.58; 7.04) | 0.48 (0.30; 4.07) |
| Loans to nonfinancial corporations (with initial rate fixation up to 1 year) | 0.67 (0.31; 5.76) | 0.87 (0.19; 3.05) | 0.66 (0.29; 4.06) |
| Deposits from households (1–6 months) | 0.73 (0.64; 11.49) | 0.41 (0.12; 2.40) | 0.74 (0.66; 8.44) |
| Deposits from non-financial corporations (1–6 months) | 0.96 (0.74; 14.58) | 0.89 (0.46; 5.54) | 0.96 (0.75; 10.46) |

*The adjusted R square and t-statistics are presented in brackets.

*Source:* Lietuvos bankas, author's calculations.

Based on the pass-through regressions, coefficients are obtained for each analysed segment of interest rates along with their correlation coefficients. The coefficient of 1.00 represents a direct and immediate pass-through of the VILIBOR rate changes to the retail interest rates, while a coefficient below 1.00 indicates a slower pass-through. As expected, different segments react differently to bank interest rate movements. In general, the results agree well with the conclusions by other researches analysing interest rate pass-through in CEE countries. The strongest relationship can be observed for deposits from non-financial corporations and deposits from households: the coefficients of 0.96 and 0.73 for the whole period, followed by loans to nonfinancial corporations (0.67) and mortgage loans (0.51). The results do provide some evidence that the changes in VILIBOR are more directly passed to retail deposit rates, while the relationship between VILIBOR and mortgage loans to households is not as strong. It should be noted that only a narrower (specific term) segment of loans was analysed, restricting the possible error terms due to yield curve impact. The results would have been even more diluted if the average mortgage loans were analysed.

A similar analysis was carried out for two subperiods. Indeed, the data (see Table 5) show that changes in pass-through can be observed for all analysed interest rate seg-

ments. It should be noted that the strength of VILIBOR relationship with the deposit interest rates has increased. Specifically, the coefficient for household deposits increased from 0.41 to 0.74. On the other hand, the strength of relationship with lending rates, specifically mortgage interest rates, diminished. The regression coefficient for loans to non-financial corporations decreased only marginally (from 0.87 to 0.66), while for mortgage rates, the coefficient decreased by half (from 1.01 to 0.48). The observed break in the relationship may be partially explained by the change in interbank interest rate dynamics itself. As can be clearly seen in Fig. 5, the volatility of VILIBOR substantially increased since the second quarter of 2007. For the same subperiods, the standard deviation for 6 month VILIBOR daily changes increased from 1.0 to 2.6. The observed changes in interest rate pass-through may provide a proof that financial institutions had more power to discretionarily set interest rates for mortgage loans, while at the same time the interest rate pass-through for deposit rates became more stable and predictable.

A plot of different categories of interest rate changes over the period under analysis may reveal additional information (see Fig. 5).

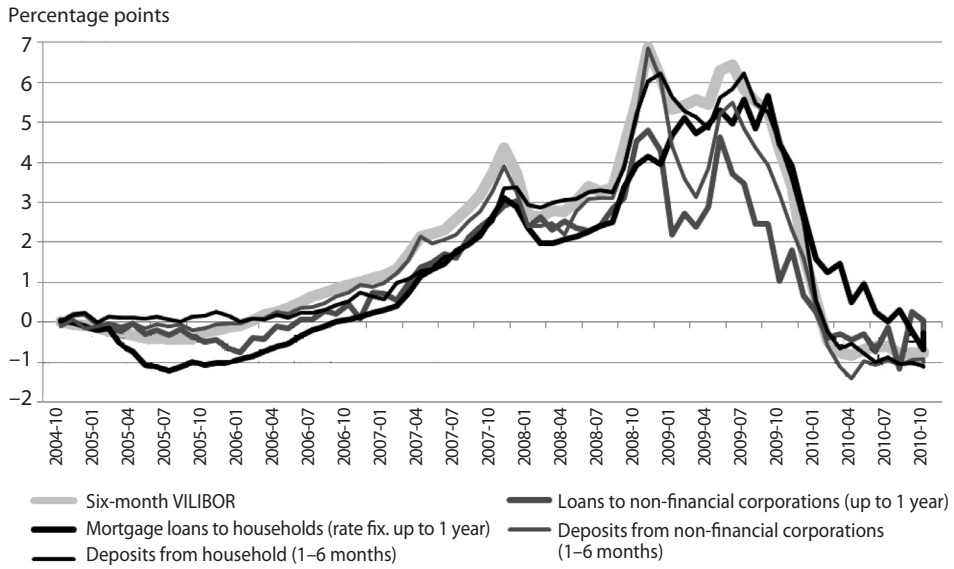


FIG. 5. **Cumulative changes for the selected interest rates (October 2004 = 0)**
*Source:* Lietuvos bankas, author's calculations.

It shows that, from the beginning of the period, the interest rates for mortgage loans have decreased somewhat more than the VILIBOR and deposit rates. Then, the interest rates moved in tandem until the end of 2008 when deposit interest rates experienced a sharp drop and VILIBOR decreased only with some lag, while mortgage interest rates

decreased last, with a substantial lag of almost a whole year. At the end of the analysed period, interest rates appear to stay at a comparatively similar level as at the beginning of the period. Therefore, the revealed changes in the interest rate setting policy over the considered period do not necessarily disclose the aim of Lithuanian banks to profit from interest-bearing products.

To broaden the analysis, several additional related variables were checked. One of the direct effects of the commercial banks' interest rate setting policy on banks' financial results is the banks' profit / loss account. Among other items, data are provided for revenues and expenditures from interest-bearing instruments. A brief analysis of the quarterly data for the same period does not show any increase in net interest income during the financial crisis. Actually, the net interest income stabilized during the last quarter of 2007 and even decreased in 2009 along with the diminishing of overall activity. Therefore, a direct proof of banks' abnormal profit from interest-bearing operations cannot be identified (see Fig. 6).

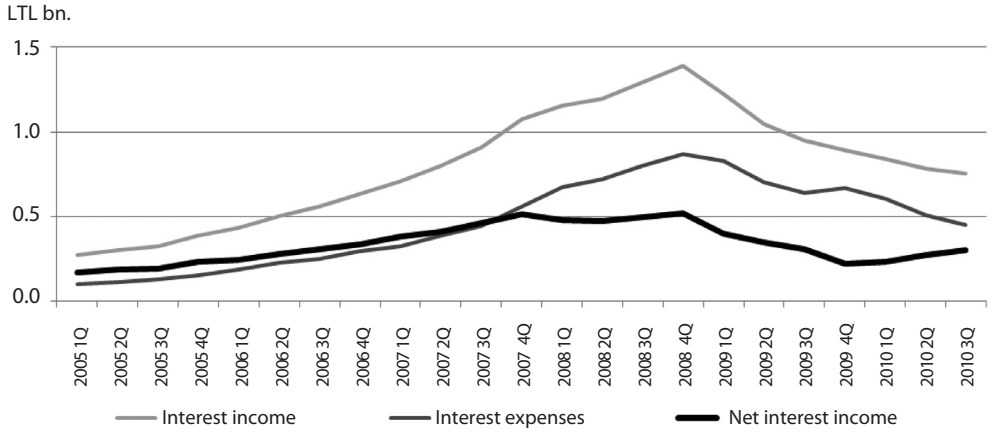


FIG. 6. **Interest income and expenditures of financial institutions**

*Source*: Lietuvos bankas.

Another related measure of the bank interest rate setting policy is associated with additional administrative costs applied above the direct interest rate cost. Banks may vary their administrative measures to stimulate or restrict lending or to increase the revenue from lending operations. These may be administrative measures limiting the loan-to-value ratio, additional cash reserve requirements, striker collateral evaluation rules. Revenues may be increased by other loan charges as well.

One of the available measures showing non-interest-related cost is the difference between the interest rate and the annual percentage rate of charge. The latter item comprises all the costs, including interest and other charges, which the consumer has to pay

for the credit. These data are available in the same interest rate data set from Lietuvos bankas. As one can see in Fig. 7, additional administrative costs have decreased considerably due to a strong bank competition over the period 2004–2007 and only marginally increased afterwards for mortgage loans in litas.

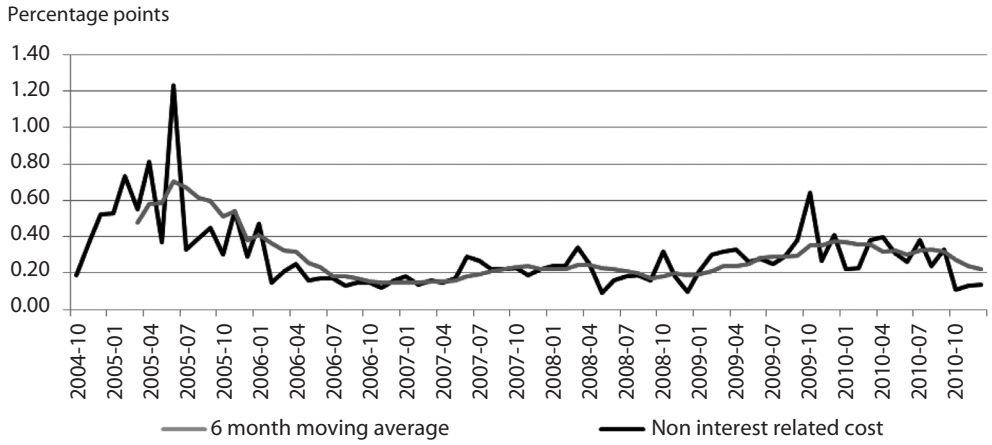


FIG. 7. **The evolution of non-interest-related cost for mortgage loans for households**

*Source:* Lietuvos bankas, author's calculations.

A crosscheck of interest rate analysis and several alternative measures of bank borrowing and lending policy does not provide a decisive result. Indeed, interest rate movements were more volatile for the period which started in the second quarter of 2007 and particularly around the outbreak of the financial crisis in the last quarter of 2008. In general, the analysis of VILIBOR and retail interest rate pass-through shows pass-through patterns similar to those obtained from other CEE and eurozone countries. The interbank interest rate pass-through to deposit rates is more straightforward, while the relationship to lending rates, especially to mortgage lending, is much less direct. The analysis also shows that a structural break may be identified in VILIBOR and retail interest rate relationship around the beginning of the financial crisis: the pass-through became much stronger for deposit interest rates but decreased substantially for mortgage interest rates. Therefore, banks were able to set the lending rates relatively independently of VILIBOR changes. On the other hand, several alternative measures do not prove that bank policy in the retail loans interest rate setting was related to abnormal profits from these operations. The net interest income has decreased in line with the diminishing lending and borrowing operations, and additional costs above the interest's only costs for newly granted loans increased only marginally for mortgage loans in litas.

As mentioned in the beginning of the present work, the analysis was basically restricted to interest-rate-related data. It should be noted that interest rates are not the only

source of bank deposits and, especially, the lending policy. The further analysis of the dynamics of borrowing and lending capacity and changes in the general lending conditions should provide more information and help better describe the general situation. One of the alternative sources for a qualitative evaluation of changes in lending conditions may be various expert or general public surveys[6]. Indeed, survey data prove that not only interest developments have played an important role in making borrowing and lending decisions. The survey shows that already in the period from October 2007 to April 2008, banks had substantially tightened bank credit standards for all segments of loans. At the same time, banks became aware of a great decrease in loan demand, first, for mortgage and consumer loans and later for loans to non-financial corporations. Therefore, lending conditions and demand have deteriorated significantly even prior to increased interest rate volatility and deposit-loan interest rate dislocations observed at the end of 2008.

To conclude, public frustration by banks' interest rate setting policy may be only partially explained by interest rate movements. Several additional factors may have played a role in public perceptions. Firstly, the negative impact was exaggerated by the fact that overly optimistic public expectations, supplemented with the overconfident market reaction, prevailed just before the financial crisis; even a slight change in lending practices has a very strong effect under conditions of an unstable market and decelerating economic growth. Secondly, banks started tightening qualitative credit standards already from October 2007, i.e. even before the increase in interest rate. Thirdly, the period of increased interest rate volatility observed from the end of 2008 to the beginning of 2010 coincided with the decelerating economic growth and considerably tighter lending standards. Banks really changed their policy and adapted it to new conditions and constraints prevailing in the market. However, the alternative financial data measures do not reflect the abnormally high profit margins or the long-term dislocation of interest rate setting behaviour.

## Conclusions

The monetary transmission mechanism and interest rate pass-through have been extensively studied for the developed countries. However, Lithuania and other countries having a fixed exchange rate have been much less investigated. Therefore, there is a natural need for a more thorough analysis of this group of countries.

The Lithuanian financial system is mainly based on banking institutions, while other financial sectors still have a limited role in the overall financial system. Consequently, the interest rates set for the retail banking products (loans and deposits) play the main role in the general economic development in Lithuania.

After the sharp rise in VILIBOR, induced by the Russian crisis at the end of 1999, Lithuanian interest rates tended to converge to the anchor currency interest rates and were almost identical from the last quarter of 2005 to the first quarter of 2007. The

[6] See "Bank lending survey". Lietuvos bankas. October 2010. http://www.lb.lt/surveys

positive economic development and the hopes for a rapid and easy euro introduction at that time created a self-sustained optimism in the market. From mid 2007, the interbank interest rate trend has diverged, and interest rates even moved to the opposite directions after the bankruptcy of Lehman Brothers and the peak of the global financial crisis at the end of 2008. At the same time, the interest rate volatility has increased considerably.

A brief analysis of the bank balance sheet data reveals that term deposits in litas are comparable in size to litas loans; consequently, they can be a natural source of financing for the loans. The picture is different for the loans in euro because euro deposits represent less than 20 per cent of the loan amount while the remaining part has to be financed by foreign liabilities.

A comparison of mortgage lending and household deposit interest rates has revealed some statistical discrepancies only for the end of 2008 (the spread of lending and deposit interest rate decreased) and in 2010 (the spread increased).

The analysis of the interest rate pass-through from Lithuanian interbank rates (VILIBOR) to retail deposit and loan interest rates in litas shows the tendencies similar to those found in the analysis presented for other CEE countries. The interest rate pass-through is most direct and strongest for deposits from non-financial corporations and from households. At the same time, the interest rate pass-through to mortgage interest rates is least direct and unstable. The pass-through to interest rates for loans to corporations lies somewhere in-between. The division of the data array into two almost identical subperiods shows what the relationship between interest rates have changed over time, although the results are not straightforward. In some cases, the pass-through increased (mainly for the deposit interest rates), while the strength of the interest rate relationship between interbank and household mortgage interest rates decreased considerably.

The alternative quantitative profitability measures of the bank interest rate setting policy do not show any abnormal increase. Net revenues from the interest-rate-related instruments were decreasing starting from 2009, in line with the decreasing overall financing activity. Additional administrative costs (represented by the spread between the annual percentage rate of charge and direct interest rate costs) have increased only slightly for loans in litas since the last quarter of 2009.

Bank Lending Survey, an alternative source for a qualitative evaluation of lending conditions, shows that as early as from the end of 2007, banks have substantially tightened bank credit standards for all segments of loans and noted a strong decrease in the demand for loans. Therefore, qualitative measures of lending standards tightened considerably even before the increased interest rate volatility and deposit – the loan interest rate dislocations observed at the end of 2008.

Public frustration by banks' interest rate setting policy may be only partly explained by interest rate movements. Apparently, a very strong negative impact was felt due to the overly optimistic public expectations which were supplemented with overconfident market reaction prevailing just before the outbreak of the global financial crisis. The tighten-

ing of lending standards by banks, observed already from the end of 2007, had a very strong effect in the conditions of unstable market and decelerating economic growth. The analysis of the interest rate data and the results of various surveys prove that banks really changed their policy and adapted it to the new conditions prevailing in the market, but the data on the alternative financial measures do not reflect the abnormally high profit margins or a long-term dislocation of the litas interest rate setting.

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