# Data-Driven Approach to the Coordination of Monetary and Fiscal Policy Amid War

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***Abstract*—This paper investigates the problem of the interrelationship and coordination of fiscal and monetary policies in Ukraine under martial law. The aim of the study is to evaluate the effectiveness of macro-financial regulation and identify contradictions between the government's objectives and the central bank's strategy. Based on a data-driven approach using econometric modeling methods, the non-linear nature of the monetary transmission mechanism is quantitatively proven. The research results indicate that the critical threshold of the key policy rate, beyond which the elasticity of lending to the economy acquires persistently negative values, is at the level of 16.5%. It is proven that the prolonged maintenance of a strict contractionary policy by the National Bank of Ukraine has caused a massive crowding-out effect: over 61% of the banking sector's net assets are accumulated in risk-free government instruments (domestic government bonds and certificates of deposit). This distorts the fundamental function of financial intermediation and generates negative fiscal consequences, exponentially increasing budget expenditures on state debt servicing. The paper substantiates the necessity of transitioning to an optimal scenario of coordinated state regulation that combines fiscal consolidation – controlling expenditures and debt dynamics – with monetary expansion – gradually reducing interest rates. This is essential to replenish the budget and prevent financial resources from operating exclusively within the closed boundaries of the financial sector, as is currently the case in Ukraine.**

***Keywords—data-driven approach, mathematical modeling, fiscal policy, monetary policy, macroeconomic regulation, martial law***

## I. Introduction

One of the most crucial conditions for the effective implementation of state influence on economic processes is the close coordination between fiscal and monetary policy. Ensuring proper interconnection and interaction between state institutions directly affects the effectiveness of the policies conducted by the country's monetary and fiscal authorities, which objectively necessitates the coordination of their efforts to exert a meaningful impact on the economy. Coordination should facilitate monetary and fiscal authorities in achieving their established objectives in the most efficient manner, while also ensuring the mutual accountability of fiscal and monetary structures for each other's goals. This helps to avoid the problem of time inconsistency when modeling the consequences of active macroeconomic stabilization policy measures, which is absolutely essential amidst wartime conditions. Ultimately, monetary policy, only through effective interaction with fiscal policy, is capable of helping to overcome the macroeconomic shocks in the Ukrainian economy caused by the devastation associated with military operations.

Importantly, in the context of unfolding financial and economic crises of various scales, causes, and origins, monetary and fiscal policies consistently serve as the most critical instruments of influence on the real sector of the economy through the monetary and budgetary spheres. Consequently, they essentially constitute the foundation of the entire anti-crisis architecture within the framework of the respective state economic policy. Moreover, it is an undeniable fact that the significance of monetary and fiscal policies, as the primary levers of state influence on the economy, increases substantially under conditions requiring a flexible and prompt response to situations associated with the escalation of crisis phenomena. The full-scale military aggression launched against our country has triggered a macroeconomic crisis that exerts a comprehensive impact on all aspects of society's economic life. This includes the prospects for normal economic development and the implementation of appropriate state regulatory measures, which primarily encompass the instruments of monetary and fiscal policy. Under such unprecedentedly complex economic conditions, the effective coordination of the implementation process of the state's monetary and fiscal policies – as key levers capable of ensuring macro-financial stability, the uninterrupted operation of the banking sector, and the proper execution of state functions through the budgetary mechanismserves as the fundamental basis for the country's economic survival.

## II. Literature Review

Until the 1980s, fiscal and monetary policies were typically examined separately, and the most influential schools of economic thought advocated for the priority of applying either fiscal or monetary policy. The idea of the necessity to consider the interaction between fiscal and monetary policies was first put forward by the American economist C. F. Christ. In his work, he substantiated that the effect of an isolated or joint policy of the government and the central bank is determined by their actions as a consolidated sector in relation to the rest of the economy [1]. This idea was even more robustly substantiated by Thomas Sargent and Neil

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Wallace, who, in their seminal paper "Some Unpleasant Monetarist Arithmetic," demonstrated that even if the central bank is institutionally independent of the government, it cannot conduct an independent monetary policy – for instance, a tight monetary policy to maintain low inflation – if the government fails to resolve issues related to the budget deficit and public debt [2].

To date, the economic literature has formed a number of directions for analysing fiscal and monetary policy from the perspective of their effective interaction. First, the study of optimal monetary policy with an exogenously given or passive role of fiscal policy from the perspective of the New Keynesian economic paradigm with sticky prices. Here, assumptions regarding the goals, instruments, preferences, and criteria for the optimal behavior of the central bank are analysed from the standpoint of its independence and conservatism [3, 4, 5]. Second, studies that substantiate the need for the coordination of fiscal and monetary policy based on the mechanism through which government budget constraints can affect inflation dynamics. This served as the foundation for the so-called "fiscal theory of the price level," which demonstrates that, under certain conditions, a reduction in specific taxes financed by an increase in public debt can stimulate aggregate demand [6, 7, 8, 9, 10]. Third, the analysis of the interaction of fiscal and monetary policy under the influence of external and internal shocks through the prism of the New Keynesian dynamic stochastic general equilibrium (DSGE) model, where the role of public policy is examined based on the strategic compatibility of fiscal and monetary instruments [11, 12]. Fourth, the use of game-theoretic models based on the variability of the institutional aspects of interaction between fiscal and monetary authorities, and the evaluation of different versions of this interaction from the perspective of social welfare theory [13, 14]. Fifth, the study of the conflict of interests between fiscal and monetary policy related to the regulation of public debt and inflation, which forms the basis for substantiating the government's intolerance to inflation to an even greater extent than the central bank [15, 16]. Sixth, the search for a trade-off between the strategic goals of stimulating aggregate output and the need to curb inflation, since both fiscal and monetary policy can use their respective instruments to influence both aggregate demand and price dynamics [17, 18].

The unfolding of global financial and economic crises in recent decades proves that in both developed and emerging market economies, monetary and fiscal authorities have failed to effectively achieve their strategic goals. This is largely due to the acceleration of financial globalization and the growing vulnerability of national financial systems to external shocks. However, in the context of crises developing due to full-scale hostilities, the issue of the responsibility of monetary and fiscal authorities for the stability of macroeconomic processes acquires particularly crucial and urgent significance, bringing the problem of coordinating fiscal and monetary policy in wartime to the forefront. **The aim of the study** is to evaluate the effectiveness of macro-financial regulation in Ukraine under martial law, identify contradictions between the government's fiscal objectives and the central bank's monetary strategy, and substantiate an optimal coordinated economic policy scenario to overcome credit stagnation and stabilize public finances.

## III. Materials and Methods

### *A. Conceptual Research Design*

The implementation of state economic policy implies that the measures of fiscal and monetary regulation, as its integral components, are determined by the established goals of combating inflation, smoothing cyclical economic fluctuations, reducing the unemployment rate, stimulating economic growth, as well as generating state budget revenues and making effective expenditures to fulfill the state's social and economic functions. In this process, the state regulates aggregate demand and real national income through the money supply, the volume of bank lending, government spending, budget transfer payments, and the taxation mechanism. Under these circumstances, assessing the key differences and determining the directions for the coordination of monetary and fiscal policy plays a particularly significant role specifically in the context of the overall effectiveness of state economic policy. At the institutional level, the key difference between fiscal and monetary policy lies in who exactly – that is, which state institution – conducts the respective policy. This determines all aspects of political burdens, influences, as well as autonomy and independence in making relevant decisions: the government conducts fiscal policy, while the central bank conducts monetary policy. Furthermore, differences are also defined by the specific instruments the government and the central bank utilize to achieve their respective economic goals, especially when overcoming a deep economic crisis is required. Thus, anti-crisis fiscal policy involves increasing budget expenditures, including guarantees and direct payments under various assistance packages, as well as reducing or deferring the collection of taxes, duties, and other mandatory payments. As for monetary policy, it involves the implementation of monetary economic support measures aimed at providing additional liquidity to financial market institutions, relaxing regulatory requirements for banking institutions, and facilitating an increase in lending to the real sector of the economy. Based on this, the objective necessity for the coordination of fiscal and monetary policy is primarily associated with the impact of the following objective factors:

- the presence of shared strategic goals between the government and the central bank, such as maximizing social welfare and increasing output;
- the objective need to reduce public debt, which is important not only for the government but also for the central bank;
- the presence of shared constraints for fiscal and monetary authorities, as an imbalance specifically in the fiscal sphere can quite often serve as the root cause of unfolding inflationary processes;
- the need for a trade-off choice between low inflation and output growth;
- the formation of mutual alternatives between fiscal and monetary policy;
- the presence of chronological differences in the impact of various policy instruments.

To move beyond theoretical assumptions and quantitatively assess the effectiveness of this coordination, this study employs a data-driven approach based on nonlinear mathematic modelling. The utilization of these methods,

including interval analysis and non-linear structural modeling, is directly driven by the characteristics of wartime input data (high uncertainty and severe structural deformations), allowing to mathematically secure the identification of critical points and non-linear monetary transmission trajectories [19, 20, 21].

### *B. Data and Empirical Base*

The empirical base of the study comprises retrospective macroeconomic data on the functioning of Ukraine's financial sector over a 15-year period, 2011–2025, (Table 1).

The data was retrieved from the official statistical databases of the National Bank of Ukraine (NBU) and the State Statistics Service of Ukraine. To model the transmission mechanism, two key variables were selected:

- independent variable $X$ – the NBU Key Policy Rate, %, which serves as the primary indicator of the strictness or expansiveness of monetary policy;
- dependent variable $Y$ – the volume of loans provided by commercial banks to the real sector of the economy (in billions of UAH), representing the level of financial support for businesses.

To eliminate scaling issues and normalize the variance of the absolute values, logarithmic transformations were applied to both variables prior to the regression analysis. Model Specification

Classical macroeconomic approaches often rely on the assumption of a linear monetary transmission mechanism. However, under conditions of structural deformations and wartime supply shocks, the reaction of economic agents to changes in the cost of money becomes highly non-linear. To capture complex market extremums and inflection points, a log-linear regression model (translog function) was specified. The general equation of the non-linear regression is expressed as a polynomial of the $n$-th degree:

where $\beta_i$ are the unknown regression coefficients that determine the shape of the curve; $\varepsilon$ is the stochastic error term. The estimation of the model parameters was performed using the Ordinary Least Squares (OLS) method. The computational procedures and data visualization were executed using the Python programming language (specifically the statsmodels and scipy libraries).

TABLE I. DYNAMICS OF FINANCIAL MARKET INTEREST RATES AND INFLATION RATES [23]

| Year | Consumer price growth rate, % | Industrial producer price growth rate, % | NBU key policy rate, % | Weighted average rate on all NBU refinancing instruments, % | Weighted average yield of UAH domestic government bonds, % | Interest rates on bank loans to enterprises in national currency, % | Loans granted by commercial banks, mln UAH | GDP dynamics, % to the previous year |
|---|---|---|---|---|---|---|---|---|
| 2011 | 4.6 | 14.1 | 7.75 | 12.4 | 10.5 | 14.7 | 801,809 | 105.5 |
| 2012 | -0.2 | 0.4 | 7.5 | 8.1 | 13.5 | 17.3 | 815,142 | 100.2 |
| 2013 | 0.5 | 1.7 | 6.5 | 7.2 | 12.5 | 15.2 | 910,782 | 100.0 |
| 2014 | 24.9 | 31.7 | 14.0 | 15.6 | 15.6 | 16.7 | 1,020,667 | 93.4 |
| 2015 | 43.3 | 25.5 | 22.0 | 25.2 | 19.8 | 21.4 | 981,627 | 90.2 |
| 2016 | 12.4 | 35.8 | 14.0 | 17.4 | 15.5 | 17.7 | 998,682 | 102.4 |
| 2017 | 13.7 | 16.6 | 14.5 | 16.1 | 14.3 | 15.1 | 1,016,657 | 102.4 |
| 2018 | 9.8 | 14.3 | 18.0 | 19.2 | 17.5 | 18.1 | 1,073,131 | 103.5 |
| 2019 | 4.1 | -7.5 | 13.5 | 18.4 | 16.8 | 18.0 | 971,871 | 103.2 |
| 2020 | 5.0 | 14.7 | 8.0 | 7.9 | 10.2 | 11.1 | 948,386 | 96.2 |
| 2021 | 10.0 | 62.3 | 9.0 | 7.7 | 11.3 | 9.7 | 1,044,049 | 103.4 |
| 2022 | 26.6 | 38.3 | 25.0 | 19.8 | 18.3 | 16.5 | 1,007,648 | 71.2 |
| 2023 | 5.1 | 16.4 | 15.0 | 26.1 | 18.7 | 19.4 | 997,877 | 105.5 |
| 2024 | 12.0 | 27.7 | 13.5 | 16.5 | 15.9 | 16.1 | 1,106,844 | 102.9 |
| 2025 | 8.0 | 8.2 | 15.5 | 18.8 | 16.2 | 15.9 | 1,197,680 | 101.8 |

The key methodological innovation of this study is the transition from static elasticity (which remains constant in simple linear models) to dynamic elasticity. Dynamic elasticity $E$ demonstrates the percentage change in the volume of lending in response to a 1% change in the key policy rate, contingent upon the current level of the rate itself. Mathematically, the elasticity coefficient is derived as the first derivative of the regression function with respect to the logarithm of the independent variable:

$$E = \frac{\partial ln(Y)}{\partial ln(X)}. \quad (2)$$

### *C. Methodological Framework for Policy Coordination and Identification*

Given the impact of these factors, an adequate understanding of the main aspects of coordinating the state's monetary and fiscal policy is essential for considering them as two integral components of a unified institutional mechanism for ensuring macro-financial stabilization. The main direction for evaluating such an interconnection should be considered the analysis of the interaction mechanism between fiscal policy and monetary transmission channels, which determines the contractionary or expansionary nature of the state's impact on the economy. Expansionary policy is conducted when the economy experiences a slowdown or recession, prompting the state to take measures to stimulate growth. Contractionary policy is pursued when the economy is exposed to high inflation or shows signs of overheating. Based on this logic, four main scenarios for combining monetary and fiscal policy measures within the overall mechanism of macroeconomic regulation are possible (Fig. 1).

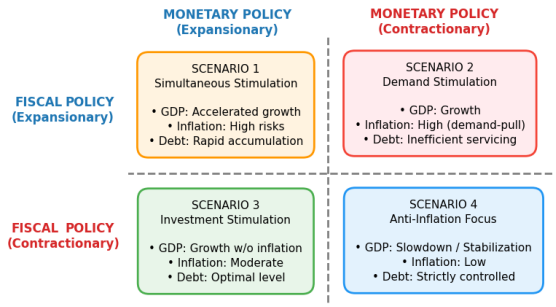



Fig. 1. Scenarios of monetary and fiscal policy coordination in the process of state economic regulation.

The first scenario entails the simultaneous expansionary orientation of both fiscal and monetary policy, determining the focus of the state regulatory mechanism on the simultaneous stimulation of investment and consumption, which should lead to accelerated GDP growth. However, this creates risks of rising inflation rates in the country, while a low market interest rate implies a negligible initial cost of servicing public debt, which can lead to its rapid accumulation with all the negative consequences of this trend for the financial sector.

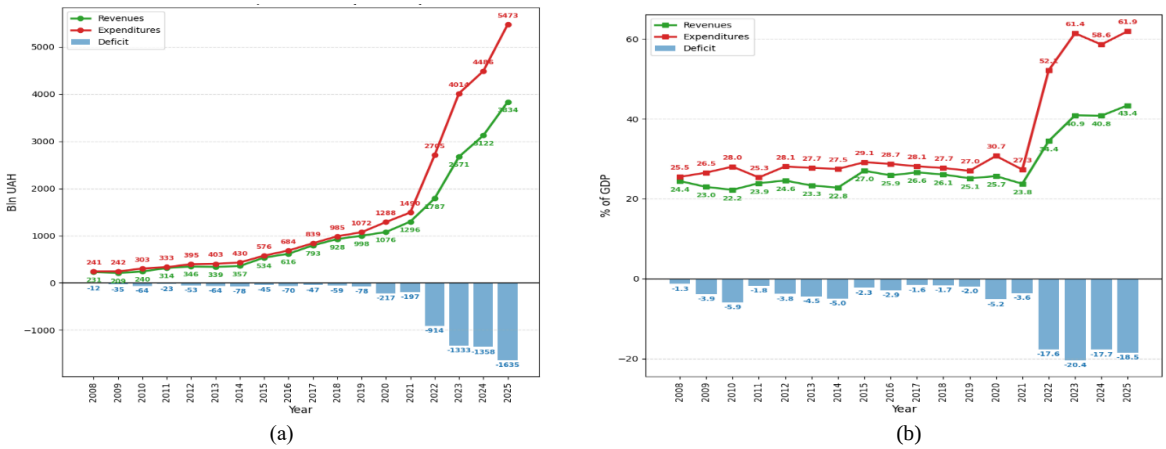
The second scenario is characterized by an expansionary fiscal and a contractionary monetary policy. This involves a state regulation scenario in which the stimulation of aggregate demand prevails over the stimulation of investment and production. This can threaten price stability by amplifying the demand-pull inflation effect in the market. Consequently, GDP grows alongside a fairly substantial level of inflation. Conversely, high market interest rates and significant state budget deficits mean inefficient government spending related to servicing public debt, including debt owed to foreign creditors. The third scenario defines a contractionary orientation of fiscal policy and an expansionary orientation of monetary policy. This indicates a state of the economy where the state's strategy is primarily aimed at economic growth through the stimulation of investment and production, allowing for GDP growth without a significant increase in inflation rates. In this context, the cost of servicing public debt can remain low due to the government's policy of reducing the deficit and the low level of interest rates, which, in turn, should align with the objective of optimizing the distribution of public sector revenues. The fourth scenario includes contractionary fiscal and contractionary monetary policy, pointing primarily to an anti-inflationary focus of the state economic policy, aimed at preventing economic overheating and a crisis of overproduction. This should contribute to slow GDP growth or its stabilization at low inflation rates. In this case, fiscal contraction itself is accompanied by the containment of public debt growth, as government spending and the state budget deficit are controlled and strictly limited.

Within this framework, the interaction between fiscal policy and monetary transmission channels is analyzed through a functional matrix of four policy scenarios (Fig. 1). These scenarios function as a methodological matrix for interpreting the results of our econometric modeling, specifically the dynamic elasticity curve.

This approach allows us to operationalize theoretical constructs of macroeconomic stabilization and transform them into an applied tool for state governance. Specifically, the point where the elasticity coefficient falls below zero (E < 0) mathematically identifies the zone of "monetary exhaustion" and the onset of the crowding-out effect. The necessity to strictly coordinate policies becomes particularly urgent under martial law, where the economy operates under supply constraints, high uncertainty, and the loss of production potential, supported primarily through large-scale budget support and external financing.

## IV. Results and Discussion

It should be emphasized that since the beginning of the declaration of martial law, the problems of coordinating monetary and fiscal policy have been associated with a certain contradiction in the tasks of regulating the financial sector. Thus, the sharp decline in tax revenues to the budget and the covering of this shortfall through an emission-based mechanism for financing the budget deficit meant an automatic increase in the inflation tax on all economic agents using the hryvnia. It also led to a loss of confidence in the national currency and the inability to maintain its exchange rate at a constant level. In particular, the state budget deficit of Ukraine for 2023 reached 1.3 trillion UAH, and in 2025 it grew to 1.6 trillion UAH (18.5% of GDP), which was associated with a sharp increase in budget expenditures following the onset of the full-scale war. Specifically, in 2023, compared to 2022, state budget expenditures increased by 1,309.1 billion UAH, or by 48.4%, amounting to 61.4% of GDP. In 2024, compared to 2023, state budget expenditures grew by 472.3 billion UAH, or by 11.8% (58.6% of GDP). In 2025, compared to 2024, state budget expenditures increased by 986.9 billion UAH, or by 22.1%, constituting 61.9% of GDP. This growth is largely explained by the need to ensure increasing volumes of government financing for the defense and security sector during the war years (Figure 2).




(a) (b)

Fig. 2. Execution of the state budget of Ukraine [22]: (a) – dynamics of state budget indicators; (b) – state budget indicators as % of GDP.

The data in Fig. 2 indicate a significant expansion of the state budget deficit over the last four years. Since the war imposes an enormous financial burden on the state, this trend is entirely logical. Defense budget expenditures currently take priority, while all other government spending related to socio-economic programs is forced to be financed at the minimum necessary level. Under these conditions, the monetization of the budget deficit by the central bank allows for the rapid financing of the state's funding shortage, which at certain moments is critically important, including for the country's defense capability. However, this only partially solves the problem, as large-scale financing of the budget deficit that continues for years can deal a devastating blow to macro-financial stability and the country's monetary system. Therefore, at the very beginning of the war, the National Bank of Ukraine committed to limiting government financing to covering only critical expenditures and maintaining maximum transparency in disclosing such operations.

At the same time, during the period of martial law, the National Bank received a temporary capability to purchase government bonds. Consequently, from March 8 to December 31, 2022, the NBU purchased military government bonds worth 400 billion UAH. As a result, the monetization of military domestic government debt bonds made it possible to support the country's defence capability and ensure the uninterrupted functioning of critical infrastructure and the public finance system as a whole.

On the other hand, the official position of the National Bank of Ukraine regarding the monetization of the state budget deficit and the potential risks of such a monetary policy was to restrict financing solely to critical budget expenditures. Furthermore, the direct financing of the budget deficit by the NBU that had already been conducted in the amount of 400 billion UAH was to be sterilized through foreign exchange interventions and tied up using certificates of deposit. Therefore, within the framework of this policy, after initially keeping the key policy rate unchanged, the National Bank returned to an active interest rate policy in early June 2022, raising the key policy rate immediately from 10% to 25% per annum. The NBU viewed this step as necessary to increase the attractiveness of hryvnia assets and reduce pressure on the foreign exchange market and international reserves. However, this exact choice of monetary policy strategy ultimately had highly negative consequences for the dynamics of economic development. Such actions by the National Bank of Ukraine were intended to determine the main interest rate trends in the financial market, since the interest rate was chosen by the regulator as the primary monetary policy instrument to influence inflation, which is the NBU's priority target.

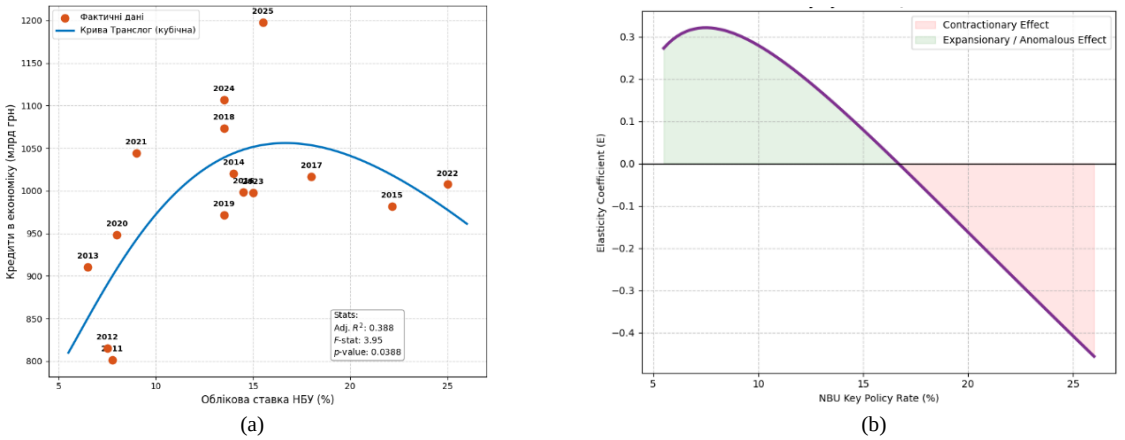
As evidenced by the empirical data and mathematically substantiated by the developed econometric models (Figure 3), the NBU's interest rate policy triggered severe stagnation in the country's credit market. The cubic approximation of lending volumes is:

$$ln(Y) = 7.5171 - 1.7218 \cdot ln(X) + 1.0136 \cdot ln(X)^2 - 0.1677 \cdot ln(X)^3. \quad (3)$$

Figure 3.a visually demonstrates a distinct non-linear transmission mechanism. While the credit market showed some resilience at moderate rates, the abrupt hike to a 25% key policy rate initiated a sharp downward trajectory in credit allocation to the real sector. This phenomenon is precisely identified by the calculated dynamic elasticity curve (Figure 3.b), which assumes a quadratic form:

The elasticity coefficient $E$ drops below the zero threshold at a critical interest rate of approximately 16.5%. Any rate above this inflection point pushes the financial system into the "Contractionary Effect" zone. Consequently, maintaining the key policy rate at 25% locked the economy in a state of severe negative elasticity, $E \approx -0.45$, rendering bank loans fundamentally inaccessible for the vast majority of enterprises with standard profitability margins. Such a policy undermines the banking sector's ability to support economic development, which is critical during wartime when the country's GDP growth is hovering near the statistical margin of error. Although the National Bank argues that the key interest rate is relatively moderate when adjusted for projected rather than actual inflation, investors are unlikely to be incentivized by a rate that is disconnected from the actual profitability of the real sector. Furthermore, the existing dynamics of consumer and industrial producer prices cannot be meaningfully correlated with the 5% inflation target proclaimed in the NBU's "Monetary Policy Guidelines" [24].

Under these circumstances, the interest rate policy pursued by the National Bank of Ukraine reveals a series of critical contradictions in the interaction between monetary and fiscal policies during the war. Specifically, an increase in the key policy rate as part of a contractionary monetary stance drives up the yield on domestic government bonds (OVDPs). While this increases budget revenues from their sale – as they become highly attractive to economic agents seeking risk-free asset placement – it triggers a massive crowding-out effect.




(a) (b)

Fig. 3. Non-linear impact of the NBU key policy rate on lending volumes and credit market elasticity: (a) – approximation of lending volumes; (b) – elasticity dynamics.

Simultaneously, this dynamic contributes to a massive surge in budget expenditures required to service the growing debt, which subsequently exacerbates the budget deficit problem and the search for adequate funding sources. Thus, the NBU's current monetary policy directly conflicts with the government's fiscal objectives of accumulating and optimally allocating budget resources. The high-interest-rate environment exponentially increases budget pay-outs on state debt obligations, placing a crippling burden on an already rapidly ballooning national debt, which has now surpassed 9 trillion UAH (approximately 213.33 billion USD).

As illustrated in Figure 4, a rapid accumulation of Ukraine's state debt has been observed over the four years of the war. Currently, the state and state-guaranteed external debt amounts to 7,011.18 billion UAH (77.53% of the total debt), or 165.41 billion USD, while the state and state-guaranteed domestic debt stands at 2,031.50 billion UAH (22.47% of the total debt), or 47.93 billion USD. This means that three-quarters of the state debt are obligations to external creditors. This structural imbalance requires particular attention considering the NBU's implementation of a free-floating exchange rate regime for the hryvnia and its systematic devaluation against foreign currencies, which automatically magnifies the burden of external debt servicing.

Simultaneously, it should be emphasized that the dynamics of the state's debt obligations, alongside the growing burden of military budget expenditures, are largely a direct consequence of the NBU's interest rate policy. Due to the high interest rates set by the National Bank and escalating war risks, the level of bank lending to the economy has contracted significantly. Conversely, the burden on the state budget has increased substantially due to the necessity of making massive interest payments on debt obligations. This further exacerbates the already ballooning national debt. The National Bank of Ukraine possesses the autonomy to set the key policy rate, which dictates the magnitude of interest payments for debt servicing that the Ministry of Finance must pay to the NBU from the state budget. Consequently, the escalation of interest payments on such borrowings effectively results in a critical shortfall of budget funds required for vital state expenditures, including military needs.

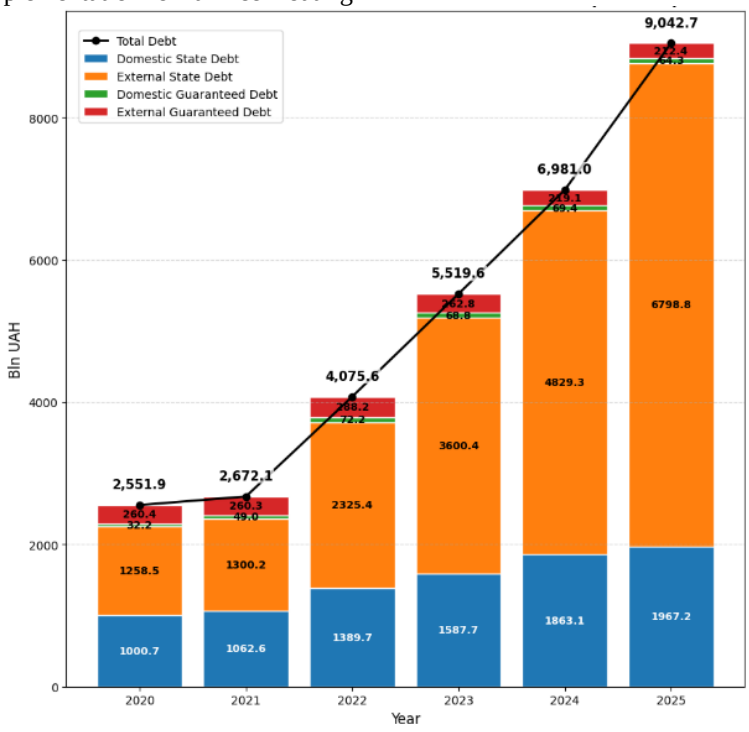



Fig. 4. State and state-guaranteed debt of Ukraine [26].

Furthermore, this interest rate policy pursued by the NBU creates powerful incentives to divert financial resources from the real economy into the financial sector, rather than the reverse. The implementation of a contractionary monetary policy by the National Bank – anchored in raising the key policy rate and, consequently, establishing exceptionally high yields on certificates of deposit – created objective preconditions for curtailing the lending activity of commercial banks to the real sector. Banks were essentially presented with a highly lucrative alternative: investing their resources in virtually risk-free assets, namely NBU deposit certificates or government bonds (Figure 5).

The culmination of this monetary policy by the NBU, coupled with the risk-averse credit strategies of the commercial banks themselves, has resulted in a profoundly distorted asset structure within the banking system. Currently, the share of the loan portfolio comprising loans to corporate entities and individuals accounts for only about one-quarter of total bank assets – 19.3% and 7.4%, respectively. Simultaneously, bank funds invested in NBU certificates of deposit (19.4%), held in accounts at the NBU and other banks (17.1%), and allocated to domestic government bonds (25%), collectively constitute a staggering 61.5% of assets. This signifies that nearly two-thirds of the banking sector's total asset portfolio is channeled into state debt and central bank instruments. Such a structural anomaly demonstrates the virtual nullification of the fundamental macroeconomic function of banks: organizing credit relations through financial intermediation and transforming savings into productive investments.

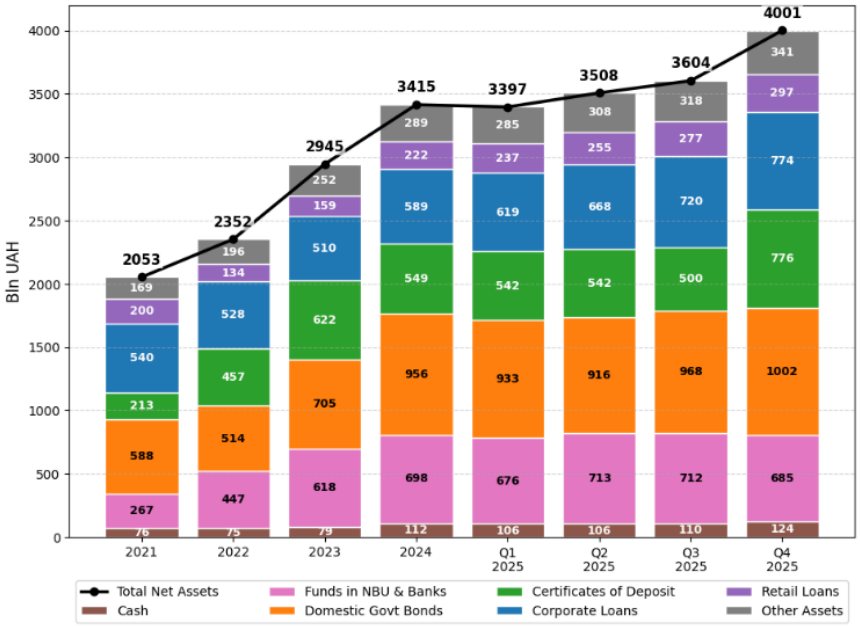



Fig. 5. Structure of the banking sector's net assets by main components [27].

In reality, the primary objective of current monetary policy should be enhancing the efficiency of its transmission mechanism [27]. The clarity of signal transmission from the key policy rate to the financial sector depends on how effectively this mechanism can translate monetary impulses into economic outcomes, as well as on the financial sector's role in the circulation of financial resources and the level of public and business trust in financial intermediaries. In this context, reducing inflation should be viewed merely as the initial stage in setting tasks for the monetary regulation transmission mechanism, which must overcome the crisis phenomena inherent in a wartime economy. Once price dynamics are stabilized, the core objective of monetary policy should be facilitating the redirection of capital flows from the financial sector to the real sector of the economy. Accessible bank lending is critically necessary for the structural transformation of the real sector, particularly to ensure international convergence towards a climate-neutral economy [28], the digitalization of the agricultural sector, and the development of global financial capacity [29]. Moreover, macro-financial stability is a fundamental prerequisite for post-war recovery and the deepening of Ukraine's European integration, particularly through the digitalization-based integration of climate policies between Ukraine and the EU [30]. In this regard, it is advisable to highlight several factors that must be considered to optimize the interaction between fiscal and monetary policies under wartime conditions.

First, banks are currently shifting risk to the state by investing in risk-free government assets (bonds and NBU certificates) rather than the real sector. The NBU's high-interest-rate policy encourages this behavior, contradicting national development and fiscal goals. Second, the state budget relies too heavily on expensive borrowing because wartime tax revenues are insufficient. The central bank must gradually lower interest rates to unlock real-sector lending and reduce the government's crippling debt-servicing burden. Third, under severe economic shock, the central bank should abandon strict inflation targeting. Instead, it must revitalize real-sector credit, leveraging monetary policy's inherent speed, flexibility, and political independence to mitigate the downturn. Fourth, fiscal policy currently has a low stimulative impact, and radical tax changes will not effectively boost business activity or budget revenues. Therefore, monetary instruments must take the lead in stimulating the economy. Fifth, while central bank monetization of the war-driven budget deficit provides vital, rapid funding for defence, it must be strictly limited to prevent the collapse of macro-financial stability. Sixth, effective policy coordination requires clearly delineated responsibilities, timelines, and tools between government bodies to manage inflation, the deficit, and debt sustainability simultaneously. Seventh, the most effective strategy to ensure macro-financial stability (Scenario 3) is combining fiscal contraction (reducing non-critical spending and strictly controlling debt) with monetary expansion (lowering the key rate and supporting targeted credit programs for production and consumption).

## V. Conclusions

This empirical study demonstrates a critical imbalance between Ukraine's fiscal and monetary policies under martial law. Applying a data-driven approach quantitatively proves the non-linear nature of monetary transmission. It is mathematically established that the critical threshold beyond which credit elasticity turns negative is a key policy rate of 16.5%. Maintaining the rate at 25% locked the financial system in a severe contractionary state ($E \approx -0.45$), causing profound stagnation in the real sector.

Consequently, an unprecedented crowding-out effect has emerged: over 61% of the banking system's net assets are currently locked in risk-free instruments (NBU certificates of deposit and government bonds). This essentially nullifies the fundamental role of banks as financial intermediaries. Furthermore, this contractionary policy generates direct negative fiscal consequences, critically inflating budget expenditures needed to service a state debt that is rapidly approaching 10 trillion UAH. To overcome the macroeconomic crisis, the NBU's monetary policy must align with the state's fiscal survival priorities.

The optimal scenario at the current stage is combining strict fiscal consolidation (controlling expenditures and debt)

with monetary expansion (gradually reducing interest rates) to unlock economic lending and minimize debt servicing costs.

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