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INTEREST RATE PASS-THROUGH IN UKRAINE: EVIDENCE FROM THE BANK OWNERSHIP

ABSTRACT

A full-scale war started by Russian Federation on February 24th, 2022 disrupted the classic monetary policy Ukraine has been conducting for years. Nevertheless, it remains critical to preserve price stability. In June 2022, NBU significantly increased its key policy rate aiming to decrease inflationary pressure through higher market interest rates. Hence, the Central bank still relies on the interest rate transmission mechanism despite the war. This research is focused on the transmission of the key policy rate changes to the commercial bank interest rates depending on the banking sector structure. We believe that this research is useful not only for the west academia but policymakers since it helps to assess monetary policy efficiency. We tested the transmission of changes in key policy rates on new loans' and deposits' interest rates of different maturities and groups of banks based on banks' ownership that in the case of Ukraine closely connected to the bank's efficiency. We applied autoregressive distributed lag models with error correction forms. Our research confirms that interest rate pass-through from the key policy rate to the bank interest rates differs for banking groups. Less effective banks have more powerful transmission to their new deposits interest rates and weaker to new loans interest rates, therefore, exposed to interest risk. Moreover, according to our results, interest rate pass-through is weaker with higher maturity among both deposits and loans.

Keywords: monetary policy, key policy rate, autoregressive distributed lag models, interest rate channel, transmission mechanism, corporate and household interest rates

JEL Classification: C22, E40, E43, E52, E58, E59

INTRODUCTION

Since the crisis in 2015-2016, Ukraine has started a series of reforms in the financial sector. The transition to the inflation targeting (IT) regime was a key one. It helped to curb inflation and anchor inflation expectations for both households and corporates. IT regime works through several channels including the interest rate channel through which key policy rate influences inflation. By changing the key policy rate Central bank controls the price of the financial resources, thus economic agents' behavior. High interest rates discourage consumption and investment raising incentives for savings. As a result, a constrained aggregate demand slows down inflation. The interest rate channel operates in two steps – signal from the key policy rate is transmitted to the money market interest rates. Afterward, interbank interest rates define the retail interest rates.

This simplistic description of the interest rate pass-through mechanism in practice is more complex. Despite the NBU generally succeeded in curbing inflation since 2016, the effectiveness of the interest rate pass-through varies in different periods. The reaction of the market interest rates differs for periods of key policy rate increase and decrease. From Figure 1 we can observe that transmission works differently for corporate and household segments (Appendix A includes more granular data). However, the goal of our research is to confirm that other characteristics of the banking sector also determine transmission power. In our research, we emphasize the impact of loans and deposits maturity structure and bank ownership structure.

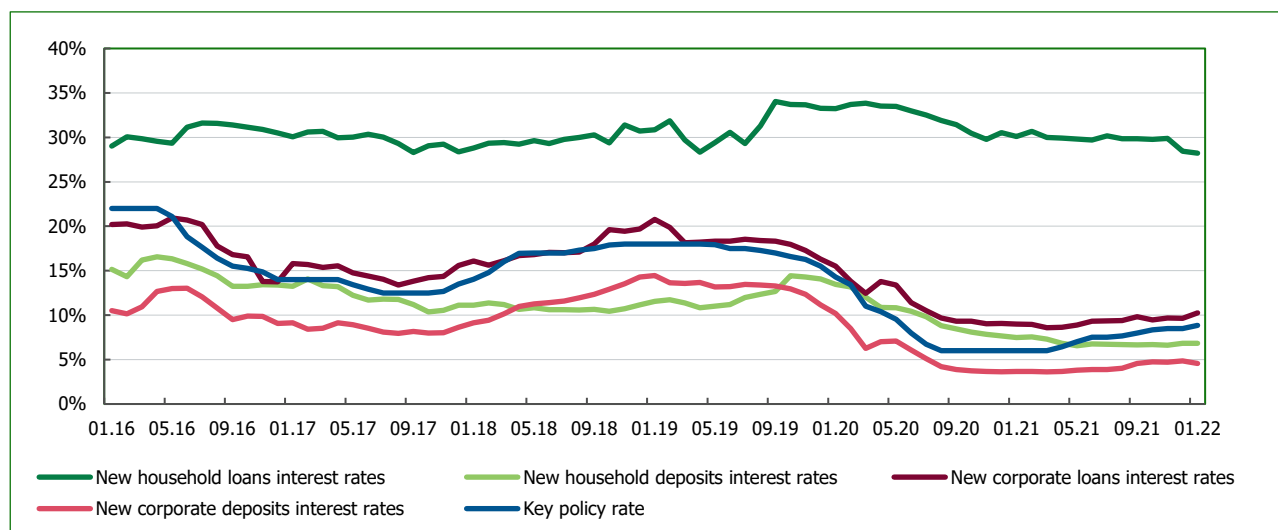


Figure 1. New loans and deposits interest rates in Ukraine. (Source: official website of the NBU)

Firstly, we aim to analyze interest rate transmission on interest rates for loans and deposits of different maturities. We expect that the interest rate pass-through is weaker for longer-maturity deposits and loans. According to Friedman (1980) short-term yields, defined by supply, demand, and inflation expectations play a large role in determining long-term yields. Loans and deposits with higher maturity require an additional surcharge for risk, therefore, transmission is slower.

Secondly, we suggested that the effectiveness of the interest rate pass-through could vary from bank to bank depending on the banks' ownership type. In this research, we analyze separately state-owned banks, private Ukrainian, and international banks. We used bank ownership as a proxy for the business model and assumed that the effectiveness of the business model could define the speed and strength of the interest rate reaction to the market signals, in particular monetary policy impulses. We contribute to the literature by analyzing the influence of business models' effectiveness on the interest rate pass-through in Ukraine.

Our research questions:

- What are the long-run and short-run relationships between bank interest rates and key policy rates in Ukraine depending on the instruments' maturity?
- What are the differences in the interest rate pass-through depending on the banks' business models and their effectiveness?

The main results are the following:

We found that with longer maturity interest rate pass-through is fading for both loans and deposits. Short-term loans and deposits have a faster and stronger response to the change in the key policy rate. Therefore, shifting the loan portfolio and funding structure to a shorter maturity accelerates transmission.

According to our results, bank ownership structure, which in the case of Ukraine determines the business model, also influences interest rate pass-through. Moreover, banks' business models influence the maturity structure of loans and deposits. State-owned banks, except for PrivatBank, demonstrate the strongest response in both new corporate and household deposit interest rates to the policy rate changes. However, private Ukrainian and foreign banks adjust their deposit rates at a faster pace. On the contrary, those banks have the strongest reaction to changes in the new corporate loan interest rates, with foreign banks exhibiting the quickest response time and private Ukrainian banks the slowest reaction. PrivatBank has either the slowest or the weakest response to the key policy rate change.

Combining maturity structure and banking sector structure we can find some interdependencies that will influence banks' reaction to key policy rate changes. For instance, in the case of contractionary monetary policy less effective banks will be more exposed to the interest rate risk since their interest rates on new loans adapt slower and weaker than deposits. Depending on the market power, the reaction to the decisions of the central bank can be slowed down.

We suggest considering a wider time series in future research. In particular, the 2022 period should be treated very carefully due to structural breaks in the data. Further analysis could be concentrated on the disruption provoked by the

war revealing new results. Also, there is still room for research with existing data by focusing on the asymmetry of the interest rate's reaction to the key policy rate.

The rest of the paper is organized as follows. In the second section, we described our literature review where we concentrated on methodologies used in the recent papers. In the third section, we described our methodology. Forth section is devoted to the data analysis, specifically, why results could vary across different bank ownership. Results are described in the fifth section and, finally, in the sixth section, we made a conclusion.

LITERATURE REVIEW

Studies on interest rate pass-through in Ukraine are scarce. Recently, Zholud, Lepushynskiy, and Nikolaychuk (Zholud, Lepushynskiy, and Nikolaychuk, 2019) conducted research on monetary policy effectiveness and analyzed different monetary transmission channels including the percent channel. They indicated that the structure of the Ukrainian banking system is crucial for the effectiveness of the transmission, in particular dollarization level or share of non-performing loans (NPLs). They analyzed different channels of the transmission mechanism and found that the exchange rate channel is one of the main sources of key policy transitions on inflation. They also confirmed that commercial bank rates on business loans and deposits quickly and fully react to changes in the key rate. The reaction of household deposit rates is slower and weaker. However, they did not analyze different bank interest rates across maturity and bank ownership.

The percent channel of the transmission mechanism could be characterized as the speed and level of interest rate response to the change of the central bank's key policy rate (monetary policy impulse). Therefore, in papers on the percent channel, researchers are estimating the effects of the key policy rate and other factors on different types of interest rates. The response of the interest rates is analyzed in the short-run and long-run.

The key policy rate does not always lead to the same change in the loan or deposit interest rates. Full transmission of the key policy rate to the interest rates is a rather rare event. For example, the full transmission could be observed in the USA (Espinosa-Vega and Rebucci, 2003; Friedman, 1980). However, in some European countries, monetary policy impulse transmission is partial (Mojon, 2000; Kok & Werner, 2006; Donnay & Degryse, 2001). The smallest transmission could be observed in countries with emerging markets. For instance, Saborowski & Weber (Saborowski and Weber 2013) analyzed monetary policy impulses in more than 70 countries and estimated the average response of the loan interest rates to the final borrower. In particular, the average response was approximately 60% of the output impulse in 2008 and 30% in 2003.

Interest rates do not respond to the change of the key policy rate instantly. It takes time to adjust, for example, in most of the literature major part of the response to the monetary impulse translates to the interest rates from 3 to 6 months. However, in some countries, this process could be shorter (Cas, Carrion-Menendez, and Frantischek, 2011) or longer (Espinosa-Vega and Rebucci, 2003).

Most of the papers are concentrated on credit interest rates neglecting deposit rates. However, in those papers where both types of interest rates are analyzed, results indicate the slower and weaker response of the deposit rates to the key policy rate change (Mojon 2000; de Bondt 2002). Some of the countries with emerging markets are exceptions (Hana, Thailand, or Indonesia) as in those countries the effect of monetary impulse on the credit rates is even weaker than on deposit rates (Tai and Wai Mun, 2012).

The level of response varies depending on the segments of the market. For example, interest rates with longer maturity have a lower level of response to the change of the key policy rate than interest rates with a short maturity (Kok and Werner, 2006; de Bondt, 2002). In advanced economies, monetary impulses are fully transmitted on both interest rates (long and short maturity). Nevertheless, the only difference is the speed of transmission: it is faster on short-term interest rates (Hansen and Welz 2011). However, maturity is not the only factor influencing the speed and level of the response to the monetary policy impulse. For instance, long-term mortgage interest rates could have a higher and faster level of response than short-term consumer loan interest rates (Kok and Werner, 2006; de Bondt, 2002). The level of the response to the key policy rate could vary over time. In particular, financial crises are among the factors that could influence the response to the monetary policy impulse and change the pricing mechanism in banking services (Ahmad, Aziz, and Rummun 2013).

AIMS AND OBJECTIVES

In this research, we aim to analyze short-term and long-term relationships between key policy rate and new loans and deposits interest rates in Ukrainian commercial banks. Additionally, our goal is to demonstrate the different reactions to the key policy rate change depending on bank ownership.

Objectives of the article are the following:

- to describe interest rates in Ukrainian banks and explain factors determining the dynamics;
- to build a set of econometric models capturing long-run and short-run relationships between key policy rate and commercial banks' new interest rates depending on maturity and bank ownership;
- to estimate impulse response functions describing the reaction of the interest rates to 1 p.p. key policy rate increase.

METHODS

In general, the most common method in the interest rate pass-through is Error Correction Model (ECM) (Banerjee, Bystrov, and Mizen, 2010; Ahmad, Aziz, and Rummun, 2013; de Bondt, 2002; Espinosa-Vega and Rebucci, 2003; Mojon, 2000; Leroy and Lucotte 2015; Leuvensteijn et al. 2008) and Vector Error Correction Model (VECM) (Burgstaller, 2005). The advantage of these methodologies is the ability of quantitative estimation of the long-run relationship between interest rates and the policy rate. Moreover, they allow estimating the speed of adjustment of interest rates indicating how fast they can return to their long-run in case of a deviation from it.

In our research, we applied the Auto-Regressive Distributed Lag (ARDL) model with a cointegration technique and error correction term. ARDL(p,k) models regress the dependent variable on p of its lags and k lags of one or more additional regressors.

ARDL model could be applied only when variables are integrated in levels (I(0)) or differences (I(1)) or a combination of both. For this purpose, we used the Dickey-Fuller test and the Phillips-Perron test for unit root. Thus, the ARDL model allows using data with mixed stationarity.

Most importantly, ARDL models allow us to estimate the long-run relationship and cointegration testing between the dependent and independent variables by a linear transformation of the ARDL model into ECM form. For this purpose, we applied the boundary test (Pesaran, Shin, and Smith, 2001) in our research. In the case of the positive cointegration test and significant long-run coefficient, we can confirm the presence of the interest rate pass-through and quantitatively estimate it. Cointegration testing indicates whether equilibrium forces will pair time series and drift them not far apart from each other (Nkoro and Uko, 2016).

In most of the literature devoted to the interest rate pass-through, authors are using monetary policy rates (we refer to the monetary policy rates as a key policy rate or a refinance rate) or money market rates (money market rates mean LIBOR, EURIBOR, and EONIA which are benchmark rates for the Central banks in their monetary policy) as the main factor determining the interest rates of the banks. In our case, our independent variable – key policy rate and dependent variables are a wide range of bank interest rates weighted on the size of loans or deposits.

We collected monthly data on household and corporate deposit and lending rates of different maturity and for groups of banks with different ownership. NBU implemented inflation targeting in 2016, therefore, to avoid breaking points in data we included in the analysis period from 1M2016 to 1M2022. We ended up in total with 52 models: all new household and corporate loans and deposits interest rates (4 models) plus grouped by bank ownership (5 categories – 20 models) and maturity (7 categories – 28 models) (Table 1).

Table 1. Data structure. Note: * PrivatBank is singled out in a separate case due to extensive related party lending, insolvency, and subsequent nationalization, which will be discussed in more detail. (Source: NBU, own calculations)

Grouped by bank ownership	Grouped by maturity
▪ PrivatBank*	▪ Current deposit/ overdraft loan
▪ State-owned banks (w/o PrivatBank)	▪ Overnight
▪ Private Ukrainian banks	▪ Less than 1 month
▪ Foreign banks (w/o RF banks)	▪ 1-6 month
▪ RF banks (excluded from analysis)	▪ 6- 12 months
	▪ 1-5 years
	▪ More than 5 years

Each model is built on separate new bank deposits or loans interest rate varying across maturity and bank ownership. Our ARDL model setup is the following:

$$y_t = \alpha + \sum_{i=1}^p \gamma_i y_{t-i} + \sum_{j=1}^k \delta_j x_{t-j} + u_t, \quad (1)$$

where y_t is a bank interest rate x_t is a key policy rate, u_t is an error term, p and k are the lags numbers which we defined according to the Bayesian information criteria (BIC).

BIC has a higher "punishment" for an additional lag in comparison with Akaike information criteria. Therefore, to avoid the risk of overfitting the model we preferred to use BIC.

The ECM can be derived from the ARDL model through a simple parametrization of short-run dynamics into a long-run relationship without losing any information. It could be done through the first differences:

$$\Delta y_t = \alpha + \sum_{i=1}^{p-1} \phi_i \Delta y_{t-i} + \sum_{j=1}^{k-1} \psi_j \Delta x_{t-j} - \lambda(y_{t-1} - \theta x_t) + u_t, \quad (2)$$

where $\theta = \frac{\sum_{j=0}^k \delta_j}{\lambda}$ is a long-run coefficient, $\lambda = 1 - \sum_{i=1}^p \gamma_i$ is an adjustment rate, and $(y_{t-1} - \theta x_t)$ is an error correction term (EC).

We suggest that impulse response functions (IRF) are helpful in the short-run and long-run analysis. Those models that passed the cointegration test and had significant long-run coefficients were chosen for IRF simulations. Our IRFs are based on the variance-covariance matrix with applied Newey-West standard errors and 1 million iterations for each period to construct 95% confidence.

Ownership structure analysis

Ukraine went through a series of reforms resulting in a large banking system "cleanup" from 2015 to 2017. The number of commercial banks reduced from 163 to 82. Some of the banks were nationalized, in particular PrivatBank, the largest bank in Ukraine. We distinguish PrivatBank as a separate case for the research. All banks can be broadly separated into three categories: state-owned, private Ukrainian, and foreign-owned, mainly by the international banking groups. These banking groups are different in terms of corporate governance and business models. We assume that due to these differences, banks that belong to these groups may react differently to the changes in key policy rate.

There are four large state-owned banks operating in the market. Since PrivatBank's nationalization, the share of state-owned banks has become dominant. State-owned banks are characterized by a long history of weak corporate governance. Nevertheless, state-owned banks have been responsible for providing banking services and social payments to a wide range of population categories. They have developed a wide branch network, which leads to high administrative costs and lower operational efficiency. The government supports state-owned banks; thus, they are considered a "safe haven" in times of crisis stimulating clients to hold finances on their accounts significantly increasing state-owned banks' liquidity. As a result, state-owned banks are less reactive to market shifts due to the absence of market pressure on liquidity, profitability, and solvency.

Currently, the largest state-owned PrivatBank has a widespread branch network and specializes in consumer lending (Figure 2) providing banks with the highest profits in the banking system (Table 2). But we analyze it separately as for a long time its portfolio was driven by corporate related-party lending on non-market terms. Hence, we assume it may react differently to key policy rate change.

Table 2. Bank structure in Ukraine. Note: *shares from total by the end of 2021. (Source: NBU, access mode: https://bank.gov.ua/files/stat/Aggregation_new.zip)

	Total assets*, %	Net assets*, %	Profits*, %	Number	Government bonds*, %
PrivatBank	24.7	19.8	45.2	1	35.4
State-owned banks w/o PrivatBank	25.0	26.9	9.8	3	27.6
Foreign banks w/o RF banks	26.2	27.9	22.7	18	10
Private banks	20.2	22.1	16.2	47	22.1

Foreign banks have the longest history of well-established corporate governance, hence these banks are mostly highly efficient. Foreign banks are active in the lending market, moreover, they are very careful in borrowers' analysis of financing the most viable companies. Their activity is focused generally on the corporate sector.

Ukrainian private banks are very heterogeneous: they have very different business models. Although private Ukrainian banks have emerged more prudent after the reform and considerably improved business models and corporate management, they are still less effective than foreign banks.

Based on Figures 2 and 3, it is evident that there are variations in the loan and deposit structures across different bank ownership groups. PrivatBank, being a major retail bank, has a predominantly household-focused loan and deposit structure. On the contrary, other banks tend to specialize in corporate lending, although there has been a slow shift towards consumer lending over the past years within private Ukrainian banks and other state-owned banks. For funding Ukrainian banking system relies on deposits almost evenly distributed between corporates and households among all banks except PrivatBank.

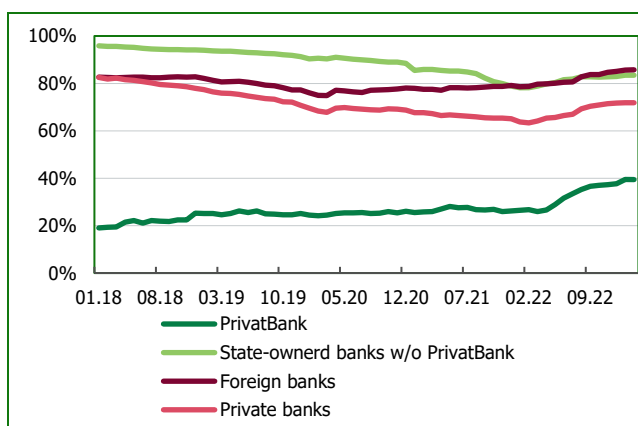


Figure 2. Share of corporate loans in the total loan portfolio. (Source: NBU, https://bank.gov.ua/files/4-Financial_markets.xlsx)

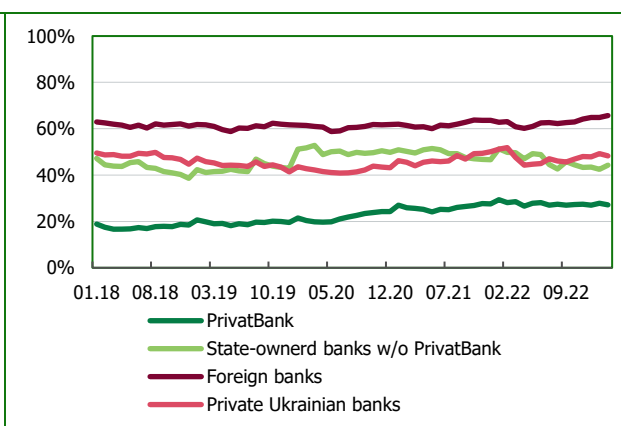


Figure 3. Share of corporate deposits in total deposits. (Source: NBU, https://bank.gov.ua/files/4-Financial_markets.xlsx)

Maturity structure analysis

Corporate deposits maturity is very short—more than a third of corporate deposits are overnights (Figure 4). Companies hold their funds in bank accounts but prefer to be mobile and have quick access to them.

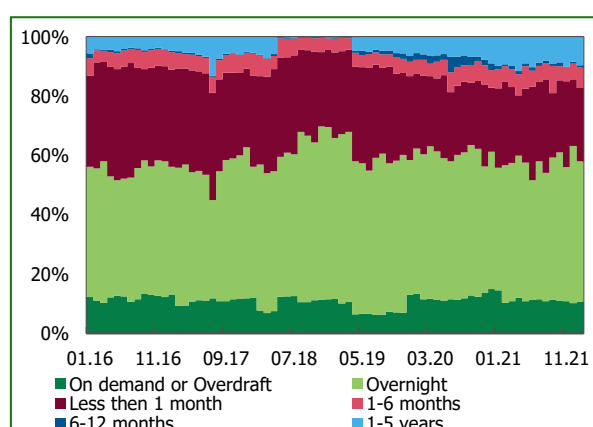


Figure 4. New NFC deposits' maturity structure. (Source: NBU, https://bank.gov.ua/files/4-Financial_markets.xlsx)

Household deposits have higher maturity in comparison with non-financial corporations (NFCs) deposits. Most of the household deposits are up to 6 months (Figure 5). However, households hold a high share of deposits on current accounts due to liquidity risk.

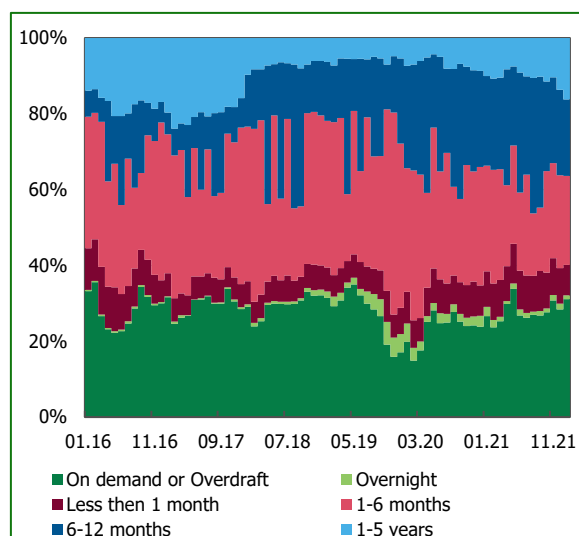


Figure 5. New household deposits' maturity structure. (Source: NBU, https://bank.gov.ua/files/4-Financial_markets.xlsx)

Banks' loan portfolio mostly includes corporate loans, slowly increasing during almost the entire observed period. According to the bank lending survey, over the last 6 years, the majority of the new corporate loans were short-term loans for working capital renewal or debt restructuring. From Figure 6, the maturity of most new corporate loans is less than 1 month.

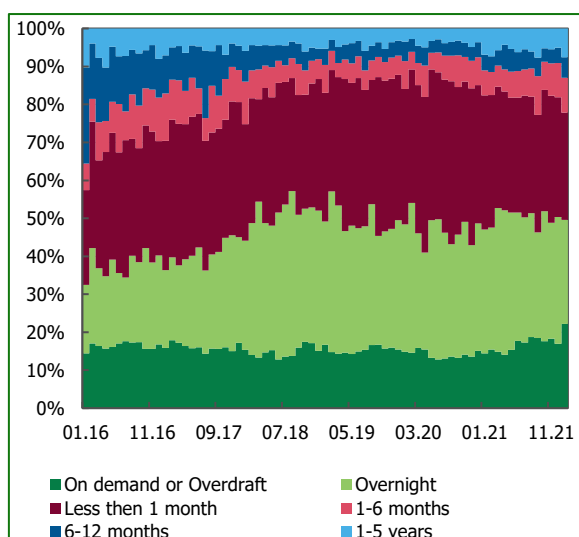


Figure 6. New NFC loans' maturity structure. (Source: NBU, https://bank.gov.ua/files/4-Financial_markets.xlsx)

On the contrary, households' loans have been growing faster but they have a very low share in the total portfolio. Most of the retail loan growth is fueled by consumer loans while mortgage is almost absent. Households' loans were also included in the analysis. However, most of them are risky consumer loans with interest rates near 30%. We suggest that household interest rates are driven by factors other than key policy rate. Risky consumer loans require a significant profit surcharge on top of the cost of funding. Moreover, high demand and competition are the key factors in consumer loans pricing in Ukraine.

RESULTS

Results across maturities

Our results confirm a long-run relationship between the key policy rate and all new NFC deposit interest rates. A 1% key policy rate change on average leads to a 0.9% increase in the NFC deposit rates. The transmission will be reflected by

interest rates in almost 3 months. As expected, the long-run reaction is decreasing with higher corporate deposits' maturity (Table 3).

Table 3. NFCs' deposits interest rates ARDL models results. Note: *p<0.05, **p<0.01, ***p<0.001. Correlation with a key policy rate. All models passed the cointegration test.

	All	Current deposit/over-draft loan	Overnight	Less than 1 month	1-6 month	6- 12 months	1-5 years	More than 5 years
correlation	0.9561	0.1029	0.8699	0.9161	0.3752	0.0638	0.8785	-0.2606
adj. rate	-0.186**	-0.124***	-0.214***	-0.211***	-0.307***	-0.425**	-0.281***	-0.375***
s.e	(0.054)	(0.029)	(0.057)	(0.054)	(0.051)	(0.127)	(0.074)	(0.106)
long-run coef.	0.845***	0.610***	0.900***	0.921***	0.825***	0.547***	0.639***	0.654*
s.e	(0.063)	(0.089)	(0.074)	(0.059)	(0.049)	(0.083)	(0.115)	(0.264)

Interest rates on household deposits react weaker and slower to the key policy rate change in comparison with corporate deposits (Table 4). For instance, if the policy rate is increased by 1%, then on average new household deposits' interest rates will increase by 0.6% and only half of the long-run effect will be realized in 6 months. Less than 1-month deposits have a higher adjusting rate than longer deposits meaning that short-term deposits adjust to the key policy rate faster than long-term deposits. According to the IRF (Appendix B) 1% key policy rate translates to deposits with a maturity 1-6 months faster and stronger than deposits with a maturity 6-12 months. In conclusion, long-term funding has a slower reaction to the key policy rate, therefore shifting funding structure to shorter maturity stimulates key policy rate transmission to both households and corporate deposits.

Table 4. Households' deposits interest rates ARDL models results. Note: *p<0.05, **p<0.01, ***p<0.001. Correlation with a key policy rate. Red color – cointegration test failure.

	All	Current deposit/over-draft loan	Overnight	Less than 1 month	1-6 month	6- 12 months	1-5 years	More than 5 years
correlation	0.8936	0.4178	0.9181	0.9453	0.9441	0.905	0.9386	0.7171
adj. rate	-0.125***	-0.0869*	-0.247**	-0.193***	-0.0782**	-0.164***	-0.112***	-0.0840
s.e	(0.028)	(0.040)	(0.077)	(0.042)	(0.028)	(0.037)	(0.029)	(0.046)
long-run coef.	0.606***	0.274	0.951***	0.630***	0.952***	0.799***	0.697***	0.883*
s.e	(0.102)	(0.234)	(0.101)	(0.079)	(0.173)	(0.116)	(0.100)	(0.400)

Key policy rate affects almost all corporate loan interest rates except loans with a maturity of more than 5 years. The overall long-term reaction of all new corporate loan interest rates to a 1 % policy rate change is 0.8% and the full effect is transmitted very quickly (Table 5). Long-run effects and adjusting rates with maturities of less than 1 month are relatively higher than models with longer maturity. Moreover, IRFs indicate a weaker monetary policy impulse with higher corporate loan maturity (Appendix B).

Table 5. NFCs' loans interest rates ARDL models results. Note: *p<0.05, **p<0.01, ***p<0.001. Correlation with a key policy rate. Red color – cointegration test failure.

	All	Current deposit/over-draft loan	Overnight	Less than 1 month	1-6 month	6- 12 months	1-5 years	More than 5 years
correlation	0.6846	0.0542	0.8075	0.8755	0.8075	0.2756	-0.0319	0.0095
adj. rate	-0.561***	-0.0771***	-0.208**	-0.329***	-0.324***	-0.189***	-0.216***	-0.790***
s.e	(0.091)	(0.009)	(0.067)	(0.074)	(0.064)	(0.043)	(0.058)	(0.120)
long-run coef.	0.828***	0.920***	1.047***	0.944***	0.757***	0.730***	0.851***	0.0668
s.e	(0.029)	(0.074)	(0.109)	(0.054)	(0.069)	(0.096)	(0.142)	(0.123)

As we expected almost all interest rates of new loans to households do not react to the key policy rate (Table 6). This is confirmed by the failed cointegration test and insignificant long-run coefficients across most maturities.

Table 6. Households' loan interest rates ARDL models results. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Correlation with a key policy rate. Red color – cointegration test failure.

	All	Current deposit/overdraft loan	Overnight	Less than 1 month	1-6 month	6- 12 months	1-5 years	More than 5 years
correlation	-0.0139	0.7499	-0.6303	0.7101	-0.089	0.2985	-0.1507	0.5085
adj. rate	-0.239**	-0.0321	-0.769***	-0.250**	-0.196*	-0.133	-0.269**	-0.186**
s.e	(0.076)	(0.040)	(0.126)	(0.086)	(0.077)	(0.074)	(0.079)	(0.069)
long-run coef.	0.122	0.472	-2.217***	0.804	0.159	0.0284	0.135	0.470
s.e	(0.103)	(0.860)	(0.632)	(0.476)	(0.700)	(0.257)	(0.102)	(0.249)

As a result, new loan interest rates' reaction is similar to deposit interest rates': short-term loans have a faster and stronger response to the change of the key policy rate. Consequently, shifting loan portfolio structure to a longer maturity is weakening transmission.

Results across bank ownership

Results across the different bank ownership groups confirm our hypothesis that bank ownership is influencing key policy rate transmission. The model showed a strong positive reaction of the new corporate deposits' interest rates to a key policy rate increase within all bank ownership groups. State-owned banks including PrivatBank have the strongest response to the monetary impulse, but their reaction is the slowest, especially PrivatBank's (Table 7).

Table 7. NFCs' deposit interest rates ARDL models results. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

	adj. rate	s.e	long-run coef.	s.e.
Privatbank	-0.0211**	-0.007	1.069***	-0.305
State-owned banks w/o Privatbank	-0.125**	-0.046	1.067***	-0.14
Foreign banks	-0.174**	-0.052	0.827***	-0.09
Private Ukrainian banks	-0.177**	-0.065	0.869***	-0.069

Household deposit interest rates react to the key policy rate increase similar to corporate interest rates across bank ownership groups except PrivatBank (Table 8). We observe that the key policy rate is influencing state-owned banks the most, the effect on private Ukrainian banks and foreign banks is lower but faster in contrast to the state-owned banks. PrivatBank's reaction is very weak even in comparison with other private Ukrainian or foreign banks. PrivatBank is benefiting from its size and well-developed branch network attracting numerous employers to have salary projects. As a result, PrivatBank has almost no incentives to adjust its deposit interest rates for households and deviates from market behavior.

Table 8. Households' deposit interest rates ARDL models results. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

	adj. rate	s.e	long-run coef.	s.e.
Privatbank	-0.151**	-0.046	0.330*	-0.156
State-owned w/o Privatbank	-0.0778***	-0.023	0.939***	-0.155
Foreign banks	-0.246***	-0.042	0.634***	-0.052
Private Ukrainian banks	-0.140***	-0.023	0.758***	-0.073

According to our results, key policy rate transmission to the new corporate loan interest rates is strongest among private Ukrainian and foreign banks. However, the adjustment rate in foreign banks is the highest while in Ukrainian private banks is the lowest (Table 9).

Table 9. NFCs' loans interest rates ARDL models results. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

	adj. rate	s.e	long-run coef.	s.e.
Privatbank	-0.312***	-0.082	0.590**	-0.207
State-owned w/o Privatbank	-0.183***	-0.051	0.867***	-0.169
Foreign banks	-0.365***	-0.074	0.944***	-0.045
Private Ukrainian banks	-0.122***	-0.034	1.063***	-0.147

It is also important to analyze IRFs demonstrating dynamics. The speed of the key policy rate transmission to the commercial banks' interest rates defines changes in interest income and losses revealing exposure to the interest rate risk. The level and speed of interest rate reaction will depend on both ownership structure and maturity structure, which are related.

As we mentioned above PrivatBank can deviate from market behavior and does not adjust its deposit rates quickly. Therefore, an increase in the key policy rate will not influence PrivatBank's net interest income significantly signaling the absence of significant interest risk (Figure 10).

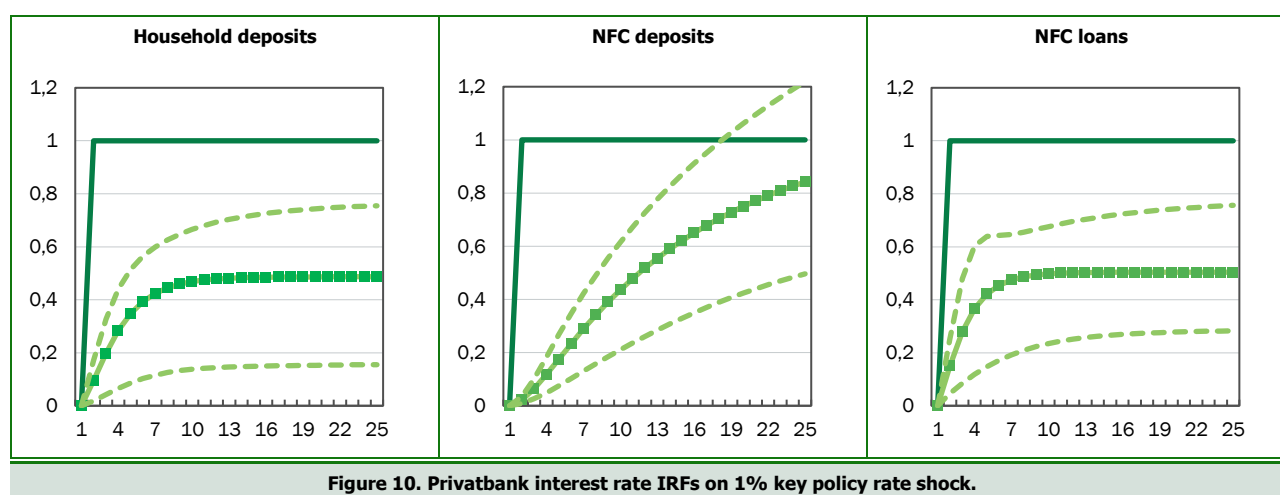


Figure 10. Privatbank interest rate IRFs on 1% key policy rate shock.

State-owned banks are exposed to the interest rate risk. From Figure 11 we observe a quick and strong reaction of the new corporate deposits interest rate to the key policy rate change among state-owned banks (w/o PrivatBank). On the contrary, interest rates of new corporate loans adjust more slowly. In the short term, corporate interest rates on new loans respond somewhat more quickly to key policy changes than household deposits. However, in the long run, both types of interest rates exhibit a similar response.

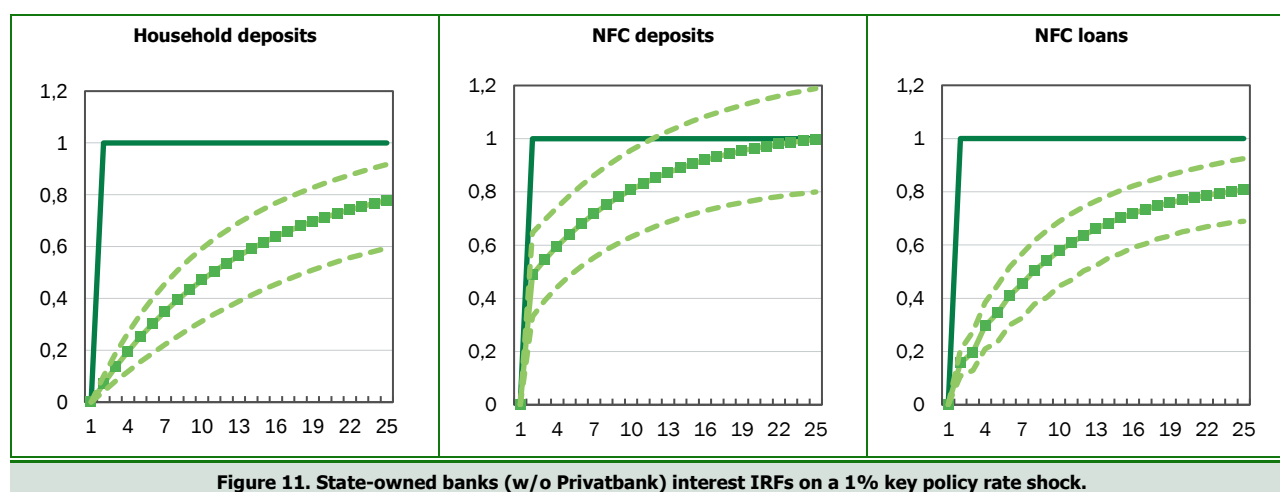


Figure 11. State-owned banks (w/o Privatbank) interest IRFs on a 1% key policy rate shock.

Figure 12 illustrates that the adjustment of interest rates for new corporate loans in Ukrainian private banks in response to changes in the key policy rate is a slow process. Specifically, a 1% increase in the key policy rate results in new corporate loan interest rates converging to corporate deposit rates after more than 18 months. During this period, Ukrainian private banks managed their interest rate risk by adjusting their household deposit interest rates at a sluggish pace. Additionally, it is worth noting that the long-term effect of changes in household deposit interest rates is less pronounced compared to that of corporate loans.

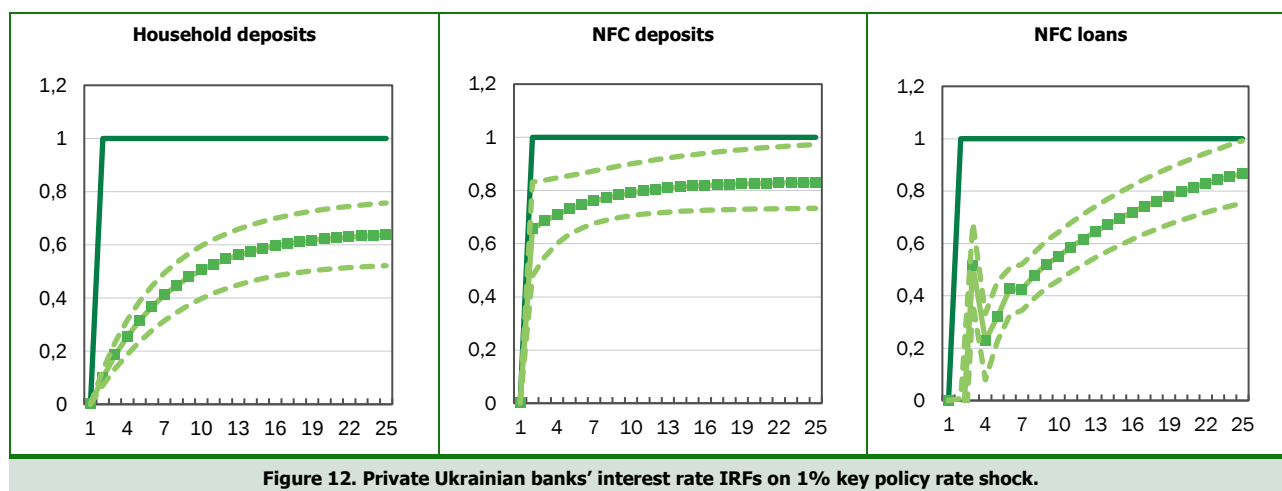


Figure 12. Private Ukrainian banks' interest rate IRFs on 1% key policy rate shock.

Foreign banks appear to adopt a similar approach to private Ukrainian banks in responding to changes in the key policy rate (Figure 13). During the first six months following a 1% increase in the policy rate, the adjustment of interest rates for corporate deposits is faster than for corporate loans. However, the reaction of foreign banks' household deposit rates to the key policy rate changes is slow and provides limited impact, which may serve as a hedge against interest rate risk.

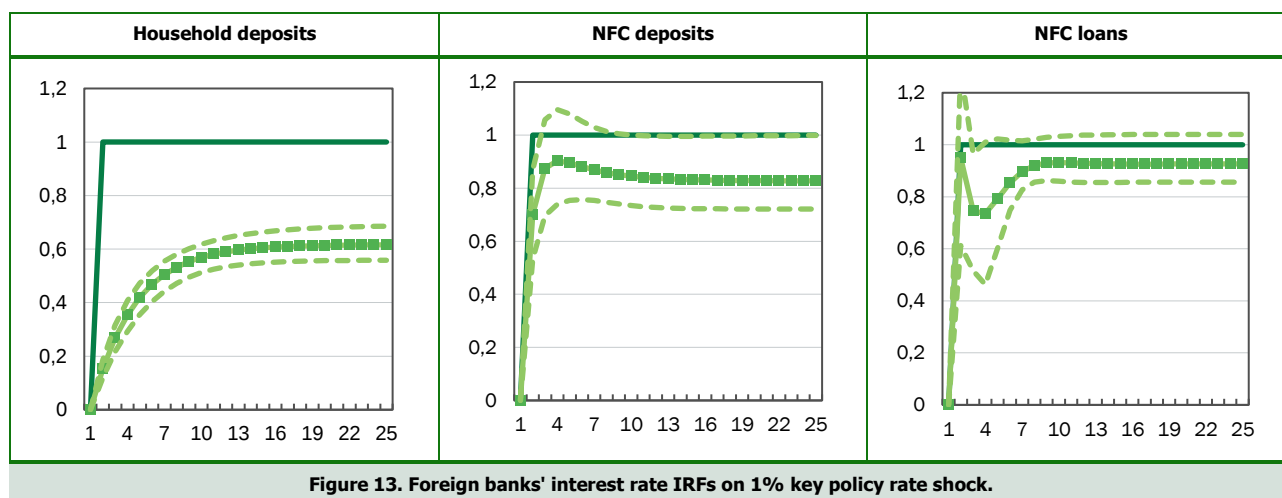


Figure 13. Foreign banks' interest rate IRFs on 1% key policy rate shock.

DISCUSSION

Zholud, Lepushynskyi, and Nikolaychuk (2019) analyzed the effectiveness of the monetary policy transmission mechanism, in particular, the interest rate channel. They found transmission from weekly overnight rates on the interest rates on short-term business loans. However, their research was limited since the operational design of the monetary policy transmission mechanism came into effect in 2016.

Recently, Grui et al (2023) updated their report on the effectiveness of the monetary policy transmission mechanism. It included exchange rate and inflation expectations channels but most importantly interest rate channels. Among many, they analyzed key policy rate pass through to the corporate loan interest rates and household deposit interest rates depending on bank ownership. According to their long-run effects on 1% increase in key policy rate fully translates to the new corporate loan interest rates in state-owned (PrivatBank was excluded from their analysis), private Ukrainian, and

foreign banks corresponding with our results. Moreover, they found full transmission to the household deposit interest rates only within state-owned banks. In our research, we additionally analyze corporate deposits interest rate depending on the bank ownership because a high share of total deposits is corporate. Moreover, our research also includes interest rates depending on maturity. We suggest including asymmetry analysis in future research since banks usually adjust their deposit interest rates slower and loan interest rates faster to the key policy rate increase (contractional monetary policy).

CONCLUSIONS

We found that the effectiveness of the transmission from key policy rate to interest rates of commercial banks operating in Ukraine depends on the business models varying across bank ownership. Also, we confirm that the monetary policy impulse is fading with higher deposits and loan maturity. Therefore, conducting an analysis of the maturity combinations in loan portfolio and deposit structure could be beneficial in identifying potential exposure to interest rate risk.

State-owned banks, excluding PrivatBank, have a higher proportion of corporate loans and an equal distribution of deposits between NFCs and households. While household deposits tend to adjust slowly to changes in the key policy rate in the short term, in the long run, both corporate and household deposits exhibit a stronger response to changes in the key policy rate than new corporate loans exposing state-owned banks to the interest risk. In contrast to other state-owned banks, PrivatBank has a lower exposure to potential interest rate risks, given its retail focus. PrivatBank's interest rates adjust to the key policy rate either very slowly or weakly.

Foreign and private Ukrainian banks have a significant share of corporate loans and an equal distribution of deposits between households and corporates. They exhibit a higher response of new corporate deposit interest rates to changes in the key policy rate than new corporate loans, with foreign banks reacting for 6 months and private Ukrainian banks for 18 months. However, both ownership groups tend to hedge against interest rate risks through a relatively weak and prolonged reaction of new household deposit interest rates to changes in the key policy rate.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

Conceptualization: *Anatolii Hlazunov*

Data curation: *Anatolii Hlazunov*

Formal Analysis: *Anatolii Hlazunov, Pervin Dadashova, Iryna Lukianenko*

Methodology: *Anatolii Hlazunov*

Software: *Anatolii Hlazunov*

Resources: *Anatolii Hlazunov, Pervin Dadashova, Iryna Lukianenko*

Supervision: *Pervin Dadashova, Iryna Lukianenko*

Investigation: *Anatolii Hlazunov*

Visualization: *Anatolii Hlazunov*

Project administration: *Anatolii Hlazunov, Pervin Dadashova, Iryna Lukianenko*

Writing – review & editing: *Pervin Dadashova, Iryna Lukianenko*

Writing – original draft: *Anatolii Hlazunov*

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https://bank.gov.ua/files/4-Financial_markets.xlsx

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ТРАНСМІСІЯ ПРОЦЕНТНИХ СТАВОК: ДОКАЗ ІЗ БОКУ ФОРМИ ВЛАСНОСТІ БАНКІВ

Повномасштабна війна, розпочата російською федерацією 24 лютого 2022 року, порушила класичну монетарну політику, яку Україна проводила роками. Незважаючи на це, збереження цінової стабільності залишається критично важливим. У червні 2022 року НБУ суттєво підвищив облікову ставку з метою зниження інфляційного тиску через

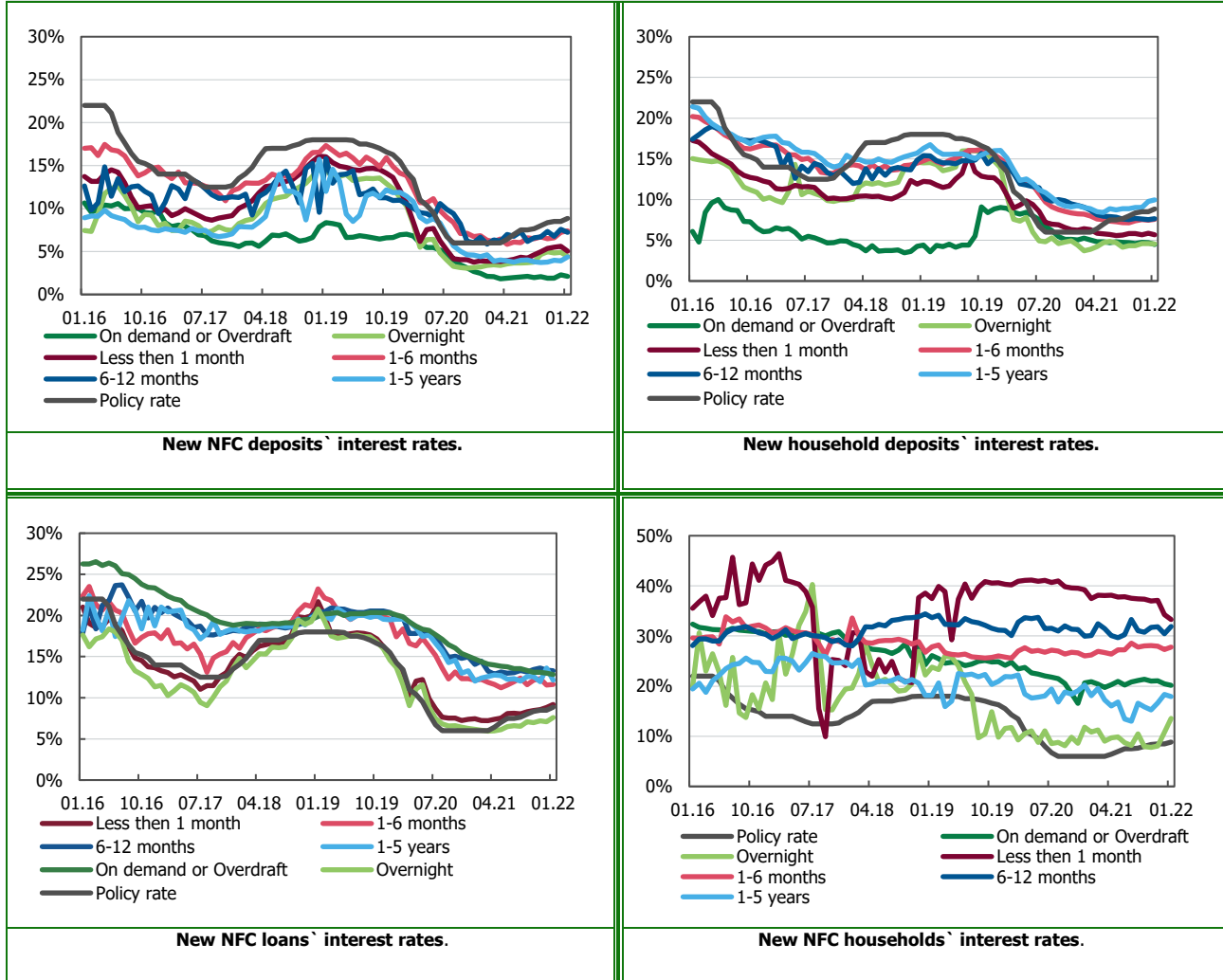
вищі ринкові процентні ставки. Таким чином, попри війну, центральний банк продовжує покладатися на механізм трансмісійного впливу процентних ставок. Це дослідження зосереджене на трансмісійному впливі змін облікової ставки на процентні ставки комерційних банків залежно від структури банківського сектора. Ми вважаємо, що це дослідження є корисним не лише для західних науковців, але й для розробників політик, оскільки воно допомагає оцінити ефективність монетарної політики. Ми перевірили вплив зміни облікової ставки на процентні ставки за новими кредитами та депозитами різних строків і груп банків за формою власності, що у випадку України тісно пов'язане з ефективністю банків. Ми застосували авторегресійні моделі з розподіленим лагом та формою корекції похибки. Наше дослідження підтверджує, що трансмісія від облікової ставки до банківських процентних ставок є різною для різних банківських груп. Менш ефективні банки мають сильнішу передачу процентних ставок на нові депозити й слабшу – на нові кредити, а отже, є більш схильними до процентного ризику. Крім того, згідно з нашими результатами, вплив процентної ставки слабшає зі збільшенням строку погашення й для депозитів, і для кредитів.

Ключові слова: грошово-кредитна політика, облікова ставка, авторегресійні моделі розподілених лагів, канал відсоткової ставки, механізм трансмісії, корпоративні та побутові процентні ставки

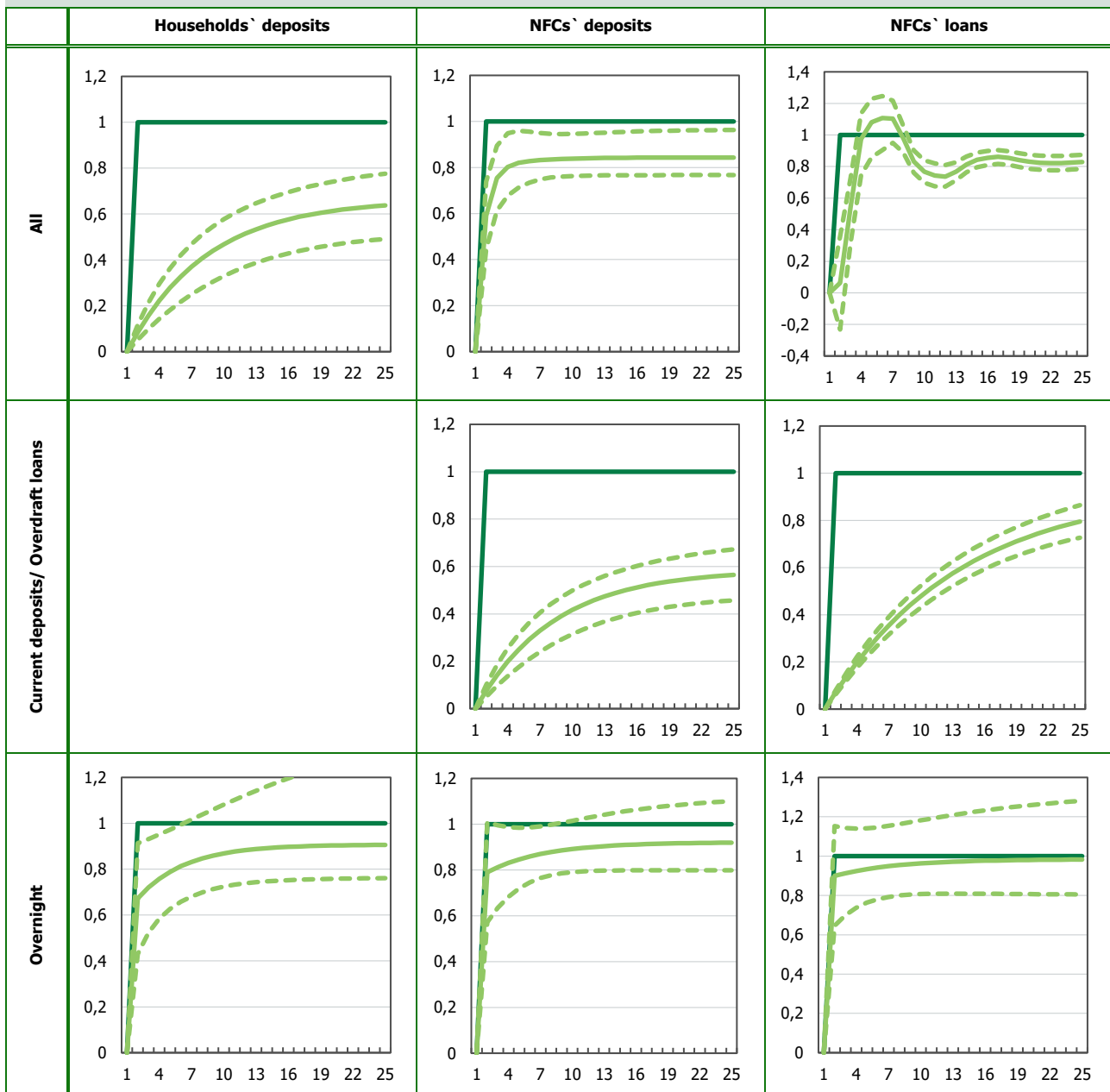
JEL Класифікація: C22, E40, E43, E52, E58, E59

APPENDICES / ДОДАТКИ

Appendix A. New loans and deposits interest rates in Ukraine depending on maturity. (Source: NBU, https://bank.gov.ua/files/4-Financial_markets.xlsx)



Appendix B. Bank interest rate impulse response functions on 1% key policy rate shock depending on maturity, %. Note: dashed lines – 95% confidence intervals.



Appendix B. Continued.

