INTEREST RATE PASS THROUGH IN UKRAINE

by

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Abstract

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This paper aims to investigate the issue of interest rate pass through in Ukaine between 2000 and 2006. After identifying a structural break in the interest rate data, we apply structural vector autoregressive methodology to model the process of pass through from monetary policy shock and from a measure of cost of funds to a series of bank retail rates for the whole period and a post-break subperiod. We find the evidence of incomplete pass through in the short run: the transmitted proportion of changes in market interest rate to bank deposit and credit rates within one month is at most 64%. At the same time, the hypothesis of full pass through to most retail rates in the long run can not be unanimously rejected. Also, the pass through from monetary policy rate (the NBU discount rate) appears to be higher both in the short and long run than the pass through from market interest rates, which stands out against the popular belief that the monetary policy does not work in Ukraine. Inaddition, we find the pass through to be both higher and associated with a shoter lag since the July of 2002, the point of structural break. Finally, no asymmetry is found in the interest rate pass through process.

TABLE OF CONTENTS

LIST OF CHARTS

LIST OF TABLES

Number *Page*

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GLOSSARY

MTM - Monetary Transmission Mechanism

NBU - National Bank of Ukraine

IMF - International Monetary Fund

UAH – Ukrainian currency hryvna

IRF- Impulse Response Function

Interest Rate Pass Through – The process of transmission of changes into policy/market interest rates to changes in market/bank interest rates

Chapter 1

INTRODUCTION

The belief that monetary policy could have an effect on the activity of real economy at least in the short-run induced many economists to investigate and explain the possible channels through which money supply affects output, inflation and other real economic variables. These channels constitute the so-called monetary transmission mechanism (MTM). Depending on structure of the particular economy channels of MTM could be divided into two groups: core and minor channels. A necessary condition for monetary authority to achieve its intermediate targets and final objectives is a clear understanding of the outcomes a particular policy will have on the economy, which justifies the creation of an appropriate model of MTM (Mishkin 1996).

During the last decade Ukraine has been pursuing monetary policy focused on pegging the exchange rate of Ukrainian currency (hryvna) to the US dollar. Therefore, the exchange rate channel is considered to be the most important channel of MTM in this country. Capital controls which are de facto present in Ukraine imply some independence of monetary policy from foreign monetary policy[1]. So, there is the possibility that other channels of MTM can operate as well. Some evidence of credit channel functioning in Ukraine was found by Kryshko (2002). He also made an assumption of the existence of interest rate channel of MTM in this country. But as a whole MTM has not been investigated in Ukraine yet.

Strong IMF's recommendation to the NBU to turn to the regime of inflation targeting makes a more thourough investigation of Ukrainian MTM even more important task (IMF, 2005). Due to considerable policy lags, using inflation as a target anchor requires very good forecast of future price

[1] De jure a number of permits is needed to make an international capial transaction, which results in both additional costs and time lags of capital movement.

movements, thus calling for an appropriate econometric model of MTM. When being an intern in the Research department of the National Bank of Ukaraine the author was involved in the first attempts of monetary policy makers to describe the core channels of MTM in Ukraine, which motivated the current research interest rate pass through.

Since the interest rate pass through is the process of transforming changes in policy and market interest rates into bank retail rates, it is important part of such channels of MTM as interest rate channel, credit channel and asset price channel. Therefore, the quicker and fuller pass through is a necessary condition for operation of these channels. Which in turn implies better economic performance. For example, through interest rate channel the Central Bank can make expansionary monetary policy by lowering interest rate, which in turn leads to the increase in investment and aggregate demand. Or, if credit channel operates in the economy, decrease in the short term interest rate will lead to the increase in the net wealth of economic agents, which in turn increases the capacity to obtain a loan, which provokes investment and aggregate demand expansion.

A significant effect of interest rate pass through on possible operation of some MTM channels was noticed only decade and a half ago (Lowe and Rohling, 1992, Cottareli and Kourelis, 1994). Therefore, the share of studies dealing with the estimation of interest rate pass through is very small in the bulk of MTM literature. Despite the fact that interest rate pass through is estimated to be heterogeneous across countries there are common findings on this issue. For example, interest rate pass through is found to be sticky (or incomplete) in the short run, or in other words, there is very small reaction of reail interest rates to the changes in the reference rate (market or policy nominal interest rate). On the other hand, interest rate pass though appears to be complete in the long run, or in other words, there is one to one relation between changes in reference rate and in retail rates. Some research on interest rate pass through is concerned with testing for asymmetry in this process (whether interest rate pass through depends on the direction of

changes in reference rate), even though there are no consistent evidence on this issue.

While a considerable amount of studies estimated interest rate pass through both in developed and developing countries, using either cross country data or data for one country, Ukrainian pass through process was not subject to research of neither cross countries studies, nor a paper focusing only on one economy. This paper is aiming to fill this gap in the research on interest rate pass through in Ukraine. Particularly, such issues as completeness of pass through both in the short run and in the long run, asymmetry in the interest rate pass through process, and the possibility of independent monetary policy in Ukraine are of main interest of this research. Therefore, this thesis will make a considerable contribution to the knowledge of interest rate pass through in Ukraine, and test the assumption of Ukrainian policy makers about absence of links between policy interest rate and retail rates.

The rest of paper is organized as follows. Chapter 2 provides description of literature review of interest rate pass through investigation. Chapter 3 describes methodology we use in our research. Chapter 4 gives data description and Chapter 5 provides results of an empirical analysis. Chapter 6 concludes.

Chapter 2

LITERATURE REVIEW

This section is organized in the following way. First, four theories which explain interest rate stickiness are presented. Then, the well-known paper of Caureliss and Kotarelli(1994), that initiated the estimation of interest rate pass through, is described. The question of whether single monetary policy has the same effect on different EU countries pushed many researches investigate this issue. Their work is summarized in next section. Then we describe the investigation of interest rate pass through in CEEC countries which recently joined EU. After that review of literature dealing with analysis of pass through process for the single country is given. The chapter finishes with the description of studies concentrating on the financial structure of the economy while interest rate pass through issue is being investigated.

The issue of interest rate pass through is relatively new and started to be investigated only nearly fifteen years ago. Most of them explore this issue using empirical estimation. Only few try to explain interest rate stickiness theoretically. According to Lowe and Rohling (1992) there are several theories suitable to justify price stickiness in financial markets. Among them are agency costs (Stiglitz and Weiss, 1981), adjustment costs (Cottareli and Kourelis, 1994), switching costs (Lowe and Rohling, 1992) and risk sharing(Fried and Howidd, 1980). Agency costs appear as a result of asymmetric information. As market interest rate increases, banks do not necessary respond by raising loan rate proportionally to it. If loan interest rate increases, firms with the safest projects and therefore rellatevely low rate of return will refuse from banks' funding. Therefore, the share of bank's clients with riskier investment opportunities rises. Moreover, with the increase in interest rate firms will be willing to undertake riskier investment projects. Due to these reasons the probability of default on bank loans enlarges. Therefore,

with the increase in loan rate the risk-adjusted expected receipts to banks will not necessary rise. Consequently, banks will try to ration the credit and set loan rate below the market interest rate.

The theory of switching costs applies to markets where transactions costs and costs of acquiring new information are very high. Since for a bank one customer is not the same as another, bank should find clients with the better risk profile. But searching procedure is not without cost, which is transferred to customers in the form of additional fee. This additional payment (switching costs) makes it costly for a client to switch from one bank to another, which results in a retail interest rate pass through from market interest rate to be less then one (Lowe and Roling, 1992).

Adjustment costs theory states that banks will not respond to change in market interest rate when cost of adjusting to new loan rate exceeds the cost of keeping old loan rate. It may happen because of two reasons. Firstly, the cost of keeping non-equilibrium rate is positively related to the elasticity of demand for loans. The latter will be smaller in markets with higher barriers to entry, less competitors and no alternative sources of finance. And secondly, banks may not adjust their loan rate if they expect the change in market interest rate to be temporary (Cottarelly and Kourelis, 1994).

In addition, risk sharing theory explains lending rate stickiness in the case when borrowers are more risk averse than stakeholders of the banks. If clients demand more stable interest payments, banks will charge higher additional fee to compensate themselves for paying interest rate less flexible than their marginal cost of funds, so that average interest receipt of the bank will be higher then in the case of flexible interest rates on deposits. Borrowers consider this fee as an insurance premium. They will not change the bank because of presence of switching cost. As a result we obtain lending rate stickiness (Fried and Howitt, 1980). In our research, we will try to find the source of interest rate stickiness for the case of Ukraine, and attribute it to one or several of these theories. This theory may be the most suitable to

explain stickiness of lending rate in Ukraine, because it incorporates the structure of financial market and institutional arrangement of the country.

The amount of studies trying to investigate how changes in the policy interest rate are transmitted into changes in the short/long term market and retail interest rate constitute very small part in the bulk of literature dealing with the estimation of the MTM as a whole (e.g. Sander and Kleimeier, 2004, Cottarelli and Kaurelis, 1994, and Bondt, 2002). Cottarelli and Korelis(1994) are the first to suggest the measure of retail rates stickiness to changes in market rates. They estimate interest rate pass through in 31 developed and developing countries and reveal that short term pass through to lending rates is incomplete and rather different across countries. Moreover, authors try to explain the degree of interest rate stickiness observed across countries by regressing the pass through on different characteristics of each country's financial market structure. They reveal several factors that reduce the inflexibility of retail rates. Among them are the absence of constraints on capital movements, high degree of competition in banking sector, private sector ownership of banking system, and the presence of alternative sources of financing. Additionally, discount rate is found to have strong effect on reducing interest rate stickiness in the developing countries, but the strength of this effect was decreasing substantially when discount rate was used repeatedly in a signaling purpose. But results obtained in this study should be interpreted with the caution, since authors estimate nonstationary time series by OLS, because methodology dealing with such data was not developed at that time.

Following by the study of Cottarelli ad Kaurelis (1994), several authors continue exploring interest rate pass through in across country perspective, applying more advanced empirical technologies. Researchers use VAR model for time series, and panel data models for estimation of pass through both across countries and time. Also, error correction mechanism is employed to test for convergence of different countries lending rate pass through. While the set of countries differ across papers, the main results are the same – the

transmission of changes in the policy and market rates to retail rates is not full in the short run for all countries, although the size of pass through differ across states. In the long run lending rate pass through is estimated to be complete.

Testing for asymmetry in the interest rate pass through process constitutes an integral part of the research on this issue. The techniques used for estimation of asymmetry vary across studies. For example, Bond at all (2005) divide their sample into two subsamples regarding whether reference rate is above or below its equilibrium level. Lim (2001) and Burgstaller (2005) interact the reference rate with an indicator function, that shows the direction of movement of this rate. The nature of tested asymmetry is also different. While some authors are trying to find irregularity of pass through depending on whether reference rate is above or below its equilibrium level, others test the asymmetry arising when policy/market interest rate increases or decreases (Mojon, 2000). There is evidence that interest rate pass through is quicker when the reference rate moves to its equilibrium level from above than in case when it moves from below(Kleimeier and Sander, 2000). Besides these results, it is found that the timing of the response to change in market rates depends on whether these rates are increasing or decreasing (Borio and Fritz, 1995, Burgstaller, 2005). In the short run lending rates appear to react faster and more completely when reference rate increases than when it is decreases, even though in some studies this difference is found to be insignificant (Borio and Fritz, 1995, Sander and Kleimer, 2004). For example, in the long run there is no evidence on asymmetries in the interest rate pass through in Italy. (Gambacorta L. and S. Iannotti, 2005). Also, the difference between market and retail bank rate influences the stickiness of pass through. Rosen (2002) finds that the longer is the gap between market and bank deposit rate the smaller is the reaction of deposit rate to the changes in the reference rate. In our research we will mainly follow Burgstaller (2005) by using VAR model to test for asymmetry in interest rate pass through, but the method of estimating

asymmetry is one of the author, and it was not used in any of the known to the author studies.

With the creation of European Monetary Union, a number of studies investigating the impact of single monetary policy on EU countries appeared. Using monthly panel data, responses of retail rate to policy rates in 6 largest European countries are estimated during two main interest rate cycles, from 1979 to 1988, and from 1988 to 1998, Mojon (2000) finds the faster reaction of borrowing rates to changes in market rates since the introduction of common currency, even though these responses are heterogeneous across countries. Updating the estimation approach of Caturreli and Korelis (1994) by using the error correction mechanism, Toolsema et all (2002) also investigate whether the effect of monetary policy on retail rates has evolved over time. They use monthly data from 1980 to 2000 for 6 EU countries and find no convergence of monetary transmission since the start of EU. ECB policy decisions are found to alter the interest rate in EU countries differently, consequently making the conducting of single monetary policy more complicated. In contrast to these two studies, Bondt (2002) employs sample period from January 1996 to May 2001 for several EU countries. She uses several empirical techniques, error correction model and VAR model, and analyzes the market and bank interest rate of the same maturity. While estimating interest rate pass through the researcher confirms the finding that transmission of changes in markets rates to retail rate has begun faster since the introduction of Euro. The rise in pass through is explained by the increase in banking competition since the introduction by EU. Oppose to Bond (2002), Sander H, and S. Kleimeier (2003) tested structural break in the data for UE countries interest rate. They reveal that changes in the relationship between market and bank interest rates have happened before the creation of single monetary union. The increase in the interest rate pass through is explained by the banking sector reforms proceeding the entering of EU by these countries. Moreover, using cost of fund approach no improvement in pass through process since the introduction of EU is found in this paper. But

taking into account short sample period authors attempt to report results with causation. In our research we will follow the recommendation given in the papers described above while testing for structural break in the relationship between interest rates. Moreover, since the data sample for our estimation is also short, using the same techniques for estimation interest rate pass though as in Bond (2002) makes our results more comparable to those received in this study.

Also the structure of financial sector has an influence on the magnitude and timing of pass through effect. For a bank with a very strong market power interest rate pass through is incomplete, while competitive environment of banking sector push the pass through up to one (Bondt, 2002, Mojon, 2000). However, the degree of competition plays more important role for the deposit rates pass through than for the lending rates pass through (Coricelly et all, 2006). Kot (2004) reveals that the higher the competition among banks is the faster and with higher magnitude the transmission of policy rate changes into changes in the retail rates is. The researcher gives possible explanation of discrepancies in the interest rate pass through in euro zone and EU accession countries by the different degree of competition in banking sector in these countries. The presence of competition from additional sources of investing enlarges the pass through from market rates to bank rates (Mojon, 2000). Some researches investigate how magnitude and speed of pass through from market rates to retail rates depends on competition within banking sector in one country. Cotarelli et. all (1995) find that Italian bank which operates in local credit market with high degree of concentration experiences larger retail rate stickiness, then the one in more competitive area.

Most studies of interest rate pass through in transition countries are motivated by the accession of the CEEC to the EU. They intend to investigate whether the single monetary policy has the same effect on the developing countries as it has on developed ones. For example, in Poland, Hungary and Czech Republic the long run pass through from policy to retail

rates was found to be very heterogeneous across countries. With the help of Autoregressive distributed lag model (ARDL) it is estimated that the transmission of changes from policy rates to lending rate tends to be rather full in the short run. On the other hand, deposit rate pass through appears to be sticky both in the short run and in the long run in these countries. Also, there is no evidence of asymmetric behavior of the speed of the pass through depending on whether policy interest rate increases or decreases for these countries (Egert et. all, 2004).

Crespo-Cuaresma et al. (2006) explore interest rate pass through in five CEEC countries (the three countries mentioned above plus Slovenia ad Slovakia are investigated) and three euro area countries. Besides investigating the pass through from market to retail interest rates, the full transmission from policy to deposits and lending rates via market rates is estimated using a VAR model. Little evidence on transmission of policy rates into long run market rates is found, and this is explained by instability of yield curve in CEEC countries. But policy rate appears to have effect through money market and T-bill rate on long run retail rates. Even though interest rate pass through in CEEC countries is estimated to be on average higher then in EU countries, it is declining over time. This puts question on the existing in these countries beliefs about the increasing competition in CEEC banking sector. Retail rate pass through are found to be on average lower then those reported in the literature, but rather complete pass through to corporate lending rates was found in all five CEEC countries. The authors explain this by the fact that they do check for existence of cointegration relationship between interest rates. Preceding to their work studies, error correction model was employed without checking for cointergration, which may exists only for several bivariate interest rate relationships. Therefore, wrong assumption of existence of long-term relationship between interest rates may lead to different results. Also, oppose to the early findings, significant discrepancies between interest rate pass through are detected when policy interest rate have different direction of changes.

Some homogeneity in the pass through to lending rates in the four Common Monetary Area (CMA) countries of the South Africa Customs Union (SACU) is detected. But pass through to deposit rates appears to be rather heterogeneous across these countries. Moreover, pass through to deposit rates is more asymmetric than the one to lending rates. All this findings may be explained by the low competition of the banking sectors of the members of SACU (Sander H. and S. Kleimeier, 2006).

To compare interest rate pass through in five CEEC countries described above with the one in Rumania, Tieman (2004) uses the error correction model. Romania with very similar to Ukrainian conditions in financial sector (excess liquidity in banking sector and underdeveloped financial markets) was hypothesized to have weaker pass though from policy to market and retail rates as compared to other CEEC countries. However, the obtained results contradicted this assumption. Estimates of interest rate pass through from policy rates to credit and deposit rates are found to be very similar to ones obtained for these CEEC countries. But unlike the CEEC countries, the transmission of changes in policy rates to changes in market rates have strengthened over time, what is consistent with the observable increase in competition in banking sector.

In some studies interest rate pass through is estimated using bank level data It appears, that the structure of the banking sectors has significant influence on the transmission of changes from policy/market to bank retail rates. For example, for both Chile (Berstein S. and R. Fuentes, 2003) and Germany (Weth, 2002) the pass through to lending rates charged by bigger banks is faster, than the ones to lending rates charged by smaller banks. Also pass through depends on type of banks' customers. The larger the share of household consumers, the faster bank credit rate reacts to the changes in reference rate. And the smaller portion of long term business with firms and households bank has the faster interest rate pass through from market rates is. Additionally, banks that rely on savings deposit to fund their loans react slower to the changes in the reference rate (Weth, 2002).

Interest rate pass through also differs across instruments. In most literature pass through to corporate lending rate is higher than to deposit or household credit rates. At the same time, overnight deposits are much less responsible to changes in reference rate than short or long-tern deposit rates (Crespo-Cuaresma at al., Mojon, B., 2000). Also, the lower the maturity of bank interest rate the higher interest rate pass-through to it is (Sander H. and S. Kleimeier, 2003)

Some authors tested whether deposit rates have effect on lending rates. In the literature related to banking efficiency and productivity there are two approaches concerning banks' deposits. Asset or intermediation approach views them as inputs to bank lending activity, while the service provision or production approach consider deposits as one of the main services provided by banks to their clients (Mlima and Hjalmarsson, 2002). Most results received from analyzing data on this issue conclude that deposits are outputs of banking activity (Fixler and Zieschang, 1999).

To summarize main findings from literature dealing with estimation of the pass though, the following conclusions can be made. The lending rates are very sticky with respect to movements into policy and market rates in the short run, while in the long run there is almost complete pass through. The process of transmissions of changes in policy/market rate to retail rates is flowing differently across countries, and there is no convergence of pass through among countries in the long run. The structure of financial market and institutional arrangement inside the country are the main factors that contribute to variability of path through across countries.

We are not aware of any attempts to measure interest rate pass through in Ukraine. Moreover, Ukraine was not included in any set of countries while the estimation of interest rate pass through was done in cross countries perspective. Therefore, we expect our work significantly contribute to the world literature and answer question about possibility of existing interest rate channel of MTM in Ukraine.

Chapter 3

METHODOLOGY

A VAR framework

The issue of interest rate pass through is usually estimated using one of the following methodologies: panel data estimation, error correction model, and vector autorregression model. The first approach is based on the pioneering work of Cottarelli and Kourelis(1994). Authors estimate interest rate pass through in the cross country perspective, trying to reveal and explain the heterogeneity in the interest rate pass through process across different countris. This framework is not suitable for our study, as we explore this topic in the perspective of only one country, Ukraine.

The main assumption of the second approach, error correction model, is that market interest rates are weakly exogenous to bank retail rates, which is not appropriate in case of Ukraine. The reason is the following. In this study we consider interbank lendig interest rate to be a proxy for market interest rate. And, not only the NBU but also retail banks can influence interbank rate. For example, suppose that there is positive shock to the demand for loans in the economy. Then bank lending rate increases. In this situation banks may need more funds to satisfy the loan demand. Therefore, the demand for interbank loans increases forcing interbank lending rate to go up. The model for our estimation of pass through process uses the third approach, VAR methodology, because it allows incorporating possible influence of bank retail rates on market rates. We will employ two approaches while estimating interest rate pass through: cost of funds approach and monetary policy approach.

3.1. Cost of Funds Approach

This approach is the best method to describe the second stage of interest rate pass through, or , transmission changes in market interest rates to bank retail rates. There are several reasons for bank deposit and lending rates to be influenced by market rates. Firstly, banks can rely on money market resources to fund their short term loans. Secondly, the yield on government securities can be viewed as opportunity costs for banks' loans. Because of this the link between the yield on government bonds and long term bank lending rate should exist. Thirdly, banks can rely on money market rates instead of deposits for funding loans. This can explain why bank deposit rates should incorporate market rates. Also, households and non financial sector can save its funds instead of deposit in form of government securities of comparable maturity (Crespo-Cuaresma et al., 2006).

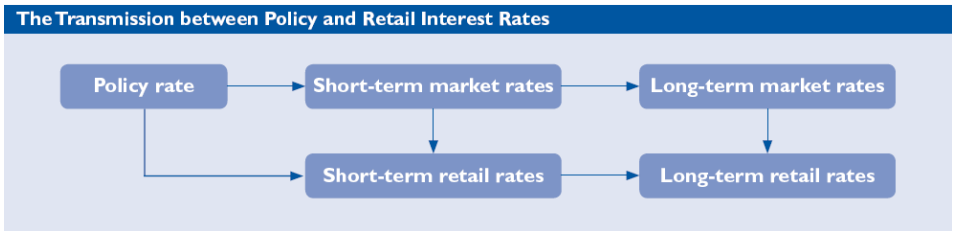
3.2. Monetary Policy Approach

This approach assumes the availability of direct link between policy interest rate and bank retail interest rates. There are several explanation for bank deposit and credit rates to be influenced by discount rate. Firstly, discount rate is the cost of banks' refinancing. Secondly, policy rate signals about future stance of monetary policy and helps to form public expectations about monetary policy actions. And finally, discount rate influences money market interest rates, which in turn affect bank retail rates. But, according to Sander and Kleimeier, 2004, the direct relationship between policy and bank retail rates can only exists in the case of stable yield curve.

3.3. Testable Hypothesises

In this study we will investigate the path of transmission of changes in policy rate / market rate to retail banking rates described in Chart 1.

Chart 1. The Transmission between Policy and Retail Rates



Source: Crespo-Cuaresma et al., 2006.

We wil investigate the following relationships between interest rates:

1) Policy interest rate ➔ Bank deposit interest rate (Monetary Policy Approach);
2) Policy interest rate ➔ Bank credit interest rate (Monetary Policy Approach);
3) Market interest rate ➔Bank deposit interest rate (second stage of Cost of Funds Approach);
4) Market interest rate ➔Bank credit interest rate (second stage of Cost of Funds Approach);
5) Policy rate ➔ Short term market rate ➔ Long term market rate➔ Bank deposit ineterst rate ➔ Bank credit interest rate (Cost of Funds Approach)

In this study the following hypothesis wil be tested;

1) Complete pass-through from the reference interest rate to the bank retail rate in the long run;
2) Policy interest rate can affect bank retail interest rates;
3) Pass through is not different in different segments of Ukrainian economy (e.g. household sector vs. firms' sector);
4) Pass though is not different across instruments (e.g. we want answer the question wether pass though differs across interest rates denominated in different currencies, with different maturities);

5) There are no asymmetries in interest rate pass through process.

3.4. Bivariate Var Approach

Following Bondt (2002), the next uniform specification will be used while:

$$Y_t = c + \sum_{k=1}^{K} AY_{t-k} + e_t, \quad (1)$$

With $Y_t = \begin{bmatrix} i_t^B \\ i_t^R \end{bmatrix}$, $c = \begin{bmatrix} c^B \\ c^R \end{bmatrix}$, $A = \begin{bmatrix} a_k^B & b_k^B \\ a_k^R & b_k^R \end{bmatrix}$, $e_t = \begin{bmatrix} e_t^B \\ e_t^R \end{bmatrix}$;

Where

i_t^B - bank retail (deposit or credit) ineterst rate;

i_t^R - reference rate: policy interest rate (Monetary Policy Approach) or market interest rate (Cost of Funds Approach);

This specification is suitable in case when interest rate series are stationary. If at least one of the two series is integrated of order k, we should take k'th differences of both series, and only then run model (1).

To determine lag order we will use such criteria as Akaike, Hannan Quin, and Schwartz, but bearing in mind that our sample is short. Therefore, underestimation is considered to be a smaller problem, then overestimation of lag order. Thus, in case of discrepancies between different test we will focus on Schwartz criterion, which is more suitable for short sample.

To determine which exactly market interest rate to use we will perform correlation analysis and for each bank retail rate we will select appropriate market rate, which has with bank rate the highest correlation coefficient. This procedure of selecting reference rate is common to the literature (Bond, 2002, Sander and Kleimeier, 2004). Sometimes, researches propose select market interest rate that match the maturity with bank interest rate. But, it is not always possible to find for each bank retail rate reference rate of comparable maturity (Sander and Kleimeier, 2004). So, additionally, we will select the reference rate based on matching the maturity approach.

In solving identification problem we will assume that shock in retail interest rate does not have simultaneous effect on market interest rate. This restriction makes sense, because we want to investigate how exogenouse shock to market rate is transmitted to bank interest rate. Therefore, we can use Cholesky decomposition with the lower zero triangular matrix of imposed restriction. In this approach shock in market interest rate could contemporaneously cause retail bank interest rate, but not the other way around.

3.5. Test for asymmetric interest rate pass through

To investigate the asymmetry in interest rate pass through process using VAR framework we will follow slightly modify the Burgstaller(2005) approach. Opposite to Burgstaller (2005) we will use structural Var not reduced form VAR and test for asymmetry using IRF approach. This is the innovation of methodology used in this thesis. The equation from the systems of VAR equations for bank interest rate has to be of the following form:

$$i_t^B = \mu + \beta_0 i_t^R + \gamma_0 i_t^R I_t + \sum_{k=1}^{K} (\alpha_k i_{t-k}^B + \beta_k i_{t-k}^R + \gamma_k i_{t-k}^R I_{t-k} + \delta_k I_{t-k}) + e_t^B \qquad (2)$$

Here it is again assumed reference interest rate contemporaneously affect the retail rates, but not vice versa. I_t is the dummy variable indicating the case when reference interest rate is falling. Then β_k coefficient will capture the effect of rising market rates.

3.6. Multivariate vector autoregression model

After establishing pair wise links between market and retail rate, we consider multivariate models of interest rate pass through. Firstly we should determine whether deposit rates influence pass through process of lending rates(Bondt,

2002). Since some banks can finance loans by raising deposits rather than issuing securities, the deposit interest rate may serve as marginal cost for loan interest rate. For each particular lending interest rate we determine deposit rate which has the highest correlation with it and include it in the regression. Then the following model is tested:

$$Y_t = c + \sum_{k=1}^{K} AY_{t-k} + e_t, \qquad (3)$$

with $Y_t = \begin{bmatrix} i_t^P \\ i_t^{MS} \\ i_t^{ML} \\ i_t^{BD} \\ i_t^{BL} \end{bmatrix}$, $c = \begin{bmatrix} c^P \\ c^{MS} \\ c^{ML} \\ c^{BD} \\ c^{BL} \end{bmatrix}$, $A = \begin{bmatrix} a_k^P & b_k^P & f_k^P & h_k^P & g_k^P \\ a_k^{MS} & b_k^{MS} & f_k^{MS} & h_k^{MS} & g_k^{MS} \\ a_k^{ML} & b_k^{ML} & f_k^{ML} & h_k^{ML} & g_k^{ML} \\ a_k^{BD} & b_k^{BD} & f_k^{BD} & h_k^{BD} & g_k^{BD} \\ a_k^{BL} & b_k^{BL} & f_k^{BL} & h_k^{BL} & g_k^{BL} \end{bmatrix}$,

$e_t = \begin{bmatrix} e_t^P \\ e_t^{MS} \\ e_t^{ML} \\ e_t^{BD} \\ e_t^{BL} \end{bmatrix}$

Where i_t^{BL} -interest rate on bank loans at period t, i_t^{BD} - interest rate on bank deposits at period t, i_t^{ML} - long term market interest rate, i_t^{MS} -short term market interest rate, i_t^P - policy ineterst rate at period t.

Since bivariate VAR is a partial case of Multivariate VAR model, why do we need estimate bivariate VAR model? There are several explanations. Firstly, most studies estimating interest rate pass through use bivariate VAR model, and even when some of them use multivariate VAR, the bivariate VAR model is estimated as well. Therefore, running bivariate VAR model will make our estimates of interest rate pass through comparable to the literature. Secondly, given very short sample period of data, estimation of model with smaller

number of variable will lead to smaller standard errors. Thirdly, bivariate VAR allows to estimate Marginal Cost approach directly. And finaly, we can not use Multivariate VAR for the case of bank retail rates denominated in foreign currency, because policy interest rate is only denominated in UAH.

Before estimating regression (3) we will perform Granger causality test to test whether deposit rates Granger cause lending rates. If we can reject the hypothesis that bank deposit rate do not Granger cause bank lending rate, we will run regression (3). In other case, we will estimate regression (3) without bank deposit rates. While choosing appropriate lag structure, we will perform test similar to the case of bivariate VAR. To solve the identification problem, we will use the following statements known from the Monetary Economics.

1) Policy interest rate can only influence short term nominal interest rate;
2) According to the expectation theory of interest rate, long tern interest rate is the average of current short term interest rate and expected future short term interest rates. Therefore, short term interest rate influences long term interest rate;
3) While making consumption/investment decisions, public concerns only about real interest rate.

Bearing in mind these facts, we can construct the following chain of transmission of changes in policy interest rate to bank retail rates:

$$\Delta\, policy\ rate \rightarrow \Delta\, short\ term\ rate \rightarrow \Delta long\ term\ rate \rightarrow$$

$$\rightarrow \Delta\, bank\ deposit\ rate \rightarrow \Delta\, bank\ credit\ rate$$

In solving identification problem we will assume that contamporaneously interest rate from the chain above can not influence rates, which preceed it in this chain. Therefore, we can use Cholesky decomposition with upper triangular matrix to solve identification problem.

Chapter 4

DATA DESCRIPTION

4.1. Data description

Data on interest rate series come from the monthly bulletin of the National Bank of Ukraine "Visnyk NBU" and official website of the NBU[2]. The sample period from January 2000 until November 2006. Each interest rate series contains 83 monthly observations, and is computed as average weighted percentage per annum. Relatevely short sample period is a weakness of the thesis. However, adding observations before 1999 is inappropriate taking into account high volatility of data after period of financial crisis of 1998. Moreover, there are big holes in data before 2000 year.

The three broad categories of relevant interest rate series are: interest rates set by the NBU, interbank interest rate series and retail bank interest rates. There are three series on policy interest rates: discount interest rate, interest rate on tender credits, and the NBU overnight interest rate. Interbank rates consist of deposit interest rates and credits interest rates, which differ across maturity (deposit rates: up to 1 month, from 1 to 3 months, from 3 to 6 months, from 6 to 12 months, and over 12 months maturity; credit rates: overnight, from 1 to 7 days, from 8 to 21 days, from 22 to 31 days, from 32 to 92 days, and over 92 days maturity) and across currency denominated (UAH and US dollar). Bank retail rates series also can be divided into credit and deposit interest rate series, which in turn differ across maturity (up to 1 month, from 1 to 3 months, from 3 to 6 months, from 6 to 12 months, and over 12 months maturity), across currency denominated (UAH and US dollar), and across type of client (households and enterprises). Chart 2 shows

[2] www.bank.gov.ua

the behavior of interbank lending rates and policy discount rate denominated in UAH. All series fluctuate heavily and have downward trend during the first part of the sample period.

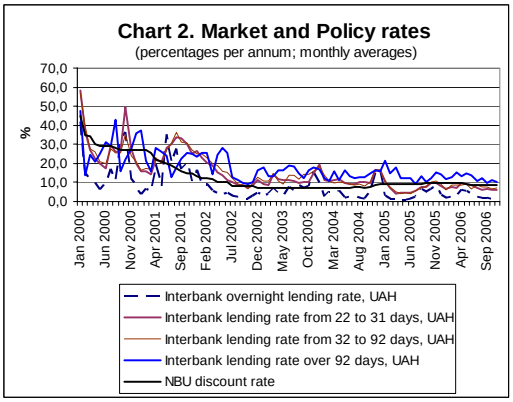
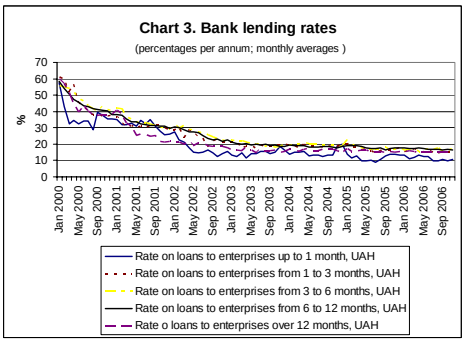
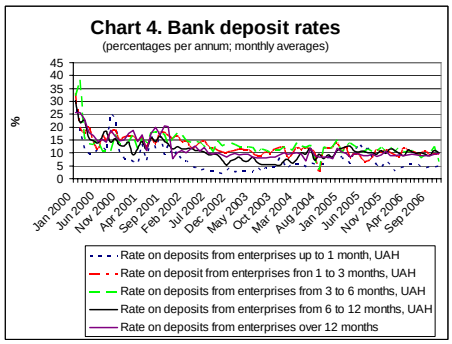


Chart 3 and Chart 4 plot hryvna-denominated bank lending and deposit rates denominated in hryvna respectively. As interbank rates, these series also firstly have decreasing trend and fluctuate more than in the second part of the sample. Graphical inspection of the interest rate behavior suggests the presence of a structural break in the data accounting to mid of 2002.





We have tested the structural break using Hansen's (1992) test on model stability, which is based on a cumulative sum of the least squares residuals (CUSUM)[3]. The advantage of this technique is that it "is appropriate for time series data and might be used if one is uncertain about when a structural change might have taken place" (Green, 2000). Also, in contrast to the Chow

[3] Test was conducted in STATA8 statistical package using programs written by Sean Becketti (original version), November 1993, STB-24 sts7_6 and Modified for Stata 6 by Christopher F Baum (baum@bc.edu), 1 March 2000

test (which is also frequently used in tests for structural break in the literature (Bondt, 2002)), this test allows for the unequal disturbance variances in both samples. From the graphical representation of interest rates behavior we may conclude that disturbance variance is indeed not equal across the whole sample. Therefore, using Chow test is not appropriate here.

For the most of bank retail rates the CUSUM test indicates the presence of structural break in the interval from 28th to 33th observation[4]. Therefore, we decided to put the point of structural break to be the 30th observation, which corresponds to July 2002. An interesting question is what economic event might have caused the structural break in the interest rate series. Before the middle of 2002 the NBU was constantly decreasing discount rate to lower the bank retail rates and stimulate the demand for loans. But 2002 is the first year of huge increase in real estate prices. This led to increase in demand for banks loans and to increase in banks' competition. And if we look at Table 1, which gives the descriptive statistics of the interest rate series for the whole sample (first five columns) and for the sample starting from July 2002 (last 5 columns), starting 2002 all interest rate series have lower mean, and variance is several times smaller comparatively to the variances in the whole sample. The structural breake may be explained by the natural sequence of envents: the constant decrease in riskiesness of the loans led to fall in interest rate, but it should be stopped at some point.

4.2. Correlation Analysis

One insight that economic theory can yield on the determination of retail bank rate is to represent the latter as a function of another interest rate or combination of rates. These rates can be thought as the opportunity cost of bank lending decisions. For example, when bank maximizes its profit it is the marginal cost that matters. Money market rate is the most widely used rate to

[4] Results of the test for the structural break are available from the author upon request.

determine the marginal cost of funds or revenue foregone in making the loan. However, other rates can influence bank lending rates. For example, policy rate may be a better indicator of marginal cost of funds in the following cases. Firstly, when money market is highly volatile the policy rate can signal about persistent movements of money market rates, rather than their transitional behavior. Secondly, in the model of uncertainty with withdrawal of deposits and illiquidity of loans, penalty costs of the Central Bank is what really matters in setting interest rates by bank (Borio, 1995). Because in the case of unexpected withdrawal of deposits bank has to borrow funds from the Central Bank. And the policy interest rate is the cost of borrowing these funds.

A distinction should be made between monetary policy and cost of funds approaches when selecting an appropriate reference rate (changes in which are transmitted into retail rates). As it was said in the methodology section, the data on three types of policy interest rates is available: the discount rate, overnight interest rate, and interest rate on tender credits. The interest rate on tender credits is the least appropriate policy interest rate in our case because of the following reasons. Firstly, it is not completely determined by the NBU. The NBU only sets the lowest interest rate under which it is willing to lend funds. Actual tender interest rate is determined through auction procedure. But, there were months during which there were no tender credit auctions. In these cases there is no data on interest rate on tender credit. The absence of credit auctions can be explained by the several reasons. For example, there were no demand for the NBU credits or the NBU was not willing to give tender credits. Therefore, we can not fill missing data, because we do not know the actual reason for the absence of each particular observation.

The second policy interest rate is the NBU overnight interest rate. It always should be not less than discount interest rate. However, the actual procedure how the overnight interest rate is determined is not evident. There is a suspision that policy makers can refinance banks 'favorable' for them and set low overnight rate.Moreover, the NBU overnight rate has only one night

maturity, and it is less likely, that it contains more information about monetary policy stance than the NBU discount rate. Therefore, we will use the NBU discount rate as policy interest rate. Besides the fact that it signals about monetary policy stance, it is also a basis for formaulating other policy interest rates, and lehally it is very difficult for the policy makers to use it to reach their short term private objectives.

In majority of research dealing with interest rate pass through money market interest rate is selected as the one that represent marginal cost of funds for retail bank interest rates (Bondt, 2005 and Sander and Kleimeier, 2004a). In this section we conduct correlation analysis aiming to detect the money market rate which exhibits the highest correlation with retail bank interest rate[5]. The reference rate for bank lending and deposit rates is selected among such money market rates as interbank overnight credit rate, interbank credits rates of maturities up to 7 days notice, from 8 to 21 days, from 22 to 31 days, from 32 to 92 day, and with the notice more than 92 days. For both bank deposit and lending rates the market rate denominated in the same currency is selected. Correlations are computed both across maturity and different lags of market interest rate.

The results of correlation computations for the whole sample starting in 2000, January and subsample starting from 2002, July to 2006, November are presented in Table 2, Table 3, and Table 4 respectively. In the second column reference rate which has the highest correlation with the bank retail rate during the whole sample is presented, while the fifth column gives the market rate which has the highest correlation with appropriate retail rate during subsample period. Third and sixth columns give the corresponding correlation coefficients. And the sixth column presents the market rate chosen as marginal cost for retail bank rate in case of both periods. For credit rates denominated in UAH the correlation coefficients varies from 0.45 to 0.91. Interest rates on credits to enterprises exhibit higher co movements with

[5] Sander and Kleimeier (2004 a) suggest to use the market rate of comparable maturity as the marginal cost. We tried to do this but received insignificant results. It may be because it is not always possible to match the maturities of retail and reference rates.

market rates than the ones on credits to households. In most cases for credit rates the lag with the highest correlation is zero, implying that lending rates collectively react with the same speed to the changes in market rates. The correlation coefficients, lag order and reference rates for the credits rate in the case of shorter subsample are nearly the same as the ones in the whole sample. This suggests that interest rate pass through process to credit rates does not change after 2002. The only unexpected result is the negative correlation coefficient near long term credit rate to households. Other correlations coefficients between long tern credit rate to households and market rate are also negative for the case of whole sample. This might imply that interbank interest rate is not an appropriate measure of marginal cost for the long term rate on credit to households redeemable in UAH. In addition, it may be explained by the fact that market for this type of credit has not been developed very well in Ukraine[6].

The correlation coefficients between lending interest rates and market interest rates denominated in US dollars are on average lower than the ones between lending rates denominated in UAH. In both whole and short sample the most appropriate measure of marginal cost is interbank lending rate with over 92 days notice. The correlation coefficients vary between 0.55 (long term credits to households) and 0.79 (credits to firms with maturity more than 6 months) for the case of whole sample, and between 0.249 (credit to households with maturity from 6 to 12 months) and 0.418 (credits to households with maturity from1 to 3 months). The correlation coefficients for the short sample are on average two times lower suggesting the decrease in interest rate pass through for the lending rates redeemable at US dollar since the structural break period.

Turning to the case of deposit rates redeemable in UAH, correlation coefficients vary between 0.48 and 0.75 for the whole sample, and between 0.17 and 0.40 for the subsample. Lower correlations in the second period

[6] The amount of long term credit given to natural persons is in 10-15 times lower than the ones given to firms. Conclusion is drawn from the author's first look at the data. Numerical illustration of this statement is in the process of development.

imply that relationship between market and retail deposit rates became weaker in the last for years comparatively to the first 2 and one half years. It may have happened because of the increase in the funding opportunities for the banks, as well as enhanced competition in the deposit market among banks. Also, the lag orders increase in subsample comparatively to the whole sample implying that the speed with which bank deposit rates react to the changes in the market rate decreased in the last years. It also may be due to banks' attempt to attract more deposits by raising deposit rates and keeping them high regardless of market rates movements. But it is only possible in the short run. The correlation coefficients for the case of credit rates is nearly two times higher than the ones for deposit rates, suggesting that pass through to deposit rates is lower than to credit rates.

Chapter 5

ESTIMATION RESULTS

5.1. Bivariate VAR model.

5.1.1. Marginal Cost Approach

There are two approaches to test interest rate pass through in the literature: error correction model and structural VAR model. We will employ the latter model, because the former assumes that market interest rate are fully exogenous to the retail bank interest rates, while VAR model allows variables endogenously influence each other[7]. So, in this section we estimate model (1) described above.

Dickey Fuller test on stationarity showed that almost all retail bank and interbank interest rate series in both samples are stationary at 5% or 10% significance level. Interbank credit rates redeemable in US dollar with maturity up to 7 days are I(1) in both samples, as well interest rates on credits in foreighn currency wih maturity higher than 6 months. Policy interest rate are I(1) process in the short sample. Test statistics are given in Table 5 for the case of interbank credit rates, bank lending interest rates, and discount rate; and in Table 6 for the case of bank deposit interest rates. Also we have done Durbin's alternative test for autocorrelation for each series. At 5 % significance level we can not reject the null hypothesis of no correlation in each interest rate series[8].

Therefore, we run regression (1) in levels in case of stationarity of both bank and reference interest rate, and regression (1) is estimated in the first

[7] In Ukraine banking sector is the largest and most developed among all financial sectors, therefore it is very unlikely that bank retail rates do not influence market rates.

[8] p-value and chi2 statistics for each interest rate series are available upon request..

differences when at least one of the two interest rate entering this model is I(1) process. To determine the VAR lag order we use the Akaike's information criterion (AIC), Schwartz's Bayesian information criterion (SBIC), and the Hannan and Quinn information criterion (HQIC). When they show different lags we choose the lag according to SBIC, because this test is the most appropriate for small samples. In some cases SBIC can underestimate the lag order, but in the case of short sample, overestimation problem is more severe than the underestimation one.

In computing the structural responses of retail bank interest rate to the impulses in the reference rate the underidentification problem is solved using Cholesky decomposition (zero lower triangular transition matrix). As it was said above we make indentification restrictions by assuming that bank rate do not cause market rate contemporaneously, while the inverse is possible. Since we are interested how the shocks of the monetary policy are transmitted via market rates to the bank retail rates, the assumption that shocks to market rates are exogenous seems reasonable. For each credit and deposit bank rate we run a VAR model using market rate selected via correlation analysis from Table 2, Table 3, and Table 4.

After estimating VAR model we check the eigenvalue stability condition. For all bank retail rates VAR models appear to satisfy stability condition[9]. Also, we implement the Lagrangian Multiplier test for autocorrelation in residuals of VAR model. Mainly, there are no autocorrelation found in VAR model's residuals. When the autocorrelation in some lag is detected we try to vary the number of lags in the model[10].

Interest rate pass through coefficients are computed using cumulative impulse response functions. Since this function gives the response to one standard deviation shock in the market rate, we divide the values of cumulative impulse response function by the standard deviation of corresponding market rate. Immediate pass through estimator is the response

[9] Computed eigenvalues for each VAR model are available upon request.

[10] P-values and chi2 statistics for each Lagrangian Multiplier test are available upon request..

of the respective retail rate to the 100 basis points shock in the reference rate in period zero, short term pass through estimator is the response of this rate after 1 month, long term pass through estimator – response after 12 months, and very long tern estimator-the response after 36 months. This classification is common to the literature. The results of estimation for the whole sample are given in Table 7 for the case of credit rates denominated in UAH, Table 8 – for the case of lending rates denominated in US dollar, and in Table 9 for deposit rates denominated in UAH. Several conclusions can be made.

Firstly, the interest rate pass through is not complete in the short run, which is in line with other empirical findings. In almost all cases contemporaneous responses of lending rates to 1 percentage point shock to the reference rate is insignificantly different from zero at 5% significance level. There are only two cases when the market rate has significant contemporaneous effect credit rates: credit rates to enterprises with maturity 1 and 12 months, which is equal to 15 and 2 percents respectively. On the other hand, the only two lending rates redeemable in the USA dollar for which there is significant contemporaneous pass through are 3 months and 6 months maturity rates to households with interest rate pass through 15 % and 16 % respectively. In a month the pass through to lending rates redeemable in the USA dollar increases to 1.2%-4% but still remains significantly different from zero for several rates for households. In all cases with deposit rates redeemable in UAH contemporaneous pass through is significantly different from zero, but it is very low ranging from 0.046 for the case of interest rate on deposit to enterprises for 12 months to 0.31 for this rate with 1 month maturity.

The short term pass through to interest rates on credit to enterprises is still not complete, but significant for all rates. It varies between 5 basis points for the case of lending rate at up to 12 months maturity and 25 basis points in case of rate up to 1 month maturity. On the other hand, all short term pass through to lending rates on credits to households are still insignificant. It can be explained by the inelastic demand for this type of credit, which is likely in

the case of absence alternative sources of financing. In contrast to the lending interest rate redeemable in UAH, only three lending rates to households redeemable at the US dollar react significantly after a month to changes in reference rate. This are rate with maturity of 3, 6, and more than 12 months and pass through ranging from 0.22 to 0.4 . Turning to the case of deposit, interest rate pass through increases in a month and is significant to all but deposit rate to enterprises with maturity of 12 months. Changes transmitted from reference to deposit rates ranges from 0.069 for 6 month deposit rate to households to 0.49 for 1 month deposit rate to enterprises.

Secondly, pass through to lending and deposit rates is higher in the long term. In case of lending rates redeemable in UAH it varies between 0.39% (credits to enterprises at 12 moths maturity) and 1.28 % (credits to households at 3 months maturity). Pass through to lending rates redeemable at the US dollar fall in the range between 5 % (credits to households at 12 months notice) and 1.26 % (6 months credits to households). This pass through remains insignificantly different from one for the case of lending rates to firms. After 36 months responses of credit rates to shock in market rates increase even more. They vary between 0.65 and 2.05 (credits to households at 3 months maturity redeemable at UAH). Overshooting in the pass through can mean that banks attempt to increase lending rate by the higher amount than increase in reference rate to provide themselves with the risk premium for the increase in the share of more risky borrowers. This situation is described in detail in the literature review section. The other explanation for overshooting, which can also explain sticky pass through in the short run is that menu and switching costs prevents banks from changing the interest rate too frequently. But when they actually change the credit rate, they increase (decrease) them by the higher amount then the change in market rate. But this explanation could be appropriate only in case when banks expect market rates to change in the same direction[11]. Even though the pass

[11] Autocorrelations for all lending rates are positive assuming these rates to move in the same direction in te future.

through to these rates is estimated to be higher than one we can not reject the hypothesis of equality the pass through to 1 in the long run. But there are still some lending rates which are insignificant to the changes in the corresponding market rate (interest rates on credits to households at the 1, 12, and more than 12 months maturity redeemable at UAH). It can be explained by the underdevelopment of market for such type of credits. As one looks at the Chart 5, the amount of credit redeemable at UAH and given to households is 10-15 times less than the amount of credits given to enterprises during the period under review. Oppose to credit rates redeemable at UAH, only lending rates on credits to enterprises given in the US dollar are insignifficntly different from zero in the long run. But for all credit rates redeemable in foreign currency we can not reject the hypothesis of complete pass through after 36 months.

Lets turn to the case of deposits. We can not reject the hypothesis of complete pass though to deposit rates to households except rate with 12 months maturity. But for interest rates on deposit to firms the pass through is still incomplete even though significantly different from zero Overall, long term pass through to rates on deposit to enterprises are lower by 2- 3 times than to ones on deposit to households. The explanation might be that the segments of markets for deposits from enterprises are not fully competitive or the switching costs of these deposits are relatively high.

Third conclusion is that the average speed of adjustment from the shock in reference rate is 15 -20 months for the case of lending rate redeemable both in UAH and the US dollar, and to interest rate on deposit given to households. This can be seen from Chart 6, 7 and 9 in Appendix. On the other hand, from Chart 8 it can be drawn that depost rates to firms reacts to changes in reference rate on average after 10 months, even though the pass through remains incomplete for these rates.

And finally, there is some evidence that interest rates with lower maturity have higher pass through, than the ones with higher maturity. For example, from Chart 6 we can see that response functions of rates with lower maturity

lie above the ones with higher maturity. The exception is the interest rate pass through behavior of lending rate to enterprises, but it is the only lending rate that has another reference rate.

So, the results from the bivariate VAR for the case of full sample are very similar to once described in the literature. We have received stick pass through in the short run, but rather complete in the long run. Also, interest rate pass through to deposits to enterprises appears to be not complete even in the long term, which fits the literature as well. Moreover, interest rates with lower maturity have higher pass through. But, oppose to the results received in another studies, the average lag of interest rate transmission is higher for Ukraine.

5.1.2 .Subsample results from bivariate VAR .

Results of estimation the interest rate pass through over the subsample starting from 2002 July are presented in Table 10 for the case of lending rate redeemable at UAH, Table 11 for the case of lending rates redeemable at the US dollar, and in Table 12 for the case of deposit rates denominated in UAH. The methodology is the same as described in the previous section. At first glance, the results on pass through to lending rate redeemable in UAH are similar to the onces described earlier: sticky pass through in the short run, full pass through in the long run, and presence of differences in the interest rate pass through process across different instruments. It can be seen from the Table 10 that over this subsample period in the short run interest rates on credits to enterprises become more sticky to the shock in reference rate (all short term pass through are not significant different from zero except lending rate to enterprises at the maturity up to 1 month). This may be due to the short sample period that causes high standard errors. But from the other hand, long term pass through to enterprises credits has increased during subsample period. Even though long term credits are still estimated to have not significant pass through, lending rate to enterprises with the maturity from 6 to 12 months becomes significantly different from zero and complete

in the long run. If we look at Chart 6 (for the whole sample) and Chart 10 (for the short sample) we may observe that the lag of transmission of changes from the reference rate to the retail rates droped by nearly 3 times and constitutes on average 5 moths. This length of interest rate pass through is very similar to the one observable in the foreigh countries. The increase in speed of adjustments of lending rate to enterprises to the change in market rate since the middle of 2002 can be explained by increase in competition and decrease in switching and asymmetric information costs in these segments of retail bank market. Also, as in the whole sample the reaction of the interest rates on credit to households is not significant to the changes in interbank rates. The only pass through significantly different from zero in the long run is to household lending rate with maturity up to 3 months. But, compared to the whole sample results, there is no overshooting in this type of pass through, moreover, it became not complete even in the long run. It may suggest that the demand elasticity for this type of loans decreased starting the point of structural break. It could be due to un developments of this sector of retail banking[12].

The interest rate pass through to the lending rate denominated in the US dollar become insignificantly different from zero and significantly different from one in both short term and long term. Credit rate to enterprises remain the only instrument the pass through to which is complete even though not significantly different from zero in the long run starting point of the structural break. The only explanation which come to mind is that interbank interest rate is ot an apropiate measure for marginal cost for these type of instruments.

Results shown in Table 12 say that interest rate pass through to bank deposit rates to households increase in the short run and remain complete in the lon run compared to the result for the whole sample. Moreover, as the Chart 13 shows the lag of transmission of changes from reference rate to

[12] It can be seen from Chart 5 that amount of credits to enterprises rose more rapidly than amount of credits to household over the subsample period.

deposit rates to houseolds decrease by two times since the structural break point. But interest rate pass through to bank rates on enterprises deposit with maturity higher than 6 months became insignificantly different from zero in both short and long run in subsample.

5.1.3.Monetary policy Approach

In this section we estimate the interest rate pass through from policy rates to retail banks rate. For estimation we test model (1) with the reference rate being policy rate (NBU discount rate). In case of the whole sample we estimate model (1) in levels, and in case of subsample, we estimate (1) in first differences because discont rate appears to be I(1) process starting the point of structural break. We use the same methodology for determining lag order and identification restriction as we employed in the Cost of Funds Approach. We will only estimate pass through to bank retail rates denominated in UAH, because the NBU discount rate is redeemable in UAH. The results of estimaton are presented in Table 13 for the case of lending rates and full sample period, in Table 14 for the case of lending rate and sort sample period. Table 15 and Table 16 depict the results for interest rate pass through to deposit for the case of full and short sample period respectively. As can be seen from Table 13 interest rate pass through is also stick in the short run. But oppose to the cost od funds approach the pass hrough to lending rates to enterprises with maturity more than 6 months are significantly different from zero, suggesting that policy rate is more appropriate reference rate for long term rates to firms that interbank rate is. It may be due to the fact that policy rate signals about long term behaviour of interest rate while interbank term rate is short term rate. Even though after 12 months the interest rate pass through increases, only for some rates(lending rates to firms with up to 1 month and 1-3 months maturity, and up to 1 month and long term to households), while for other rates pass through is less than 100% or even insignificantly different from 0 for the case of lending rates to firms with

maturity of 1-3 months and 6-12 months. But after 36 months pass through becomes complete for all rates but leding rates to households with maturity more than month.

If we turn to short sample results (Chart 15, Chart 17), the pass through to lending rates to enterprises becomes higher in the short run (it ranges from 0.468 for 1 month maturity to 0.638 for 1-3 months maturity rate). But in the long run only two rates with maturity less than 3 months have complete pass through, but long term rate to enterprises has insignificantly different from 0 pass through both in the short and long terms. The pass through to rates on credits to households with maturities less than 6 months is complete already in a month, but rates with maturity higher than 6 months have negative but insignificantly different from 0 pass through both in the short and in the long term.

If we look at Table 15, we can see that interest rate pass through to deposit rates to all type of customers are not significantly different from 0 in the short run. After 12 months pass through increases a little bit (it ranges from 0.114 for deposit rates to firms with maturity of 6-12 months to 0.629 for the case of deposit rates to households with maturity of 6-12 months), but remains not complete even after 36 months. From Table 16 it can be drawn that discount rate does not influence deposit rates to firms except to ones with long term maturity. But pass through to deposit rates to households increases in the short term and becomes even complete for the case of interest rates with maturity less than 3 months.

To sum up, we an not reject the hypothesis that the NBU discount rate has influence on the bank retail rates, even though the reaction of interest rates differ across instruments. Also, there is some evidence on fuller and quicker pass through since the mid 2002.

5.1.4.Results on asymmetry of responses in bivariate models.

One of the issues investigated in interest rate pass through process is the asymmetry of responses of retail bank rates to the changes in market rate. It is assumed that when market interest rate goes up the lending (deposit) bank interest rate are less (more) sticky comparatively to the case when market interest decreases. Mostly researchers estimate error correction model to test interest rate asymmetry. We can not rely on error correction model to the reason described above. Burgstaller (2005) proposed to estimate VAR model of type (2) and test the hypothesis of equality to zero coefficients near dummies variable. But, what we received in this case are the coefficients of reduced form VAR, not the structural VAR. But these two sets of coefficients are not necessary equal to each other, they even might have different signs. Therefore, we should use the results from structural VAR to test for asymmetry, which are not given in Stata package. Therefore, we make asymmetry test in the following way. We estimate model (2) and then we use Cholesky decomposition to turn reduced form VAR coefficients into structural ones. While imposing identification restriction, we assume as before that retail rates do not cause contemporaneously market interest rate, but not vice versa. From this follows that interacted with market rate terms also are not influenced by retail bank rate at the same period, but not vice versa. From this followes that interacted with market rate terms also are not influenced by retail bank rate at the same period, but not vice versa. We take the same pair of interest rates as in a bivariate model and add to them to interacted variable. All interacted variables appears to be stationary at 5 % significance level. The number of lags is chosen in the same manner as in the section above. Then we compute cumulative impulse response function from the changes in market rate to the changes in market rate interacted with dummy, which take 1 when market interest rate increases. If there is asymmetric behavior in the pass through process, the computed coefficients of this cumulative IRF should be significantly different from zero. For both

sample, the results of testing on asymmetric response to changes in market rate indicates that there are no asymmetry in responses both deposit and credit bank rates to the change in market rate except long term interest rate on credit to enterprises. As it was assumed, when market interest rate increases the pass through is higher, then when it decreases. But for this interest rate, the cumulative IRF is statistically different from zero only in the first 4 periods. Starting with the 5th period there is no statistical difference between pass through in case increasing or decreasing reference rate. [13]

5.2.Results from Multivariate Var

In this section we examined the pass through process through multivariate VAR model (3). Even though the bivariate VAR is the partial case of the multivariate VAR model, analyzing the bivariate VAR first can be justified by the following reasons. Firstly, it makes results compared with the literature, since bivariate model of interest rate pass through is very frequently used. Secondly, it allows to test the cost of funds approach directly. And thirdly, for our particular case of very short sample, the smaller number of variables leads to the increase in the degree of freedom.

To estimate the multivariate model of the pass through process and to reveal the transmission chain of changes in different interest rates, we need firstly to examine whether deposit rates cause lending rate. For each retail lending rate we select the reference deposit rates from the set of bank deposit rates which exhibit the highest correlation with it. Then we perform the Granger causality test to test the hypothesis that bank deposit rate does not Granger cause the lending rate. The results of this test for the whole sample are presented in Table 21.

[13] We do not present the results of testing for asymmetric pass through here because it was estimated that there is no significant asymmetric behavior of interest rate pass through except for the one rate. For the case of interest rate on long term credit to enterprises, when market interest rate increases the pass through is higher then when market rate decreases on 0.05%, 0.11%, 0.15%, and 0.19% correspondingly in period ,1,2, ad 3.

The second column of Table 21 shows the deposit rate chosen via correlation analysis as the possible candidate for having predictive power for selected credit rate beond the marginal cost approach. As it can be seen from this table, bank rate on deposits made by households move closer with credit rates. The third columns gives the p-value for the hypothesis that deposit rate does not Granger cause lending rate. For the case of the whole sample, we can reject the hypothesis that banks rates on loans to households at the maturity of up to 1 month, from 1 to 3 months, and up to 12 months are not caused by deposit rate.

After we revealed which credit rates may be caused by deposit rate, we perform the multivariate VAR model for estimating interest rate pass though. As describe in the methodology section, we include the following variables into the model: long term interbank lending rate as a proxy for long term market rate (since it is the only available for author rate with maturity more then 3 months), short term market rate proxied by interbank rate used as marginal cost for bank rate in the marginal cost approach, the NBU discount interest rate, which represent the polict interest rate, and the lending rate itself. We include also deposit rate if the particular lending rate is Granger caused by deposit rate. While imposing identification restriction to receive structural parameters, we follow the logic explained in the methodology section. We assume that policy rate is conteproraneously exogenous to all other rates, long term market rate is contemporaneously exogenous to all but policy interest rate. Then we assume that bank lending rate is caused in one period by all other rates, and short term market rate can influence the deposit rate in one period, but not vice versa. Since all ineterst rates are stationary for the case of whole sample, we run regression (3) in levels. We follow the same strategy as in bivariate VAR while determining the appropriate lag order. Then we compute cumulative IRF . As it was done above, the immediate pass through from one rate to another is the value of cumulative IRF in period 0, short term pass through is the response after 12 months, and very long term pass through – the response after 36 months. Long term market interest rate

appears to have no effect both on bank retail rates and on short term market rate. It can be explained y the fact that the yield curve is not stable in Ukarine (which is common evidence for developing countries), or that banks use rather short term interest rate than long term rate as a measure of marginal cost.

The results for interest rate pass through from market rates to the bank lending rates for the whole sample are presented in Table 17 and from deposit rate to bank lending rates in Table 19. Bank rates on credit to households at the maturity of up to 1 month and up to 3 months do not react to changes in short term market rate, but these two rates transmit shocks made to deposit rate. Therefore, we can suggest that appropriate marginal cost for these two lending rates is deposit rate, so it is possible that banks finance their lending activities to households with the help of sources from 6 months maturity deposits made by household. The pass through from interbank rate to 6 months credit rate to enterprises is a little bit lower then the one estimated in bivariate model and it is not influenced by deposit rates. Even though for majority of lending rates interest rate pass through from market rate is insignificantly different from zero, but for some rates we can not reject the hypothesis that pass through is complete in the long run (lending rates to firms with the maturity of 1, 1-3, and 6-12 months, and lending rate to hoesholds with the maturity of up to 1 month). It may be that short sample sample period and big number of variables compared to bivariate VAR model contribute to the insignificance of the coefficients.

Table 18 and Table 20 present the results of interest rate pass through from the NBU discount rate to the bank retail and market ineterst rates respectively. As it always appears, pass through from the policy rate is sticky in the short term for both market and bank lending rates, but it becomes complete and sigifficantly different from 0 already after 12 months.

Chapter 6

CONCLUSIONS AND IMPLICATIONS

This thesis presents an empirical analysis of the interest rate pass through process in Ukraine. Both bivariate and Multivariate specifications of Vector Autoregressive model are used to estimate the pass through from policy and market interest rates to bank retail rates. Two approaches, cost of funds approach and monetary policy approach, are involved when we describe the transmission of changes from policy and market rates to retail rates. Also the distinction between maturity, currency denominated (UAH and the US dollar), and type of bank customers (households and enterprises) for bank retail rates are made while estimated interest rate transmission process. A structural break that corresponds to July 2002 is found in the data using CUSUM test for structural break. Therefore, the estimation is conducted for two samples: the whole original sample, and the sample starting from July, 2002.

The first finding is that pass through appears to be stick in the short run, but rather complete in the log run, which is common to the literature. There is evidence that interest rates with lower maturity have higher pass through. The interest rate pass through to instruments with long term maturity is estimated to be insignificant. This implies that market interest rate is inappropriate measure of marginal cost for them. The lag of transmission from market to retail rates decreases on average by two times since the point of structural break. This suggests the increase in banking competition since the mid 2002. Also, deposit rates react quicker to the changes in reference rate than bank lending rates do, but in the long term their pass through tends to be incomplete, which is also common to the literature. The pass through to interest rates on credits to enterprises is bigger than to credits to households

(which is estimated to be insignificantly different from 0 for majority of cases). This may be due to underdevelopment of market for this type of credit compared to market for credits to firms.

Secondly, we can reject the hypothesis that policy rate does not influence bank retail rates. For both samples, the pass through is incomplete in the short term (even though it is higher than the pass through from market rates) while for almost all instruments pass through is complete in the long run. Also, the pass through from policy rate becomes fuller and quicker since the point of structural break. From the results from multivariate VAR we can conclude that banks respond more to the NBU discount rate than on the market interest rate while setting their retail rates.

Thirdly, we have not found the precence of asymmetric interest rate pass through in Ukraine, which is in line with results received for other developing countries.

In order to strengthen the process of monetary transmission in Ukaine, to iget better the soundness of banking sector, as well as to improve the monetary policy , we suggest the few decisive measures. Namely,

- take into account the possibility of presence of MTM channels which include the interest rate pass through as subchannel; presence of complete interest rate pass through suggests the operation of first stage of interest and credit channels of MTM in Ukraine;

- pay more attention to the consequences of changes in the NBU discount rate; It appears that Ukrainian banks take ino account the behaviour of the NBU discount rate when setting their retail rates;

- take into account the timing effect while conducting monetary policy; the interest rates transmission is estimated to have longer lag then the one for other developping countries.

The further research in the field of interest rate pass through in Ukraine can be done on the Micro level. In particular, it is interesting how different bank characteristics and the structure of bank sector itself influence interest rate pass through process. To make this kind of research bank level data is needed. It is available at the NBU, but public access to this data is restricted by Ukrainian legislation.

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APPENDIX

Table 1. Descriprive statistics

Interest rate series	*Number of observations*	*Mean*	*Standard Deviation*	*Min*	*Max*	*Number of observations*	*Mean*	*Standard Deviation*	*Min*	*Max*
	01.2000-11.2006					07.2002-11.2006				
Policy interest rate										
Discount rate	83	13.26	8.67	7	45	53	8.10	0.99	7	9..5
Overnight	57	12.25	4.41	8	24.6	46	10.96	3..24	8	20
Rate on tender credit	59	11.43	3.48	7.7	21	45	10.11	2.04	7.7	15
Interbank lending rate denominated in UAH										
Overnight	83	8.19	8.44	0.8	41.7	53	4.55	3.58	0.8	16.8
Up to 7 days notice	83	9.96	8.54	1.9	43.8	53	6.13	3.79	1.9	18.6
From 8 to 21 days	83	12.78	8.33	4.3	45.6	53	8.7	3.70	4.3	20.4
From 22 to 31 day	83	15.16	10.07	4.3	58	53	9.4	3.04	4.3	19.4
From 32 to 92 days	83	15..57	9.49	4.1	56.5	53	9.86	3..24	4.1	18.2
Over 92 days notice	83	17.92	7.66	9.3	47.4	53	13.74	2.80	9.3	21.4
Interbank lending rate denominated in $										
Overnight	83	3.81	1.48	1.4	6.4	53	3.02	0.98	1.4	5.4
Up to 7 days notice	83	3.93	1.53	1.3	7..2	53	3.08	0.91	1.3	4.7
From 8 to 21 days	83	5.21	1.64	2.8	9..5	53	4.29	0.73	2.8	5.8

Interest rate series	Number of observations	Mean	Standard Deviation	Min	Max	Number of observations	Mean	Standard Deviation	Min	Max
		01.2000-11.2006					07.2002-11.2006			
From 22 to 31 day	83	5.71	1.94	3.3	12.3	53	4.47	0.60	3.3	6..2
From 32 to 92 days	83	6.45	3.15	2.5	15.3	53	4.42	0.92	2.5	6.7
Over 92 days notice	83	9.09	3.44	4	18.3	53	7.04	1.85	4	13
Bank lending rate denominated in UAH to firms										
Up to 1 month	83	19.82	10.19	8.7	57.6	53	13.34	2.39	8.7	20
From 1 to 3 months	83	24.57	10.31	14.5	61.1	53	18.19	2.16	14.5	23.4
From 3 to 6 months	83	26.21	10.69	15.4	55.8	53	19.35	2.53	15.4	27
From 6 to 12 months	83	25.47	10.17	16.3	58.3	53	18.88	1.91	16.3	25.1
Long term notice	83	22.24	10.55	14.4	59.7	53	16.25	1.32	14.4	20.9
Bank lending rate denominated in UAH to households										
Up to 1 month	83	25.50	11.34	3.3	59.8	53	18.52	6.16	3.3	32.3
From 1 to 3 months	83	25.34	7.87	13.2	46.7	53	20.63	2.76	13.2	26.9
From 3 to 6 months	83	22.87	7.77	9.7	51	53	18.25	3.43	9.7	25.2
From 6 to 12 months	83	22.52	2.79	14.1	28.4	53	21.72	2.07	17	27.5
Long term notice	83	17.67	2.72	8	21.3	53	18.99	1.24	14.6	21.3
Bank credit rate denominated in $ to firms										
Up to 1 month to	83	10.91	3.17	7	21.7	53	9.60	1.45	7	12.8
From 1 to 3 months to	83	12.36	2.76	8.5	22.8	53	10.77	1.22	8.5	13.5

Interest rate series	Number of observations	Mean	Standard Deviation	Min	Max	Number of observations	Mean	Standard Deviation	Min	Max
		01.2000-11.2006					07.2002-11.2006			
From 3 to 6 months	83	14.29	2.39	9.5	23.8	53	13.24	1.51	9.5	16.1
From 6 to 12 months	83	14.21	2.14	10.05	19.8	53	12.88	1.20	10.05	15.4
Long term notice	83	14.08	2.18	11.3	20.1	53	12.78	0.91	11.3	14.9
Bank lending rate denominated in UAH to households										
Up to 1 month	83	14.92	2.94	10.1	24.7	53	13.90	1.39	10.1	17.2
From 1 to 3 months	83	15.82	2.48	10.8	24.4	53	14.71	1.15	10.8	16.7
From 3 to 6 months	83	16.3	2.85	11.5	24	53	14.75	1.27	11.5	17.3
From 6 to 12 months	83	16.60	2.03	14	23.9	53	15.55	0.86	14	18.5
Long term notice	83	14.37	1.74	11.8	22.9	53	13.74	0.79	11.8	15.2
Bank deposit rate denominated in UAH to firms										
Up to 1 month	83	7.64	5.17	2	30.2	53	5.60	2.58	2	13.9
From 1 to 3 months	83	12.45	3.97	2.7	33.3	53	10.30	1.80	2.7	13.8
From 3 to 6 months	83	13.07	4.39	3.5	38.4	53	11.39	2.00	3.5	14.9
From 6 to 12 months	83	10.95	4.07	5.3	30.4	53	8.91	2.01	5.3	12.7
Long term notice	83	11.63	4.27	6.8	25.7	53	9.21	0.87	6.8	11.9
Up to 1 month	83	14.69	6.62	6.6	38.3	53	10.75	2.63	6.6	16.1
From 1 to 3 months	83	17.10	4.97	10.06	33.1	53	13.94	1.62	10.06	18.4
From 3 to 6 months	83	18.08	5.19	12.05	33	53	14.73	1.33	12.05	18

Interest rate series	Number of observations	Mean	Standard Deviation	Min	Max	Number of observations	Mean	Standard Deviation	Min	Max
		01.2000-11.2006					07.2002-11.2006			
From 6 to 12 months	83	19.16	7.16	10.2	43.1	53	14.75	1.45	10.2	19.1
Long term notice	83	24.72	13.78	13.9	74.8	53	16.59	2.47	13.9	25.1
Bank deposit rate denominated in $ to firms										
Up to 1 month	83	3.05	0.92	1	5.4	53	3.05	0.91	1.8	5.4
From 1 to 3 months	83	5.71	1.37	3.4	10.5	53	5.64	1.14	3.4	8.4
From 3 to 6 months	83	7.09	1.50	3.7	11.6	53	6.9	1.39	3.7	9.3
From 6 to 12 months	83	8.29	2.40	3.8	15.8	53	7.25	1.25	4.4	10
Long term notice	83	7.06	1.74	2.8	15.4	53	6.80	0.88	4.7	8.3
Bank deposit rate denominated in $ to households										
Up to 1 month	83	5.92	2.27	3.3	17.2	53	5.25	0.77	4.2	8
From 1 to 3 months	83	6.74	1.24	4.4	9.9	53	7.22	1.19	5.2	9.9
From 3 to 6 months	83	7.97	1.52	5.7	16.7	53	8.17	0.70	7.1	10.1
From 6 to 12 months	83	8.37	0.89	6.7	12.1	53	8.31	0.68	6.7	10.3
Long term notice	83	10.80	2.69	8.4	21.4	53	9.50	0.42	8.4	10.4

Table 2. Correlation Analisys between bank lending rate and Interbank lending rates redeemable in UAH

Bank rate	*Market Rate*	*Corre-lation*	*Lag in months*	*Market rate*	*Corre-Lation*	*Lag in months*	*Market rate chosen*
	2000.01-2006.11			2002.07-2006.11			
Lending rate	Interbank lending rate			Interbank lending rate			Interbank lending rate
Up to 1 month to firms	32 - 92 days notice	0.91	0	from 32 to 92 days	0.91	0	from 32 to 92 days
From 1 to 3 months to firms	32 - 92 days notice	0.86	0	32 - 92 days notice	0.85	0	32 - 92 days notice
From 3 to 6 months to firms	32 - 92 days notice	0.81	0	32 - 92 days notice	0.81	0	32 - 92 days notice
From 6 to 12 months to firms	32 - 92 days notice	0.84	0	32 - 92 days notice	0.84	0	32 - 92 days notice
Long term notice to firms	over 92 days notice	0.76	0	32 - 92 days notice	0.77	0	over 92 days notice
Up to 1 month to households	32 - 92 days notice	0.71	0	32 - 92 days notice	0.69	0	32 - 92 days notice
From 1 to 3 months to households	32 - 92 days notice	0.78	1	32 - 92 days notice	0.78	1	32 - 92 days notice
From 3 to 6 months to households	32 - 92 days notice	0.76	0	32 - 92 days notice	0.76	0	32 - 92 days notice
From 6 to 12 months to households	over 92 days notice	0.45	2	over 92 days notice	0.45	2	over 92 days notice
Long term notice to households	Overnigt Interbank lending rate	0.61	1	Interbank lending rate from 21 to 32 day	- 0.59	1	Overnigt Interbank lending rate

Table 3. Correlation analysis between bank lending and market interest rate redeemable in US dollar

Bank rate	*Market rate*	*Corre-lation*	*Lag in months*	*Market Rate*	*Corre-Lation*	*Lag in months*	*Market rate chosen*
	2000.01-2006.11				2002.07-2006.11		
Lending rate	Interbank lending rate			Interbank lending rate			
Up to 1 month to firms	22 - 31 days notice	0.60	1	22 - 31 days notice	0.356	10	22 - 31 days notice
From 1 to 3 months to firms	over 92 days notice	0.78	2	over 92 days notice	0.292	1	over 92 days notice
From 3 to 6 months to firms	over 92 days notice	0.63	3	32 - 92 days notice	0.337	10	over 92 days notice
From 6 to 12 months to firms	over 92 days notice	0.79	1	over 92 days notice	0.304	1	over 92 days notice
Long term notice to firms	over 92 days notice	0.79	2	over 92 days notice	0.355	1	over 92 days notice
Up to 1 month to households	up to 7 days notice	0.62	2	up to 7 days notice	0.339	6	up to 7 days notice
From 1 to 3 months to households	over 92 days	0.59	1	over 92 days	0.418	10	over 92 days
From 3 to 6 months to households	over 92 days	0.74	1	over 92 days	0.290	2	over 92 days
From 6 to 12 months to households	over 92 days notice	0.69	3	over 92 days notice	0.249	0	over 92 days notice
Long term notice to households	over 92 days notice	0.55	1	over 92 days notice	0.267	1	over 92 days notice

Table 4.Correlation analysis between bank deposit and market interest rates redeemable in UAH

Bank deposit Rate	*Market rate*	*Correlation*	*Lag in months*	*Market rate*	*Correlation*	*Lag in months*	*Market rate chosen*
	2000.01-2006.11			2002.07-2006.11			
To firms	Interbank lending rate			Interbank lending rate			
Up to 1 month	Overnight	0.844	0	up to 7 days notice	0.3671	6	up to 7 days notice
From 1 to 3 months	32 - 92 days notice	0.880	0	32 - 92 days notice	0.406	5	32 - 92 days notice
From 3 to 6 months	32 - 92 days notice	0.727	0	32 - 92 days notice	0.372	8	32 - 92 days notice
From 6 to 12 months	32 - 92 days notice	0.750	2	32 - 92 days notice	-0.712	1	32 to 92 days notice
Long term notice	32 - 92 days notice	0.819	1	32 - 92 days notice	-0.387	1	32 - 92 days notice
To households							
Up to 1 month	32 - 92 days notice	0.841	1	32 - 92 days notice	0.695	1	32 - 92 days
From 1 to 3 months	32 - 92 days notice	0.873	3	32 - 92 days notice	0.742	2	32 - 92 days notice
From 3 to 6 months	32 - 92 days notice	0.847	2	32 - 92 days notice	0.540	2	32 - 92 days notice
From 6 to 12 months	32 - 92 days notice	0.806	2	32 - 92 days notice	0.454	1	32 - 92 days notice
Long term notice	32 - 92 days notice	0.800	2	32 - 92 days notice	0.467	1	32 - 92 days notice

Table 5. Dicket Fuller test for unit root for interbank and bank lending rates, discount rate[14]

Interest rate	*Test statistics*		Interest rate	*Test statistics*	
Interbank lending rate (UAH)	2000.01-2006.11	2002.07-2006.11	Interbank lending rate ($)	2000.01-2006.11	2002.07-2006.11
Overnight	-5.72	-3.88	Overnight	-1.81	-1.29
Up to 7 days notice	-5.57	-3.46	Up to 7 days notice	-1.72	-1.4
8-21 day notice	-4.84	-3.18	8-21 day notice	-3.16	-3.21
22-31 days notice	-4.74	-3.02	22-31 days notice	-2.89	-3.63
32-92 days notice	-4.83	-2.95	32-92 days notice	-3.1	-5.05
Over 92 days notice	-5.84	-5.9	Over 92 days notice	-3.77	-6.05
Bank lending rate (UAH)			Bank lending rate ($)		
To firms			*To firms*		
Up to 1 month	-4.11	-3.08	Up to 1 month	-3.39	-2.95
From 1 to 3 months	-4.85	-3.00	From 1 to 3 months	-2.98	-5.48
From 3 to 6 months	-3.82	-2.95	From 3 to 6 months	-4.14	-2.76
From 6 to 12 months	-8.33	-4.49	From 6 to 12 months	-2.04	-2.28
Long term notice	-5.38	-3.84	Long term notice	-2.58	-1.51
To households			*To households*		
Up to 1 month	-2.90	-2.27	Up to 1 month	-4.62	-5.53
From 1 to 3 months	-3.94	-5.23	From 1 to 3 months	-5.43	-5.98
From 3 to 6 months	-5.90	-2.97	From 3 to 6 months	-3.41	-4.55
From 6 to 12 months	-5.92	-2.95	From 6 to 12 months	-3.03	-3.61
Long term notice	-3.92	-4.53	Long term notice	-6.09	-2.79
NBU discount rate	-6.80	-1.95			

[14] For the whole sample : 10% critical value is -3.54, 5% critical value is -2.9, 1% critical value is -2.59; For the short sample : 10% critical value is -3.58, 5% critical value is -2.93, 1% critical value is -2.60

Table 6. Dicket Fuller test for unit root for bank deposit rates[15]

Bank deposit rate (UAH)	*Test statistics*		Bank deposit rate (UAH)	*Test statistics*	
	2000.01-2006.11	2002.07-2006.11		2000.01-2006.11	2002.07-2006.11
To firms			*To households*		
Up to 1 month	-5.48	-2.59	Up to 1 month	-2.86	-3.15
From 1 to 3 months	-6.52	-5.74	From 1 to 3 months	-3.92	-2.20
From 3 to 6 months	-5.73	-5.21	From 3 to 6 months	-2.87	-2.71
From 6 to 12 months	-5.61	-2.74	From 6 to 12 months	-3.16	-3.57
Long term notice	-3.89	-7.40	Long term notice	-2.80	-3.07

[15] For the whole sample : 10% critical value is -3.54, 5% critical value is -2.9, 1% critical value is -2.59; For the short sample : 10% critical value is -3.58, 5% critical value is -2.93, 1% critical value is -2.60

Table 7. Interest rate pass through based on biviriate Var model from Market rate to bank lending rate redeemable at UAH; full sample estimation.

Bank lending rate	Immediate pass through	Pass through in a month	Pass through after 12 months	Pass through after 36 months	Lag order of Var	Market rate chosen
						Inerbank lending rate with maturity of
To firms						
Up to 1 month	0.15* (0.03)	0.25* (0.06)	0.5^ (0.39)	0.54^ (0.53)	1	32 - 92 days
From 1 to 3 months	0.02 (0.02)	0.09* (0.04)	0.98*^ (0.25)	1.3*^ (0.36)	1	32 - 92 days
From 3 to 6 months	0.02 (0.01)	0.06* (0.03)	0.7*^ (0.23)	1.22*^ (0.41)	1	32 - 92 days
From 6 to 12 months	0.02* (0.01)	0.048* (0.02)	0.39* (0.14)	0.65*^ (0.24)	1	32 - 92 days
Long term notice	-0.0 (0.02)	0.0 (0.03)	0.31 (0.27)	0.51^ (0.40)	1	> 92 days
To households						
Up to 1 month	0.04 (0.02)	0.12* (0.05)	0.69*^ (0.27)	0.94*^ (0.39)	1	32 - 92 days
From 1 to 3 months	0.07 (0.06)	0.16 (0.11)	0.85^ (0.54)	1.06 ^ (0.73)	1	32 - 92 days
From 3 to 6 months	0.07 (0.04)	0.13 (0.07)	1.28* ^ (0.40)	2.05*^ (0.90)	2	32 - 92 days
From 6 to 12 months	0.04 (0.03)	0.097 (0.06)	0.82* (0.40)	1.24 (0.68)	2	> 92 days
Long term notice	0.03 (0.03)	0.08 (0.05)	0.16 (0.09)	0.16 (0.09)	1	Overnigt

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 8. Interest rate pass through based on biviriate Var model from market to bank lending rates redeemable at US dollar; full sample estimation

Bank lending rate	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Lag order of Var*	*Market rate chosen*
						Interbank lending rate
To firms						
Up to 1 month	-0.05 (0.08)	-0.02 (0.14)	1.30^ (0.93)	1.95^ (1.42)	1	22 - 31 days notice
From 1 to 3 months	0.07 (0.04)	0.12* (0.06)	0.80*^ (0.32)	1.14*^ (0.56)	2	over 92 days notice
From 3 to 6 months	-0.04 (0.03)	-0.05 (0.06)	0.22 (0.31)	0.69^ (0.67)	3	over 92 days notice
From 6 to 12 months	0.01 (0.02)	0.03 (0.04)	0.21 (0.26)	0.35^ (0.45)	1	over 92 days notice
Long term notice	0.04* (0.02)	0.06 (0.03)	0.25 (0.22)	0.45^ (0.43)	2	over 92 days notice
To households						
Up to 1 month	0.22 (0.16)	0.38 (0.27)	1.53^ (1.07)	2.31^ (2.31)	2	up to 7 days notice
From 1 to 3 months	0.15* (0.06)	0.40* (0.10)	1.14*^ (0.41)	1.17*^ (0.45)	1	over 92 days notice
From 3 to 6 months	0.16* (0.04)	0.35* (0.09)	1.26*^ (0.47)	1.41*^ (0.64)	1	over 92 days notice
From 6 to 12 months	0.03 (0.03)	0.03 (0.05)	0.5* (0.2)	0.85*^ (0.42)	3	over 92 days notice
Long term notice	0.09* (0.04)	0.22* (0.06)	0.6*^ (0.24)	0.62*^ (0.26)	1	over 92 days notice

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 9. Interest rate pass through based on biviriate Var model from market to deposit rate redeemable at UAH; full sample estimation

Bank deposit rate	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Lag order of Var*	*Market rate chosen*
						Interbank Lending rate
To firms						
Up to 1 month	0.3131* (0.3311)	0.4949* (0.0615)	0.7532*^ (0.2028)	0.7548*^ (0.2069)	1	up to 7 days notice
From 1 to 3 months	0.0959* (0.0210)	0.1984* (0.0274)	0.5799* (0.1148)	0.6249* (0.1545)	1	32 – 92 days notice
From 3 to 6 months	0.0233 (0.0308)	0.1037* (0.0405)	0.5179* (0.1069)	0.5522* (0.1303)	1	32 – 92 days notice
From 6 to 12 months	0.0461* (0.0196)	0.0929* (0.0036)	0.3669* (0.1339)	0.4082*^ (0.1534)	2	32 – 92 days notice
Long term notice	0.0514* (0.0235)	0.1316* (0.0381)	0.5952* (0.1429)	0.6547*^ (0.1816)	1	32 – 92 days notice
To households						
Up to 1 month	0.0371 (0.0213)	0.099* (0.0339)	1.1778*^ (0.2682)	2.1205*^ (0.8268)	3	32 – 92 days notice
From 1 to 3 months	0.0186* (0.0073)	0.0813* (0.0166)	0.9415*^ (0.2083)	1.3627*^ (0.4572)	2	32 – 92 days notice
From 3 to 6 months	0.0347* (0.0153)	0.0692* (0.0250)	0.8150*^ (0.2302)	1.2066*^ (0.4492)	2	32 – 92 days notice
From 6 to 12 months	0.0145 (0.0152)	0.0082 (0.0225)	0.4527* (0.1310)	0.8238*^ (0.2917)	4	32 – 92 days notice
Long term notice	0.0772* (0.0350)	0.1722* (0.0540)	0.9773*^ (0.3569)	1.7624*^ (0.7674)	3	32 – 92 days notice

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 10. Interest rate pass through based on biviriate Var model from market to lending rate redeemable in UAH. Short sample estimation

Bank lending rate	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Lag order of Var*	*Market rate chosen*
To firms						Interbank lending rate
Up to 1 month	0.305* (0.063)	0.615* (0.106)	1.585*^ (0.560)	1.646*^ (0.660)	1	32 - 92 days
From 1 to 3 months	0.043 (0.028)	0.192 (0.083)	0.823*^ (0.509)	0.901*^ (0.582)	1	32 - 92 days
From 3 to 6 months	-0.002 (0.038)	0.071 (0.074)	1.106*^ (0.499)	1.325*^ (0.660)	1	32 - 92 days
From 6 to 12 months	0.006 (0.021)	0.050 (0.042)	0.664*^ (0.306)	0.785*^ (0.389)	1	32 - 92 days
Long term notice	-0.083 (0.029)	-0.108 (0.048)	0.104 (0.192)	0.194 (0.250)	1	over 92 days notice
To households						
Up to 1 month	0.002 (0.139)	-0.152 (0.266)	-2.220^ (1.672)	-3.031^ (2.696)	1	32 - 92 days
From 1 to 3 months	0.052 (0.103)	0.220 (0.149)	0.799*^ (0.393)	0.817*^ (0.414)	1	32 - 92 days
From 3 to 6 months	-0.068 (0.098)	-0.100 (0.180)	-0.045^ (815)	-0.025^ (0.895)	1	32 - 92 days
From 6 to 12 months	-0.002 (0.079)	-0.020 (0.147)	-0.075 (0.361)	-0.076 (0.364)	1	over 92 days notice
Long term notice	-0.048 (0.049)	-0.046 (0.079)	0.051 (0.225)	0.053 (0.229)	1	Overnigt

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 11. Interest rate pass through based on biviriate Var model from market to lending rate redeemable at the US dollar. Short sample estimation.

Bank lending rate	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Lag order of Var*	*Market rate chosen*
To firms						Interbank lending rate
Up to 1 month	0.032 (0.219)	0.167 (0.421)	1.012^ (1.691)	1.048^ (1.77)	1	22 - 31 days
From 1 to 3 months	0.132 (0.082)	0.267 (0.127)	0.337 (0.174)	0.337 (0.175)	1	over 92 days notice
From 3 to 6 months	0.040 (0.082)	0.211 (0.158)	0.654 (0.444)	0.660 (0.455)	1	over 92 days notice
From 6 to 12 months	-0.016 (0.047)	-0.681 (0.098)	-0.310 (0.376)	-0.324 (0.423)	1	Over 92 days notice
Long term notice	-0.001 (0.025)	-0.054 (0.655)	-0.456 (0.336)	-0.681 (0.608)	1	over 92 days notice
To households						
Up to 1 month	0.436 (0.193)	0.589 (0.313)	0.238 (0.787)	0.138 (0.879)	2	up to 7 days notice
From 1 to 3 months	-0.198 (0.251)	-0.069 (0.375)	0.245 (0.665)	0.245 (0.666)	1	over 92 days notice
From 3 to 6 months	0.139 (0.082)	0.233 (0.14)	0.350 (0.219)	0.315 (0.219)	1	over 92 days notice
From 6 to 12 months	0.096 (0.051)	0.096 (0.093)	0.067 (0.186)	0.067 0.186	1	over 92 days notice
Long term notice	0.012 (0.040)	0.016 (0.078)	0.025 (0.207)	0.025 (0.211)	1	over 92 days notice

* denotes 5 % level significance of t statistics;
^ denotes equality to 1 at 5% level

Table 12. Interest rate pass through based on bivariate Var model from market to deposit rate redeemable at UAH. Short sample estimation

Bank deposit rate	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Lag order of Var*	*Market rate chosen*
To firms						Interbank lending rate
Up to 1 month	0.181* (0.053)	0.261* (0.107)	0.132^ (0.550)	0.079^ (0.644)	1	up to 7 days
From 1 to 3 months	0.080 (0.068)	0.221* (0.091)	0.621*^ (0.277)	0.633*^ (0.295)	1	32 - 92 days
From 3 to 6 months	0.046 (008)	0.128 (0.112)	0.380 (0.268)	0.386 (0.273)	1	32 - 92 days
From 6 to 12 months	-0.074 (0.055)	-0.127 (0.103)	-0.263 (0.387)	-0.268 (0.411)	1	32 - 92 days
Long term notice	-0.064 (0.036)	-0.029 (0.043)	0.072 (0.071)	0.073 (0.071)	1	32 - 92 days
To households						
Up to 1 month	0.136* (0.051)	0.372* (0.097)	1.704*^ (0.602)	1.732*^ (0.660)	1	32 - 92 days
From 1 to 3 months	0.074* (0.019)	0.268* (0.051)	0.833*^ (0.302)	0.842*^ (0.271)	1	32 - 92 days
From 3 to 6 months	0.039 (0.023)	0.160* (0.051)	0.751*^ (0.270)	0.739*^ (0.264)	2	32 - 92 days
From 6 to 12 months	0.041 (0.033)	0.141* (0.059)	0.714*^ (0.249)	0.696*^ (0.236)	2	32 - 92 days
Long term notice	0.021 (0.038)	0.098* (0.074)	1.040*^ (0.515)	1.200*^ (0.640)	1	32 - 92 days

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 13. Interest rate pass through based on biviriate Var model from policy to lending rate denominated in UAH. Full sample estimation

Bank lending rate	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Correlation coefficient*	*Lag order of Var*
To firms						
Up to 1 month	0.081* (0.034)	0.164* (0.059)	0.844*^ (0.170)	1.215*^ (0.255)	0.993	1
From 1 to 3 months	0.000 (0.021)	0.013 (0.035)	0.326 (0.168)	0.954*^ (0.393)	0.938	1
From 3 to 6 months	0.006 (0.016)	0.022 (0.031)	0.409* (0.188)	0.831*^ (0.317)	0.944	1
From 6 to 12 months	0.034* (0.008)	0.067* (0.007)	0.359 (0.141)	0.624^ (0.335)	0.957	1
Long term notice	0.058* (0.018)	0.137* (0.034)	0.818*^ (0.164)	1.494^ (0.375)	0.975	2
To households						
Up to 1 month	0.136* (0.057)	0.233* (0.097)	0.987*^ (0.246)	1.549*^ (0.308)	0.838	2
From 1 to 3 months	0.044 (0.045)	0.125* (0.056)	0.732*^ (0.128)	1.087*^ (0.23)	0.880	1
From 3 to 6 months	-0.031 (0.034)	0.032 (0.049)	0.455* (0.138)	0.942*^ (0.213)	0.895	2
From 6 to 12 months	0.028 (0.031)	0.047 (0.039)	0.148* (0.055)	0.195* (0.068)	0.433	1
Long term notice	-0.003 (0.023)	-0.014 (0.037)	-0.168* (0.079)	-0.263* (0.117)	0.791	1

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 14. Interest rate pass through based on biviriate Var model from policy to lending rate redeemable in UAH. Short sample estimation

Bank lending rate(ss)	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Correlation coefficient*	*Lag order of Var*
To firms						
Up to 1 month	0.125	0.468^	0.523^	0.523^	0.177	1
	(0.260)	(0.349)	(0.391)	(0.391)		
From 1 to 3 months	0.139	0.638*^	0.669*^	0.669*^	0.366	1
	(0.174)	(0.212)	(0.278)	0.278		
From 3 to 6 months	0.428*	0.519*	0.546*	0.546*	0.210	1
	(0.152)	(0.162)	(0.179)	(0.179)		
From 6 to 12 months	0.319*	0.533*	0.639*	0.639*	0.407	1
	(0.080)	(0.109)	(0.149)	(0.149)		
Long term notice	-0.001	-0.010	0.098	0.096	0.273	2
	(0.112)	(0.121)	(0.107)	(0.107)		
To households						
Up to 1 month	0.682^	0.055^	0.025^	0.025^	0.276	1
	(0.473)	(0.606)	(0.605)	(0.605)		
From 1 to 3 months	-0.625	0.337^	0.174^	0.174^	0.187	1
	(0.354)	(0.376)	(0.333)	(0.333)		
From 3 to 6 months	0.609^	0.336^	0.389^	0.389^	0.166	1
	(0.323)	(0.381)	(0.378)	(0.378)		
From 6 to 12 months	0.141	-0.77	-0.235	-0.235	0.244	1
	(0.222)	(0.262)	(0.257)	(0.257)		
Long term notice	-0.151	-0.305*	-0.280	-0.292	0.378	3
	(0.129)	(0.139)	0.201	0.206		

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 15. Interest rate pass through based on biviriate Var model from policy to deposit rate redeemable at UAH. Full sample estimation

Bank deposit rate(fs)	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Correlation coefficient*	*Lag order of Var*
To firms						
Up to 1 month	0.021 (0.039)	0.048 (0.051)	0.274* (0.096)	0.388* (0.126)	0.706	1
From 1 to 3 months	0.009 (0.025)	0.032 (0.032)	0.243* (0.043)	0.368* (0.067)	0.792	1
From 3 to 6 months	-0.192* (0.033)	-0.253* (0.050)	-0.087 (0.083)	0.028 (0.087)	0.585	1
From 6 to 12 months	-0.009 (0.017)	0.008 (0.031)	0.114* (0.079)	0.273* (0.116)	0.840	2
Long term notice	-0.038 (0.024)	-0.019 (0.033)	0.293* (0.056)	0.446* (0.088)	0.863	1
To households						
Up to 1 month	-0.063* (0.028)	-0.087 (0.047)	0.011 (0.179)	0.354 (0.247)	0.843	2
From 1 to 3 months	0.008 (0.009)	0.013 (0.023)	0.238* (0.102)	0.555* (0.149)	0.904	2
From 3 to 6 months	0.010 (0.018)	0.024 (0.028)	0.263* (0.108)	0.620* (0.182)	0.913	2
From 6 to 12 months	0.039 (0.023)	0.092* (0.039)	0.629* (0.111)	0.918* (0.175)	0.938	2
Long term notice	0.006 (0.036)	0.094 (0.060)	-0.017 (0.353)	0.057 (0.748)	0.915	3

* denotes 5 % level significance of t statistics;
^ denotes equality to 1 at 5% level

Table 16. Interest rate pass through based on biviriate Var model from policy to deposit rate redeemable at UAH. Short sample estimation

Bank deposit rate(fs)	*Immediate pass through*	*Pass through in a month*	*Pass through after 12 months*	*Pass through after 36 months*	*Correlation coefficient*	*Lag order of Var*
To firms						
Up to 1 month	0.274 (0.664)	0.331 (0.868)	0.346 (0.934)	0.346 (0.934)	0.225	1
From 1 to 3 months	0.734 (0.794)	0.360 (0.907)	0.435 0.912	0.435 (0.912)	0.317	1
From 3 to 6 months	-0.535 (0.843)	0.128 (0.921)	0.043 (0.984)	0.043 (0.984)	0.199	1
From 6 to 12 months	0.189 (0.512)	0.330 (0.597)	0.333 (0.606)	0.333 (0.600)	0.250	1
Long term notice	0.183 (0.377)	0.537 (0.324)	1.030* (0.383)	1.021* (0.388)	0.156	3
To households						
Up to 1 month	0.324* (0.534)	2.18*^ (0.659)	2.214*^ (0.694)	2.214*^ (0.694)	0.413	1
From 1 to 3 months	0.301 (0.232)	1.201* (0.426)	2.501*^ (1.031)	2.502*^ (1.032)	0.471	1
From 3 to 6 months	0.279 (0.257)	0.922* (0.404)	1.293* (0.609)	1.293* (0.609)	0.340	1
From 6 to 12 months	0.373 (0.339)	1.156* (0.418)	1.131* (0.444)	1.131* (0.444)	0.270	1
Long term notice	0.424 (0.383)	0.316 (0.474)	0.337 (0.491)	0.337 (0.491)	0.460	1

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 17. Interest rate pass through based on Multivariate VAR model from market to credit rates redeemable at UAH. Full sample estimation.

Bank lending rate	Immediate pass through	Pass through in a month	Pass through after 12 months	Pass through after 36 months	Lag order of Var	Market rate chosen
						Inerbank lending rate with maturity of
To firms						
Up to 1 month	0.099* (0.022)	0.189* (0.042)	0.401^ (0.030)	0.305^ (0.371)	3	32 - 92 days
From 1 to 3 months	0.016 0.017	0.079* (0.031)	0.308 0.198	0.056 (0.329)	1	32 - 92 days
From 3 to 6 months	0.011 (0.013)	0.025 (0.023)	0.553^ (0.211)	0.333^ (0.597)	2	32 - 92 days
From 6 to 12 months	0.007 (0.006)	0.047* (0.012)	0.436 (0.160)	0.419^ (0.500)	2	32 - 92 days
Long term notice	0.018 (0.017)	0.046 (0.033)	0.072 (0.138)	0.049 (0.195)	1	32-92 days
To households						
Up to 1 month	0.040 (0.050)	0.066 (0.090)	0.233^ (0.460)	0.176 (0.496)	2	32-92 days
From 1 to 3 months	0.066 (0.036)	0.106* (0.047)	0.245 (0.249)	0.060 (0.452)	1	32-92 days
From 3 to 6 months	0.009 (0.034)	0.032 (0.052)	-0.163 (0.192)	0.528 (0.375)	1	32 - 92 days
From 6 to 12 months	-0.003 (0.027)	-0.017 (0.038)	0.042 (0.112)	0.624 (0.141)	1	32-92 days

* denotes 5 % level significance of t statistics;
^ denotes equality to 1 at 5% level

Table 18. Interest rate pass through based on Multivariate VAR model from policy to credit rates redeemable at UAH. Full sample estimation.

Bank lending rate	Immediate pass through	Pass through in a month	Pass through after 12 months	Pass through after 36 months	Lag order of Var
To firms					
Up to 1 month	0.017 (0.026)	0.063 (0.049)	0.808*^ (0.250)	1.852*^ 0.481	3
From 1 to 3 months	0.002 0.019	0.036 (0.033)	0.588*^ (0.124)	0.927*^ (0.201)	1
From 3 to 6 months	0.034* (0.014)	0.066* (0.024)	0.510*^ (0.158)	1.271*^ (0.375)	2
From 6 to 12 months	0.028* (0.007)	0.057* (0.014)	0.421*^ 0.124	1.006*^ (0.380)	2
Long term notice	0.031 (0.019)	0.090* (0.034)	0.753*^ (0.147)	1.128*^ (0.238)	1
To households					
Up to 1 month	0.131* (0.056)	0.221* (0.098)	0.936*^ (0.250)	1.502*^ (0.311)	2
From 1 to 3 months	0.099* (0.041)	0.148* (0.048)	0.658* (0.141)	1.063*^ (0.271)	1
From 3 to 6 months	0.037 (0.038)	0.096 (0.054)	0.652*^ (0.110)	1.012*^ (0.229)	1
From 6 to 12 months	0.011 (0.030)	0.010 (0.039)	0.119* (0.062)	0.176* (0.085)	1

* denotes 5 % level significance of t statistics;

^ denotes equality to 1 at 5% level

Table 19. Interest rate pass through based on Multivariate VAR model from deposit to credit rates redeemable at UAH. Full sample estimation.

Bank lending rate	Immediate pass through	Pass through in a month	Pass through after 12 months	Pass through after 36 months	Lag order of Var	Deposit rate chosen
To households						*To households*
Up to 1 month	0.216* (0.090)	0.456* (0.160)	1.184*^ (0.547)	0.837*^ (0.576)	2	From 3 to 6 months
From 1 to 3 months	0.061 (0.065)	0.206* (0.086)	0.622*^ (0.251)	0.839*^ (0.373)	1	From 3 to 6 months
From 6 to 12 months	-0.049 (0.576)	0.022 (0.069)	0.191 (0.123)	0.228 (0.131)	1	From 1 to 6 months

Table 20. Interest rate pass through based on Multivariate VAR model from policy to credit rates redeemable at UAH. Full sample estimation.

Immediate pass through	Pass through in a month	Pass through after 12 months	Pass through after 36 months	Equation for the lending rate
				To firms
-0.012 (0.032)	0.023 (0.070)	0.251* (0.320)	1.160*^ (0.425)	Up to 1 month
0.069 (0.043)	0.138 (0.077)	0.557*^ (0.216)	0.745*^ (0.250)	From 1 to 3 months
-0.026 (0.037)	-0.001 (0.079)	0.395^ (0.337)	0.955^ (0.515)	From 3 to 6 months
-0.042 (0.039)	-0.018 (0.079)	0.285^ (0.344)	0.728^ (0.667)	From 6 to 12 months
0.252* (0.066)	0.359* (0.089)	0.708*^ (0.168)	0.861*^ (0.207)	Long term notice
				To households
0.027 (0.033)	0.021 (0.075)	0.37* (0.20)	0.89*^ (0.24)	Up to 1 month
0.043 (0.039)	0.11 (0.08)	0.42* (0.22)	0.83*^ (0.25)	From 1 to 3 months
0.062 (0.042)	0.123 (0.075)	0.548* (0.205)	0.802*^ 0.271	From 3 to 6 months
0.046 (0.042)	0.082 (0.074)	0.450* 0.221	0.682*^ 0.309	From 6 to 12 months

Table 21. Results from Granger causality test

Bank lending rate	Bank deposit rate	P -value	Correlation coefficient
To firms	*To households*		
Up to 1 month	From 3 to 6 months	0.977	0.929
From 1 to 3 months	From 6 to 12 months	0.159	0.975
From 3 to 6 months	From 6 to 12 months	0.222	0.978
From 6 to 12 months	From 6 to 12 months	0.819	0.975
Long term notice	From 6 to 12 months	0.573	0.962
To households			
Up to 1 month	From 3 to 6 months	**0.016***	0.836
From 1 to 3 months	From 3 to 6 months	**0.007***	0.884
From 3 to 6 months	From 6 to 12 months	0.982	0.874
From 6 to 12 months	From 3 to 6 months	**0.012***	0.452
Long term notice	From 6 to 12 months	0.144	-0.741

Chart 5. The amount of credits ginev in the economy.

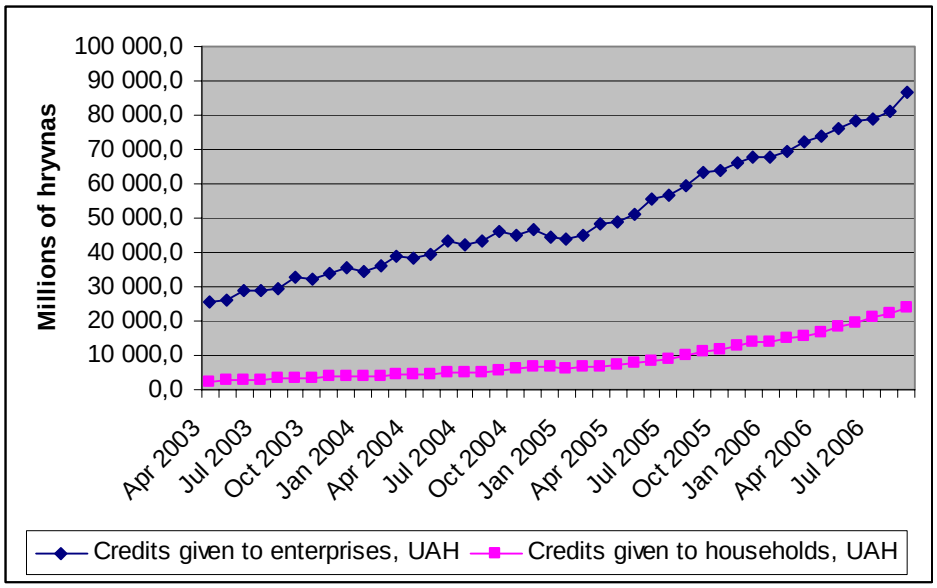


Chart 6. Interest rate pass through to lending rates redeemable in UAH. Full sample esimation.

(The change in lending rate to the 1% cumulative shock in market rate)

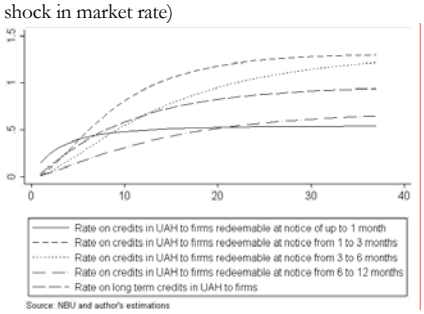


Chart 7. Interest rate pass through to Lending rates redeemable in the US dollar. Full sample estimation

(The change in lending rate to the 1 % cumulative shock in market rate)

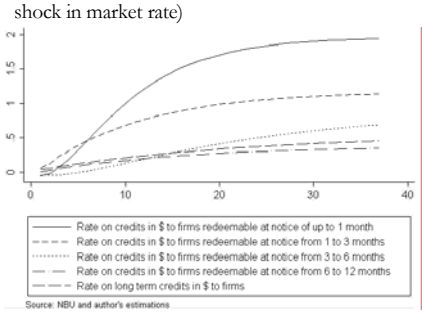


Chart 8. Interest rate pass through to deposit rates to firms redeemable in UAH. Full sample estimation.

(The change in deposit rate to the 1 % cumulative shock in market rate)

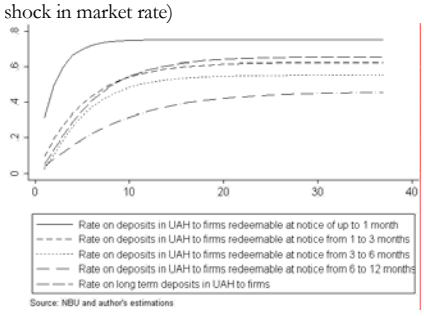


Chart 9. Interest rate pass through to deposit rates to households redeemable in UAH. Full sample estimation

(The change indeposit rate to the 1 % cumulative shock in market rate)

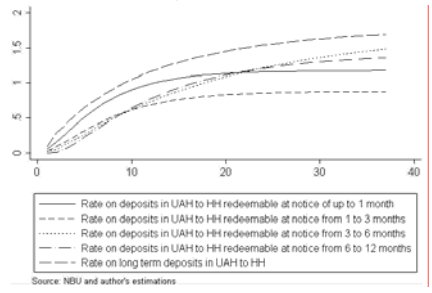


Chart 10. Interest rate pass through to lending rates redeemable in UAH. Short sample esimation.

(The change in lending rate to the 1 %cumulative shock in market rate)

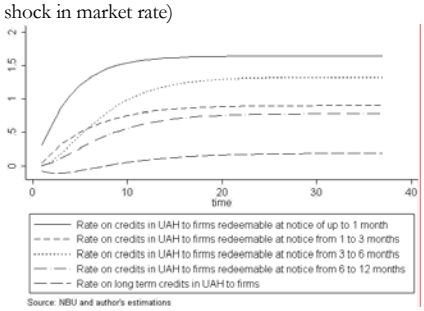


Chart 11. Interest rate pass through to Lending rates redeemable in the US dollar. Short sample estimation

(The change in lending rate to the 1% cumulative shock in market rate)

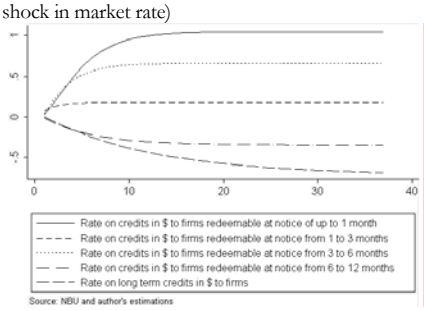


Chart 12. Interest rate pass through to deposit rates to firms redeemable in UAH. Short sample estimation.

(The change in deposit rate to the 1 % cumulative shock in market rate)

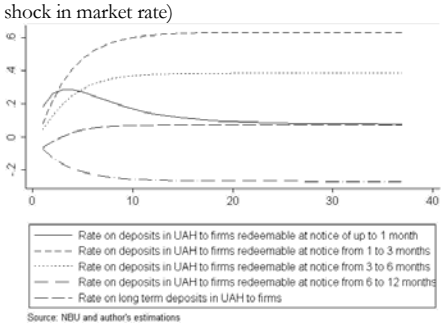


Chart 13. Interest rate pass through to deposit rates to households redeemable in UAH. Short sample estimation

(The change in deposit rate to the 1 % cumulative shock in market rate)

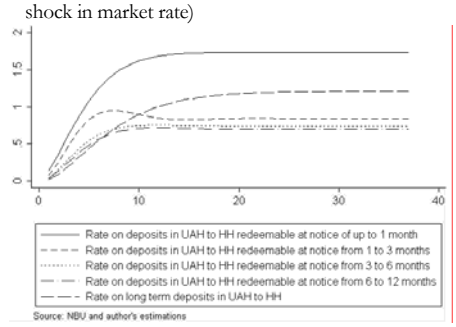


Chart 14. Interest rate pass through to lending rates redeemable in UAH. Monetary policy approach Full sample esimation.

(The change in lending rate to the 1 %cumulative shock in discount rate)

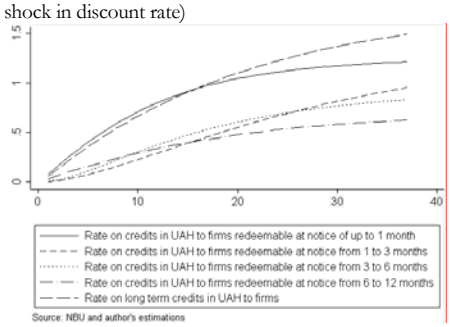


Chart 15. Interest rate pass through to lending rates redeemable in the UAH Monetary policy approach Short sample estimation

(The change in lending rate to the 1% cumulative shock in discount rate)

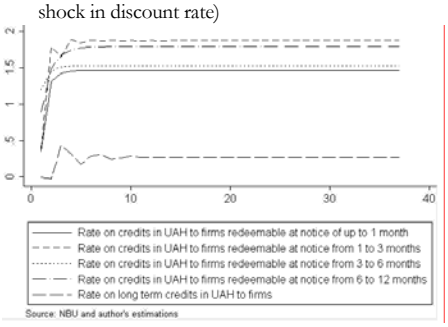


Chart 16. Interest rate pass through to lending rates to households redeemable in the UAH. Monetary policy approach. Full sample esimation.

(The change in lending rate to the 1 %cumulative shock in discount rate)

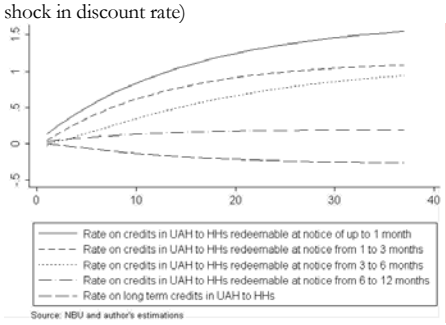


Chart 17. Interest rate pass through to lending rates to households redeemable in UAH. Monetary policy approach. Short sample estimation.

(The change in lending rate to the 1% cumulative shock in discount rate)

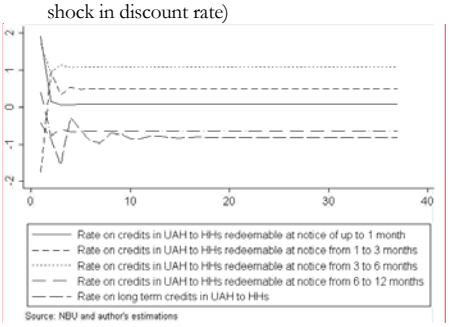


Figure 18. Interest rate pass through to deposit rates redeemable in UAH. Monetary policy approach. Full sample esimation.

(The change in deposit rate to the 1 %cumulative shock in discount rate)

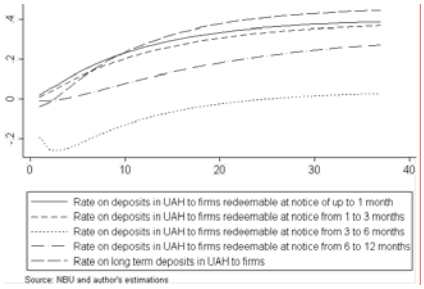
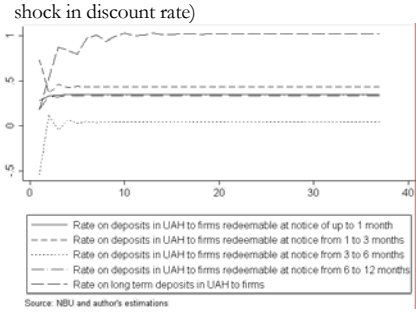


Figure 19. Interest rate pass through to deposit rates redeemable in the UAH Monetary policy approach. Short sample estimation

(The change in deposit rate to the 1% cumulative shock in discount rate)



INDEX