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TRANSMISSION OF THE KEY POLICY RATE TO COMMERCIAL BANK INTEREST RATES: VAR-BASED EVIDENCE FROM UKRAINE[5]

The purpose of the article is to assess the direct and indirect impact of the discount rate on credit and deposit rates in the Ukrainian banking system, taking into account inflation dynamics and monetary transmission time lags.

The methodological basis of the study is a vector autoregression (VAR) model, supplemented by impulse response analysis (IRF) and forecast error variance decomposition (FEVD), which made it possible to reproduce the time structure of monetary shock transmission through the interest rate channel.

The results show that an increase in the policy rate raises lending rates with a lag of about two months, while deposit rates respond more gradually, and inflation exhibits a weaker and slower short-term reaction. It was found that the key channel for transmitting the monetary impulse to inflation is the deposit rate. The scientific novelty lies in the comprehensive combination of IRF and FEVD analysis to reconstruct the time architecture of monetary transmission and in substantiating the role of the deposit channel in shaping inflation dynamics. The practical significance of the results lies in the possibility of using them for macroprudential analysis and improving price stability policy.

Keywords: monetary transmission; inflation; interest rate channel; causal modeling
JEL: E31; E42; E43; E52; E58

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1. Introduction

Crisis periods are traditionally accompanied by inflationary processes, to which central banks respond by tightening monetary policy through key rate increasing. During the full-scale invasion of Ukraine in 2022, the National Bank of Ukraine (hereinafter – NBU) leaned toward precisely such a monetary regulation policy. Tighter monetary policy can lead to higher borrowing costs for businesses and households, lower investment activity, reduced consumer demand, and slower economic growth (Bernanke, Gertler, 1995). As a result of such actions, the level of available financing for the real sector decreases amid a simultaneous decline in investment activity due to uncertainty and risk. As loan costs rise, and real incomes and employment decline, household consumption correspondingly decreases.

At the same time, research by European Central Bank (ECB) experts emphasizes a broad perception of monetary policy objectives, not limited to inflation targeting, but also including financial stability in terms of the transmission of monetary policy impulses in the short and medium term (impact on monetary transmission channels) and the accumulation of risks in the financial and non-financial sectors, which leads to a decline in output and an increase in inflation (ECB, 2021).

The IMF's 2024 Financial Stability Report highlights the global trend toward accommodative monetary policy and corresponding favourable financial conditions and low asset price volatility. At the same time, experts believe that containing short-term risks contributes to the accumulation of vulnerabilities, such as the global growth of private and public debt. The consequences of this problem are seen as an increased threat of future risks and adverse shocks due to the gap between high economic uncertainty and low financial volatility (IMF, 2024).

Consequently, raising the key rate, via the interest rate transmission channel, suppresses business activity and leads to a contraction in real GDP, intensifying the crisis. Reconciling the tension between strict inflation targeting (the strategy adopted by the NBU in 2022) and the need to sustain economic activity (the stance of many developed-economy central banks) requires rigorous empirical assessment of the effects of monetary regulation.

The main hypothesis of the study is that the impact of the discount rate on inflation is realised through a sequential causal chain of changes in interest rates in the banking sector, with time lags, and short-term inflation dynamics are largely determined by their own inertia.

The authors' key contribution is integrating VAR modelling, impulse-response analysis, and variance decomposition into a single causal framework of the interest rate channel of monetary policy, as well as reconstructing the conditional causal chain of monetary shock transmission between the discount rate, bank interest rates, and inflation.

The study considers theoretical approaches to the analysis of the transmission mechanism of monetary policy, describes the research methodology and the specification of the VAR model, and presents the results of empirical analysis, including impulse response functions and variance decomposition. The conclusions summarise the findings and outline directions for their practical application.

2. Literature Review

Numerous studies focus on the objectives of central banks, the effects of conventional and unconventional monetary policies, and the behaviour of banks under low or even negative interest rates. Nevertheless, important dimensions of the transmission mechanism, exemplified as the causal relationship between the key policy rate and commercial banks' lending and deposit rates in emerging economies, remain underexplored.

The functioning of the monetary policy transmission mechanism is studied through various transmission channels, including the interest rate channel, the credit channel, and the expectations channel (Boivin, Kiley, Mishkin, 2010). The impact of the discount rate through the interest rate channel of the transmission mechanism on the cost of credit resources, savings, and aggregate demand is outlined by Mishkin (1996) and Taylor (1995). Monetary policy researchers (Jiménez et al., 2023) conclude that raising the key rate significantly increases the risk of crisis, but only if rates have been kept low for a long time.

Contemporary scientific works pay considerable attention to the response of commercial banks' interest rate policy to monetary policy impulses. Scientists argue that higher interest rates allow banks to increase liquidity by attracting deposits, as well as through high spreads on bank rates (Di Tella, Kurlat, 2021). Others argue that it is necessary to take into account the ratio of the terms of banking operations and the sensitivity of the interest margin to the interest rate (Drechsler et al., 2021).

The introduction of the negative interest rate policy (NIRP) has generated extensive debate regarding its overall effectiveness. While NIRP has contributed to credit expansion and stimulated investment activity in the Eurozone, the potential for additional monetary easing through this instrument appears limited. Scholars argue that the recent rise in inflation has intensified pressure on the ECB, making the continuation of negative interest rates increasingly impractical and suggesting that such a policy should be phased out (Beckmann et al., 2022).

Focusing on the consequences of NIRP implementation for banking institutions, researchers (López-Penabad et al., 2022; Beauregard, Spiegel, 2020; Czudaj, 2020; Ampudia, Van den Heuvel, 2022) indicate a decline in net interest margins and asset profitability. At the same time, according to the authors (López-Penabad et al., 2022), the depth of this impact depends on the bank's business model. Other scholars (Grandi et al., 2021) contend that the ECB's adoption of negative interest rates is linked to an expansion in lending by banks that are predominantly deposit-funded – institutions characterised by lower capital levels and a higher proportion of liquid and household deposits. According to this view, deposit funding plays a central role in the transmission of monetary policy rates. In addition, it is emphasised that the expansion of lending (which is the goal of lowering the key rate) is only temporary: during prolonged periods of negative rates, both bank profitability and a decline in their lending activity are observed (Beauregard, Spiegel, 2020).

The view that negative rates have a negative impact on deposit volumes and the effectiveness of banks` monetary policy is contradicted by researchers (Altavilla et al., 2022). A study (Boucinha, Burlon, 2020) indicates that the impact of negative interest rates is neutral, and the decline in the net spread is offset by an increase in business activity.

When it comes to using analytical tools in scientific research, it should be noted that a significant number of empirical studies use vector autoregressive models (VAR and SVAR) to analyse dynamic relationships between macroeconomic variables (Sims, 1980; Christiano, Eichenbaum, Evans, 1999; Stock, Watson, 2001; Kilian, Lütkepohl, 2017; Jarociński, Karadi, 2020). Researchers also turn to factor-augmented vector autoregression (FAVAR) and DSGE models (Boivin, Kiley, Mishkin, 2010). VECM models are also gaining popularity (Lütkepohl, 2005). Impulse response analysis and decomposition of forecast error variance allow us to assess the time structure of the economy's response to monetary shocks and determine the relative role of different transmission channels (Uhlig, 2005; Gertler, Karadi, 2015; Miranda-Agrippino, Ricco, 2021).

A synthesis of recent empirical studies shows that the transmission of the policy rate to bank interest rates is gradual and often asymmetric, with the speed of adjustment depending on the competitiveness of the banking sector and the structure of the credit market (Zhemelko, Kocisova, 2026). SVAR estimates for the euro area show that the full transmission of a monetary shock to inflation takes approximately 12-18 months, and for core inflation, more than two years (Zlobins, 2025). Other empirical studies confirm that the inflation response is often weak in the short term and increases over time (Lukmanova, Rabitsch, 2023).

Recent studies emphasize that lags are not universal, as in countries with less developed financial markets, transmission through the credit channel may be longer, and during periods of crisis or high uncertainty, lags may change due to changes in agent behavior and risk premiums, as confirmed by a VAR study of the euro area, which demonstrates significant cross-country heterogeneity in responses even within the union (Žihala et al., 2025).

At the same time, in economies characterised by high uncertainty and structural shocks, such as Ukraine, the causal interpretation of the interest rate channel and the identification of monetary transmission lags remain insufficiently explored.

3. Methodology

There is an ongoing scientific debate regarding the effectiveness of central banks` interest rate policy: on the one hand, lowering the key rate stimulates lending, investment, and economic activity through the expectations channel, while on the other hand, low rates can reduce banks` profitability, weaken their creditworthiness, and create risks to financial stability. This contradiction creates a demand for an empirical assessment of how the key rate affects banking behaviour and policy in different macroeconomic regimes. Such analysis is particularly relevant for Ukraine, as the NBU applies an inflation targeting regime using the discount rate as the main instrument of monetary policy.

In the context of increased financial market volatility, structural transformations in the banking sector, and adaptation to European regulatory standards, it is important to understand how changes in the key rate affect banks' lending, deposit, and interest rate policies. Analysis of this relationship will not only allow us to assess the effectiveness of monetary transmission in Ukraine, but also to formulate scientifically sound recommendations for optimising interest rate policy to ensure macrofinancial stability.

The purpose of the study is to research is to assess the direct and indirect effects of the key rate on commercial banks' lending rate and deposit rates in Ukraine, with inflation control in Ukraine and taking into account the time lags of monetary transmission identified through the VAR model.

The empirical analysis of monetary transmission in this study relies on a vector autoregression (VAR) model, which allows examining dynamic interactions among key macrofinancial variables without imposing restrictive a priori assumptions on causal directions (Sims, 1980). The chosen model specification is aimed at assessing the time transmission of the monetary impulse through the interest rate transmission channel.

The choice of the VAR model is based on the following methodological considerations:

- the main objective of the study is to assess the lag structure of interest rate and price responses to monetary shocks, which corresponds to the standard application of VAR in studies of monetary transmission (Christiano et al., 1999; Uhlig, 2005) with a focus on short-term dynamics;
- unlike VECM, which is used in cases of confirmed cointegration between variables and focuses on the analysis of long-term equilibrium relationships, this study concentrates on the short- and medium-term responses of the system to monetary shocks, i.e., the established absence of the need to model long-term equilibrium;
- the study period covers periods of macroeconomic instability and military shock in Ukraine, which potentially disrupt the stability of long-term equilibrium relationships. Under such conditions, the use of VECM can lead to unstable estimates of cointegration relationships, while VAR provides more flexible modelling of short-term dependencies;
- the VAR model is the standard basis for constructing impulse response functions (IRF) and decomposing forecast error variance (FEVD), which allows for a quantitative assessment of the time transmission of monetary impulses.

In addition, VAR is widely used to analyse the causal mechanisms of monetary policy, provided that economically sound identification assumptions are imposed and impulse-response analysis is used (Sims, 1980; Christiano et al., 1999; Stock, Watson, 2001; Kilian, Lütkepohl, 2017). Within the scope of this study, the causal interpretation is based on the following principles:

- temporal hierarchy (lag structure), i.e., VAR uses variable lags, which allows separating the previous values of factors from their subsequent reactions, in line with the principle of temporal causality;
- an economically justified variable specification, as the policy rate is treated as a central bank instrument that theoretically precedes the response of bank rates and prices, consistent with standard assumptions of the monetary transmission mechanism;
- impulse-response analysis, as a tool of structural interpretation, enables the assessment of the dynamic effects of an exogenous monetary shock on other variables in the system and is commonly interpreted in empirical monetary policy research as evidence of causal transmission.

The study uses panel data on monthly indicators of the NBU key rate (ID), the average rate on loans of commercial banks in Ukraine (IC), the average rate on deposits of commercial banks in Ukraine (IDEP), and the consumer price index (CPI) from January 2007 to August 2025 (224 observation points). The empirical basis is the statistical sources of the NBU (2025).

At the first stage, monthly data, cleaned of gaps and reduced to the same frequency of observations, were used to analyse the dynamic relationships between the key rate (ID), the lending rate (IC), the deposit rate (IDEP), and CPI:

$$Y_t = \begin{bmatrix} IDt \\ ICt \\ IDEPt \\ CPIt \end{bmatrix}. \quad (1)$$

The Akaike Information Criterion (AIC) was used to determine the optimal lags for the VAR model:

$$AIC(p) = ln\left|\sum_u (p)\right| + \frac{2k^2 p}{T}, \quad (2)$$

where:

$\sum_u (p)$ is the estimated covariance matrix of the VAR model residuals with lag p;

k – the number of endogenous variables;

T - the number of observations.

The optimal lag of the VAR model has been determined at the level of p^*=3.

A vector autoregression (VAR) model was constructed, consisting of a system of four equations, where each variable depends on its own three lags and the lags of all other variables:

$$Y_{i.t} = a_{i0} + \sum_{j=1}^{4} \sum_{\mathrm{p}=1}^{3} a_{i,j}^{(\mathrm{p})} Y_{j,t-\mathrm{p}} + u_{i,t}, \quad (3)$$

where:

$Y_{i.t}$ is the value of the endogenous variable i at time t;

$a_{i,j}^{(k)}$ – the coefficient on variable j with lag p in the equation for variable i;

a_{i0} – the vector of constants;

$u_{i,t}$ – random error.

To analyze the short- and medium-term effects of monetary impulses on system variables, impulse response functions (IRF) were used, which demonstrate the response of variableY_i (*IC, IDEP, CPI*) to a shock in variable Y_j (key *ID* rate) after h periods:

$$IFR_{i,j}(h) = \frac{\partial Y_{i,t+h}}{\partial u_{j,t}}. \quad (4)$$

The impulse response function (IRF) method allows one to determine the lags in the response of credit and deposit rates in the banking system to a key-rate shock, as well as to trace how the impulses propagate to the CPI, i.e., it illustrates the empirical view of monetary transmission.

Based on the verified chronology of impulse effects, causal linear models are constructed for each transmission channel, which integrate variables into a single hypothetical causal system (ID→IC→IDEP→CPI), including lags determined by IRF, and identify causal chains by level of significance. This allows us to refine the time delay, strength of the relationship, and directions of influence.

After substantiating the causal relationships, the following additional steps were taken:

- IRF analysis in order to check the temporal dynamics of CPI in response to shocks in IC and IDEP ;
- variance decomposition (FEVD), i.e., an assessment of the contribution of each variable to CPI fluctuations.

The proposed research methodology enables the simulation of the dynamic effects of key rate shocks and to quantify, over time, the strength of monetary transmission effects through the interest rate channel over time.

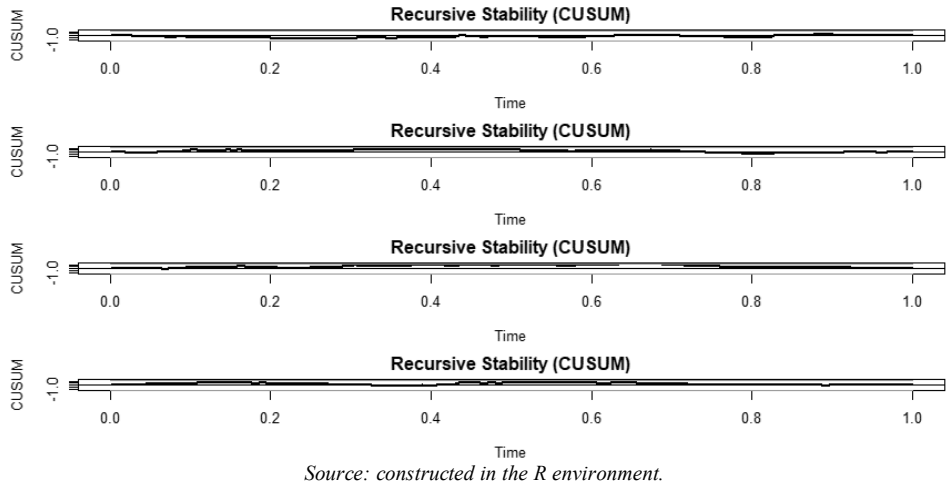
4. Results and Discussion

4.1 Results of constructing the primary VAR

Prior to estimating the VAR model, stationarity tests (ADF) were conducted. The results indicate that the policy rate and the lending rate are integrated of order one (I(1)), whereas the deposit rate and the consumer price index are stationary (I(0)). Therefore, the system exhibits a mixed order of integration of variables. Under such conditions, the use of VECM is not mandatory, since the error correction model assumes the presence of cointegrated variables of the same order of integration.

The primary third-order vector autoregression model (VAR(3)) includes four endogenous variables (ID, IC, IDEP, CPI), and all roots of the characteristic polynomial have moduli less than one (the largest value is ≈ 0.93, Figure 1), which confirms the stability of the VAR model and the possibility of using IRF and forecasts.

Figure 1. Parameters of the characteristic polynomial for testing the stability of the VAR model



Source: constructed in the R environment.

Individual equations demonstrated the following statistical parameters (Table 1).

Table 1. Statistical parameters of the VAR model equations

Indicator	Equation ID		IC equation		IDEP equation		CPI equation	
	p-value	R^2	p-value	R^2	p-value	R^2	p-value	R^2
ID.l1	0.000****	0.9497	0.615125	0.8998	0.0308 **	0.9143	0.000****	0.4676
IC.l1	0.63339		0.000****		0.1143		0.90481	
IDEP.l1	0.49462		0.052746		0.000****		0.14700	
CPI.l1	0.12918		0.506455		0.3875		0.00****	
ID.l2	0.12958		0.316553		0.8311		0.00156***	
IC.l2	0.02049		0.450463		0.4727		0.39373	
IDEP.l2	0.06763		0.242052		0.1773		0.95173	
CPI.l2	0.66186		0.440009		0.6683		0.36398	
ID.l3	0.6245		0.30797		0.1028		0.52976	
IC.l3	0.00117		0.310241		0.7100		0.16064	
IDEP.l3	0.00444		0.425612		0.3357		0.20078	
CPI.l3	0.00149		0.9555		0.4895		0.50351	
const	0.70428		0.000 ****		0.6868		0.08264	

Note: ****, ***, **, * indicate statistical significance at the 0.1%, 1%, 5% and 10% levels, respectively.

Source: calculated by the authors.

The equation for the discount rate revealed a significant lag of two months with the lending rate and a lag of three months with IC and IDEP rates, as well as CPI, indicating a reverse effect of IC and IDEP rate dynamics on monetary policy decisions regarding the key rate. The high level of R^2=0.95 confirms the predictability of the discount rate within the system.

The parameters of the equation for IC show that the most significant factor is the past value of the rate itself, which indicates a high autocorrelation of credit rates. The constant is statistically significant, reflecting the trend component.

A significant factor in the equation for IDEP was also the past value of the rate itself, as well as the value of the discount rate ($p < 0.05$), confirming the transmission of central bank policy through the deposit channel.

The p-value parameters in the equation for CPI indicate a two-phase effect of the discount rate: positive in the short-term lag of 1 month and negative after 2 months, which indicates a temporary lag in the response of inflation to monetary changes. R^2=0.47 indicates a greater role of non-monetary factors in the dynamics of the CPI.

The covariance and correlation matrices of residuals (Table 2) indicate moderate correlations between equations, in particular between credit and deposit rates (0.53), as well as between the discount rate and inflation (0.36).

Table 2. Statistical parameters of the VAR model equations

Indicators	Covariance matrix of residuals				Correlation matrix of residuals			
	ID	IC	IDEP	CPI	ID	IC	IDEP	CPI
ID	1.9271	0.2823	0.3312	0.5729	1.0000	0.2641	0.3241	0.3555
IC	0.2823	0.5933	0.3008	0.2020	0.2641	1.0000	0.5304	0.2260
IDEP	0.3312	0.3008	0.5420	0.1689	0.3241	0.5304	1.0000	0.1976
CPI	0.5729	0.2020	0.1689	1.3475	0.3555	0.2260	0.1976	1.0000

Source: calculated by the authors.

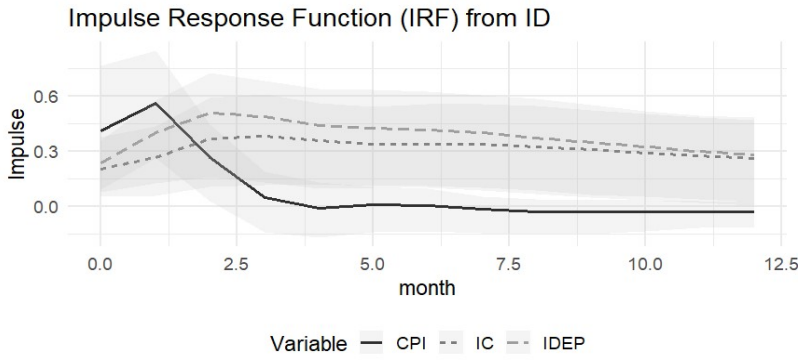
This confirms the existence of interdependent monetary transmission channels. Thus, the primary VAR model showed that rates have high internal inertia, which reduces the effectiveness of short-term monetary impulses.

4.2 Initial IRF analysis

The results of constructing an impulse response function (Figure 2) based on the primary VAR model show that the response of IC and IDEP rates to changes in the key rate is delayed in time and manifests itself approximately two months after the monetary policy shock. This lag reflects the time inertia of banking markets, which is necessary for reviewing rates under existing agreements, updating products, and responding to changes in the cost of funding.

Contrary to the standard expectation of a negative reaction of inflation to monetary policy tightening, the initial IRF shows a short-term positive deviation of the CPI after the discount rate shock, which may indicate the important role of expectations and information transmission channels when a change in the discount rate quickly affects the consumer and price behaviour of economic agents.

Figure 2. Results of the initial construction of the impulse response function regarding the impact of the key rate shock

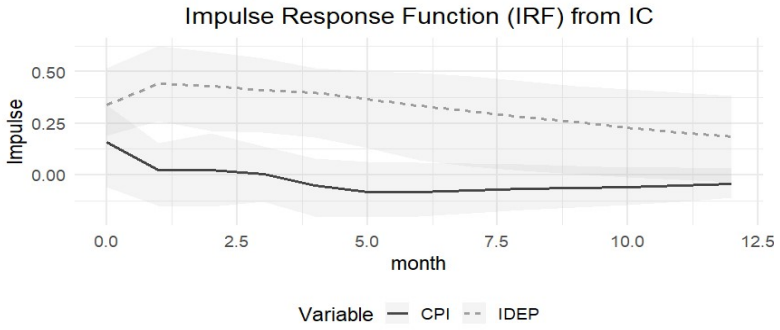


Source: constructed in the R environment.

This lag structure (1–2 months) is typical for open economies with flexible exchange rates, where monetary signals are quickly transmitted through market expectations and the financial sector.

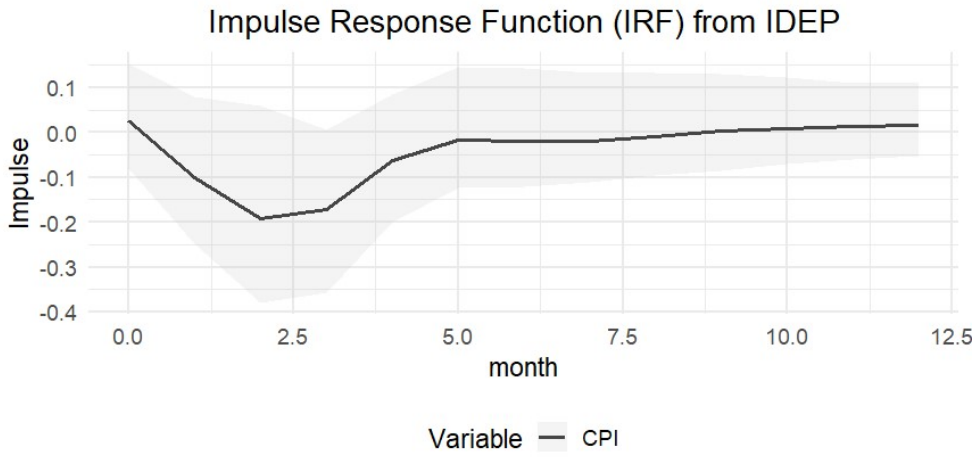
To confirm the hypothesis regarding the chronology of the impact, a preliminary *IRF* analysis was conducted on the impact of commercial bank lending rates on deposit rates and the consumer price index (Figure 3) and on the impact of deposit rates on inflation (Figure 4).

Figure 3. Results of the initial construction of the impulse response function regarding the impact of the loan rate shock



Source: constructed in the R environment.

Figure 4. Results of the initial construction of the impulse response function regarding the impact of the deposit rate shock



Source: constructed in the R environment.

Figure 3 shows that the deposit rate reacts to the credit rate shock and that this reaction is positive (the increase in the cost of loans subsequently stimulates an increase in deposit rates, but with a time lag), but gradually decreases. The CPI shows a slight negative reaction (approximately from -0.1 to -0.2) during the first period, which is consistent with a decline in aggregate demand as the cost of borrowing increases. Thus, an increase in lending rates reduces inflationary pressure, but due to its short-term effect, it is gradually offset.

Figure 4 shows a stronger impact of the deposit rate on the CPI, which is inverse, reaching a minimum in approximately the third or fourth period. This indicates a delayed anti-inflationary effect of raising deposit rates, as encouraging savings reduces consumption. Subsequently, the effect levels off, indicating that the impact is temporary. Accordingly, the deposit rate has a short-term but clearly pronounced anti-inflationary effect, acting through the savings channel.

Importantly, each estimated response lies within its corresponding 95% confidence intervals, attesting to the statistical robustness of the findings. As a result of the IRF analysis, it is possible to justify the time architecture of the monetary transmission of the key rate signal:

$$ID_t \rightarrow IC_{t+2} \rightarrow IDEP_{t+3} \rightarrow CPI_{t+6}. \quad (5)$$

The initial IRF analysis confirms the effectiveness of the interest rate channel of monetary transmission in the economy, and the results obtained allow to quantitatively assess the pace and strength of monetary shocks transmitted to the banking sector and inflation, confirming the existence of a causal chain between the NBU rate, bank rates, and prices, taking into account the identified time lags and directions of influence within the system of monetary variables.

4.3 Causal model of regression equations for the transmission of the key rate through the interest rate channel

Based on the primary IRF, we can formulate:

$$IC_t=\alpha_0+\alpha_1 ID_{t-2}+\varepsilon_1;$$
$$IDEP_t=\beta_0+\beta_1 IC_{t-1}+\varepsilon_2; \quad (6)$$
$$CPI_t=\lambda_0+\lambda_1 IDEP_{t-3}+\varepsilon_3.$$

Table 3 reports the statistical parameters of the estimated regression equations..

Table 3. Statistical parameters of the constructed regression equations

Indicators	Estimate	Std. Error	t value	p value
Equation for loan rates				
(Intercept)	12.3804	0.2751	45.01	0.000****
ID_l2	0.2721	0.0192	14.17	0.000****
Deposit rate equation				
(Intercept)	-1.46029	0.86108	-1.696	0.0913
IC_l1	0.65946	0.05353	12.321	0.000****
Equation for the consumer price index				
(Intercept)	1.75718	0.395	4.438	0.000****
IDEP_lag3	-0.08418	0.04233	-1.989	0.048

Note: ****, ***, **, * indicate statistical significance at the 0.1%, 1%, 5%, and 10% levels, respectively.
Source: calculated by the authors.

The data presented in Table 3 show that a 1 p.p. increase in the discount rate leads to an increase in the lending rate by approximately 0.27 p.p. after two months. This effect is statistically significant and economically meaningful. The model explains 47% of the variation in the lending rate.

An increase in the lending rate by 1 p.p. leads to an increase in the deposit rate by 0.66 p.p. after one month. The model accounts for 41% of the variation in the deposit rate, which represents an acceptable level of explanatory power for monthly panel data. Thus, the dynamics of the deposit rate are largely shaped by credit rates. The bank-rate spread responds to a discount-rate shock with a short lag, indicating that the credit rate is the primary transmission channel from the key rate to the deposit rate. The total lag between ID and IDEP is about three months.

The estimated parameters for the CPI indicate that a rise in the deposit rate after three months reduces inflation (the coefficient was -0.0819). This finding is consistent with the monetary restraint mechanism: higher interest rates diminish liquidity and consumer demand, thereby limiting inflation. The effect is statistically significant. At the same time, $R^2 = 0.017$, i.e., only ≈1.7% of CPI variance is explained, which indicates that inflation is determined by other factors (e.g., exchange rate, energy prices, etc.).

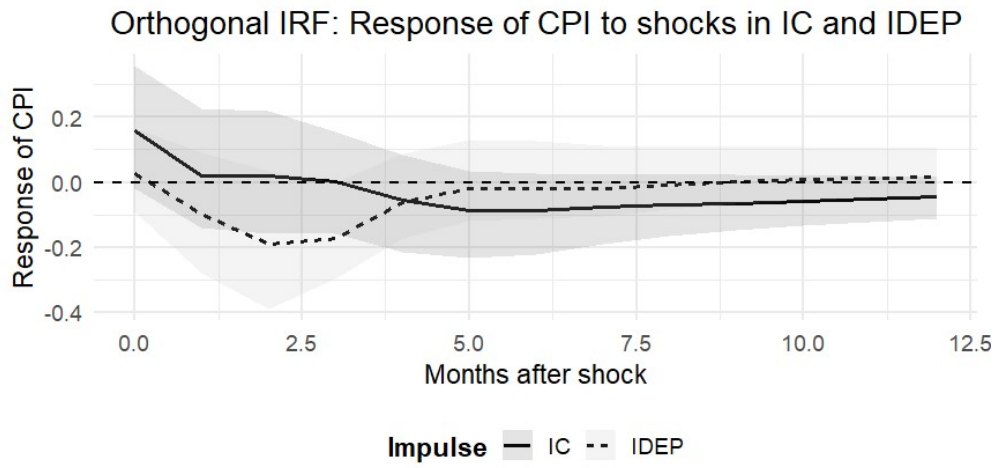
This result indicates the limited explanatory power of the specification regarding inflation dynamics and emphasises that inflation is influenced by a broader set of factors that are not included in this VAR model. In particular, the exchange rate, energy prices, fiscal policy, external shocks, inflation expectations, and structural features of the economy may play a

significant role. Importantly, a low R^2 does not undermine the validity of the estimated impulse responses, as the primary objective of VAR modelling is to capture dynamic interrelationships and shock transmission mechanisms among variables rather than to maximise the explanatory power of individual equations. Accordingly, the results should be interpreted as an assessment of short-term reactions within a limited monetary channel, rather than as a complete model of inflation determinants.

4.4 Final impulse response analysis (IRF) and decomposition of consumer price index variance

IRF analysis is shown in Figure 5 in order to test the time dynamics of the CPI in response to shocks in IC and IDEP.

Figure 5. Impulse response function (IRF) to test the time dynamics of the CPI in response to shocks in the IC and IDEP



Source: constructed in the R environment.

As shown in Figure 5, the response of the CPI to a credit rate shock declines immediately after the shock, and returns to zero within 6-8 months. The confidence interval indicates a high accuracy of the model.

The response of the CPI to a shock in the bank deposit rate is characterised by an initial sharp decline, and the depth of the reaction in this case is significantly greater than in the case of a shock in the lending rate. The confidence interval also indicates the high accuracy of the model.

Thus, the CPI is more sensitive to deposit rate shocks, which may indicate a stronger impact of demand-restricting policies in favour of savings in the case of inflation containment.

The decomposition of CPI dispersion, based on the primary VAR model, shows how the share of forecast dispersion CPI changes over time, explained by shocks in the ID, IC, IDEP, and CPI variables in previous periods. Given the data in Table 4, the impact of the key rate on inflation remains significant over a 12-month horizon, with the share of dispersion peaking after three months. In turn, the impact of commercial banks' lending and deposit rates on inflation remains of secondary significance. The CPI's own variance decreases (from 85.7% to 71.9%), meaning that shocks in other variables explain an increasing share of inflation fluctuations.

Table 4. Decomposition of CPI dispersion

Month	ID	IC	IDEP	CPI	Impact
1	0.124	0.019	0.001	0.857	The largest share of CPI dispersion is explained by idiosyncratic shocks
2	0.224	0.012	0.005	0.758	The impact of the discount rate (ID) begins to increase
3	0.231	0.011	0.02	0.73	The impact of the deposit rate (IDEP) becomes noticeable
4	0.227	0.011	0.031	0.731	Deposit rate shock gradually increases
5	0.222	0.012-0.026	0.03	0.730	CPI is increasingly responding to rate shocks, especially IDEP, but most remain their own shocks

Source: calculated by the authors.

4.5 Discussion of results

The results of the research confirm the principal conclusions reported in the existing literature on the channels of monetary policy transmission. IRF and regression analysis prove the following chronological chain: an increase in the key rate (ID) affects the bank lending rate (IC) with a lag of two months, then on the deposit rate (IDEP) one month after the change in the lending rate, and only then does it affect consumer inflation (CPI) with a lag of three months relative to the deposit rate and about six months in total for the ID→IC→IDEP→CPI channel. This chronological sequence is consistent with the conclusions of the European Central Bank (2021) that monetary policy has not only an inflationary but also a financial stabilisation aspect, and its effects manifest themselves in the short and medium term through various transmission channels.

A comparison with the International Monetary Fund (2024) data reveals a similar pattern. Short-term risk-containment measures, such as raising the policy rate, affect banks' interest-rate policies and inflation only after a lag, highlighting how extended periods of low or high rates can either exacerbate or dampen economic instability.

These findings also support earlier scholarly observations (Jiménez et al., 2023; Di Tella, Kurlat, 2021; Drechsler et al., 2021) concerning how banks respond to changes in the policy rate. Lending rates respond more quickly than deposit rates, whereas deposit rates adjust with a delay of roughly three months, consistent with the lag identified in the impulse response functions. The evidence further supports the view that interest-rate spreads and banking business models play a crucial role: banks tend to raise deposit rates in response to a policy rate increase to manage liquidity and maintain profitability.

With regard to negative interest rate policy (NIRP), the results show that the impact on bank lending and inflation is limited and subject to time lags, which is consistent with observations

in the literature (López-Penabad et al., 2022; Beauregard, Spiegel, 2020; Grandi, Guille, 2021). It has been established that the deposit rate has the most delayed effect on inflation, which indicates the role of deposits as a key transmission channel. At the same time, the effect of the lending rate on the CPI was insignificant and without a lag, which partially confirms the conclusions (Altavilla et al., 2022; Boucinha, Burlon, 2020) about the neutral impact of negative rates on lending and inflation over short periods of time.

Thus, the results of the study are consistent with current theoretical and empirical works by scientists: banks transmit monetary impulses through credit and deposit rates, but the key channel for the inflationary response is the deposit rate, which confirms the need to take into account time lags in regulatory policy and modelling of the monetary transmission mechanism.

5. Concluding Remarks

The research is devoted to substantiating the temporal architecture of monetary policy transmission in the context of the modern banking system of Ukraine and establishes clear lags in the impact of the NBU key rate on bank lending and deposit rates, as well as on inflation. The results of IRF and regression analysis show that the key rate affects the credit rate of banks with a lag of two months. After another month, the lending rate affects the deposit rate, which is the main channel of influence on consumer inflation, with a lag of 3-4 months. Thus, the overall effect of the key rate shock on a noticeable change in the consumer price index manifests itself in 6-7 months. This chronological relationship confirms and expands on the current theoretical and empirical conclusions of the ECB and the IMF, demonstrating that the effectiveness of monetary transmission is largely determined by the response of bank deposit rates and time lags, while the impact of the lending rate on inflation is minimal or temporary.

This research makes a novel contribution by a precise empirical delineation of the lag relationships among the key policy rate, bank lending and deposit rates, and the consumer price index, thereby enabling the assessment of short- and medium-term monetary policy impacts. Focusing on the deposit rate as the key channel for the transmission of monetary shocks to inflation allows us to clarify the role of bank interest rates in the traditional model of monetary regulation. On the other hand, confirming the limited direct impact of the lending rate on inflation is important for assessing the rationality of NIRP and short-term lending incentives. Thus, the work provides a deeper understanding of monetary transmission mechanisms and is important for optimising short- and medium-term banking and monetary policy.

Further research should focus on deepening the causal analysis of monetary transmission channels by integrating nonlinear dependencies and structural shifts caused by external macroeconomic shocks (changes in world prices, financial crises, currency interventions). A promising approach is to combine traditional VAR/VECM methods with causal neural network approaches, which will allow identifying hidden and asymmetric effects between interest rates, lending volumes, deposit activity, and inflation expectations, as well as improving the accuracy of inflation forecasts.

From a scientific and practical point of view, it is reasonable to conduct a comparative analysis of model responses for different monetary policy regimes, in particular inflation targeting, and to extend the time horizon of modelling to assess the long-term effects of shock transmission in the financial sector.

A separate area for further research could be the application of conditional impulse response functions to simulate central bank monetary policy scenarios and quantitatively assess their impact on inflationary processes in the medium term. This approach has the potential for practical use in the macroprudential analysis system and the formation of price stability policy.

Contribution of individual authors

Hanna Telnova: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing - original draft, Visualization, Writing - review & editing

Serhii Smerichevskyi: Conceptualization, Investigation, Writing - original draft, Writing - review & editing

Alla Ivashchenko: Conceptualization, Validation, Writing - original draft, Writing - review & editing, Supervision, Project administration

Olena Rybak: Data curation, Resources, Visualization, Writing - review & editing

Conflict of Interests

The authors declare no conflict of interest.

Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the authors used DeepL in order to translate some parts of the text from Ukrainian to English. After using this tool, the authors thoroughly reviewed, edited, and proofread the entire manuscript and take full responsibility for the content of the publication.

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