



THE IMPACT OF THE INTEREST CHANNEL OF THE TRANSMISSION MECHANISM ON THE ECONOMY IN CASE OF UZBEKISTAN – SVAR APPROACH

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ABSTRACT

In this scientific work, is studied the influence of the interest rate channel of the transmission mechanism on the economy. The analysis was carried out in case of Uzbekistan. The indicators were converted to real values relative to 2017q1, covering the period 2003q1-2024q2. We conduct our empirical analysis through the SVAR model. According to the results of the analysis, it was found that the impact of the Central Bank's key interest rate on inflation rate is high, but there is impact on the change in GDP growth. However, the impact of changes in the money supply on macroeconomic indicators is significant.

KEYWORDS: *interest rate channel, monetary policy, GDP, inflation rate, short-term loan rates.*

INTRODUCTION

The transmission mechanism of the monetary policy of the Central Bank has its own channels, through which the impulses of the monetary policy are transmitted on the economy. The channels of the transmission mechanism represent some mechanisms of interaction between the monetary policy and the real sector of the economy, starting from the announcements of monetary decisions. As a result, the reverse reaction of the monetary policy makers to the changing indicators reflecting the real situation after the measures implemented in the field of monetary policy is also taken into account.

In the economic literature, there are different views on the monetary policy transmission mechanism. In the previous period, the transmission mechanism was partially studied or some areas were studied, but after Ben Bernanke's scientific article at the Cornegie-Rochester Conference Series on Public Policy in 1986, scientists became very interested in studying this field on a large scale.

Although the impact of the central bank on the nominal interest rate by changing the money supply is undisputed by scholars, there are differing views on how the central bank affects the spending of households and firms. V. Ramey (1993), a scientist at the University of California, conditionally divided these views into two groups, i.e., "money view" and "credit view".

In the "money view" (money view) the central bank changes the short-term interest rate to affect the exchange rate and the long-term interest rate. Their change leads to a change in the volume of investments and expenses related to attracting capital. In the J.M. Keynes model, that is, in the IS-LM model, an increase in the nominal interest rate leads to an increase in the real interest rate, which, in turn, reduces aggregate demand. If we take into account the dependence of gross production on gross demand, this situation will cause a decrease in GDP. According to the "Christiano and Eichenbaum (1995)" model, an increase in the nominal interest rate reduces the aggregate supply, resulting in a negative effect on GDP growth.

In the "money view", great attention is paid to the investment demand of the financial sector. As a result, deficiencies in the financial sector and other economic indicators are ignored. The "money view" is more characteristic of Keynesians.

The nature of the "credit view" is based on the state of the financial market, information asymmetry, and the substitution of financial assets with real assets. They lead to higher interest rates and increase the cost of raising capital. From the credit view, by adjusting the price of real assets, it controls not only the interest rate itself, but also the premium paid for additional risks. Here, real assets participate as loan collateral. As the collateral price increases, the risk decreases and the reward decreases.



This situation was seen in the scientific works of A. Tobin (1969), K. Brunner and A. Meltzer (1972), who analyzed the market of various assets and tried to integrate it into the monetary policy transmission mechanism. In their work, B. Bernanke and A. Blinder (1988) focus on the imperfection of market information and the costs of a loan agreement between a bank and a client. This situation hinders the efficient functioning of the financial market and creates premiums that oblige borrowers to pay in addition to interest payments on debt.

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LITERATURE REVIEW

In the last 50 years, many scientific studies have been conducted on the importance of the monetary policy transmission mechanism and on determining the effectiveness of the transmission in different countries. In this, scientists are using various empirical models. Over the years, these scientific studies reveal new channels of monetary policy transmission and methods of determining their effectiveness.

M.P. Deb et al. (2023) studies the impact of the monetary policy transmission mechanism on the economy, with the statistical data of 33 developed and developing market economy countries during 1991-2023. According to the results of the analysis, it was determined that there are significant differences in how the monetary policy affects the economy, depending on the economic conditions in the countries, the level of development of financial institutions and other factors. In their scientific research, using VAR models and Local Projections Method, monetary restrictive policy has a quick and negative effect on economic activity, but it takes time to fully affect inflation and inflation expectations. It is worth noting that there is considerable variation in the conduct of monetary policy across countries and over time, depending on structural features and cyclical conditions. The channels of the transmission mechanism work effectively in countries with a managed exchange rate regime, a developed financial system and a strong monetary policy framework. They also found that monetary policy is stronger when there is low uncertainty in the economy, when financial conditions are tight, and when monetary policy is coordinated with fiscal policy, that is, when positions move in the same direction.

A. Cesa-Bianchi, G. Thwaites and A. Vicendoa (2020) researched the impact of changes in monetary policy in Great Britain on macroeconomic and financial variables using a new series of high-frequency monetary policy surprises. Using surprises as instruments in a monthly SVAR model over the UK's inflation targeting period, they find that monetary policy tightening leads to a decline in economic activity and the CPI, a stronger pound sterling, a contraction in bank lending and leading to a significant increase in mortgage and corporate bond spreads. UK monetary policy has also affected foreign credit spreads, confirming the large presence of large international players in the UK financial intermediation sector. Finally, they propose a new identification restriction test using the narrative series of monetary policy shocks developed by Cloyne and Hurtgen (2016) to show that high-frequency monetary policy surprises are not significantly affected by nonmonetary news.

D.Vayanos and J.L.Vila (2021) modeled the interest rate channel in their scientific work and determined that it occurs as a result of the interaction between investors' preferences for certain periods and prudent actions (arbitrageurs) in relation to risk. According to the results of the analysis, shocks in short-term interest rates are transmitted to long-term interest rates through arbitrageurs' trading on the stock exchange. Arbitrageurs benefit from passing these short-term interest rate shocks through bond risk premiums, which have been found to be directly proportional to movements in the interest rate structure. If short-term interest is the only risk factor, changes in investor demand will have the same effect on interest rates for all maturities, regardless of where they originate. The analysis showed that long-term interest rates are less affected by short-term interest rate forecasts. Buying large amounts of assets can be more effective in moving long-term interest rates, especially when focused on longer durations.

In our opinion, the econometric models used in this study show how long-term interest rate movements and their market reaction take place, taking into account the interaction of investor demand and short-term interest rates. This modeling helps to understand the relationship between investor demand and interest rates. The results show that large asset purchases and forecasts play an important role in moving long-term rates, providing important implications for economic policy and monetary policy planning.

M.Gubareva and M.R.Borges (2022) studied the sensitivity of the developing market corporate debt to interest rates. According to them, in previous studies, the sensitivity of corporate bonds to interest rates depends on the maturity, creditworthiness of issuers, embedded options and other individual factors. However, the dependence of sensitivity to interest rates on the stages of the economic cycle does not receive proper academic attention. Their research has provided empirical evidence and theoretical explanations for the bifurcation of sensitivity to interest rates across phases of the cycle, and shown how credit transmission reacts to interest rates. The research, analyzed using statistical data from 2004-2016, suggests that hedging against interest rates should be dynamic and take into account where the economy is in the current economic cycle.

B.S.Bernanke (2020) said that in order to overcome various monetary restrictions caused by the low setting of short-term interest rates in the money market, the Federal Reserve System and central banks of other developed economies have used new monetary policy instruments in recent years. In the scientific research conducted by this economist, it was noted that new monetary instruments, in particular, quantitative easing (QE) and forward guidance, are considered as the main new instruments used by the FedBank. He notes that the new instruments have been effective in easing financial conditions when central banks' key interest rates are low, and they may be even more effective in the future. He noted that new monetary instruments should be included in the set of standard central bank instruments. Simulations from the model used in FedBank show that if the nominal interest rate is in the range of 2-3 percent, which is consistent with many estimates for the US, then a combination of quantitative easing (QE) and forward-looking policy is around 3 percent. gap, and this compensates to a large extent the effects of the low threshold. The econometric models used in his research are designed to simulate the effects of monetary policy. The results show that new monetary instruments, in particular quantitative easing (QE) and forward guidance, are effective in easing economic conditions further. It also suggests that if the real interest rate is low, there is a need to strengthen countermeasures to constraints on money market rates.

RESEARCH METHODOLOGY

In this research, we analyze the impact of the interest rate channel within the monetary policy transmission mechanism on macroeconomic indicators, specifically on gross domestic product (GDP) and inflation rates. Our analysis incorporates the following dependent variables: GDP growth ($LnGDP_t$), changes in the inflation rate ($LnCPI_t$), short-term lending rate changes ($LnSTLR_t$), and long-term lending rate changes ($LnLTLR_t$). Independent variables include changes in the central bank's primary interest rate ($LnINR_t$) and changes in the money supply ($LnM2_t$).

To assess the interrelationships among these variables and to scale the statistical data comparably, we employed natural logarithmic transformations and analyzed the growth of these variables. Additionally, the indicators were converted to real values relative to 2017q1, covering the period from 2003q1 to 2024q2. We conduct our empirical analysis through the SVAR model.

ANALYSIS AND DISCUSSION OF RESULTS

The choice to consider lending rates as dependent variables is driven by the bidirectional influence of lending rates on macroeconomic indicators such as GDP and inflation, which, in turn, impact lending rates reciprocally. Therefore, only the central bank's interest rate and money supply changes were selected as independent variables.

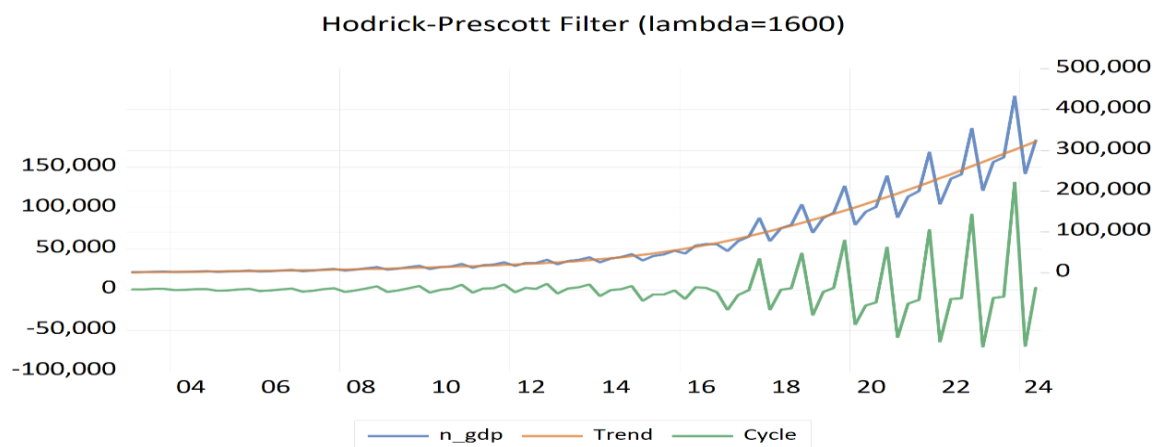


Diagram 1. The case of HP filtering of changes in the volume of GDP

A series of statistical analyses were conducted to study the selected variables, including descriptive statistics to examine their means, maximum and minimum values, and standard deviations. We also assessed the normal distribution of the selected variables in this study. Furthermore, to eliminate seasonal components, we applied the Hodrick-Prescott filter to the data.

The analysis shows that there is seasonality in the quarterly changes in the volume of GDP. That is, due to the large role of agriculture in the economy of our country, the products created are not distributed uniformly throughout the year.

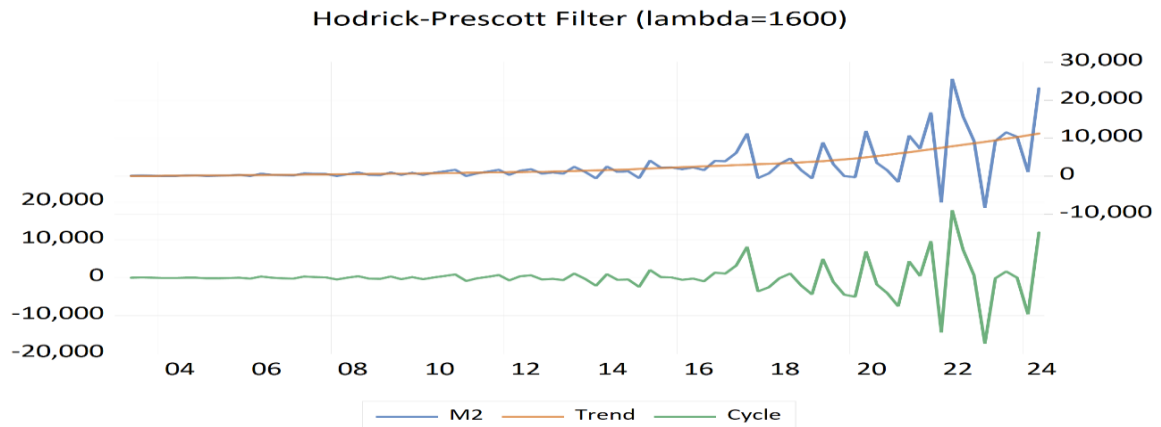


Diagram 2. The case of HP filtering of changes in the volume of Money supply.

From the analysis, we also found out that there are signs of seasonality in the money supply. That is, the Central Bank regulates the size of the money supply in relation to GDP. Therefore, the presence of seasonality in GDP, in turn, means that it is also present in the money supply.

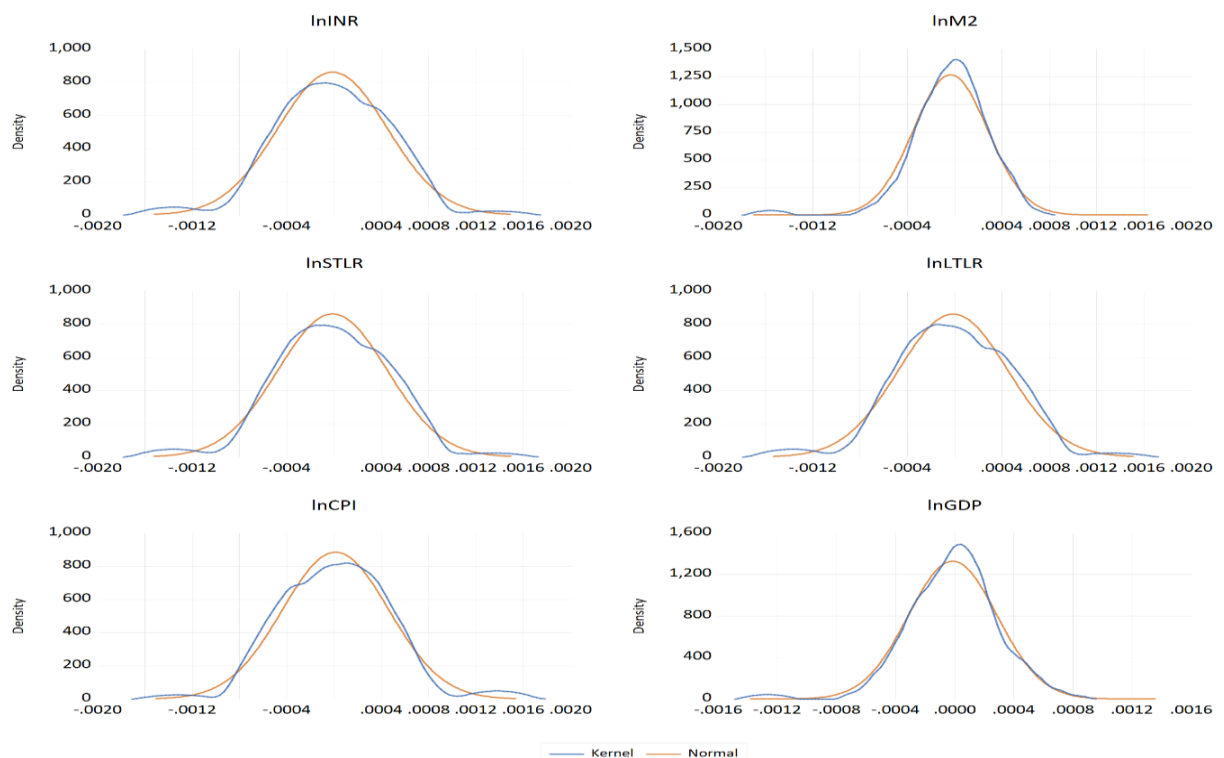


Diagram 3. Normal distribution of the selected indicator

The Jacques Bera coefficient was used to test the normal distribution of the data. The analysis showed that all the selected indicators have a normal distribution. Because it was found that the Jacques-Bera coefficient calculated for all the selected indicators is reliable and their probability is less than 0.05.

At the initial stage of the analysis, descriptive statistics of the selected indicators were performed.

Table 1
Descriptive statistics of the selected indicators

	$LnINR_t$	$LnM2_t$	$LnSTLR_t$	$LnLTLR_t$	$LnCPI_t$	$LnGDP_t$
Mean	-0.819	2215.99	-0.704	-0.782	2.747	57920.09
Median	-1.033	1608.13	-0.944	-1.017	2.924	40328.02
Maximum	6.432	13168.05	6.598	6.537	7.561	139445.1
Minimum	-5.627	-3950.48	-5.754	-5.584	-4.218	5615.65
Std. Dev.	2.175	2787.94	2.188	2.185	2.174	42632.33
Observations	84	84	84	84	84	84

We can see from the descriptive statistics of the indicators that the average real value of the selected percentage indicators is negative in the considered period. In particular, the quarterly average real value of the main interest rate of the Central Bank is -0.82 percent, its fluctuation is from -5.63 percent to 6.43 percent, and the frequency of deviation from the average is 2.17 percent units. Also, the average quarterly real indicator of the short-term loan rates is -0.70 percent, with a maximum of 6.54 percent and a minimum of -5.75 percent in the studied period, with a standard deviation of 2.19 percent. This situation is typical of the quarterly average real value of long-term loan rates.

Analyzing the quantitative indicators, the change in the quarterly average real amount of money in circulation was 2215.99 billion soums, and its fluctuation was from -3950.48 billion soums to 13168.05 billion soums, and the degree of deviation from the average was 2787.94 billion soums. Also, the average quarterly real value of the GDP was 57920.09 billion soums. During the period under review, the GDP trend fluctuated from 139445.1 billion soums to 5615.65 billion soums, and the standard deviation of GDP was 42632.33 billion soums.

At the next stage of our analysis, we determine the correlation matrix of indicators.

Table 2.
Correlation matrix of indicators.

	$LnINR_t$	$LnM2_t$	$LnSTLR_t$	$LnLTLR_t$	$LnCPI_t$	$LnGDP_t$
$LnINR_t$	1					
$LnM2_t$	-0.4137	1				
$LnSTLR_t$	0.7967	-0.4089	1			
$LnLTLR_t$	0.6895	-0.4044	0.8993	1		
$LnCPI_t$	-0.5894	0.4153	-0.7392	-0.7083	1	
$LnGDP_t$	-0.4806	0.9686	-0.4759	-0.4718	0.4833	1

According to the results of the analysis, it was found that there is a strong correlation between the Central Bank key interest rate and inflation rate. Also, there is a strong correlation between the money supply and GDP growth. We conduct our empirical analysis through the SVAR model. When using the SVAR model, we perform the Augmented Dickey-Fuller Test based on the initially selected indicators. We present the Augmented Dickey-Fuller Test model as follows:

$$\begin{aligned} \Delta INR_t &= \alpha_1 + \beta_1 t + \gamma_1 INR_{t-1} + \mu_1 \Delta INR_{t-1} + \dots + \mu_{p-1} \Delta INR_{t-(p-1)} + \sigma_t \\ \Delta R_M2_t &= \alpha_2 + \beta_2 t + \gamma_2 R_M2_{t-1} + \omega_1 \Delta R_M2_{t-1} + \dots + \omega_{p-1} \Delta R_M2_{t-(p-1)} + \theta_t \\ \Delta STLR_t &= \alpha_3 + \beta_3 t + \gamma_3 STLR_{t-1} + \zeta_1 \Delta STLR_{t-1} + \dots + \zeta_{p-1} \Delta STLR_{t-(p-1)} + \pi_t \\ \Delta LTLR_t &= \alpha_4 + \beta_4 t + \gamma_4 LTLR_{t-1} + \eta_1 \Delta LTLR_{t-1} + \dots + \eta_{p-1} \Delta LTLR_{t-(p-1)} + \varsigma_t \\ \Delta CPI_t &= \alpha_5 + \beta_5 t + \gamma_5 CPI_{t-1} + \phi_1 \Delta CPI_{t-1} + \dots + \phi_{p-1} \Delta CPI_{t-(p-1)} + \tau_t \\ \Delta GDP_t &= \alpha_6 + \beta_6 t + \gamma_6 GDP_{t-1} + \delta_1 \Delta GDP_{t-1} + \dots + \delta_{p-1} \Delta GDP_{t-(p-1)} + \varepsilon_t \end{aligned}$$

Here, $\alpha_1, \alpha_2, \alpha_3, \dots$ are constant values, $\beta_1, \beta_2, \beta_3, \dots$ are coefficients of change due to time trend.

Table 3.
Augmented Dickey-Fuller Test

		t-Statistic	Probability	Хүлоса
1	$LnINR_t$	-12.88063	0.0001	I(0)
2	$LnM2_t$	-5.931185	0.0000	I(0)
3	$LnSTLR_t$	-12.71540	0.0001	I(0)
4	$LnLTLR_t$	-12.68274	0.0001	I(0)
5	$LnCPI_t$	-12.98607	0.0001	I(0)
6	$LnGDP_t$	-14.21653	0.0001	I(0)

From the above data, it can be seen that all the selected indicators are stationary, and this is the basis that we can use the SVAR model.

At the next stage of our analysis, it will be appropriate to select the optimal "lag" for the SVAR model.

Table 4.
VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria

Lag	LogL**	LR	FPE	AIC	SC	HQ
0	4178.534	NA	5.36e-54	-105.6338	-105.4538	-105.5617
1	4442.147	480.5092	1.69e-56	-111.3961	-110.1364	-110.8914
2	4582.049	233.7601	1.24e-57	-114.0265	-111.6871	-113.0893
3	4671.472	135.8332	3.32e-58	-115.3790	-111.9598*	-114.0092
4	4745.416	101.0874*	1.37e-58*	-116.3396*	-111.8407	-114.5372*
5	4778.218	39.86073	1.70e-58	-116.2587	-110.6800	-114.0237

As can be seen from the above data, the optimal number of lags for our model is 4 based on the LR test, Final Prediction Error (FPE) and Akaike Information Criterion (AIC) and Hannan-Quinn Information Criterion (HQ) tests. However, according to the Schwarz Information Criterion (SC) test the number of lags is 3. Therefore, it is not a mistake for us to accept the optimal number of "lags" as 4 in our analysis.

When the indicators are analyzed using the SVAR model, the number of "lags" is assumed to be 4, and the results obtained are as follows.

- table
Result of SVAR model.

Vector Autoregression Estimates (with restrictions)

	$LnSTLR_t$	$LnLTLR_t$	$LnCPI_t$	$LnGDP_t$
$LnINR_t (-1)$	0.994155 (0.14531) [6.84183]	0.457437 (0.19126) [2.39168]	-1.325805 (0.13706) [-9.67331]	0.282880 (0.10154) [2.78583]
$LnINR_t (-2)$	0.767459 (0.22618) [3.39311]	0.106239 (0.29772) [0.35684]	-0.982307 (0.21334) [-4.60434]	0.187724 (0.15806) [1.18768]
$LnINR_t (-3)$	0.292731 (0.20055) [1.45964]	-0.286302 (0.26398) [-1.08456]	-0.632266 (0.18917) [-3.34235]	-0.043911 (0.14015) [-0.31332]
$LnINR_t (-4)$	0.330289 (0.12294) [2.68663]	-0.141317 (0.16182) [-0.87329]	-0.076485 (0.11596) [-0.65958]	-0.086737 (0.08591) [-1.00961]
$LnM2_t (-1)$	0.231708 (0.15582) [1.48699]	0.037026 (0.20511) [0.18052]	-0.272833 (0.14698) [-1.85626]	-1.670551 (0.10889) [-15.3413]
$LnM2_t (-2)$	-0.309784 (0.22961) [-1.34918]	-0.150332 (0.30223) [-0.49741]	0.409257 (0.21658) [1.88966]	0.811678 (0.16046) [5.05858]
$LnM2_t (-3)$	0.094092 (0.08279) [1.13653]	0.109125 (0.10897) [1.00140]	-0.196519 (0.07809) [-2.51658]	-0.126892 (0.05785) [-2.19330]
$LnM2_t (-4)$	-0.024501 (0.02275) [-1.07711]	-0.001170 (0.02994) [-0.03908]	0.026244 (0.02146) [1.22314]	0.001925 (0.01590) [0.12110]

From the model results, we can see that the impact of the Central Bank's key interest rate on exogenous indicators is high. That is, the impact of the Central Bank's interest rate channel on the economy is positive. However, the impact of the Central Bank's interest rate on gross domestic product is not noticeable. In particular, a one-percent increase in the Central Bank's key interest rate increases the short-term loan rates by 0.99 percent after one quarter, while it increases the long-term loan rates by 0.46 percent.

If we evaluate the impact of the Central Bank's interest rate channel on macroeconomic indicators, then a one-percent increase in the Central Bank's key interest rate affects the inflation rate after three quarters, reducing it by -0.63 percent. The central bank interest rate channel has a high impact on interest rates in the economy, but, it was found that there is no impact on the change in GDP.

However, the impact of changes in the money supply on macroeconomic indicators is significant. In particular, a one percent increase in the money supply affects gross domestic product with a two-quarter lag, and this impact is 0.81 percent. Also, an increase in the money supply affects not only GDP, but also the inflation rate. In particular, a one percent increase in the money supply increases the inflation rate by 0.41 percent with a two-quarter lag.

As a result of the SVAR model, the impulse response of the interest rate channel on the economy is presented below.

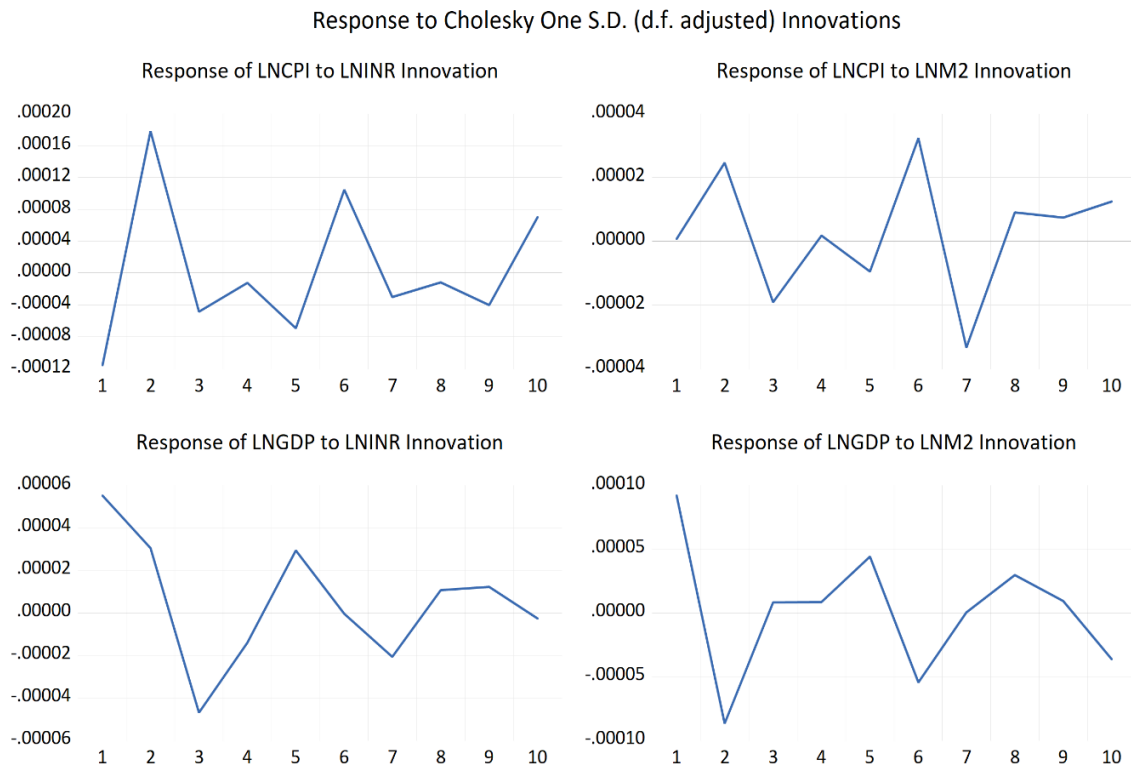


Diagram 4. Impulse response of macroeconomic indicators to the interest rate channel

From the impulse response in the structural vector autoregression (SVAR) model, we can observe that the effect of the Central Bank's interest rate channel on inflation becomes noticeable after two quarters. Specifically, an increase in the Central Bank's interest rate impacts inflation with a two-quarter lag, and this effect persists for three quarters.

Furthermore, analyzing the impulse of inflation to changes in the money supply indicates that an increase in the money supply has a short-term effect on inflation, lasting for two quarters. After the third quarter, the impact of changes in the money supply on inflation starts to dissipate.

Looking at the impulse of GDP to the interest rate channel, we find that an increase in the interest rate reduces production, with this effect lasting for three quarters. Additionally, the impulse response of GDP to changes in the money supply reveals a two-quarter lag in impact. In other words, an increase in the money supply affects GDP two quarters later, with this impact persisting for three quarters.

CONCLUSION

Based on the above analysis, it can be concluded that the Central Bank's main interest rate has been regarded as an indicative rate since 2019. Before this period, the Central Bank's influence on the money market through its primary interest rate was limited. While the Central Bank's ability to influence interbank lending and deposit rates in the money market has strengthened, its effect on bond yields remains weak.

In summary, prior to 2019, the transmission mechanism of the interest rate channel through the bond market had insufficient impact on the economy. However, since 2019, the establishment and expansion of the government securities market, and the increased issuance of Central Bank bonds in 2020, have enhanced the impact of the interest rate channel within the transmission mechanism on the economy.

It follows from the analysis that, before 2019, the Central Bank had two policy targets, which diluted the impact of the interest rate channel on the economy. However, the Central Bank's transition to a single inflation-targeting mandate in 2020 has improved the efficiency of the interest rate channel in the transmission mechanism. Negative developments in the international economy since 2022 have hindered the Central Bank's achievement of its inflation-targeting objectives, weakening the effectiveness of the interest rate channel.

It can be concluded that there are significant challenges for the Central Bank in enhancing the effectiveness of the interest rate channel through demand in the banking system. The primary reason is that the Central Bank increases the money supply not through refinancing instruments but by purchasing gold. In countries like ours, which produce gold, Central Banks' monetary policy instruments often do not function effectively.

From the above analysis, we can observe that the efficiency of the interest rate channel in the transmission mechanism relative to household consumption is improving. However, this improvement remains insufficient. According to estimated data, around 50-60% of gross domestic product is consumed by households, with roughly one-fifth of this consumption financed by bank loans. This indicates that a significant portion of assets purchased by households is funded by their savings.

From the analysis, it can be inferred that for the interest rate channel within the transmission mechanism to have a substantial impact on the economy, inflation and income dispersion among households must remain low in the short term. The analysis shows that until 2016, both inflation and household income volatility were low, providing a favorable environment for enhancing the impact of the interest rate channel on the economy. However, in 2017, both inflation and nominal household income began to fluctuate sharply, which has subsequently reduced the impact of the monetary policy transmission mechanism's interest rate channel on the economy.

In conclusion, the effectiveness of the Central Bank's monetary policy transmission mechanism's interest rate channel through interest-sensitive goods within GDP is not yet sufficient. This indicates that improving the efficiency of the interest rate channel requires increasing the resources available to commercial banks and enhancing the role of commercial bank loans in financing the production of goods in the economy.

REFERENCES

1. Ramey V.A. (1993). *How important is the Credit Channel in the Transmission of Monetary Policy?* NBER Working Paper No. 4285.
2. Christiano J. Lawrence and Martin Eichenbaum (1995). *Liquidity Effects, Monetary Policy, and the Business Cycle/ Journal of Money, Credit and Banking Vol. 27, No. 4, Part 1, November, pp. 1113-1136*
3. Tobin J. (1969). *A General Equilibrium Approach to Monetary Theory. Journal of Money, Credit, and Banking, 1(1), February, pp. 15-29.*
4. Brunner K., Meltzer A. (1972). *Money, Debt and Economic Activity / Journal of Political Economy № 80, pp.951-977.*
5. Bernanke B., Blinder A. (1988). *Credit, Money and aggregate Demand / The American Economic Review. №78– pp 435-439.*
6. Deb, M. P., Estefania-Flores, J., Firat, M., Furceri, D., & Kothari, S. (2023). *Monetary policy transmission heterogeneity: Cross-country evidence. International Monetary Fund.*
7. Cesa-Bianchi, A., Thwaites, G., & Vicondoa, A. (2020). *Monetary policy transmission in the United Kingdom: A high frequency identification approach. European Economic Review, 123, 103375.*
8. Vayanos, D., & Vila, J. L. (2021). *A preferred-habitat model of the term structure of interest rates. Econometrica, 89(1), 77-112.*
9. Gubareva, M., & Borges, M. R. (2022). *Governed by the cycle: interest rate sensitivity of emerging market corporate debt. Annals of Operations Research, 313(2), 991-1019.*
10. Bernanke, B. S. (2020). *The new tools of monetary policy. American Economic Review, 110(4), 943-983.*