

“Assessing the efficiency of the monetary transmission mechanism channels in Ukraine”

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ASSESSING THE EFFICIENCY OF THE MONETARY TRANSMISSION MECHANISM CHANNELS IN UKRAINE

Abstract

The paper is focused on the performance features of the monetary transmission mechanism (MTM) in Ukraine as a small open economy. To assess the efficiency of monetary transmission channels, it is important to disclose their interaction, define criteria and tools for analyzing their impact on key macroeconomic parameters. The study deepens approaches to the analysis of the intensity of using monetary, credit, interest rate and exchange rate channels in Ukraine in 2005–2020 and detects violations in the functioning of the MTM. Using economic and statistical methods and regression models, the influence of the main channels of monetary transmission on real GDP growth rate and inflation in Ukraine was assessed. It was concluded that it is advisable to clarify the conditions for increasing the efficiency of MTM in Ukraine; also, the parameters of forecasting the intensification of its channels in the medium and long term are determined. The paper highlights measures to improve the formation of volume and structure of the monetary base and monetary aggregates, improve credit and investment climate, and increase the efficiency of monetary regulation. Moreover, interest rate and foreign exchange policies of the central bank to transmit impulses from the decisions of monetary authorities to market participants were substantiated.

Keywords

central bank, monetary policy, monetary transmission mechanism, transmission channels, interest rates, Ukraine

JEL Classification

C10, C49, E51, E52, E59

INTRODUCTION

The monetary transmission mechanism (MTM) plays an extremely important role in achieving the central bank's primary goals of ensuring price stability and supporting economic growth by transmitting monetary impulses from the central bank to the real economy. Impulses from the central bank are transmitted through the transmission mechanism channels, such as monetary, interest rate, exchange rate, credit channels, the asset price channel, and the expectations channel.

Nowadays, due to the economic crisis, the COVID-19 pandemic, and political instability, the efficiency of MTM in Ukraine remains low, making it difficult for the central bank to make effective decisions, exacerbating monetary imbalances and holding back economic growth. The low MTM efficiency manifests itself in the imbalance of money and foreign exchange markets, deformation of the credit market, deterioration of credit and investment climate, disruption of financial intermediation, reduced impact of monetary impulses from the central bank on the financial system and the real economy, which increases inflation and devaluation expectations.

To assess the effectiveness of each channel of monetary transmission, it is vital to disclose their interaction and identify the criteria and tools for assessing the impact of each channel on the main macroeconomic parameters.

The peculiarity of MTM's operation in Ukraine as a small open economy is the complex interconnection of its channels; therefore, the activation of one affects the efficiency of other channels and the effectiveness of monetary impulses. Given the complexity and unpredictability of economic processes, changing economic conditions and financial instability, the operation of MTM in Ukraine requires an expanded understanding of the transfer of monetary impulses from the central bank to the real sector of the economy, so that monetary authorities can make better decisions.

1. LITERATURE REVIEW

The study of MTM in the scientific literature is one of the priority areas of modern monetarism development. Attention to this issue increased in the mid-1990s. Mishkin (1995) was one of the first to study the process of monetary transmission, highlighting two main channels, namely, monetary and credit, and showing their influence on the monetary policy transmission mechanisms and the behavior of economic agents. Taylor (1995) introduced the concept of the interest rate channel and the exchange rate channel, and Ireland (2006) began to actively explore the asset price channel.

Today, scholars identify and study a different number of channels and differently define their importance for the effective implementation of monetary policy by central banks. Depending on the country's level of economic development and the specifics of monetary regulation, some researchers consider the following priority channels: interest and credit (Mukhtarov et al., 2016; Auclert, 2019; Ghosh, 2020); interest rate (Canova & Gambetti, 2009; Minella & Souza-Sobrinho, 2013; Wray, 2020); credit (Reichel et al., 2019); interest rate and currency (Ruslan et al., 2020; Can et al., 2020); credit and currency (Afrin, 2017), etc.

Perez (1998) and Endut et al. (2018) noted a decrease in the role of the monetary transmission credit channel in favor of the interest rate channel. Afrin (2017), using the example of Bangladesh, proved the importance of the monetary channel and drew attention to the high efficiency of the monetary aggregate targeting mechanism to ensure price stability.

Adrian and Liang (2018) introduced the concept of a new channel into scientific circulation – a risk-taking channel that ensures the transmission of financial conditions associated with a decrease in employment to financial stability in various sectors of the economy. According to Egea and Hierro (2019), leveraging the risk-taking channel in the US and most EU countries to ensure financial stability has become an efficient new monetary transmission mechanism.

In the process of researches, scientists formulate MTM's objectives in different ways: supporting economic growth (Lange, 2018; Brandao-Marques et al., 2020); curbing inflation, in particular, based on inflation targeting (Minella & Souza-Sobrinho, 2013; Mishchenko & Mishchenko, 2015); improving the investment climate and expanding access to finance (Durante et al., 2020); reducing the risks of financial instability. However, according to most scholars and practitioners, the ultimate goal of the transmission mechanism is to improve the efficiency of the central bank's monetary policy and monetary regulation of the economy.

Wray (2020) places significant emphasis on ensuring effective monetization of the economy through interest rate management, including the base interest rate and yields on deposits and government bonds.

Canova and Gambetti (2009), studying the influence of the interest rate channel using the example of the United States, conclude that it has a significant impact on the dynamics of production and does not affect the dynamics of inflation. Brandao-Marques et al. (2020) have shown that in emerging markets, raising interest rates helps reduce inflation but reduces output.

Mohanty and Rishabh (2016) highlight the need to strengthen financial intermediation as a crucial factor in the functioning of MTM in emerging markets. Due to the decline in global long-term interest rates, the monetary policy of national central banks cannot be implemented solely on the basis of managing short-term interest rates. Therefore, to ensure economic and financial stability, new tools are needed that can adequately reflect the consequences and improve the performance of monetary transmission channels.

The international aspects of the operation of the transmission mechanism were not ignored either. Thus, Avdjiev et al. (2018) investigated the use of the US dollar and the euro in international bank lending, and Anaraki (2019) analyzed the impact of the Federal funds rate (FFR) and LIBOR rate on the economic development of the euro area in the context of non-traditional monetary policy. Can et al. (2020) conducted similar studies on the impact of the FFR interest rate on monetary channels in Turkey and proved its significant impact on national output.

A separate area of research in the context of improving the MTM mechanisms is the analysis of the impact of different monetary systems on monetary transmission channels in developing countries, and the development of proposals for countercyclical monetary regulation and use of macroprudential policies (Mishchenko et al., 2016; Adrian & Liang, 2018; Farhi & Werning, 2019; Auclert et al., 2020; Ivanov et al., 2019).

2. AIMS AND METHODS

The paper aims to improve approaches to analyzing the utilization rate of the transmission mechanism channels in Ukraine, such as monetary, credit, interest and exchange rates, and to assess their impact on real GDP growth and inflation.

The purpose of monetary transmission is to transmit impulses (signals) from the decisions of monetary authorities in the sphere of monetary policy to the real sector to accelerate economic growth, increase employment and curb inflation.

It is based on the fact that the main channels of monetary transmission, which can be actively

influenced by the National Bank of Ukraine, are monetary, credit, interest rate, and currency channels. Assessing the intensity of usage and efficiency of each of them testifies to the effectiveness and consistency of actions taken by monetary authorities and the government.

The study is based on using a wide array of statistical data of the National Bank of Ukraine in 2005–2020, as well as on the calculations using a set of economic-statistical and economic-mathematical methods.

When revealing the cause-and-effect ties, the main resulting indicators characterizing the effectiveness of MTM channels are the growth rates of the real GDP and the inflation rate. Indicators characterizing the use of the main transmission mechanism channels are selected as factor features:

- monetary – the growth rate of the monetary base and monetary aggregates, the velocity of money, money multiplier, the level of the economy monetization;
- credit – lending growth rate, the loan-to-GDP ratio, the share of non-performing loans;
- interest rate – the base interest rate and the yield on government bonds;
- exchange rate – the growth rate of the exchange rate, the level of financial dollarization, etc.

To determine and quantify the relationship between individual monetary indicators, economic and statistical methods, as well as regression models, were used. Practical recommendations were developed, considering the conditions for the effective functioning of MTM channels in Ukraine, for which the methods of system-structural analysis and expert assessments were used.

3. EMPIRICAL RESULTS

Analysis of individual MTM channels in Ukraine in 2005–2020 shows the different intensities of their use. Thus, in 2005–2010, the National Bank of Ukraine paid more attention to the manage-

ment of monetary and credit channels, in 2015–2018 – to the exchange rate channel, and in 2014–2020 – mainly to the interest rate channel.

The monetary channel of monetary transmission is traditionally considered the oldest and simplest, and it is based on the need to balance the money supply of the central bank with the needs of the economy in the money supply. Therefore, the main *criterion for the monetary channel efficiency* should be compliance with the established volumes, structure, and growth rates of the monetary base and monetary aggregates, indicators of money use, as well as ensuring an appropriate level of monetization of the economy as a whole.

However, the results obtained show that in the period 2005–2020 in Ukraine there were no clear proportions between the growth rates of the monetary base and monetary aggregates, which indicates an imbalance in the demand and supply of money in the national economy.

The analysis deepens the understanding of the peculiarities of the monetary channel operation. The main reason for the low efficiency of the monetary transmission channel in Ukraine is the imperfection of methods for forming the volume and structure of the monetary base (Mh). In 2020, compared to 2005, the monetary base increased 7.2 times, while the share of cash issued in the structure of Mh in 2005 amounted to 79.04%, and in

2020 – already 93.71%, i.e. 14.7 percentage points more (Figure 1).

The structure of the monetary base would be better if the share of cash decreased and the share of transferable deposits increased, as is the case in many other countries. However, it should be noted that during the COVID-19 pandemic, an increase in cash demand was observed in most countries of the world.

Imperfect formation of the volume and structure of the monetary base negatively affected the formation of the volume and structure of individual monetary aggregates. As a result, the money supply was unbalanced and did not meet the requirements for maintaining stable economic growth.

Thus, the imbalance in the structure and dynamics of monetary aggregates shows that their growth rates, even within one year, fluctuate very strongly. For example, in 2005 the growth rate of the M3 aggregate and the growth rate of the monetary base (Mh) practically coincided. In 2015, the growth of M3 exceeded the growth of Mh by 4.88 times, and in 2019 this figure was only 0.59 times (Figure 2).

In addition, in 2014–2019, the effect of monetary clamp was observed in Ukraine, which can be considered as an artificial targeted NBU restriction of the cash inflows into the money supply channels.

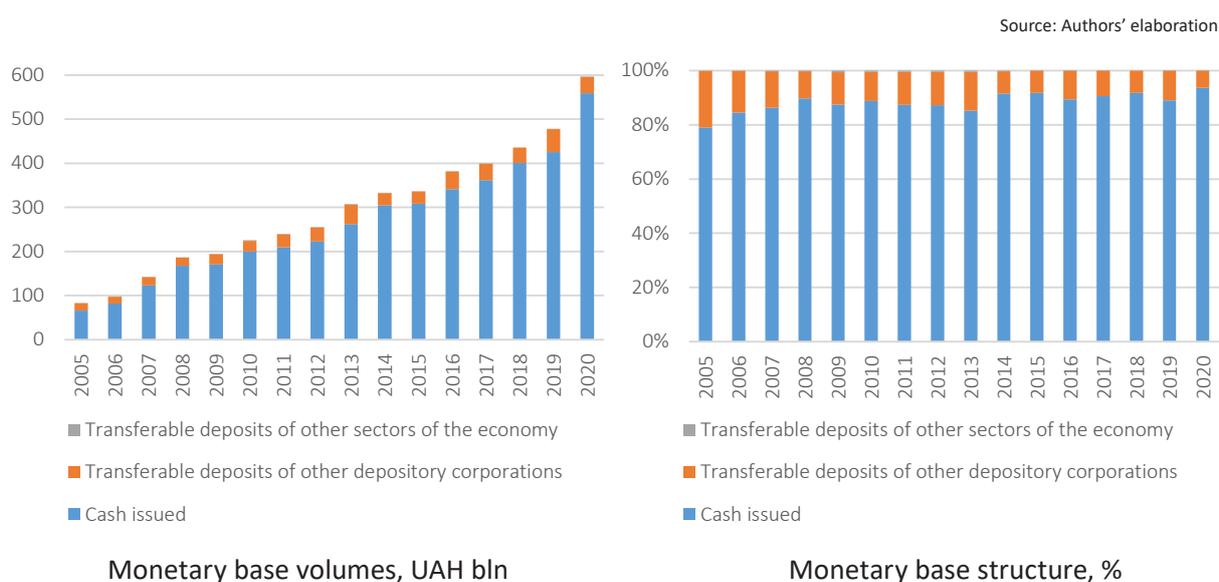


Figure 1. Volumes and structure of Ukrainian monetary base in 2005–2020

Source: Authors' elaboration.

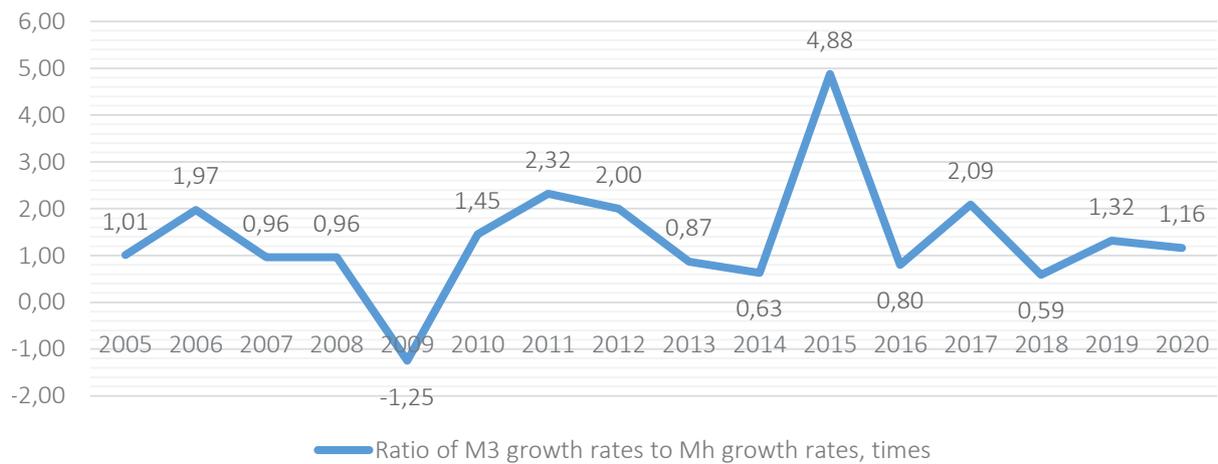


Figure 2. The ratio of growth rates of the monetary aggregate M3 and the monetary base in Ukraine in 2005–2020

As a result, the level of economic monetization decreased from 62.5% in 2013 to 35.9% in 2018 with a gradual increase to 44.1% in 2020 (Figure 3). The main reasons for this situation were a significant increase in interest rates and a decrease in lending, that is, a weakening of the credit and interest channels of monetary transmission.

2005, the velocity of money has gradually slowed down and reached 1,601 in 2013, and since 2014 it began to grow again, reaching 2,763 turnovers per year in 2019 (Figure 3).

The consequence of imbalances in the structure and dynamics of money supply indicators were significant fluctuations in the use of money, such as the money multiplier, the velocity of money, and the level of economic monetization. Since

An extremely important role in the formation of a broad money supply (M3 aggregate) belongs to the process of increasing money based on deposit and credit emission of money by commercial banks. Due to the efficient operation of banks in the money market, an increase in the value of the money multiplier reduces the need for the money supply M3.

Source: Authors' elaboration.

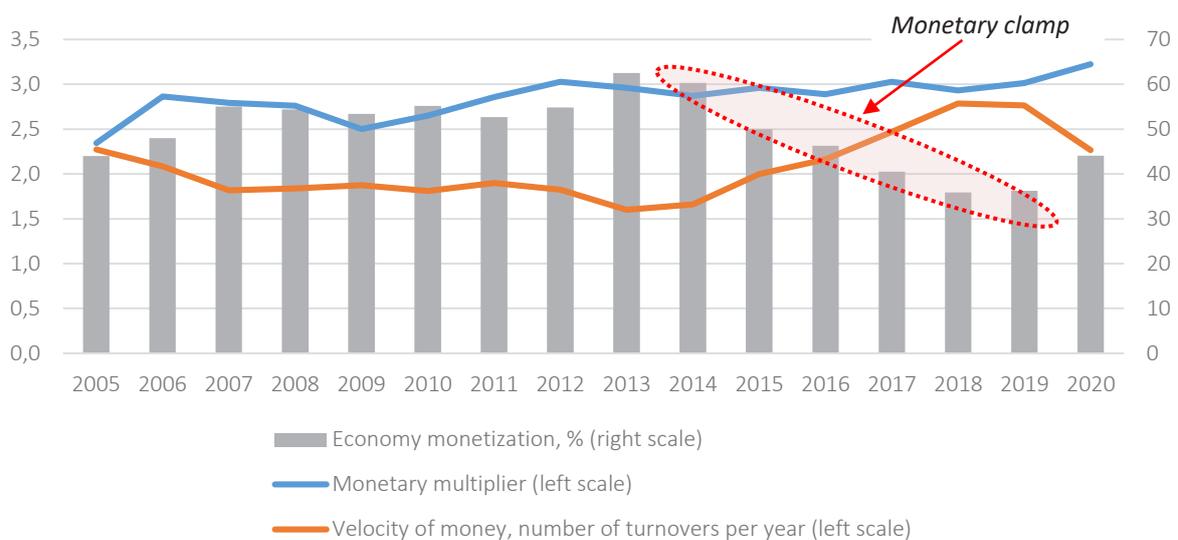


Figure 3. Monetary multiplier, speed of money turnover, and monetization ratio of the Ukrainian economy in 2005–2020

Source: Authors' elaboration.

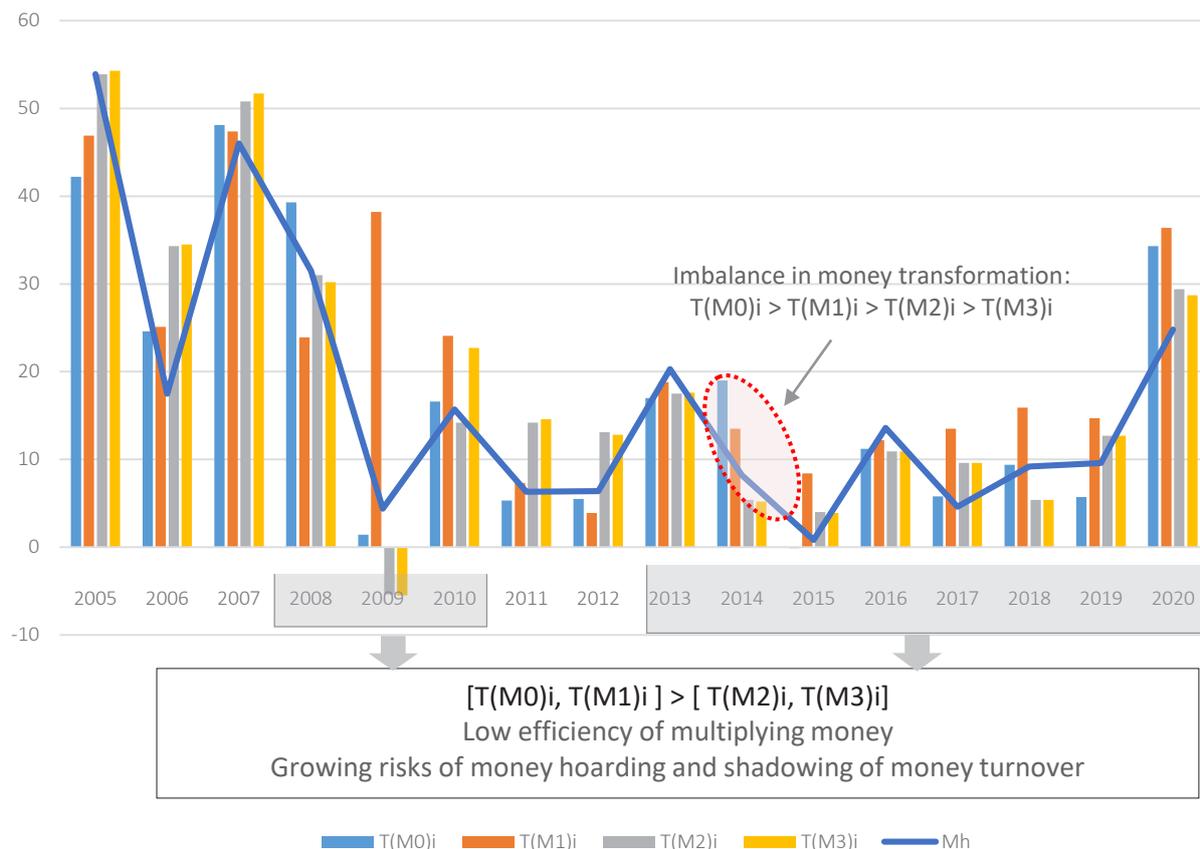


Figure 4. Slowdown and instability of monetary transformation processes in Ukraine in 2005–2020

During 2005–2020, with slight fluctuations, the money multiplier increased until 2012 and amounted to 3,029, and then began to decline again. Only after 2017, the growth of the money multiplier partially resumed and in 2020 it reached a maximum value of 3,222 (Figure 3). However, compared to other countries, the value of the money multiplier in Ukraine is still low, which once again testifies to the inefficiency of the monetary channel of the monetary transmission.

The dynamics of the money multiplier shows that due to the economic crisis and political instability the transformation of narrow money into broad money (M3 aggregate) by accumulating them in current and deposit bank accounts is very slow (Figure 4).

Due to the slowdown in this transformation, banks are poorly performing their deposit and credit issue functions. As a result, the level of monetization of the economy remains relatively low; and in 2014–2019 there was a *remonetization of the econo-*

my, accompanied by high inflation, which became a new monetary phenomenon for the Ukrainian economy.

As the analysis has shown, the intensity of the monetary transmission money channel in different periods was different, but the effectiveness of its impact on the real economy remains low. This is fully consistent with the provisions of the money neutrality theory, according to which the change in the money supply in the long run does not have a significant effect on the GDP (Figure 5).

The change in the M3 monetary aggregate had the most significant impact on the real GDP growth rates in 2005–2020. The dependence of the growth rate of the real GDP on the growth rate of the M3 aggregate indicates a relatively high level and reliability of the relationship between these indicators:

$$GDP_t = -3.9474 + 0.2220GM3_t, \quad (1)$$

$$r = 0.5960, R^2 = 0.3552, F = 7.71, DW = 1.67,$$

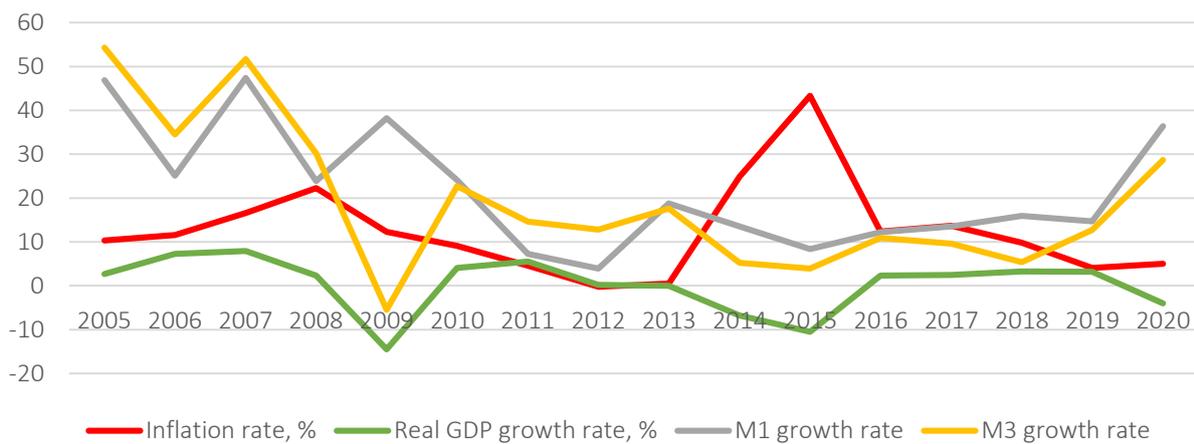


Figure 5. Values of indicators characterizing the features of the MTM monetary channel in Ukraine in 2005–2020

where GDP_t – is the real GDP growth rate in period t , and $GM3_t$ – is the growth rate of the M3 monetary aggregate in the period t .

The dynamics of the monetary aggregate M0 with a time lag of up to one year caused the greatest influence on the inflation rate in the analyzed period. However, the strength of the relationship between these indicators ($r = 0.3710$) does not give grounds to assert a high level of reliability.

According to economic theory, an increase in the money multiplier should significantly reduce the need for the money supply required to serve the economy. However, according to the analysis of Ukraine's money market in 2005–2020, the influence of the monetary multiplier on the growth rate of the M3 monetary aggregate was insignificant, since the correlation coefficient was only -0.3040 . This situation can be explained by the fact that the actual growth rates of the M3 monetary aggregate in certain periods exceeded the real need of the national economy for money.

However, the money multiplier is not the only factor influencing the dynamics of the money supply. The amount of money needed to service economic turnover is a complex indicator that depends on the dynamics of production, inflation, and exchange rates. As a result of calculations, the following equation was obtained:

$$GM3_t = 76.5204 - 0.4508GDP_t - 21.7785MM_t + 1.3558IR_t - 0.9253ER_t, \quad (2)$$

$$R = 0.7841, R^2 = 0.6149, F = 4.39, DW = 1.23,$$

where $GM3_t$ – is the growth rate of M3 in the period t , GDP_t – is the real GDP growth rate in the period t , MM_t – is the monetary multiplier value in the period t , IR_t – is the inflation rate in the period t , %; and ER_t – is the growth rate of the hryvnia exchange rate against the US dollar in the period t .

Analysis of equation (2) shows that the growth of the M3 monetary aggregate in the analyzed period was most influenced by the dynamics of real GDP and inflation. In addition, the analysis of the influence of these factors on the formation of the general need for money showed that, on average, only 61.49% of the broad money supply that was in circulation served the real economic turnover, taking into account the increase in inflation. Hence, it can be assumed that the rest of the money was either surplus or could be used to acquire financial assets or be accumulated.

Thus, due to the unbalanced structure and dynamics of the monetary base and monetary aggregates, as well as the low multiplication factor of the money supply, the efficiency of the monetary channel of monetary transmission was relatively low. As a result, the level of economic moneti-

zation increased very slowly and unstably, which held back the effect of monetary levers to stimulate economic growth.

As already noted, there is no consensus among scholars regarding the assessment of credit channel utilization. In this study, the following *credit channel effectiveness criteria* of monetary transmission are considered: favorable credit climate, availability of bank loans, favorable price and non-price conditions for their provision, high growth rates of lending to the economy, a high loan-to-GDP ratio, high quality of banks' loan portfolios, as well as a low share of non-performing and problem loans in banks' assets.

Until 2014, the credit channel in the Ukrainian economy was one of the most effective. However, since 2015, the indicators characterizing its effectiveness have deteriorated significantly, first of all, due to a decrease in bank liquidity, a sharp rise in interest rates, deteriorated lending conditions, an increase in credit risks, and an increase in the share of non-performing loans (NPLs) in banks' assets. Thus, in 2015–2018, the pace of lending slowed down significantly, and in 2019–2020, lending fell physically. In 2020, the ratio of loans to GDP was only 22.9%, while in 2008 it was 83.6%. The share of overdue debt on loans in the structure of bank assets in 2015–2020 ranged from 22.1 to 54.5% (Figure 6).

In the analyzed period, the expansion of bank lending significantly affected the growth rate of real GDP. This relationship is represented as follows:

$$GDP_t = -1.5673 + 0.1025GRL_t, \quad (3)$$

$$r = 0.5050, R^2 = 0.2550, F = 4.80, DW = 1.68,$$

where GDP_t – is the real GDP growth rate in the period t , %; GRL_t – is the growth rate of loans granted in the period t , %.

In 2019–2020, due to the relatively low efficiency of the monetary channel and the weakening of the process of multiplying money, there was a significant decrease in the coefficient characterizing the ratio of loans to deposits (Figure 6). This was also because the excess liquidity available in banks was not used to lend to the economy, but was used to purchase government bonds and NBU deposit certificates. As a result, the efficiency of the monetary transmission credit channel was very low, as evidenced by negative values or a very low ratio of credit growth rates to real GDP growth rates (Figure 7).

The reasons for the low efficiency of the credit channel were also the deterioration of the financial condition of corporations and households and the relatively low demand for investment resources and consumption, which was further constrained by high-interest rates on loans.

To analyze the relationship between lending growth rates and interest rates, a yield on short-term government bonds (up to 1 year) was chosen, which accurately reflects the real demand for

Source: Authors' elaboration.

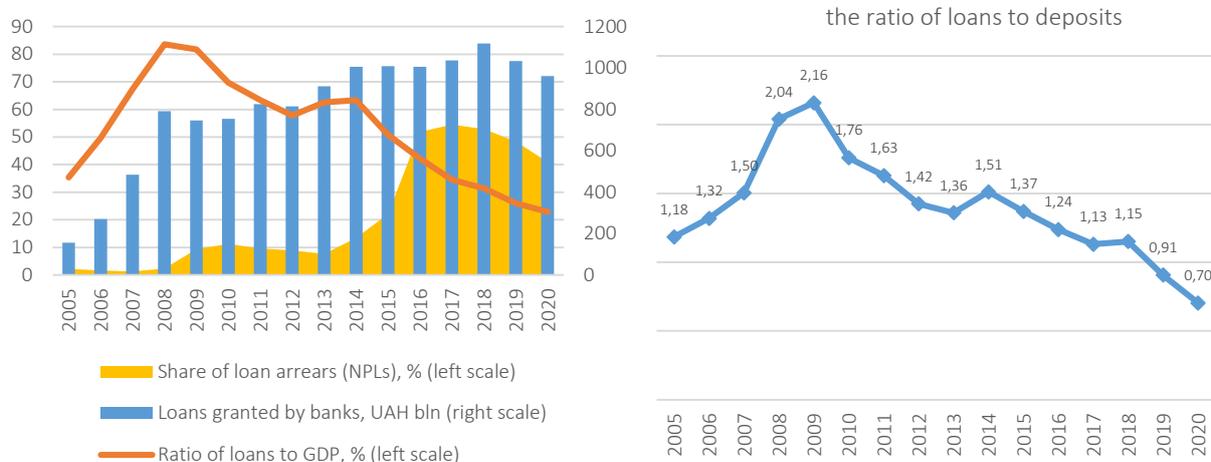


Figure 6. Indicators of Ukrainian banks' lending activity in 2005–2020

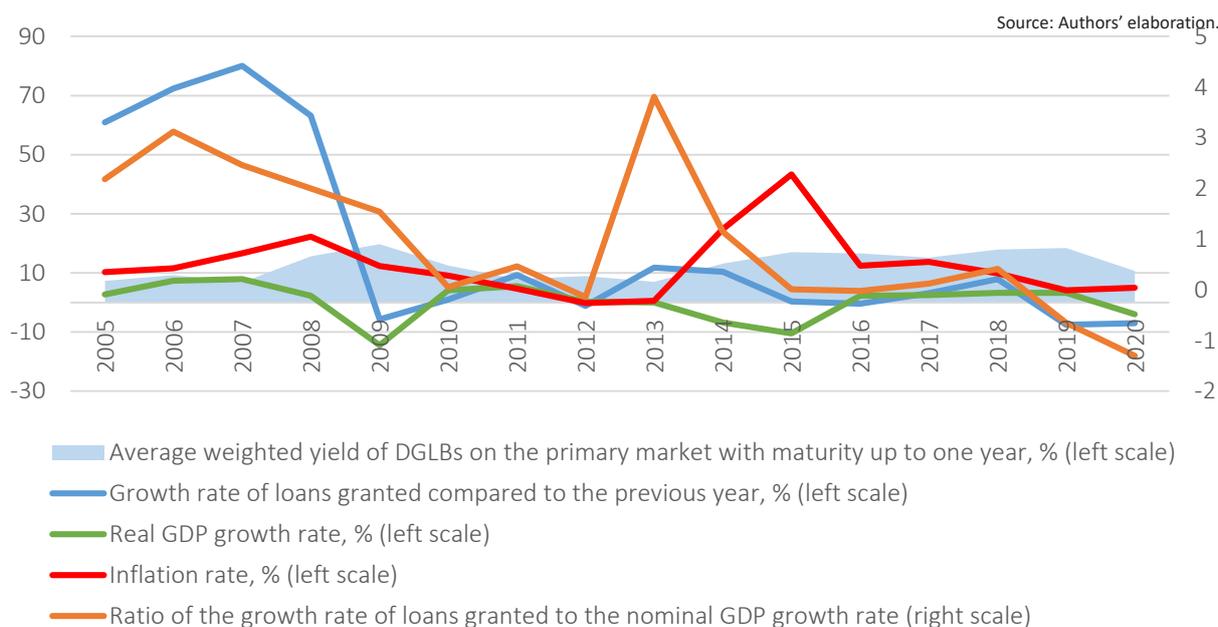


Figure 7. Values of indicators characterizing the features of the MTM credit channel in Ukraine in 2005–2020

money in the national economy. This is especially evident with a time lag of 3 to 6 months. The results of calculations using the annual lag have shown that an increase in interest rates negatively affects the dynamics of lending:

$$GRL_{t+1} = 68.6555 - 4.1005GBY_t, \quad (4)$$

$$r = -0.6420, R^2 = 0.4122, F = 9.13, DW = 0.66,$$

where GRL_{t+1} – is the growth rate of loans granted in the period $t + 1$, %; GBY_t – is the weighted average rate of return on short-term domestic government bonds in the primary market in the period t .

An increase in the base interest rate, rates on short-term government bonds, a decrease in the bank-to-GDP ratio, and a high proportion of NPLs (Figure 6) negatively affected economic growth and significantly reduced banks' financial stability, which negatively affected the efficiency of the monetary transmission credit channel.

Thus, the study showed that the efficiency of the monetary transmission credit channel in Ukraine is relatively low and largely depends on the efficiency of the interest rate channel, which in recent years has had a more significant impact on the monetary market and key macroeconomic indicators.

Thus, the main criteria for the effectiveness of the MTM interest rate channel are the insignificant and predictable volatility of the central bank's base interest rate and, accordingly, all interest rates in the monetary market, a positive difference between the base rate and the expected inflation rate; minor deviations in the yield on short-term domestic government bonds from the base rate, as well as a high level of development and stability of the stock market and the financial sector.

As the analysis showed, in the context of financial instability, the weighted average base interest rate fluctuated in a very wide range – from 7.02% in 2013 to 25.30% in 2015. In line with the changes in the base rate, the yield rates on short-term government bonds also changed, which, in fact, are one of the forms of the value of national money and have a similar effect on the monetary transmission interest rate channel (Figure 8).

Thus, the weighted average yield on short-term domestic government bonds in the primary market with a maturity period of up to 1 year ranged from 6.71% in 2007 to 19.76% in 2009. The largest gap between these rates was observed in 2009 (8.60 pp) and 2015 (–8.30 pp); this indicates significant imbalances in the NBU's monetary policy during this period (Figure 8).

Source: Authors' elaboration.

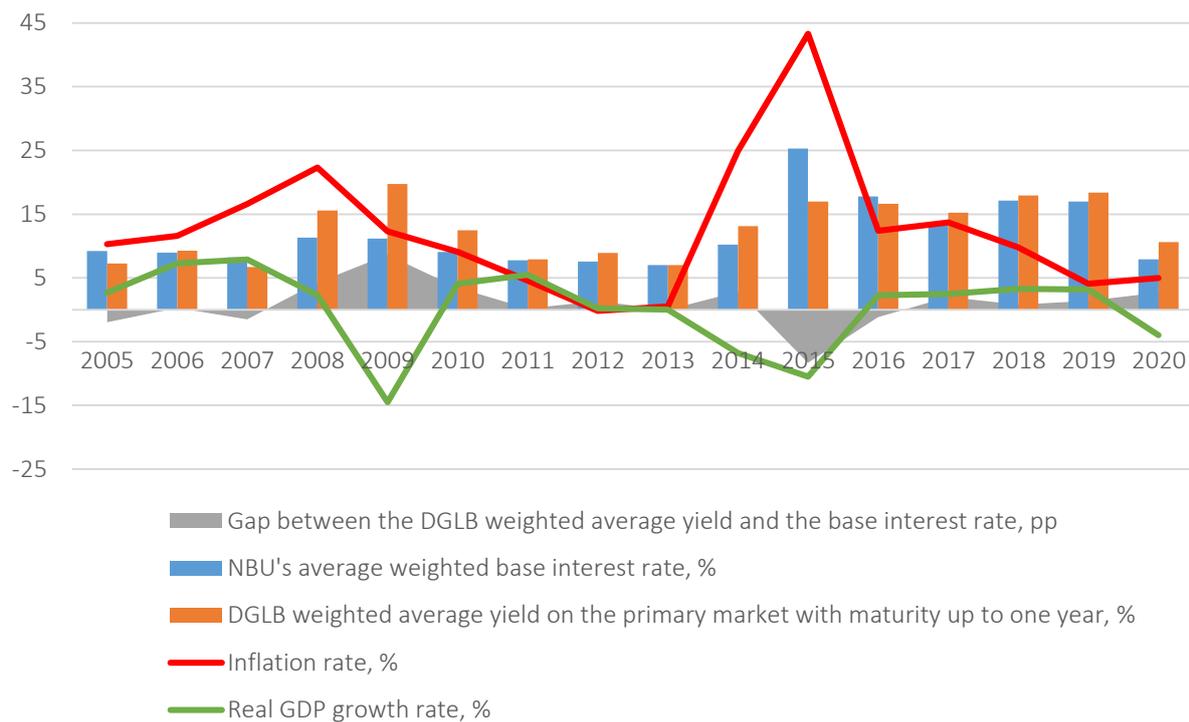


Figure 8. Values of indicators reflecting the influence of the MTM interest rate channel in Ukraine in 2005–2020

The main instrument on which the monetary transmission interest rate channel is based in the central bank's base interest rate, which determines the overall set of interest rates in the money and stock markets, as well as the yield on government bonds. For the analyzed period in Ukraine, with a probability of 53.44%, an increase in the base interest rate by 1 percentage point contributed to an increase in the average yield of short-term government bonds by 0.6547 percentage points:

$$GBY_t = 5.0157 + 0.6547BIR_t, \quad (5)$$

$$r = 0.7310, R^2 = 0.5344, F = 16.07, DW = 1.42,$$

where GBY_t – is the weighted average rate of return on short-term domestic government bonds in the primary market in the period t , BIR_t – is the weighted average base interest rate in the period t .

However, it should be noted that both the increase in the base interest rate and the yield on short-term government bonds had a negative impact on economic growth, actually restraining the growth rate of the real GDP:

$$GDP_t = 8.5619 - 0.6450GBY_t, \quad (6)$$

$$r = -0.4680, R^2 = 0.2190, F = 3.92, DW = 1.69,$$

where GDP_t – is the real GDP growth rate in the period t , GBY_t – is the weighted average yield of short-term domestic government bonds in the primary market in the period t .

Among the instruments characterizing the influence of the interest rate channel, the most effective was the impact of the base interest rate on inflation, as a result of which its 1 pp increase led to an increase in inflation by 1.3222 percentage points:

$$IR_t = -3.0831 + 1.3222BIR_t, \quad (7)$$

$$r = 0.6240, R^2 = 0.3894, F = 8.91, DW = 1.27,$$

where IR_t – is the inflation rate in the period t , BIR_t – is the weighted average base interest rate in the period t .

In addition, an increase in the base interest rate negatively affected the growth rate of the real GDP,

holding it back. However, the impact of changes in the yield on short-term government bonds was much larger, since it directly affected the situation on the credit market.

The cumulative effect of changes in the base interest rate and the gap between the weighted average yield on short-term government bonds and the base rate on inflation was significant:

$$IR_t = -0.7086 + 1.1587BIR_t - 0.4734GR_t, \quad (8)$$

$$R = 0.6383, R^2 = 0.4075, F = 7.16, DW = 1.30,$$

where IR_t – is the inflation rate in the period t , BIR_t – is the weighted average base interest rate of the NBU in the period t , GR_t – is the gap between the weighted average yield of domestic government loan bonds (DGLBs) and the NBU base interest rate in the period t .

Thus, one can conclude about the high efficiency of the monetary transmission interest rate channel in Ukraine and its significant impact on the monetary and interest rate channels, as well as on the dynamics of macroeconomic indicators. Meanwhile, the efficiency of the interest rate channel can be significantly increased by implementing more balanced approaches of the NBU to its

interest rate policy and periodic adjustments of the base interest rate, as well as reasonably setting the yield rates on government bonds. In addition, improving the efficiency of the interest rate channel, among other goals, should provide a significant increase in the level of financial depth of the economy and financial intermediation.

Recently, comparatively little attention has been paid in the scientific literature to the study of the monetary transmission currency channel, which is due to the introduction by most countries' liberal currency regulation regimes and market exchange mechanisms. However, the analysis showed that in developing countries, this channel remains one of the most effective.

The criteria for the effectiveness of the monetary transmission currency channel should be the low volatility of the national exchange rate for a long time, the absence of administrative restrictions for the functioning of the foreign exchange market, and the level of financial dollarization of the economy justified by the needs of exports and imports.

A currency channel and prudent exchange rate policies are particularly important for small commodity-based economies that are vulnerable to dramatic changes in trading conditions and prices

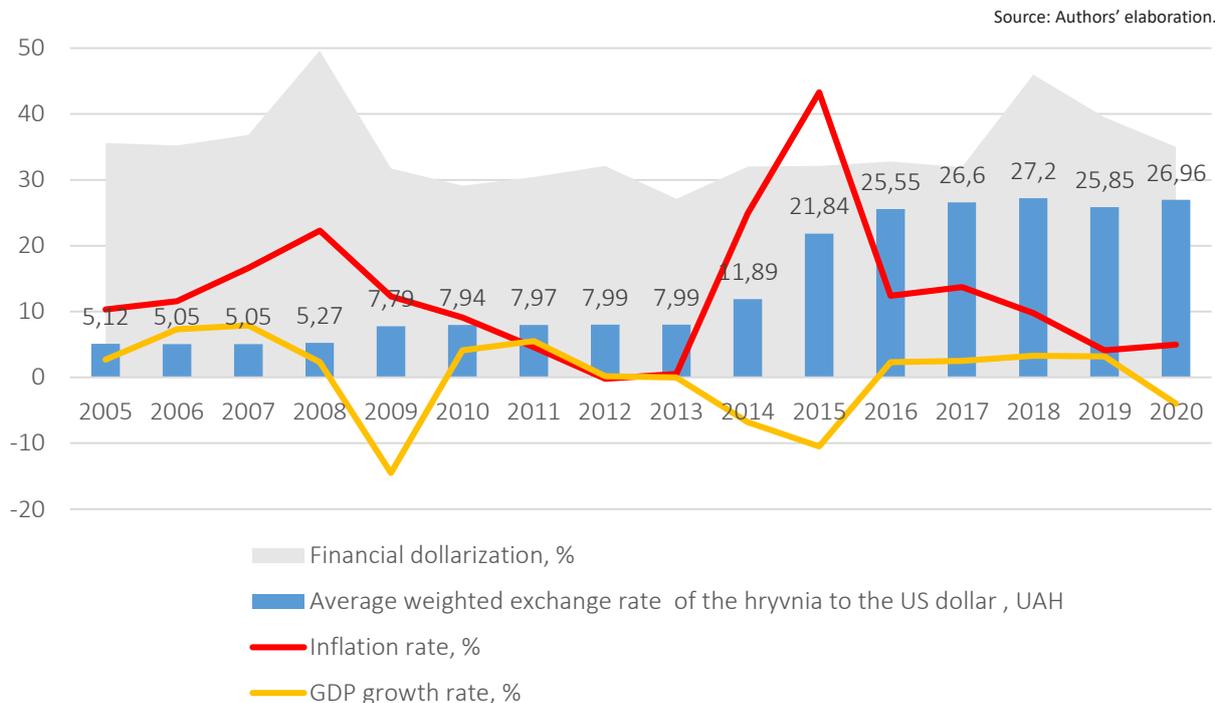


Figure 9. Values of indicators characterizing the MTM exchange rate channel in Ukraine in 2005–2020

in global commodity markets. In addition, the difference in inflation rates in Ukraine and its main trading partners may significantly affect the exchange rate of the national currency.

In Ukraine, during the analyzed period, the efficiency of using the monetary transmission currency channel was different. However, since 2016, when the actual liberalization of the foreign exchange market began, its efficiency has increased significantly. The weighted average annual exchange rate of the hryvnia against the US dollar rose from UAH 5.12 per dollar in 2005 to UAH 26.96 in 2020, and the level of financial dollarization decreased from 49.6% in 2008 to 35.0% in 2020 (Figure 9).

Today, the NBU's exchange rate policy should be aimed at curbing inflation and supporting economic growth, since calculations show that the impact of the hryvnia exchange rate dynamics on GDP growth and inflation is very large.

In 2005–2020, the relationship between the dynamics of the hryvnia exchange rate and the growth rate of real GDP was characterized by the equation:

$$GDP_t = 2.9877 - 0.2066ER_t, \quad (9)$$

$$r = -0.8270, R^2 = 0.6839, F = 30.34, DW = 1.52,$$

where GDP_t – is the real GDP growth rate for the period t , ER_t – is the growth rate of the hryvnia against the US dollar in the period t .

Based on equation (9), it can be argued with a high degree of probability that in 68.39% of cases, an increase in the hryvnia exchange rate against the US dollar by 1 percentage point leads to a decrease in real GDP growth by 0.2066 percentage points.

The influence of the dynamics of the hryvnia exchange rate against the US dollar on the inflation rate was characterized by the following relationship:

$$IR_t = 8.1605 + 0.3405ER_t, \quad (10)$$

$$r = 0.7940, R^2 = 0.6304, F = 23.91, DW = 1.68,$$

where IR_t – is the inflation rate in the period t , ER_t – is the growth rate of the hryvnia against the US dollar in the period t .

Based on equation (10), with a probability of 63.04%, it can be argued that an increase in the hryvnia exchange rate by 1 percentage point, ceteris paribus, may lead to an increase in inflation by 0.3405 percentage points.

The analysis shows that in the context of the implementation of monetary policy in Ukraine in 2005–2020, the currency channel had the greatest impact on the dynamics of GDP and inflation. Therefore, this channel can be considered the main channel of the transmission mechanism, and monetary policy should always be in the center of NBU's attention and should be consistent with other monetary policy objectives, in particular, with the need to continue targeting inflation.

It is also worth noting that there is a close relationship between all MTM channels. Thus, the interest rate channel, through a change in the base interest rate and the rate of return on government bonds, significantly affects the rate of lending to the economy, the exchange rate, the dynamics of the monetary base and monetary aggregates, as well as the level of monetization of the economy as a whole. The credit channel, through a change in lending volumes, significantly affects the formation of the volume and structure of monetary aggregates. Due to changes in the exchange rate, the currency channel has the greatest impact on the base interest rate, the dynamics of monetary aggregates, and the volume of lending to the economy. Less significant, although still significant, is its impact on the level of monetization of the economy and financial dollarization.

In addition, it should be noted that the operation of all investigated monetary transmission channels is under the constant influence of the confidence channel. It implies the need to build confidence in the central bank by ensuring adequate transparency and predictability of its monetary policy, which is an important guarantee of consolidating the expectations of market participants and improving the efficiency of monetary transmission in general.

To assess the cumulative impact of the four studied MTM channels on the Ukrainian economy macroeconomic parameters, the following indicators were selected:

GDP_t – real GDP growth rate in the period t , %;

IR_t – inflation rate in the period t ;

Mh_t – growth rate of the monetary base in the period t ;

LE_t – growth rate of loans granted in the period t , %;

BIR_t – weighted average base rate of the NBU in the period t , %;

VE_t – level of the economy monetization in the period t , %;

ER_t – growth rate of the weighted average exchange rate of the hryvnia against the US dollar in the period t , %.

As a result of calculations, the following regression equation was obtained:

$$GDP_t = -16.6643 + 0.06038LE_t + 0.7133BIR_t + 0.2241VE_t - 0.2842ER_t, \quad (11)$$

$$R = 0.9233, R^2 = 0.8525, F = 3.28, DW = 1.80,$$

Based on the established relationship (11), one can conclude that the total impact of credit, interest rate, monetary and currency channels of MTM in Ukraine on the dynamics of real GDP in 2005–2020 was 85.25% of the total variability, which indicates the statistical reliability of the results obtained.

The total influence of transmission channels on inflation dynamics was expressed by the following equation:

$$IR_t = -3.7296 + 0.00847Mht + 0.7493BIR_t + 0.3196ER_t + 0.1701LE_t, \quad (12)$$

$$R = 0.9422, R^2 = 0.8874, F = 3.36, DW = 2.82,$$

Equation (12) shows that the total impact of the four studied channels of monetary transmission on inflation in Ukraine in 2005–2020 was 88.74% of the total variability, which indicates the statistical reliability of the results and the high efficiency of MTM.

The calculations allowed determining the forecast parameters and conditions for the effective operation of MTM channels in Ukraine in the medium and long term (Table 1).

Table 1. Forecast parameters of monetary indicators to improve the efficiency of MTM channels in Ukraine

Source: Authors' elaboration.

Indicators	Mid-term perspective (2 to 3 years)	Long-term perspective (5 to 10 years)
1. Monetary base growth rate, %	6-8	8-12
2. NBU's discount rate, %	7-9	4-6
3. Average yield on short-term DGLBs (up to 1 year) in the primary market, %	8-10	5-7
4. Monetary multiplier	3,2-3,5	3,5-4,0
5. The level of the economy monetization, %	45-50	55-60
6. Lending growth rates, %	10-15	10-20
7. Loan-to-GDP ratio, %	55-70	70-80
8. Share of NPLs in banks' assets, %	20-30	5-10
9. Volatility of the hryvnia's exchange rate against the US dollar, %	1-2	1-2
10. Inflation rate, %	4-8	2-5

Thus, to increase the efficiency of MTM in Ukraine, the priority measures to intensify the work of its channels should be: ensuring political and economic stability, increasing the banking system's resilience to internal and external shocks, improving the credit and investment climate, improving methods for forming the volume and structure of the monetary base and monetary aggregates, as well as improving the efficiency of monetary regulation and the central bank's implementation of a balanced monetary, interest rate and foreign exchange policy adequate to the conditions of economic development, which will help stabilize the money market and ensure sustainable economic growth.

CONCLUSION

The analysis of the efficiency of MTM in Ukraine in 2005–2020 shows that the exchange rate channel had the greatest impact on macroeconomic parameters (real GDP growth and inflation). The interest rate channel ranks second in terms of efficiency, the monetary channel ranks third, and the credit channel ranks last.

One of the main reasons for the low efficiency of the credit channel is a significant impact on the terms of lending interest rates and demand for loans, which largely depends on the financial condition of businesses and households.

The reasons for the relatively low efficiency of the monetary channel of monetary transmission were the unbalanced structure and dynamics of the monetary base and monetary aggregates, as well as the low multiplier ratio of the money supply. As a result, the level of economic monetization increased very slowly and unstably, which held back the effect of monetary levers to stimulate economic growth.

Activation and efficiency of MTM channels in Ukraine as a small open economy should be aimed at improving the credit and investment climate, improving methods for forming the volume and structure of the monetary base and monetary aggregates, strengthening the banking system's resilience to internal and external shocks, as well as increasing the efficiency of monetary regulation and the central bank's pursuit of a balanced monetary, interest rate and foreign exchange policies. Based on the results of the study, the conditions for the effective functioning of MTM channels in Ukraine are specified. It was also determined that in the medium and long term, the forecasted parameters of monetary indicators should ensure the annual growth rate of the monetary base within 6-12%, the base interest rate – 4-9%, lending growth – 10-20%, the ratio of loans to GDP – 55-80%, the volatility of the hryvnia exchange rate – 1-2%, the monetary multiplier – 3.5-4.0, and the level of monetization of the economy – 50-60%.

Improving the efficiency of MTM channels in Ukraine requires new methods and tools to assess their effectiveness and strengthen the institutional capacity of the central bank.

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