State Agency
“INSTITUTE FOR ECONOMICS AND FORECASTING”
National Academy of Sciences of Ukraine
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Fiscal-Monetary Interaction in Mitigating the Threat of Fiscal Dominance to Post-War Recovery in Ukraine

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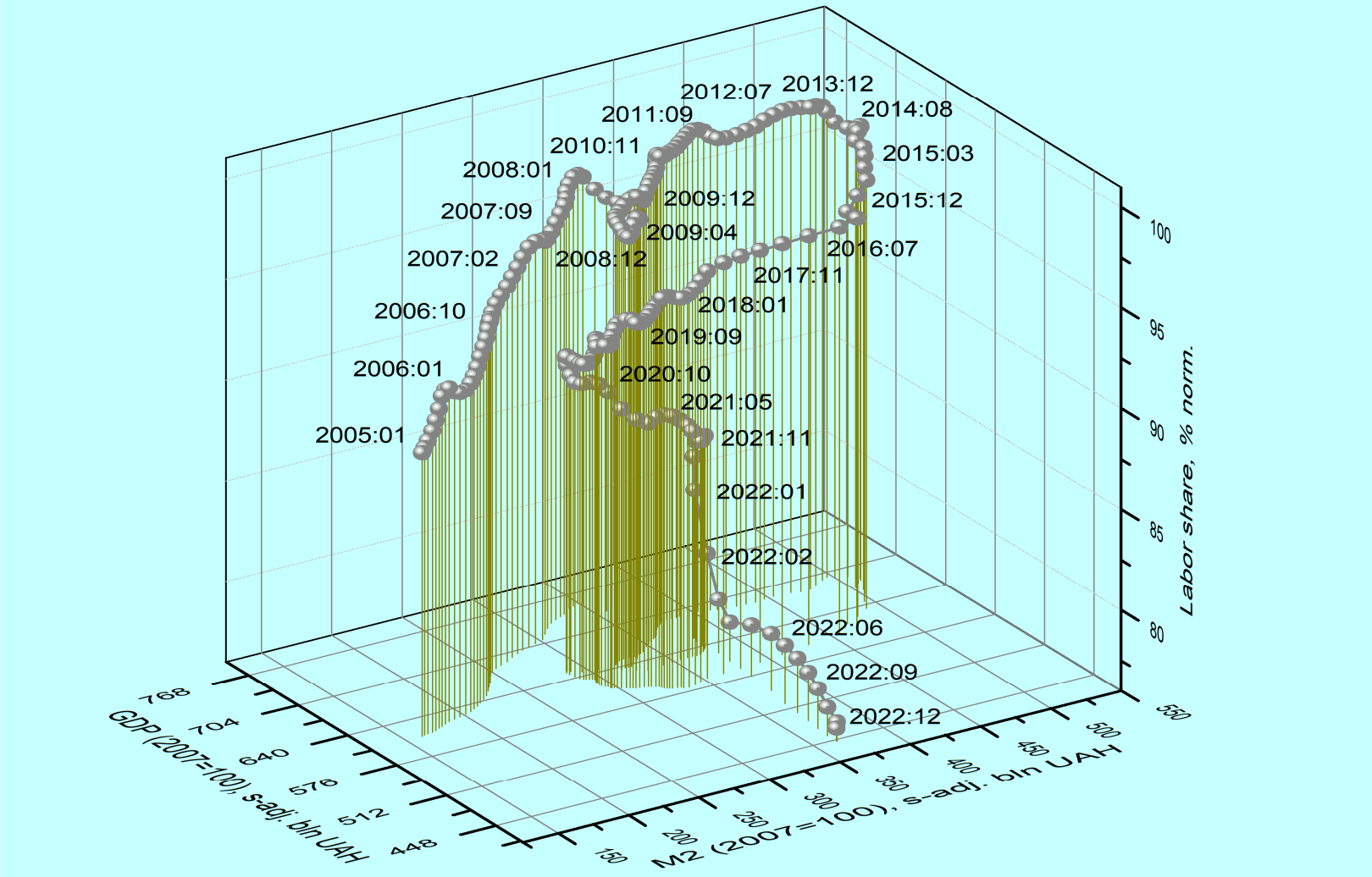
Figure 1. “Fateful circle” of Ukraine’s economy



Source: State Statistics Service of Ukraine, National Bank of Ukraine, and author’s calculation.

Internal public debt relationships

A second-order polynomial trend reproduces the dynamics of the domestic government bonds (DGB). The trend is at least ten years old, not distorted by the COVID-19 outbreak and the russian military invasion.

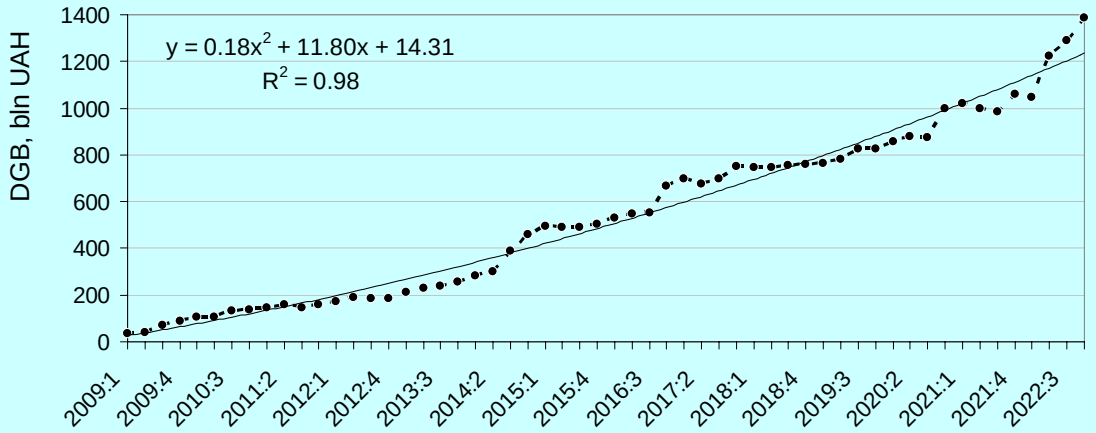
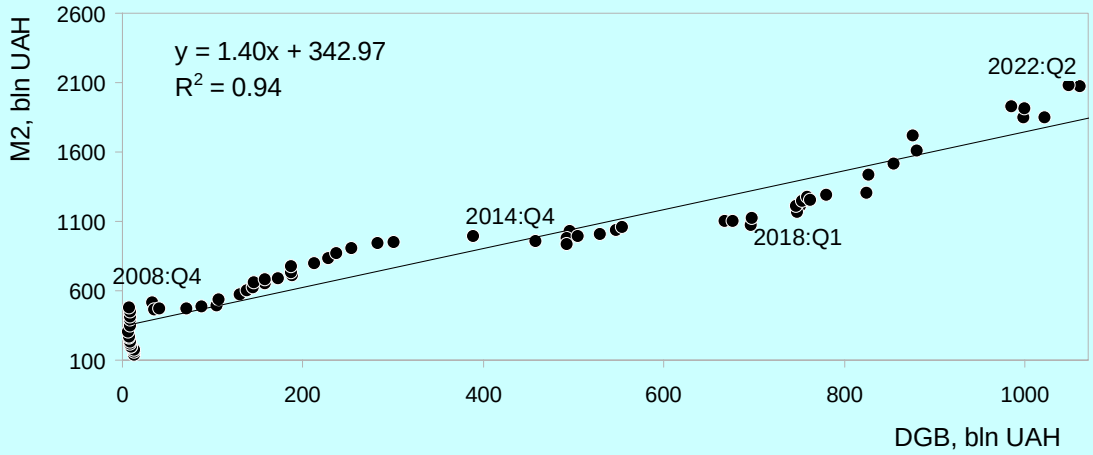


Figure 2. Trend line for domestic government bonds (DGB)

Source: National Bank of Ukraine, Ministry of Finance of Ukraine.

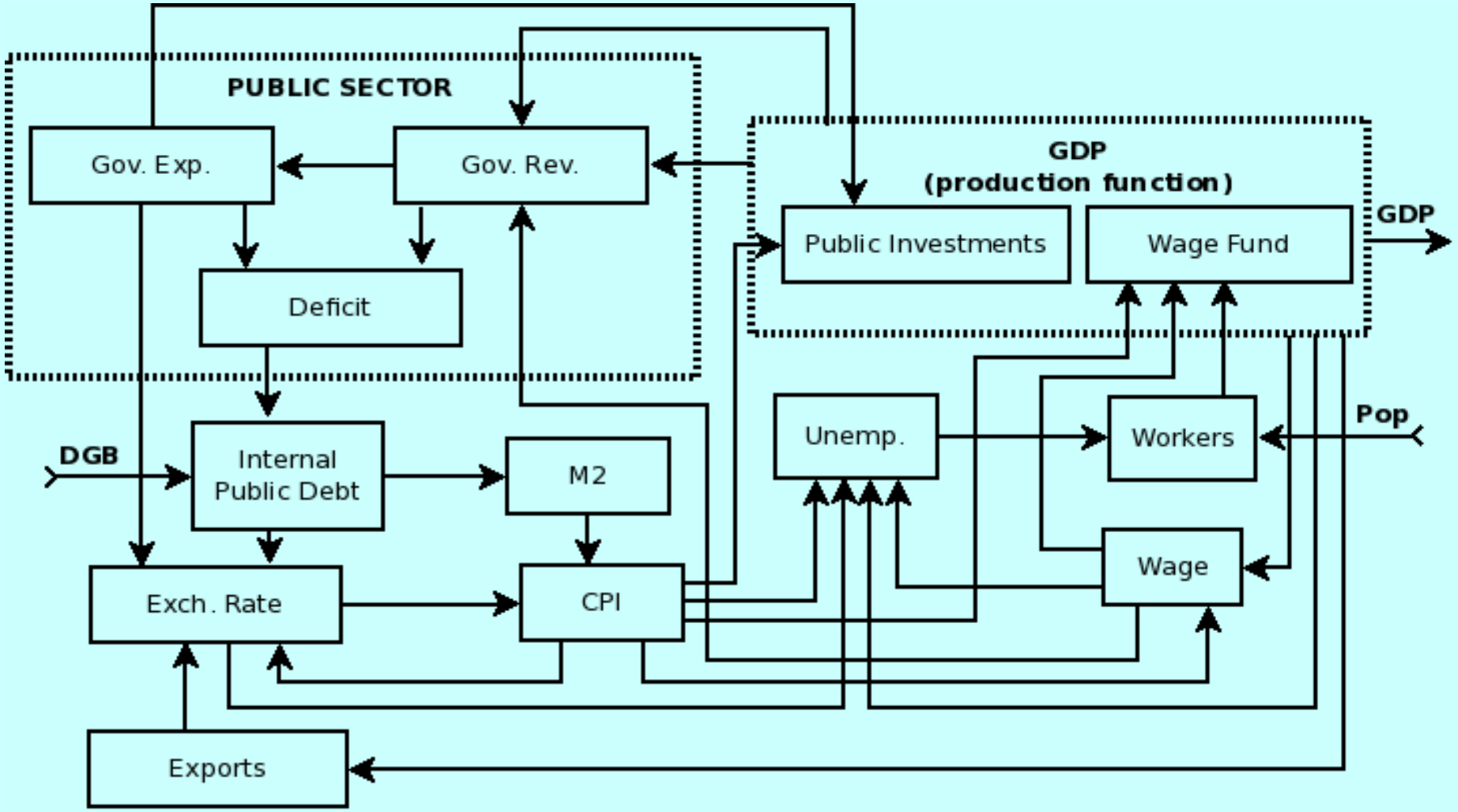


The debt factor influences the formation of the broad money in the Ukrainian economy through the monetary transmission of financing the budget deficit. The monetized debt is large enough to motivate money supply volatility.

Figure 3. Correlation between M2 and domestic government bonds (DGB) in 2005-2022

Source: National Bank of Ukraine, Ministry of Finance of Ukraine.

Figure 4. Macromodel of the fiscal-monetary interaction



Source: Author's elaboration.

Structure of the macromodel

$$
\begin{cases}
GDP = f(InvG, WageFund) \\
InvG = f(GExp, CPI, Dq) \\
Wage1 = f(GDP, M2, CPI) \\
GExp = f(GRev, AR(4)) \\
CPI = f(M2, Exch, dq, AR(2)) \\
Unem = f(CPI, Exch, WageFund, GDP) \\
GRev = f(GDP, Wage1, GDP, AR(1)) \\
Exch = f(X, GExp, DGB, CPI) \\
X = f(GDP) \\
M2 = f(DGB) \\
WageFund_r = Wage1_r \times Worker \\
Worker = Pop \times (1 - Unem/100)
\end{cases}
$$

Indicator	Description
InvG	Investments (state and local budgets)
Wage1	Salary-per-employee (Av.)
Pop	Economically active pop.
Worker	Employed pop.
WageFund	Payroll fund
Unem	Unemployment rate
GExp	Expenditures
GRev	Revenues
Dq	Dummy (1,2,3,4)
DGB	Domestic currency bonds
X	Export

Modeling results

Figure 5. GDP modeling results

Source: State Statistics Service of Ukraine, and author's calculation.

The significant contraction during the crises led to monetary transmission adjustments that affected the relationship between M2 and internal public debt.

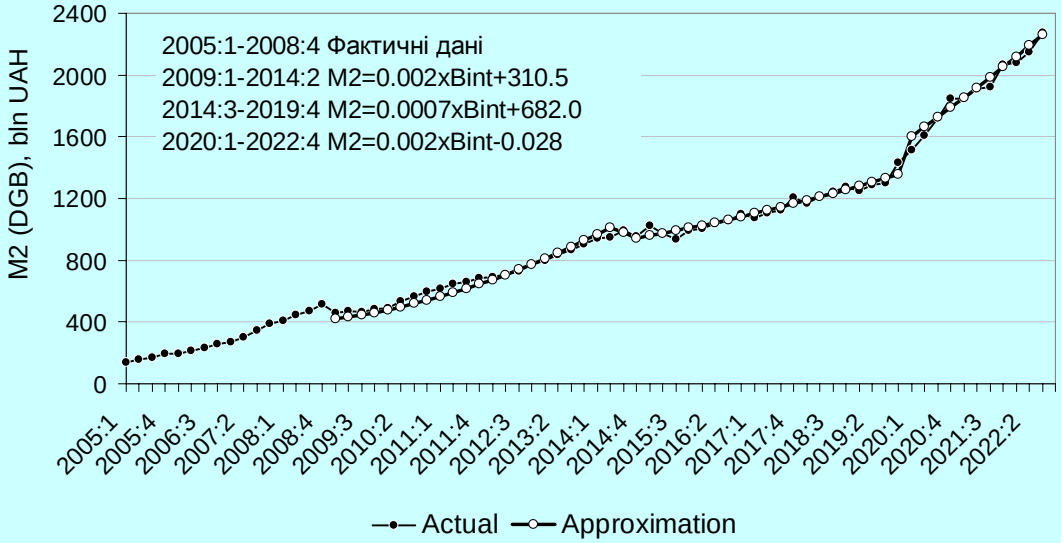
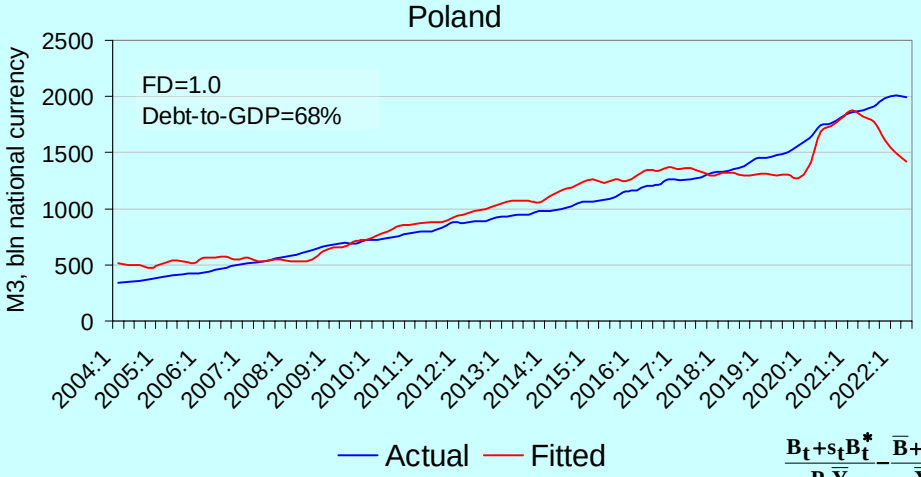
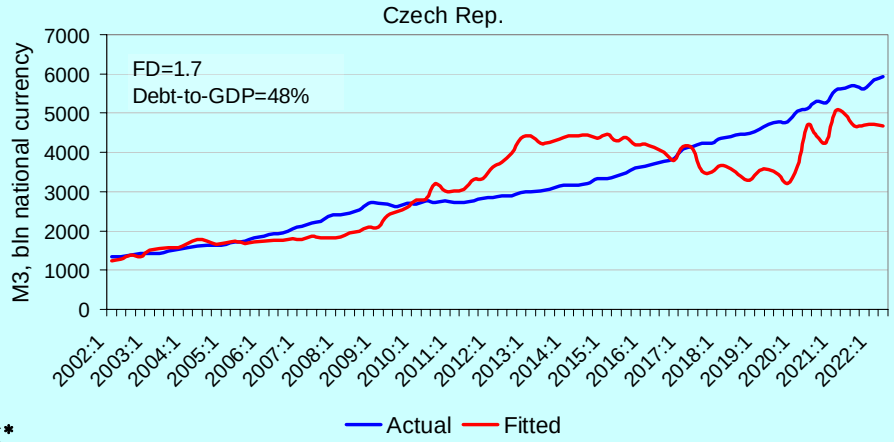


Figure 6. Approximating the relationship between M2 and internal public debt

Source: National Bank of Ukraine, Ministry of Finance of Ukraine, and author's calculation.

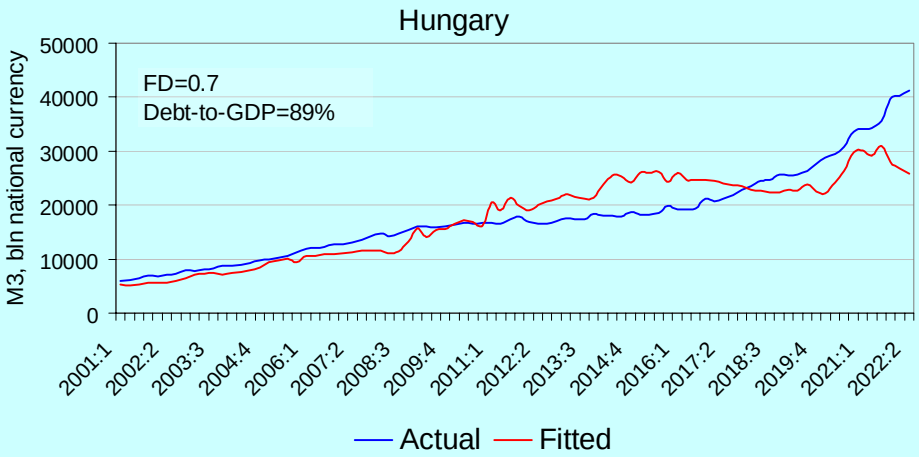
Figures 7-10. Correlation between broad money and public debt in some of Ukraine's neighboring countries

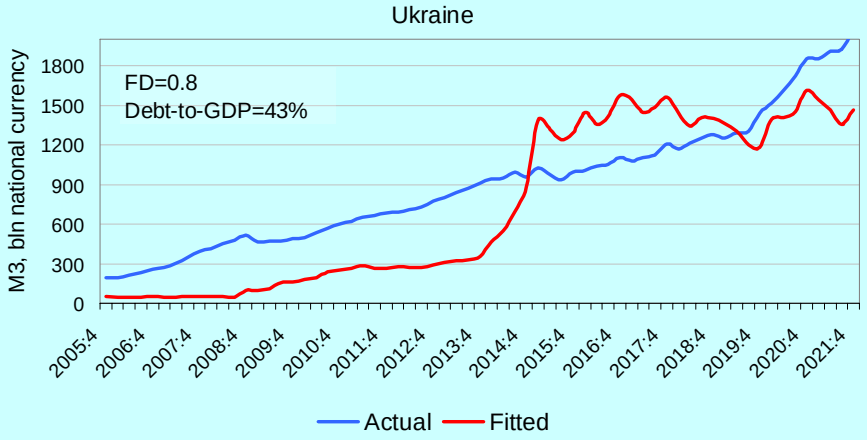




$$\mathbf{M_t = k_{fd} e^{\frac{B_t + s_t B_t^*}{P_t \bar{Y}} - \frac{\bar{B} + \bar{B}^*}{\bar{Y}}} \left(B_t + s_t B_t^* \right)} \quad (1),$$ "Brad" Crayne, R. B. et al. (2021)

where M is the broad money M3; B and B* are the public debt in domestic and foreign currency; Y is total output; P is the aggregate price level; k_{fd} is the degree of fiscal dominance; and the dash above the indicators refers to the steady-state value.





Source: IMF International Financial Statistics, World Bank Quarterly Public Debt DataBank.

Fiscal and monetary policy framework

Fiscal policy rule proposed by Gali et al. (2004):

$$T_t - \bar{T} = \sigma_g\left(G_t - \bar{G}\right) + \sigma_b\left(\frac{B_{t-1}}{P_t} - \frac{\bar{B}}{\bar{P}} + \frac{s_{t-1}B^*_{t-1}}{P_t} - \frac{\bar{s}\bar{B}^*}{\bar{P}}\right) \quad (2),$$

Fiscal policy rule including empirical specification (1):

$$T_t - \bar{T} = \sigma_g\left(G_t - \bar{G}\right) + \sigma_b\bar{Y}\left(\log\frac{M_{t-1}}{\bar{M}} - \log\frac{B_{t-1} + s_{t-1}B^*_{t-1}}{\bar{B} + \bar{s}\bar{B}^*}\right) \quad (3),$$

where T_t, is lump-sum taxes, G_t is public spending, σ_g is the elasticity of lump-sum taxes to public spending, σ_b is the elasticity of lump-sum taxes to public debt, B_{t-1} is domestic currency bonds, B^*_{t-1} is foreign currency bonds, s_{t-1} is nominal exchange rate, M_{t-1} is broad money, Y is total output; P is aggregate price level; and the dash above the indicators refers to the steady-state value.

A purely monetary indicator, broad money, is present in the reconstructed public debt sustainability rule. In the new framework, money plays an effective role in policy decisions and adjustments to the fiscal accounts. The fiscal-monetary nexus is at the forefront of the fiscal sustainability rule.

Monetary policy rule proposed by Kumhof et al. (2010):

$$i^n_t = \bar{i}^n + \rho_i\left(i^n_{t-1} - \bar{i}^n\right) + \rho_\pi\left(\pi_{t-1} - \bar{\pi}\right) + \rho_y\left(Y_{t-1} - \bar{Y}\right) + \rho_s\left(s_{t-1} - \bar{s}\right) + \rho_b\left(\frac{B_{t-1} + s_{t-1}B^*_{t-1}}{P_t\bar{Y}} - \frac{\bar{B} + \bar{s}\bar{B}^*}{\bar{P}\bar{Y}}\right) \quad (4),$$

Monetary policy rule including empirical specification (1):

$$i^n_t = \bar{i}^n + \rho_i\left(i^n_{t-1} - \bar{i}^n\right) + \rho_\pi\left(\pi_{t-1} - \bar{\pi}\right) + \rho_y\left(Y_{t-1} - \bar{Y}\right) + \rho_s\left(s_{t-1} - \bar{s}\right) + \rho_b\left(\log\frac{M_{t-1}}{\bar{M}} - \log\frac{B_{t-1} + s_{t-1}B^*_{t-1}}{\bar{B} + \bar{s}\bar{B}^*}\right) \quad (5),$$

where i_t^n is the nominal interest rate, ρ_i, ρ_π, ρ_Y, ρ_s, and ρ_b are positive parameters that respectively measure the degree of reaction to deviations from the steady-state of the nominal interest rate, inflation, output, exchange rate, and the public debt-to-GDP ratio.

As long as money creation remains within the limits of public debt escalation, the potential threat of extensive price dynamics is minimal. Otherwise, the nominal interest rate should respond positively, eliminating potential inflationary pressures.

Some of the non-policy blocks

Representative household maximizes the expected discounted value of the utility function (Ercolani & Azevedo, 2018):

$$\mathbf{U_0 = E_0 \sum_{t=0}^{\infty} \beta^t \left[\log(C_t^P - hC_{t-1}^P + \phi C_t^G) + \chi_M \log \frac{M_t}{P_t} - \chi_L \frac{L_t^{1+\varphi}}{1+\varphi} \right]} \quad (6),$$

where C^p_t is current private consumption; C^p_{t-1} is habit formation; C^g_t is utility-generating public consumption; M_t/P_t is real money holdings; and L_t is labor supply.

Ricardian households budget constraint:

$$\mathbf{C_t^R + I_t^P + \frac{M_t - M_{t-1}}{P_t} + \frac{B_t - B_{t-1}}{P_t} + s_t \frac{B_t^* - B_{t-1}^*}{P_t} = \frac{W_t}{P_t} L_t^R + r_t K_{t-1}^P + i_{t-1} \frac{B_{t-1}}{P_t} + i_{t-1}^* s_t \frac{B_{t-1}^*}{P_t} - T_t} \quad (7),$$

where I^P_t is private investment; i_{t-1} and i^*_{t-1} are past domestic and foreign interest rates on holding riskless real government bonds denominated in domestic and foreign currency, B_t/P_t and B^*_t/P_t respectively; r_t is real interest on past capital accumulation, K^P_{t-1}; s_t is nominal exchange rate; W_t/P_t is real wages; and T_t is lump-sum taxes.

Cobb-Douglas production function (Leeper et al., 2010):

$$\mathbf{Y_t = K_{t-1}^{p\ \alpha_k} L_t^{1-\alpha_k} K_{t-1}^{g\ \alpha_g}} \quad (8),$$

where K^p_{t-1} is private capital in the previous period; L_t is labor force; and K^g_{t-1} is public capital in the previous period.

Law of motion for public capital (Agenor, 2016):

$$\mathbf{K_t^g = (1-\delta) K_{t-1}^g + \varepsilon^0 \left(\frac{I_{t-1}^g}{K_{t-1}^g} \right)^{-\varepsilon^1} I_t^g} \quad (9),$$

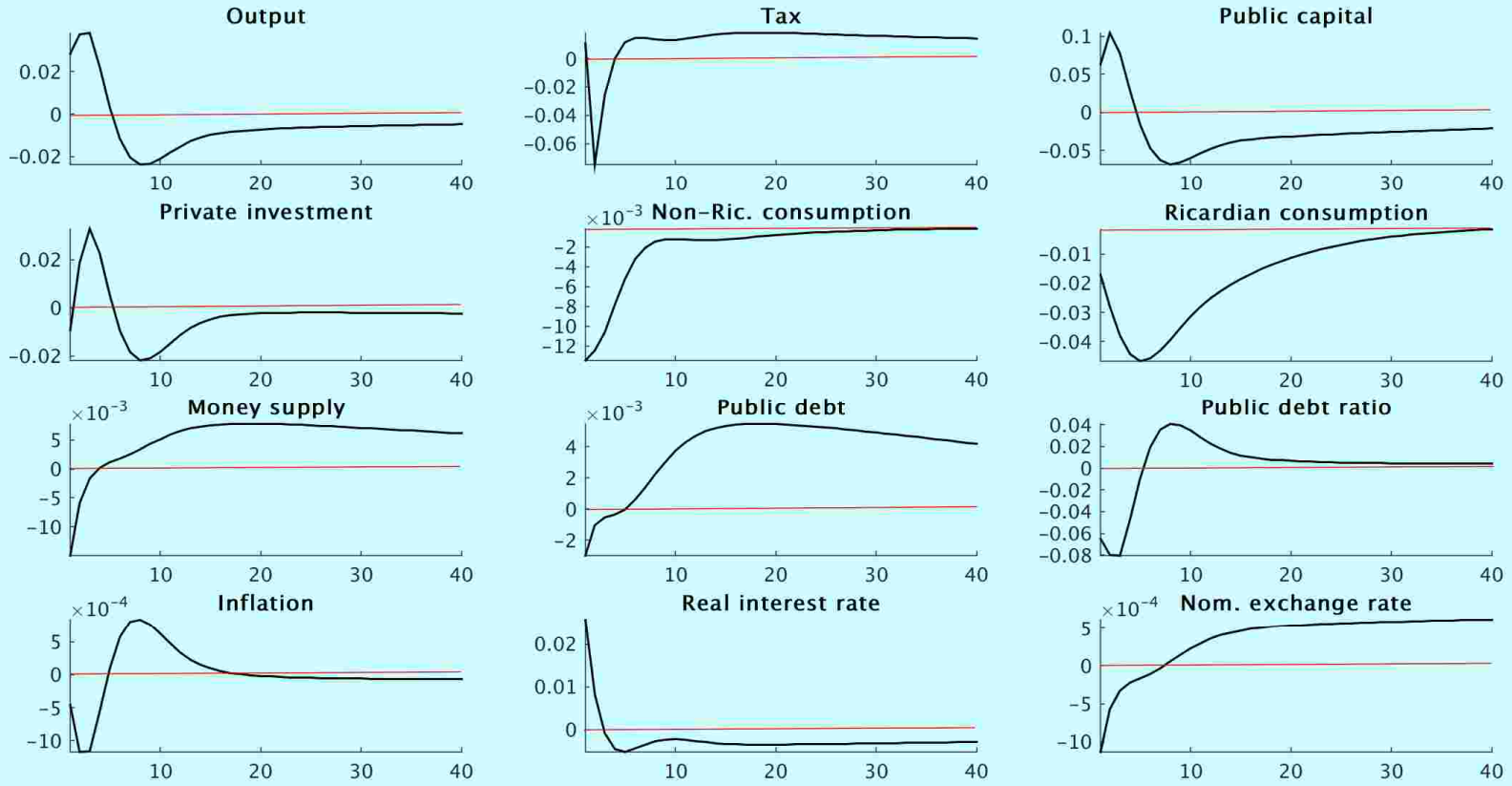
where I^g is public investment; $\varepsilon^0 \in (0,1)$ is the marginal efficiency; and $\varepsilon^1 > 0$ is the exceeding adjustment costs.

Foreign interest rate (Drechsel & Tenreyro, 2018):

$$\mathbf{i_t^* = \bar{i}^* + E_t \log \left(\frac{s_{t+1}}{s_t} \right) + \rho_{B^*} \left(e^{B_t^* - \bar{B}^*} - 1 \right) + \rho_{p^*} \left(\log P_t^* - \log \bar{P}^* \right)} \quad (10),$$

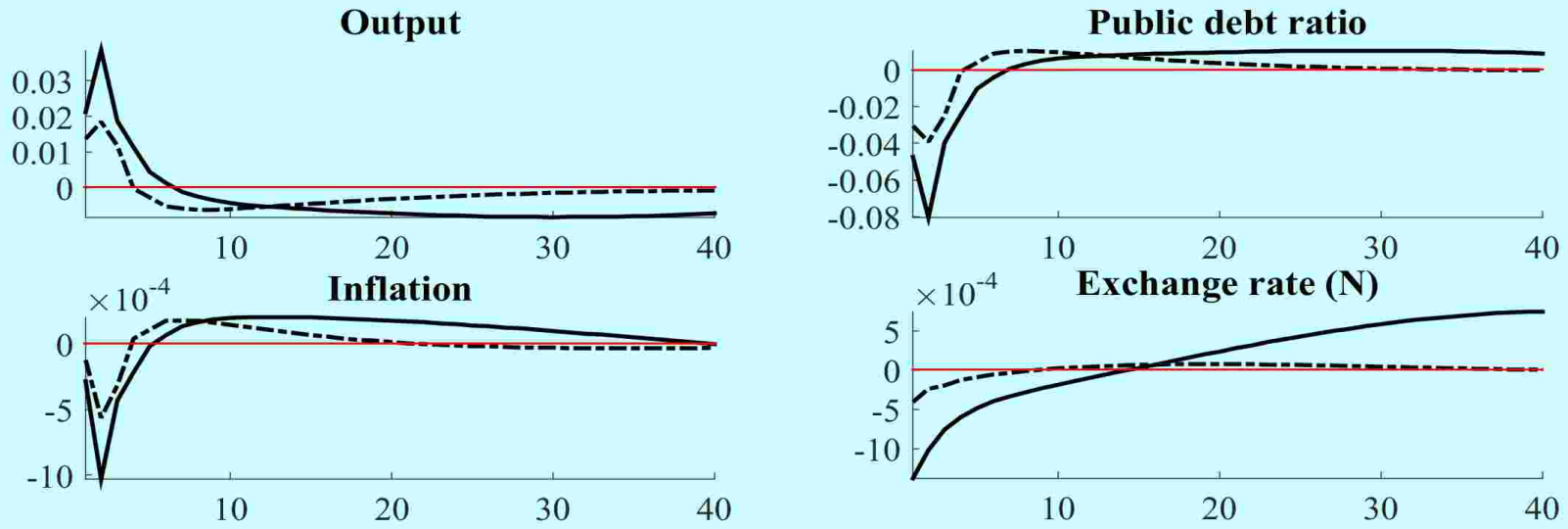
where s_{t+1}/s_t is the exchange rate gap between two adjacent periods; $e^{B_t^* - \bar{B}^*} - 1$ is country risk premium terms; $\log P_t^* - \log \bar{P}^*$ is incomplete sharing of the foreign price risk; and the dash above the indicators refers to the steady-state value.

Figure 11. Integrated responses to the public spending shock
(percentage deviations from the steady states)



In order to simultaneously meet fiscal and monetary sustainability conditions, the economy initially reacts to the public spending shock with excessive macroeconomic volatility, especially in terms of public debt and price dynamics, which subsequently leads to less optimistic growth incentives.

Figure 12. Modeling the response to public spending shock depending on the degree of monetary reaction to fiscal dominance (percentage deviations from the steady states)

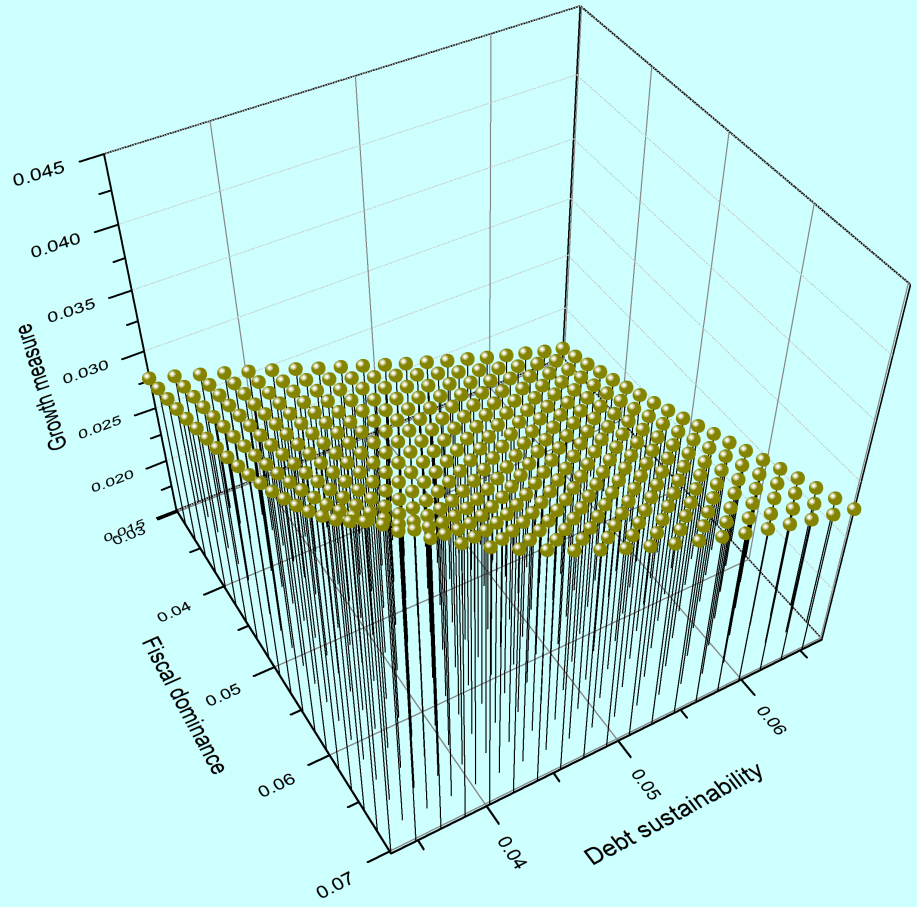


In order to bring the conditions of scenario 1 and 2 closer to the realities of Ukraine's post-war economic recovery, restrictions were placed on the amount of funds raised through the channel of external public borrowing, with priority given to financing the budget deficit through the issuance of UAH domestic government bonds.

The results demonstrate an effective joint policy framework that can agree on fiscal and monetary sustainability conditions to mitigate the consequences of fiscal dominance if it persists over time.

Figure 13. Dominance score in the fiscal-monetary interaction

The public debt ratio is not the final indicator to determine fiscal sustainability conditions. It is the degree and duration of dominance, rather than the ratio of public debt to output, that fiscal and monetary authorities should consider in pursuing pro-growth policy.



Key summary points:

- In the face of successive crises, which significantly accelerated the global debt trend, a policy review is underway that goes beyond the basic view of the fiscal-monetary interaction. The era of low-interest rates and inflation is coming to an end, and the task of sustainable growth, which is primarily related to price stability, can be solved by adjusting the inflation target and the neutral interest rate to slightly higher levels.
- Fiscal and monetary authorities should jointly control the consequences of fiscal dominance to avoid excessive volatility in financial indicators. This study demonstrates an effective rule of thumb that allows for maintaining fiscal and monetary sustainability conditions for both public debt and price dynamics. These joint measures largely prevent excessive macroeconomic volatility but weaken growth momentum.
- Monetary dominance in the fight against inflation in 2022–2023 in Ukraine is likely to give way to fiscal dominance in the second half of 2024, when external financing may not be as due as before. It is unlikely that the two dominant positions of the fiscal and monetary authorities can be maintained at the same time. In this situation, the NBU should pursue a non-dominant but effective policy to maintain price stability and stimulate growth.
- The expected investment boom in Ukraine will require appropriate monetary policy measures to absorb foreign capital inflows and avoid undesirable exchange rate appreciation. In this scenario, monetary easing should coexist with an expansionary fiscal policy that should prioritize investment.

Thank you for your attention

Extended supplementary stuff can be found in the *literature*:

Agenor, PR. (2016) Optimal fiscal management of commodity price shocks. *Journal of Development Economics*, 122, 183-196. https://doi.org/10.1016/j.jdeveco.2016.05.005

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"Brad" Crayne, RB., Williams, X., & Neupane, RC. (2021) The M2 money supply, the economy, and the national debt: A mathematical approach. *Appl Math* 12, 835–865. https://doi.org/10.4236/am.2021.129056

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