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From Kyiv to Frankfurt? Ukraine's Monetary Policy, 2009-2026

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From Kyiv to Frankfurt?
Ukraine's Monetary Policy, 2009-2026

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Abstract

This paper examines how monetary policy rules operate under conditions of institutional reform, external constraints, and war in Ukraine as a case of prospective European monetary integration. Using monthly data from 2009 to 2026, we estimate Taylor-type reaction functions for the National Bank of Ukraine, allowing the setting of the policy rate to respond to inflation gaps, industrial-production activity gaps, exchange-rate pressure, interest-rate smoothing, and regime-specific wartime interactions. We then compute deviations between actual and model-implied policy rates and test whether these deviations are associated with institutional shifts, geopolitical shocks, conflict intensity, and social disruption. The results show that Ukrainian monetary policy remained partly rule-like even during periods of extreme stress. Interest-rate smoothing is strong, exchange-rate pressure enters the effective reaction function, and the largest deviations cluster around moments of nonlinear constraints: the 2015 currency crisis, the initial full-scale-invasion policy freeze, and the June 2022 credibility-restoring interest rate hike. These findings suggest that wartime central banking is not best understood as a suspension of rules. Rather, war generates constraint-contingent rule adaptation, in which credibility is preserved through temporary modifications of the instruments, coefficients, and state variables governing policy. The paper contributes to debates on rules versus discretion by showing how monetary-policy credibility can coexist with resilience-oriented adjustment in an emerging market economy exposed to geopolitical rupture. It also speaks to Ukraine's European trajectory: eventual monetary integration will depend not only on nominal convergence, but on the demonstrated capacity to preserve rule-based credibility under extreme political and security shocks.

Keywords: Taylor-type rules; Ukraine; exchange-rate stabilization; inflation targeting; geopolitical risk; wartime monetary policy; National Bank of Ukraine.

JEL codes: E52; E58; F31; F41; O52; P34.

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1 Introduction

Ukraine offers an unusually demanding test of monetary policy credibility. Since the Global Financial Crisis (GFC), the country has experienced a balance-of-payments shock, banking stress, exchange-rate liberalization, the adoption of inflation targeting, the annexation of Crimea, the war in Donbas, the COVID-19 shock, and the full-scale Russian invasion of February 2022. In most economies, such a sequence would be sufficient to blur the distinction between rule-based policy and discretion. In Ukraine, it also raises a larger question: whether a central bank operating under existential geopolitical pressure can preserve a policy framework credible enough to support eventual European monetary integration, as required by the process of convergence and accession the country has recently began with the European (Monetary) Union (E(M)U).

This question is central to the title of the paper. The path from Kyiv to Frankfurt is not meant here as a mechanical forecast of euro adoption. It refers to the institutional distance between a wartime emerging-market central bank and the monetary-policy standards implied by deeper integration with the EU and, ultimately, the euro area, that is, the EMU. Recent work on EU enlargement stresses that Ukraine's accession process is both merit-based and geopolitical: formal progress depends on *acquis* adoption and institutional capacity, while the war has made Ukraine's European trajectory strategically urgent (Dabrowski and Louro, 2026). Monetary policy is therefore part of a broader question of institutional preparedness, not merely a narrow macroeconomic stabilization problem.

The Ukrainian case also speaks directly to a growing literature on monetary policy under geopolitical instability. Ginn and Saadaoui (2025) show that geopolitical risk shocks may generate different monetary-policy responses over short and medium horizons: accommodation may help absorb confidence and activity effects initially, while later tightening may be needed to contain inflationary pressures. For Ukraine, this tension is more than a theoretical possibility. War affects inflation, output, capital flows, fiscal financing, confidence, labor supply, and the exchange rate simultaneously. A conventional Taylor (Taylor, 1993) rule estimated without attention to these state contingencies risks misclassifying wartime stabilization as simple policy inconsistency.

Ukraine-specific studies provide our point of departure. Pifer et al. (2009) discuss the political and economic situation in Ukraine in the first decade of the century and evaluate the options and tensions of the country between the EU/NATO and Russia. Mantsurov et al. (2024) provide a longer-run view of the interrelated dynamics of economic development and inflation in Ukraine, focusing on the recent inflation targeting (IT) period. Before its formal adoption in 2015, Kozmenko et al. (2014) already argued that the interest-rate policy of the National Bank of Ukraine (NBU) could be assessed through a monetary-policy rule, while emphasizing the importance of exchange-rate liberalization and institutional reform. Grui et al. (2022) later proposed a benchmark approach to Taylor-rule evaluation under limited data availability, a constraint especially relevant for emerging market economies (EMEs) with short and structurally unstable samples. Nikolaychuk (2025) presents the 2015 move to inflation targeting as a decisive institutional break after a triple crisis of banking stress, macroeconomic instability, and balance-of-payments pressure.

At the same time, the open economy nature of Ukraine and its brief post-Soviet monetary history make the exchange-rate dimension of monetary policy unavoidable in the analysis. The hryvnia has often served as a visible barometer of confidence, external financing conditions, and policy credibility. Taylor-rule exchange-rate models show that policy-rule fundamentals can help explain currency movements, especially when monetary regimes are changing (Wang and Morley, 2023). More specifically for Ukraine, De Groot and Skok (2026) show that, after a shock on the magnitude of the full-scale invasion by Russia in February 2022, a flexible exchange rate and a conventional Taylor-type rule may fail to provide macroeconomic stability, making temporary exchange-rate stabilization and capital controls a reasonable wartime response. This insight is crucial for the interpretation of our estimates: deviations from a policy rule may be evidence of adaptation to a constrained version of the rule rather than a suspension of monetary discipline.

This paper contributes to the debate on the merits of monetary policy rules in anchoring macroeconomic expectations by combining three empirical layers. First, it reconstructs the NBU's balance-sheet structure across three regimes, namely pre-crisis, reform, and wartime, linking monetary-policy decisions to the instruments and constraints visible on the central bank's balance sheet. Second, it estimates a family of Taylor-type reaction functions for Ukraine using monthly data over 2009-2026. The economic activity gap measure is based on industrial production, as is common for monthly data, and estimated with the Hamilton (Hamilton, 2018) filter rather than the Hodrick-Prescott filter, in order to reduce endpoint distortions and artificial cycles in a sample marked by structural breaks and war. Third, it studies deviations between actual and rule-implied policy rates as episodes of state-contingent adjustment.

The empirical strategy, developed in sticky-price models since at least Clarida et al. (2000), deliberately avoids two extremes. It does not impose canonical Taylor-rule coefficients as a universal benchmark for a country whose monetary regime changed substantially after 2015. But it also does not treat wartime monetary policy as pure discretion. Instead, the paper estimates Ukraine-specific reaction functions with interest-rate smoothing, exchange-rate pressure, labor-market conditions, and regime interactions.

The residual policy component is then compared with institutional changes, conflict events, and war-related demographic and social disruption.

The main result is that Ukraine's monetary policy is better understood as adaptive rule modification than as a collapse of rules. It is in the spirit, among others, of Arestis and Mihailov (2009), who review the evolution of monetary policy frameworks after the GFC but before the Crimea invasion and the subsequent wartime complications in the Ukrainian case and denote it as converging to a 'new consensus' of 'flexible rules cum constrained discretion'. The NBU's policy rate remains systematically related to inflation, cyclical activity, exchange-rate pressure, and policy inertia. The largest deviations are concentrated around identifiable crisis moments, especially March 2015 and June 2022. These are precisely the episodes in which monetary policy had to restore a nominal anchor under acute financial and geopolitical stress.

The remainder of the paper proceeds as follows. The next section documents the evolution of the NBU's balance sheet. The Taylor-rule section then describes the monthly dataset, estimates the baseline and extended reaction functions, and derives rule-implied policy rates. The following sections compute and interpret policy-rate deviations from benchmark rule-based paths, then relate them to institutional, geopolitical, and social shocks. The conclusion returns to the implications for Ukraine's monetary credibility and its longer European integration trajectory.

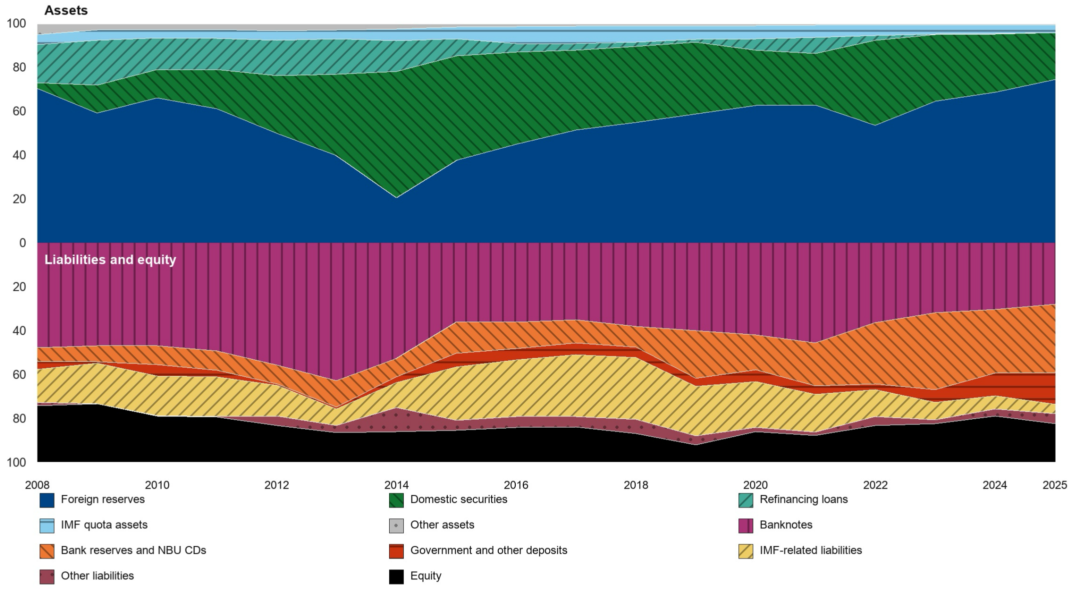
2 Balance-Sheet Structure

Figures 1 and 2 point to a central bank balance sheet whose evolution is not only quantitative, but also institutional. Figure 1 shows the composition of assets and of liabilities plus equity, with other liabilities separated from equity. Figure 2 uses the same components but scales them by nominal GDP, making the macroeconomic size of the NBU's balance sheet visible. Before the 2014 crisis, the asset side was dominated by foreign reserves, while refinancing loans still carried the trace of post-GFC banking support.

From 2016 to 2021, the structure partly normalized. Foreign reserves were gradually rebuilt and loans to banks declined, consistent with the move toward inflation targeting and a less crisis-driven operating environment. Yet the persistence of a large domestic-securities portfolio shows that the balance sheet retained a fiscal and legacy component. On the liability side, banknotes remained important, but bank accounts and NBU certificates of deposit gained weight, indicating the growing role of liquidity absorption and reserve management in the transmission framework.

The full-scale war opened a new regime. The asset side expanded with a renewed rise in foreign reserves, reflecting external support and the need to stabilize the foreign-exchange market, while domestic securities remained substantial but declined in rela-

Figure 1: NBU Balance-Sheet Components, % Shares



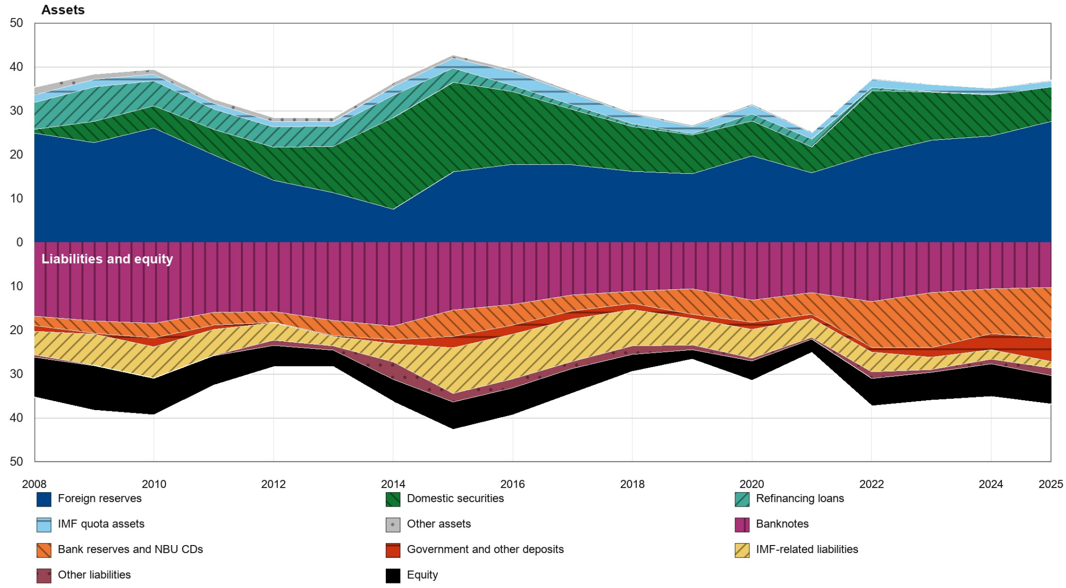
Notes: End-year asset components are reported as percentages of total assets. Liability and equity components are mirrored below zero and reported as percentages of total liabilities plus equity. Other liabilities and equity are shown separately. Source: NBU annual consolidated financial statements and management-report figures; authors' mapping.

tive weight by 2025. Liabilities shifted toward bank liquidity and government deposits, whereas IMF-related liabilities became less dominant in relative terms and equity recovered. For euro-area integration, the issue is therefore less the size of the balance sheet than its composition: reducing quasi-fiscal exposures, preserving high-quality reserve assets, and normalizing liquidity-absorption instruments are the key structural markers.

The GDP-scaled view in Figure 3 can be pushed one step further by asking whether the balance-sheet expansion generated excess monetary growth. Because the currently available dataset does not yet include a consistent broad-money aggregate, the exercise is deliberately framed as an analysis of reserve money rather than M2. Reserve money is measured as banknotes in circulation plus banks' accounts at the NBU. A second, broader liquidity measure adds NBU certificates of deposit, which are not money in circulation but capture the scale of sterilized liquidity absorbed by the central bank.

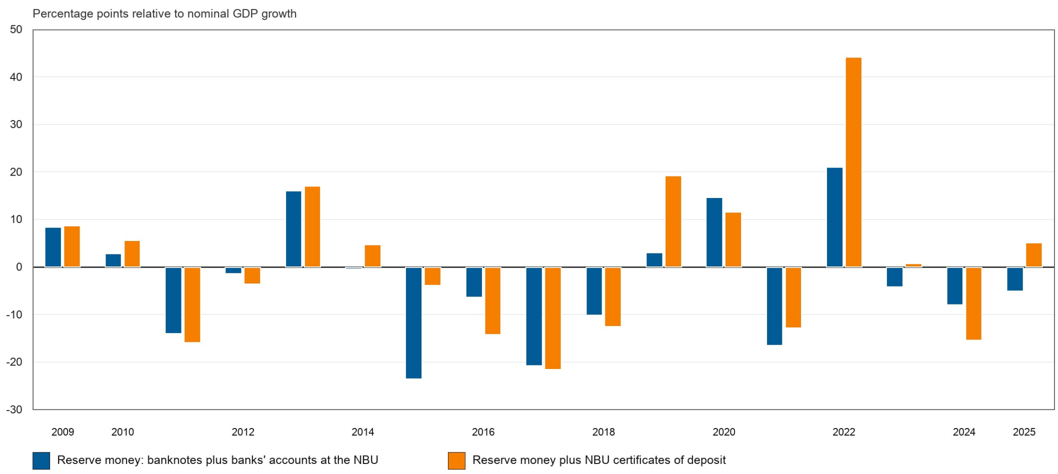
The resulting pattern reduces the purely descriptive character of the balance-sheet evidence. Reserve-money growth was not persistently excessive over the full period: after positive episodes in 2013 and 2020, it was generally below nominal GDP growth during much of the inflation-targeting period. The wartime break is sharper. In 2022, reserve money grew by about 21 percentage points more than nominal GDP, while the measure including NBU certificates of deposit exceeded nominal GDP growth by about 44 percentage points. By 2023-2025, the narrower reserve-money measure had returned

Figure 2: NBU Balance-Sheet Components, % of GDP



Notes: The figure uses the same balance-sheet mapping as Figure 1. End-year balance-sheet stocks are divided by annual nominal GDP at current prices, with asset components above zero and liability/equity components mirrored below zero. Sources: authors' calculations, from NBU annual reports.

Figure 3: Excess Reserve-Money Growth



Notes: Excess growth is defined as annual growth in the monetary proxy minus annual nominal GDP growth. Reserve money is banknotes in circulation plus banks' accounts at the NBU. The broader liquidity measure adds NBU certificates of deposit, which are shown separately because they reflect sterilized liquidity rather than circulating money. Sources: NBU annual consolidated financial statements and management-report figures; nominal GDP from the annual GDP file; authors' calculations.

below nominal GDP growth, whereas the broader liquidity measure continued to show the importance of sterilization. The balance sheet therefore records both wartime liquidity creation and the subsequent effort to prevent it from becoming an unchecked monetary overhang.

Tables 1 and 2 summarize the same mapping used in the figures at four benchmark dates: the first year of the sample, the last pre-2014 year, the last pre-full-scale-war year, and the latest available observation. Asset items are reported as a percentage of total assets; liability-side items are reported as a percentage of total liabilities plus equity.

Table 1: Asset-Side Benchmark Shares, % of Total Assets

Balance-sheet item	2008	2013	2021	2025
Foreign reserves	70.4	40.0	62.8	74.6
Domestic securities	2.6	37.0	23.5	21.2
Refinancing loans	17.4	16.1	7.3	0.1
IMF quota assets	4.6	4.1	5.6	3.5
Other assets	4.9	2.9	0.8	0.6
Total	100.0	100.0	100.0	100.0

Source: NBU annual consolidated financial statements; authors' mapping.

Table 2: Liability and Equity Benchmark Shares, % of Total Liabilities plus Equity

Balance-sheet item	2008	2013	2021	2025
Banknotes	47.9	62.8	45.6	28.1
Bank reserves and NBU CDs	6.2	12.1	19.6	31.1
Government and other deposits	3.7	1.0	4.0	14.6
IMF-related liabilities	15.1	7.5	17.1	4.2
Other liabilities	1.4	3.2	1.5	4.5
Equity	25.7	13.5	12.1	17.6
Total	100.0	100.0	100.0	100.0

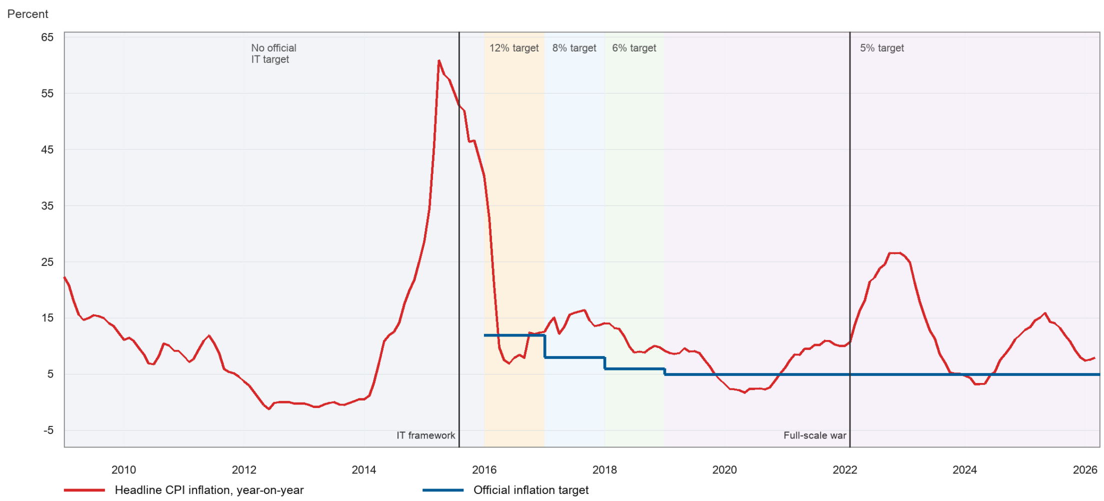
Source: NBU annual consolidated financial statements; authors' mapping.

3 Taylor-Type Rule Analysis

This section reconstructs the National Bank of Ukraine's monetary reaction function using monthly data. The purpose is not to impose a mechanical rule on a period marked by institutional reform and war, but to ask whether apparently discretionary policy movements can be understood as state-contingent adjustments to a stable rule-based framework. The analysis therefore complements the balance-sheet evidence: where the previous section documents how the NBU's instruments and balance-sheet composition changed, the Taylor-type rule exercise here evaluates whether the policy-rate reaction function changed in parallel.

Before estimating the reaction functions, Figure 4 summarizes the inflation environment faced by the NBU and the changing target path used in the official inflation-targeting period. This matters for interpretation because the sample combines an initially high-inflation environment, the 2015 disinflation shock, the gradual reduction of official targets from 12 percent to 5 percent, and the renewed inflation surge after the full-scale invasion.

Figure 4: Inflation and Official Inflation-Target Regimes, % per annum



Notes: The red line reports headline CPI inflation, year-on-year. The blue step line reports the official inflation target: 12 percent in 2016, 8 percent in 2017, 6 percent in 2018, and 5 percent from 2019 onward. The shaded areas identify the corresponding target regimes. Vertical markers indicate the adoption of the inflation-targeting framework and the start of the full-scale war. Source: NBU and State Statistics Service of Ukraine (SSSU); authors' calculations.

The estimation sample runs from December 2011 to March 2026. The starting point is dictated by the Hamilton-filtered industrial-production activity gap, which requires lagged observations and a two-year forecasting horizon. Inflation is measured by headline CPI inflation relative to a 5 percent long-run anchor in the full-sample specifications. A post-2016 robustness specification uses the official inflation-target path: 12 percent in 2016, 8 percent in 2017, 6 percent in 2018, and 5 percent from 2019 onward. Real activity is proxied by a Hamilton-filtered industrial-production gap rather than GDP gap, because the policy rule is estimated at monthly frequency and industrial production is available as a timely activity measure. Exchange-rate pressure is measured by year-on-year log depreciation of the Ukrainian hryvnia (UAH) against the US dollar (USD).

To be precise, we estimate the following Taylor-type rule specifications, in different samples or alterations, as reflected in Table 3 and explained further below.

The natural starting point is a conventional Taylor rule, denoted henceforth as monetary policy rule 1, MPR1:

$$i_t^* = c + \varphi_\pi \left(\pi_t - \pi_t^*\right) + \varphi_y \left(y_t - y_t^*\right) + \varepsilon_t, \tag{1}$$

where i_t^* is the target policy rate, c is a constant, $(\pi_t - \pi_t^*)$ is the deviation of inflation from target and φ_π measures the central bank response to it, $(y_t - y_t^*)$ is the deviation of industrial production (as proxy for real activity) from its time-varying Hamilton trend and φ_y measures the central bank response to it, while $\varepsilon_t \rightsquigarrow i.i.d.(0, \sigma_\varepsilon)$ is a stochastic disturbance.

The next step repeats equation (1) but now augmented with interest-rate smoothing or policy inertia, as is the practice of central banks and consistent with ensuring determinacy of rational expectations equilibrium in New Keynesian theoretical models of closed and open economies, e.g., Woodford (2003) and McKnight and Mihailov (2015).

$$i_t^* = c + \rho_i i_{t-1}^* + \varphi_\pi \left(\pi_t - \pi_t^*\right) + \varphi_y \left(y_t - y_t^*\right) + \varepsilon_t, \tag{2}$$

where i_{t-1}^* is the last-period interest rate target and ρ_i measures monetary policy inertia or persistence in interest-rate changes.

Further augmentation implies adding to equation (2) a depreciation term for the national currency, month-on-month in a first variation, typically a serious concern in open economies both theoretically and empirically, e.g., Monacelli (2005):

$$i_t^* = c + \rho_i i_{t-1}^* + \varphi_\pi \left(\pi_t - \pi_t^*\right) + \varphi_y \left(y_t - y_t^*\right) + \varphi_d^m d_t^m + \varepsilon_t, \tag{3}$$

where d_t^m is month-on-month national currency, i.e., UAH, depreciation against the foreign currency, i.e., USD or EUR and φ_d^m captures the central bank response to it.

Then the same specification but with annual depreciation replacing monthly depreciation:

$$i_t^* = c + \rho_i i_{t-1}^* + \varphi_\pi \left(\pi_t - \pi_t^*\right) + \varphi_y \left(y_t - y_t^*\right) + \varphi_a^a d_t^a + \varepsilon_t, \tag{4}$$

where d_t^a is annual (year-on-year) national currency, i.e., UAH, depreciation against the foreign currency, i.e., USD or EUR and φ_d^a captures the central bank response to it.

Finally, a 'full specification' including dummies and interactions:

$$i_t^* = c + \rho_i i_{t-1}^* + \varphi_\pi \left(\pi_t - \pi_t^*\right) + \varphi_y \left(y_t - y_t^*\right) + \varphi_a^a d_t^a + \beta_{dv}' \left(dv\right) + \beta_{it}' \left(it_t\right) + \varepsilon_t, \tag{5}$$

where (dv) is a column vector of dummy variables and β'_{dv} is a row vector of the same dimension collecting the respective response coefficients in the central bank reaction function and (it_t) is a column vector of interaction terms and β'_{it} is a row vector of the same dimension collecting the respective response coefficients in the central bank reaction function.

Eight specifications of the above monetary policy rules are estimated, MPR1 through MPR8 for short, where the MPR's number denotes the particular version of the monetary policy rule. As partly discussed while introducing the equations and the notation, the first three build the conventional Taylor-type rule step by step: the baseline includes the inflation gap and the industrial activity gap, the second adds interest-rate smoothing, and the third adds exchange-rate pressure. MPR4, which remains the preferred first-step residual-generating model for continuity with the subsequent policy-rule deviation analysis, adds regime indicators and interactions for inflation targeting and the full-scale war. MPR4' repeats MPR4 using monthly exchange-rate depreciation instead of year-on-year depreciation. MPR5 restricts the sample to the official inflation-targeting period and uses the official target path. MPR6 adds wartime regime terms to MPR5, while MPR6' repeats MPR6 with monthly instead of annual exchange-rate depreciation. All specifications are estimated by ordinary least squares (OLS) with Newey-West standard errors using six monthly lags.

The estimates reported in tables 3 and 4 should be read in light of the NBU's own stated hierarchy of objectives. In its annual reports, the Bank describes its main function as safeguarding the stability of the national currency, guided by the priority of price stability, while also emphasizing monetary and foreign-exchange (FX) market operations, liquidity management, and financial stability. Table 3 mirrors that hierarchy. The estimated policy-rate smoothing coefficient is high across all dynamic specifications, ranging from about 0.83 to 0.89. This persistence is consistent with a central bank that uses the policy rate as a signaling instrument and avoids excessive month-to-month volatility when credibility and financial stability are fragile.

The inflation response is also consistent with the Bank's stated price-stability priority. In the full-sample models, the inflation-gap coefficient is positive and significant, while the interaction terms imply that the response changed under inflation targeting and again during the full-scale war. In the official-target models, the inflation-gap coefficient remains positive and significant. Adding wartime terms in MPR6 slightly improves fit in terms of adjusted R-squared or root mean squared error (RMSE) relative to MPR5, but the gain is modest, suggesting that the official target path already captures part of the post-2016 monetary-policy framework.

The exchange-rate results are the main reason for reporting MPR4' and MPR6'. With year-on-year depreciation, the exchange-rate term is positive in MPR4 and only

Table 3: First-Step Taylor-Type Rule Estimates

Variable	MPR1 Baseline 5% anchor	MPR2 Smoothing 5% anchor	MPR3 FX y/y 5% anchor	MPR4 FX y/y	MPR4' FX m/m	MPR5 Official target FX y/y	MPR6 Official target war terms, FX y/y	MPR6' Official target war terms, FX m/m
Constant	12.019***	1.974***	1.793**	0.377	1.176*	1.351*	0.727	1.075
	(0.762)	(0.741)	(0.888)	(0.658)	(0.669)	(0.803)	(0.687)	(0.889)
Lagged policy rate		0.829***	0.841***	0.860***	0.834***	0.866***	0.889***	0.871***
		(0.058)	(0.066)	(0.049)	(0.062)	(0.057)	(0.045)	(0.061)
Inflation gap, 5% anchor	0.298***	0.067**	0.051	0.070***	0.113***			
	(0.037)	(0.029)	(0.039)	(0.025)	(0.025)			
Inflation gap, official target						0.124***	0.081***	0.090***
						(0.039)	(0.022)	(0.030)
Industrial activity gap	-0.113***	-0.019	-0.017	0.054***	0.033*	-0.006	0.035*	0.024
	(0.043)	(0.014)	(0.017)	(0.021)	(0.017)	(0.014)	(0.020)	(0.022)
UAH/USD depreciation, y/y			0.011	0.035*		-0.008	0.014	
			(0.019)	(0.020)		(0.017)	(0.012)	
UAH/USD depreciation, m/m					0.060***			0.022
					(0.017)			(0.045)
Inflation-targeting regime				0.662	0.340			
				(0.463)	(0.322)			
Full-scale-war regime				0.425	0.243		0.354	0.182
				(0.379)	(0.355)		(0.367)	(0.326)
IT x inflation gap				-0.058***	-0.069***			
				(0.017)	(0.017)			
War x inflation gap, 5% anchor				0.170**	0.101**			
				(0.085)	(0.046)			
War x inflation gap, official target							0.103	0.045
							(0.087)	(0.047)
War x activity gap				-0.058***	-0.039**		-0.037*	-0.027
				(0.022)	(0.018)		(0.020)	(0.019)
War x FX depreciation, y/y				-0.080			-0.067	
				(0.051)			(0.053)	
War x FX depreciation, m/m					-0.104**			-0.070
					(0.048)			(0.064)
Observations	172	172	172	172	172	123	123	123
Adj. R-squared	0.662	0.936	0.937	0.946	0.945	0.929	0.932	0.931
RMSE	3.577	1.552	1.546	1.425	1.437	1.380	1.350	1.367

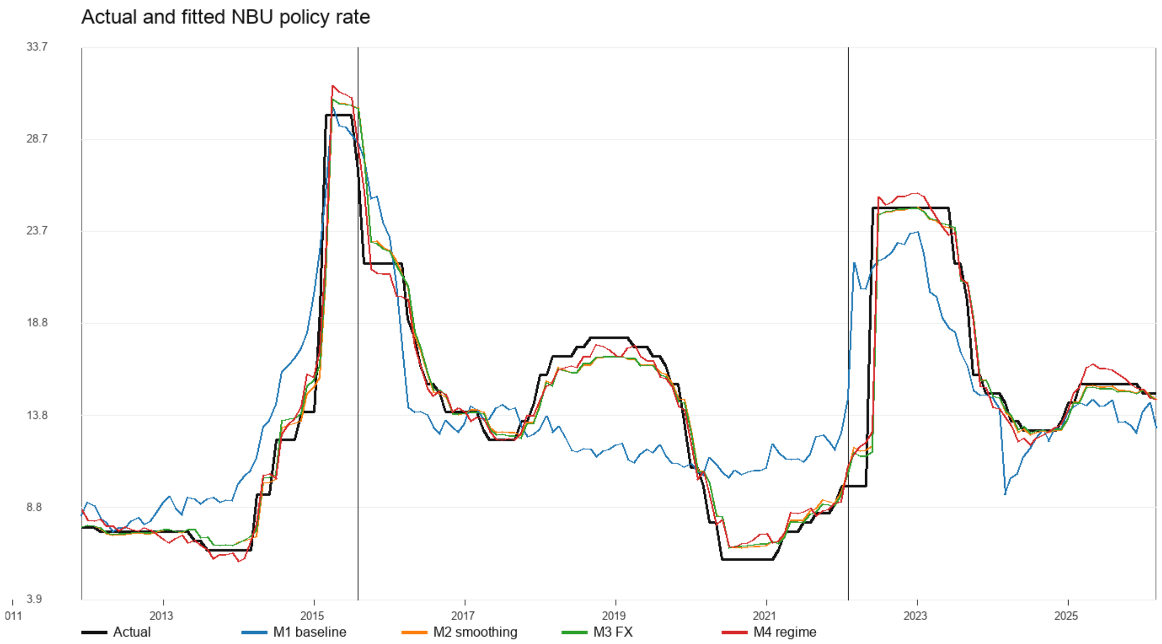
Notes: The dependent variable is the end-of-month NBU key policy rate. Parentheses report Newey-West standard errors with six monthly lags. *, **, and *** denote statistical significance of the estimated coefficients at the 10, 5, and 1 percent levels. MPR1 is the baseline Taylor rule with a 5 percent inflation anchor; MPR2 adds interest-rate smoothing; MPR3 adds year-on-year UAH/USD depreciation. MPR4 adds inflation-targeting and full-scale-war regime terms and interactions. MPR4' repeats MPR4 with month-on-month UAH/USD depreciation. MPR5 uses the official inflation-target path from 2016 onward. MPR6 adds wartime regime terms to MPR5; MPR6' repeats MPR6 with month-on-month UAH/USD depreciation. The post-IT dummy is not separately included in MPR6 and MPR6' because the official-target sample begins in 2016.

Table 4: Implied Regime-Specific Coefficients from the Preferred Policy Rule

Variable	Pre-IT	IT before full-scale war	Full-scale war
Inflation gap	0.070	0.012	0.182
Industrial activity gap	0.054	0.054	-0.004
UAH/USD depreciation	0.035	0.035	-0.044

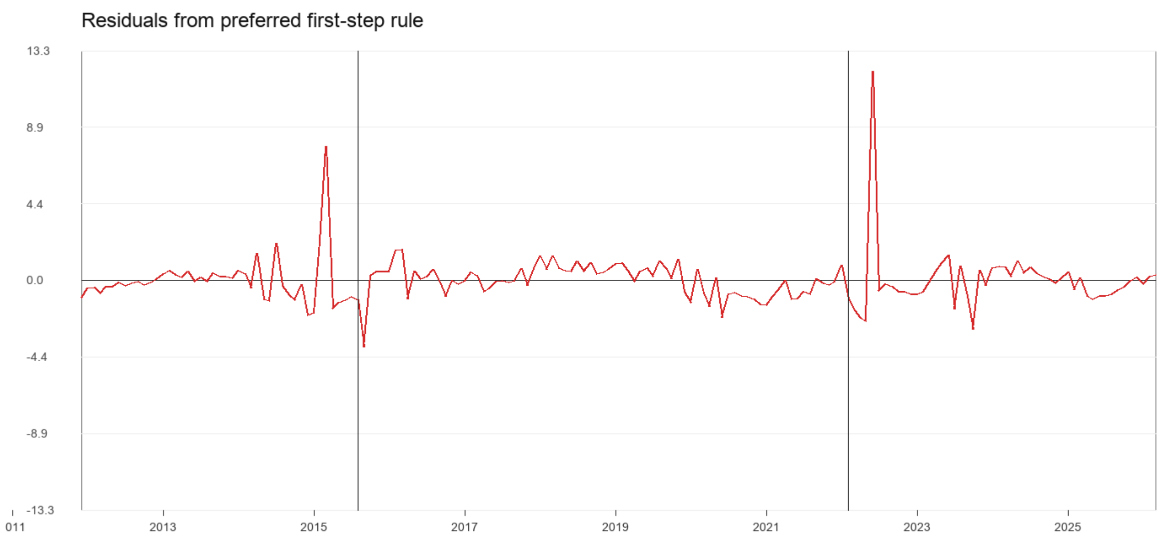
Notes: The table reports implied marginal coefficients from the preferred MPR4 regime-interaction specification in Table 3, not separate regressions by subperiod. The pre-IT column uses the baseline MPR4 coefficients. The IT before full-scale war column adds the relevant inflation-targeting interaction terms. The full-scale-war column adds the wartime interaction terms. The inflation gap is measured relative to the 5 percent long-run anchor; exchange-rate pressure is year-on-year UAH/USD depreciation. Coefficients indicate percentage-point changes in the policy rate associated with a one-percentage-point change in the corresponding variable, conditional on the lagged policy rate and other controls.

Figure 5: Actual and Fitted NBU Policy Rate



Notes: The black line reports the actual end-of-month NBU key policy rate. The colored fitted paths are generated by the first-step Taylor-rule specifications reported in Table 3. The preferred fitted path is MPR4, the full-sample regime-interaction rule with year-on-year exchange-rate depreciation. Vertical markers indicate the adoption of inflation targeting and the beginning of the full-scale war. The figure is intended to show fit and timing, not to rank models as structural representations of monetary policy.

Figure 6: Residuals from the Preferred Regime-Interaction Policy Rule



Notes: Residuals are actual policy rate minus the fitted rate from the preferred MPR4 regime-interaction rule, in percentage points. A positive residual indicates that actual policy was tighter than implied by the estimated reaction function; a negative residual indicates that actual policy was looser. The vertical markers identify the inflation-targeting launch and the start of the full-scale war. These residuals are the main policy-deviation measure used in the second-stage analysis.

weakly identified in the official-target specifications. With monthly depreciation, the non-war exchange-rate coefficient in MPR4' becomes larger and statistically stronger, while the wartime interaction turns negative. The overall fit changes little, however: MPR4 and MPR4' have very similar adjusted R-squared or RMSE, as do MPR6 and MPR6'. The higher-frequency exchange-rate measure therefore changes the interpretation of the exchange-rate channel more than it changes the broad explanatory power of the rule. In normal times, exchange-rate pressure appears to enter the reaction function as a stabilization concern. During the war, however, the exchange rate was partly stabilized through fixing, interventions, capital controls, and liquidity absorption, so the policy-rate equation no longer captures a simple floating-regime depreciation response.

The fitted paths in Figure 5 confirm that a rule-based representation captures much of the broad movement in the NBU policy rate, but not the abrupt crisis decisions. As seen in Figure 6, the two largest residuals correspond to March 2015 and June 2022. These are precisely the moments when the NBU faced nonlinear macro-financial constraints: the post-Crimea and Donbas currency crisis in the first case, and the policy-rate jump following the full-scale invasion in the second. The residual pattern is therefore not a failure of the rule-based approach. It identifies the episodes where the implemented rule must be augmented by institutional, geopolitical, and social-resilience variables, or considerations.

These results support the central claim of the paper. Wartime central banking in Ukraine should not be interpreted simply as a suspension of rules. The empirical evidence is more consistent with adaptive rule modification: policy remains anchored by inflation, activity, smoothing, and exchange-rate conditions, but the coefficients and residual shocks change when the state of the world changes. The next stage of the analysis should therefore use the estimated residuals from the preferred monetary policy rule as the object to be explained by institutional regime shifts, security shocks, refugee and displacement variables, military and civilian casualty indicators, and measures of external financial support.

This interpretation also connects the monetary reaction function to the balance-sheet evidence. The balance sheet shows how the NBU's operating environment shifted from pre-2014 reserve management, to post-2015 inflation targeting and banking-system stabilization, to wartime foreign-exchange stabilization and liquidity management. The Taylor-type rule estimates show the same sequence from the policy-rate side. Taken together, the two sets of evidence suggest that credibility and resilience were not substitutes: the NBU sought to preserve a nominal anchor while adapting its instruments to extraordinary geopolitical constraints.

4 Policy-Rate Deviations from Benchmark Paths

The previous estimates reconstruct the systematic component of the NBU's reaction function. The next question is where actual policy departed from that fitted rule path, and whether those departures look like arbitrary discretion or state-contingent responses to exceptional constraints. To answer this, we compute two families of policy-rate deviations. The first is empirical: namely, the residual from the preferred regime-interaction rule, that is, MP4. The second is comparative: the gap between the actual NBU policy rate and benchmark Taylor-type reference rates – see Table 5.

A positive deviation means that the actual policy rate is above, that is, tighter than, the fitted or benchmark-implied rate; a negative deviation means that actual policy is below, looser than, that reference path. The estimated-rule residual is the main object for the later explanatory stage, because it measures departures from Ukraine's own estimated reaction function. The benchmark gaps serve a different purpose. They show how far Ukrainian policy was from simple policy rules, including a canonical Taylor rule, a balanced rule with a stronger activity response, and an open-economy benchmark that adds exchange-rate depreciation pressure.

Table 5: Summary of Policy-Rate Deviations from Benchmark Paths

Deviation measure	Mean	SD	Min	Max
Estimated-rule residual	-0.00	1.43	-3.85	12.07
Canonical Taylor gap	-3.77	14.47	-53.06	27.66
Balanced-rule gap	-3.77	19.37	-45.27	55.71
Open-economy benchmark gap	-4.93	15.56	-59.75	27.66

Notes: Deviations are actual NBU policy rate minus the fitted or benchmark-implied rate, in percentage points, over December 2011-March 2026. The estimated-rule residual is actual policy minus the fitted rate from the preferred MPR4 regime-interaction rule. The canonical Taylor gap compares actual policy with a Taylor-style benchmark equal to r* + inflation + 0.5 inflation gap + 0.5 activity gap, with r* set to 2 percent. The balanced-rule gap uses the same inflation response but gives the activity gap a coefficient of 1. The open-economy gap adds a modest exchange-rate-pressure term to the canonical benchmark. Positive values mean the actual policy rate is tighter, above the reference path; negative values mean it is looser, below the reference path.

The contrast between the two types of deviations is central. The estimated-rule residual is centered near zero by construction and has a standard deviation of about 1.4 percentage points. Most months are therefore reasonably well described by the estimated reaction function once interest-rate smoothing, inflation gaps, activity gaps, exchange-rate pressure, and changing regimes are included. The large benchmark gaps tell a different story: canonical Taylor-type rules often prescribe substantially higher rates than those actually chosen by the NBU, particularly in periods when inflation and exchange-rate pressure were elevated. This does not imply policy failure. Rather, it shows that a simple rule is poorly suited to an economy facing institutional transition, exchange-rate constraints, and wartime financial controls.

The regime breakdown in Table 6 and Figure 7 reinforces this point. Estimated residual volatility is lowest during the inflation-targeting period before the full-scale invasion, and highest during the full-scale-war period. Benchmark gaps are negative on average before the invasion, meaning that benchmark rules generally called for tighter policy than the NBU actually implemented. During the full-scale war, however, the canonical benchmark gap turns positive on average, reflecting the exceptionally tight policy stance after the June 2022 policy-rate increase and the collapse in measured real activity captured by the industrial-production gap.

Table 6: Policy-Rate Deviations by Regime

Regime	Residual mean	Residual SD	Taylor gap mean	Open-economy gap mean
IT before full-scale war	-0.00	0.93	-7.71	-8.37
Full-scale war	-0.00	1.96	7.01	5.97
Pre-IT	-0.00	1.48	-9.02	-11.21

Notes: Deviations are measured as the actual NBU policy rate minus the fitted or benchmark-implied rate, in percentage points. The estimated-rule residual is taken from the preferred regime-interaction Taylor-rule specification. The Taylor gap is computed relative to the canonical Taylor-style benchmark, while the open-economy gap adds exchange-rate depreciation pressure. Regimes are defined as follows: pre-IT before August 2015; IT before full-scale war from August 2015 to January 2022; full-scale war from February 2022 onward.

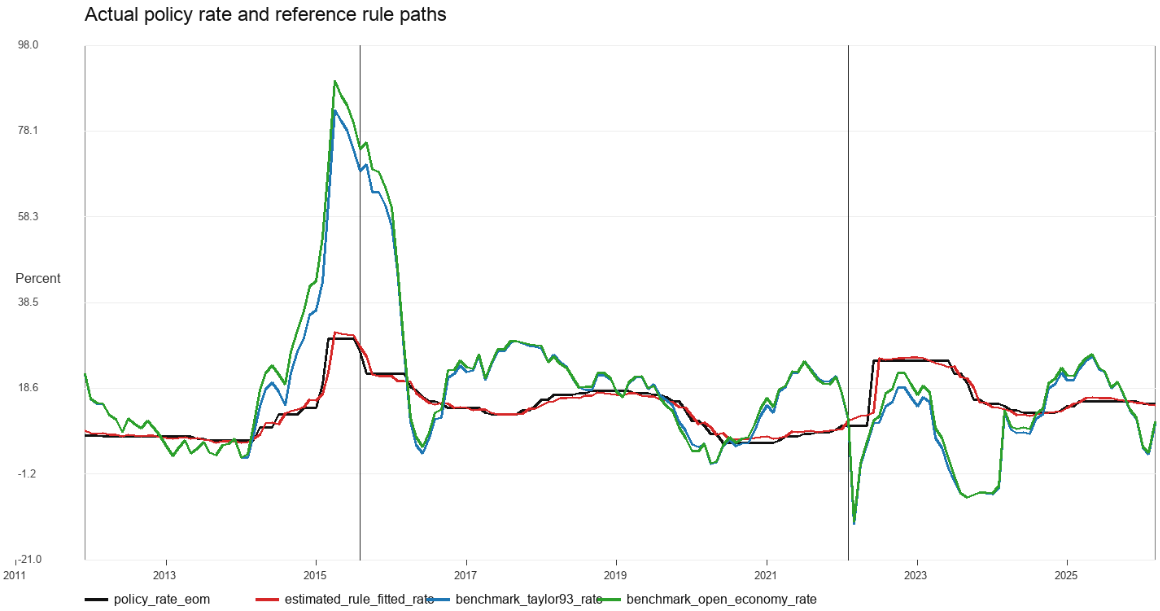
Table 7: Largest Estimated-Rule Residual Episodes, in Chronological Order

Date	Regime	Actual policy rate	Fitted policy rate	Residual	Absolute residual
2015-02	Pre-IT	19.5	17.3	2.2	2.2
2015-03	Pre-IT	30.0	22.2	7.8	7.8
2015-09	IT before war	22.0	25.9	-3.9	3.9
2020-06	IT before war	6.0	8.2	-2.2	2.2
2022-04	Full-scale war	10.0	12.1	-2.1	2.1
2022-05	Full-scale war	10.0	12.3	-2.3	2.3
2022-06	Full-scale war	25.0	12.9	12.1	12.1
2023-10	Full-scale war	16.0	18.8	-2.8	2.8

Notes: The table reports the largest absolute residuals from the preferred regime-interaction Taylor-type rule specification. The residual is defined as the actual NBU policy rate minus the fitted policy rate. A positive residual means that the actual rate was higher than implied by the estimated rule; a negative residual means that the actual rate was lower than implied by the estimated rule. Episodes were selected by absolute residual size and then reordered chronologically to show the sequence of crisis-related deviations.

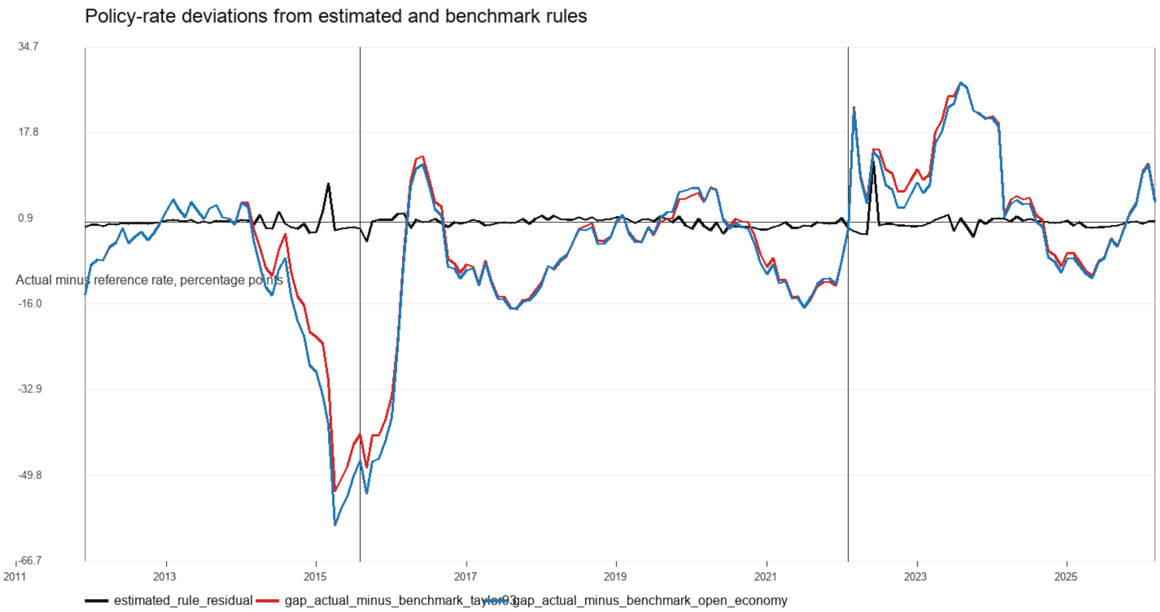
These deviations therefore refine the paper's interpretation of wartime central banking. They do not show a sharp abandonment of rules. Instead, as in Table 7 and Figure 8, they identify the points at which rule-based behavior had to be modified by constraints that are not fully captured by inflation, industrial activity, exchange-rate depreciation, and interest-rate smoothing but had emerged and needed addressing as the economy evolved. The residuals are, thus, the appropriate dependent variable for the next empirical stage. If war-related social indicators, refugee flows, internal displacement, casualty measures, external support, reserve changes, and capital-control episodes explain these

Figure 7: Actual Policy Rate and Reference Rule Paths



Notes: The figure compares the actual NBU policy rate with three reference paths: the fitted rate from the preferred estimated rule, a canonical Taylor-style benchmark, and an open-economy benchmark that adds exchange-rate depreciation pressure. Benchmark paths are deliberately unconstrained: they do not impose wartime exchange-rate fixing, capital controls, financial-stability limits, or policy-rate lower/upper bounds. Large gaps should therefore be interpreted as diagnostic distances from simple rules, not as direct policy prescriptions.

Figure 8: Policy-Rate Deviations from Estimated and Benchmark Rules



Notes: Each series is actual policy rate minus the relevant fitted or benchmark rate, in percentage points. The zero line indicates equality between actual and reference policy. Positive (resp., negative) values mean that actual policy was tighter (resp., looser) than the reference path. The estimated-rule residual is centered near zero by construction.

residuals, then the paper can verify empirically that wartime monetary policy was not merely discretionary. It was a state-contingent adaptation of rule-based central banking under extreme uncertainty.

5 Explaining These Policy-Rule Deviations

The final empirical step asks whether deviations from the estimated reaction function are systematically related to institutional, geopolitical, and social shocks. The dependent variable is the estimated-rule residual from the preferred Taylor-type rule specification, namely, MPR4: the actual NBU policy rate minus the fitted policy rate. A positive residual means that the actual rate was tighter than implied by the estimated rule, i.e., that the stance of monetary policy in Ukraine was overly restrictive; a negative residual means that the actual rate was looser, i.e., that the stance of monetary policy was, instead, overly expansionary.

The analysis is deliberately parsimonious. The residual sample is monthly but short, and many war-related variables move together. We therefore estimate two families of exploratory models. The first uses event and regime-shock dummies to identify whether residuals cluster around known crisis moments. The second adds conflict-intensity and social variables, including ACLED[1] event counts, civilian-targeting indicators, IOM[2] displacement measures, and registered-unemployment changes. The purpose is not to claim a fully causal structural model, but to test whether residuals behave like state-contingent wartime adjustments rather than unexplained discretion.

We consider both signed residuals, as in Table 8 and Figure 9 and absolute residuals. Signed residuals identify whether policy was tighter or looser than implied by the estimated rule. Absolute residuals measure the size of discretionary adjustment regardless of direction. This distinction matters because a central bank may deviate from the rule both by tightening sharply in a credibility crisis and by holding back during an initial wartime shock.

The event-based results in Table 8 and Figure 10 show that residuals are concentrated around a small number of crisis episodes. The February-March 2015 exchange-rate and policy-tightening peak is associated with a large positive residual, indicating that actual policy was tighter than implied by the estimated rule. The June 2022 policy-rate jump is even larger: the coefficient is about 12 percentage points in the signed-residual model. This confirms that the 25 percent policy-rate decision was not simply the mechanical

[1] ACLED stands for Armed Conflict Location & Event Data: `https://acleddata.com/about-acled`.

[2] IOM stands for the International Organization for Migration at the United Nations (UN): `https://www.iom.int`.

implication of the first-stage rule, but an exceptional adjustment under wartime nominal-anchor pressure.

The early full-scale-invasion period points in the opposite direction. The March-May 2022 rate-freeze dummy is negative in the signed-residual model and positive in the absolute-residual model. This means that, during the first invasion months, the actual rate was below the fitted rule, but the magnitude of the deviation was still large. The pattern is consistent with a two-step wartime response: an initial stabilization/freeze phase followed by a discrete credibility-restoring tightening in June 2022.

The conflict and social variables in Table 9 add context but should be interpreted cautiously. In the 2018-onward model, the ACLED civilian-targeting variable is negatively associated with signed residuals, while the political-violence fatality term is positive but imprecise. In the full-scale-war model, the IOM internally displaced persons (IDP)[3] stock enters positively in the signed-residual specification, but the estimate is imprecise. Month-on-month registered unemployment growth is positively associated with signed residuals, suggesting that short-run labor-market stress coincides with policy rates above the fitted rule.[4] These mixed results are not surprising: wartime intensity, displacement, unemployment, exchange-rate management, and policy-event timing are tightly correlated in a short monthly sample.

The absolute-residual models are useful because they focus on the scale of adjustment rather than direction. They confirm that the June 2022 policy-rate jump dominates the size of discretionary adjustment. With month-on-month registered-unemployment growth, the labor market term is not significant in the absolute-residual model. This reveals that administrative registration dynamics do not act as a stable labor-market stabilization channel, but that labor-market variables should be treated as social-disruption proxies rather than standard slack indicators.

The second-stage analysis strengthens the interpretation developed in the previous sections. The NBU's deviations from the estimated reaction function are not diffuse or persistent. They are concentrated around moments when the central bank faced nonlinear constraints: the post-Crimea/Donbas currency crisis, the initial full-scale-invasion freeze, and the June 2022 credibility-restoring policy-rate jump. Conflict and social variables

[3]https://www.iom.int/internal-displacement.

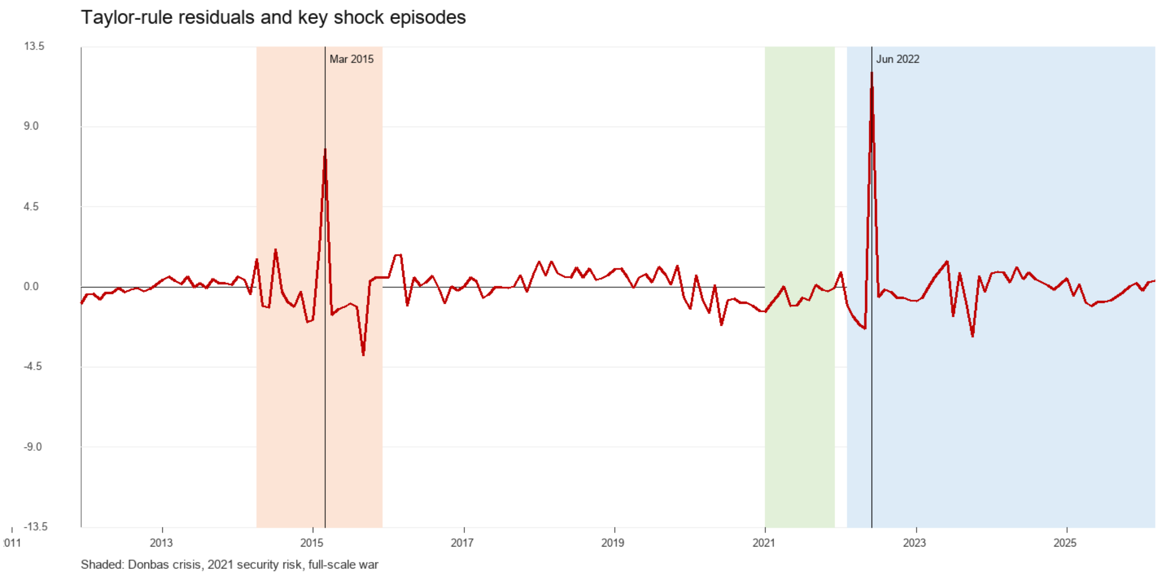
[4]Robustness checks confirm that the unemployment result is sensitive to the periodicity used for registered unemployment. Replacing the month-on-month change with a three-month change preserves the positive association with signed full-war residuals, while the year-on-year change is not significant in the signed-residual model but becomes negative and significant in the absolute-residual model. This suggests that high-frequency unemployment changes capture short-run wartime labor-market stress, whereas year-on-year changes partly reflect administrative registration dynamics and base effects. The unemployment coefficients should therefore be interpreted as social-disruption proxies rather than standard labor-market-slack responses.

Table 8: Event-Based Explanations of Taylor-Type Rule Residuals

Variable	Signed residual	Absolute residual
Constant	0.043 (0.109)	0.591*** (0.064)
Crimea annexation, Mar. 2014	-0.501*** (0.109)	-0.134** (0.064)
Donbas crisis, 2014-2015	-0.748** (0.324)	0.646*** (0.127)
FX/policy peak, Feb.-Mar. 2015	5.701*** (0.845)	3.759*** (0.694)
Security-risk period, 2021	-0.599*** (0.176)	-0.015 (0.155)
Full-scale invasion, Feb. 2022	-1.100*** (0.109)	0.465*** (0.064)
Policy-rate freeze, Mar.-May 2022	-2.099*** (0.132)	1.464*** (0.107)
Policy-rate jump, Jun. 2022	12.028*** (0.109)	11.480*** (0.064)
Observations	172	172
R-squared	0.639	0.747
RMSE	0.856	0.590

Notes: Newey-West standard errors with six monthly lags in parentheses. The signed residual is actual minus fitted policy rate. The absolute residual is the absolute value of the signed residual. *, **, and *** denote approximate significance at the 10, 5, and 1 percent levels.

Figure 9: Taylor-Type Rule Residuals and Key Shock Episodes



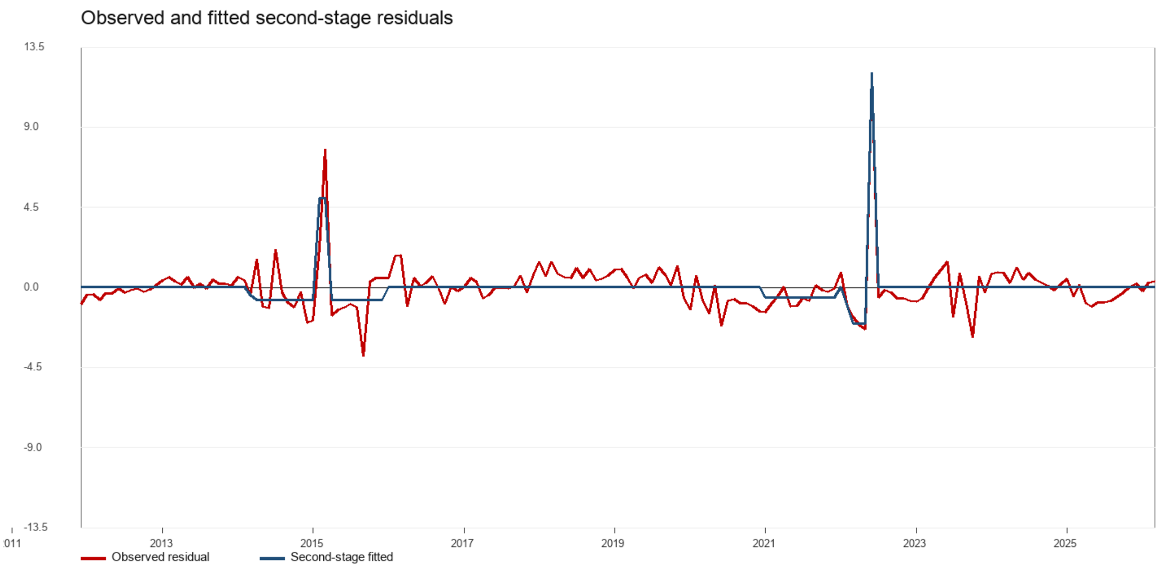
Notes: The observed series is the signed first-stage Taylor-rule residual. The fitted series is generated by the event-based second-stage regression that uses institutional and geopolitical event indicators. The figure evaluates whether those events explain the timing and direction of the main policy-rate deviations. It should be read as an explanatory diagnostic rather than a forecasting exercise.

Table 9: Conflict and Social Variables in Second-Stage Residual Models

Variable	Signed, 2018-	Signed, full war	Absolute, full war
Constant	-0.077 (0.143)	-1.387 (1.283)	1.126*** (0.397)
Policy-rate freeze, Mar.-May 2022	-1.676*** (0.243)	-2.407*** (0.785)	1.483*** (0.461)
Policy-rate jump, Jun. 2022	12.305*** (0.171)	11.867*** (0.489)	11.662*** (0.166)
ACLED political violence events	0.215 (0.271)	-0.435 (0.761)	0.019 (0.457)
ACLED civilian-targeting events	-0.668* (0.369)	0.079 (0.774)	0.012 (0.704)
ACLED political violence fatalities	0.487 (0.551)		
IOM IDP stock	1.064 (1.115)	-0.432 (0.348)	
Registered unemployment, m/m	0.357** (0.150)	-0.053 (0.086)	
Observations	99	50	50
R-squared	0.714	0.863	0.929
RMSE	0.809	0.717	0.451

Notes: Continuous shock variables are log-transformed where appropriate and standardized. Registered unemployment is measured as month-on-month growth in the stock of registered unemployed persons, standardized over the estimation sample. Signed 2018- uses the ACLED coverage period; full-war models begin in February 2022. Newey-West standard errors with six monthly lags in parentheses. Robustness checks using three-month and year-on-year registered-unemployment changes are discussed in the text.

Figure 10: Observed and Fitted Residuals from the Event-Based Second-Stage Model



Notes: The red line is the signed residual from the preferred first-stage Taylor rule. Shaded areas identify the Donbas crisis period, the 2021 security-risk period, and the full-scale-war period. The vertical markers highlight March 2015 and June 2022, the two largest residual episodes in the estimated-rule approach. The figure motivates the second-stage analysis by showing that deviations are clustered around identifiable institutional and geopolitical shocks.

help characterize the wartime environment, but the strongest empirical signal comes from the timing of institutional and geopolitical shocks.

6 Conclusion

This paper examined whether Ukraine's wartime monetary policy should be read as a departure from rule-based central banking or, alternatively, as an adaptation of the prescribed and implemented rules to exceptional state contingencies. The evidence supports the second interpretation. Across 2009-2026, the NBU's policy rate remains meaningfully connected to inflation gaps, cyclical conditions, exchange-rate pressure, and monetary policy inertia. The wartime period does not erase this systematic component. It rather changes the constraints under which the adopted rule is implemented, with appropriate adaptations.

The estimated Taylor-type rules and the deviation analysis, therefore, point to a central bank operating with both discipline to the commitment rule, IT in most of the period, and a measured dose of discretion. The largest departures from fitted rule prescriptions are concentrated in identifiable episodes: the 2014-2015 exchange-rate and banking crisis, the initial freeze after the full-scale invasion, and the June 2022 policy-rate jump that re-established a nominal anchor. These are not random residuals in the ordinary sense. They are the empirical trace of institutional regime changes, war-related financial stress, and the need to stabilize expectations when conventional Taylor-rule equilibria may be fragile, as also emphasized by De Groot and Skok (2026).

The broader implication is important for the paper's title, and for Ukraine's European accession trajectory. The path from Kyiv to Frankfurt is not only a question of eventual euro adoption, nor only a question of satisfying formal nominal convergence criteria. Before reaching there, it is also essentially a question of whether Ukraine can sustain credible, rules-oriented monetary institutions while rebuilding after war. In that respect, the NBU's experience since the introduction of inflation targeting in 2015, discussed by Grui et al. (2022) and Nikolaychuk (2025), is best understood as part of a longer institutional convergence process rather than as a sequence of isolated crisis measures.

The accession perspective developed in Dabrowski and Louro (2026) provides a useful benchmark for this interpretation. Their quantification of European Commission assessments shows that Ukraine remains behind the Western Balkan front-runners in textitacquis adoption, with weighted overall preparedness scores of 31 in 2023, 31 in 2024, and 33 in 2025. At the same time, they stress that Ukraine's accession process has been accelerated by geopolitical circumstances: candidate status was granted in June 2022, accession negotiations opened in December 2023, the first intergovernmental conference was held in June 2024, screening was completed in September 2025, and Cluster 1 negotiations were opened in June 2026 after Hungary lifted its block. This mixture of merit-based conditionality and geopolitical urgency is precisely the environment in which monetary credibility becomes strategically valuable.

Our results add a monetary-policy dimension to that accession debate. They suggest that Ukraine's central bank has preserved a rule-like reaction function under conditions that would normally threaten fiscal dominance, orderly exchange-rate functioning, and institutional credibility. This does not mean that the road to EU membership, let alone to the euro, is short. War complicates *acquis* implementation, raises questions about the timing of capital-account normalization, and makes the future exchange-rate regime unusually consequential. But it does mean that resilience itself should be treated as part of the evidence on institutional capacity.

For policy, the conclusion is therefore two-sided. Ukraine should preserve the operational independence and transparency of the NBU, rebuild monetary transmission, and sequence the exit from wartime controls in a way that protects the nominal anchor. The European Union, for its part, should recognize that wartime stabilization is not a substitute for *acquis* adoption, but neither is it irrelevant to accession readiness. A central bank able to combine rules, flexibility, and credibility under invasion offers an unusually strong test of European monetary integration in extreme conditions.

The conceptual contribution of the paper follows from this point. Wartime central banking is often described as the suspension of normal policy. Ukraine's case shows a different possibility: rules can survive by becoming explicitly state-contingent. The relevant comparison is not between rule and discretion, but between ad hoc discretion and disciplined adaptation. That distinction may matter well beyond Ukraine, for emerging market economies whose monetary regimes must remain credible while exposed to geopolitical shocks.

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A Appendix

to "From Kyiv to Frankfurt: Ukraine's Monetary Policy, 2009-2026"

Sources and Construction of the Database

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July 2026

This appendix describes the construction of the monthly database used to estimate Taylor-type monetary policy rules for Ukraine, as analyzed in the main text.

A.1 Sample and Frequency

The database is monthly and covers January 2009 to March 2026. Monthly frequency is retained throughout. This is important because the National Bank of Ukraine's (NBU) key policy rate changes on decision dates, CPI and exchange-rate indicators are available monthly, and industrial production provides the most suitable monthly real-activity measure for Ukraine over the sample.

A.2 Policy Rate

The policy instrument is the NBU key policy rate. The source is the NBU policy-rate, which lists effective decision dates and annualized policy rates. The event-date observations are converted into two monthly measures:

- `policy_rate_eom`: the rate in force on the final calendar day of each month;
- `policy_rate_monthly_avg`: the calendar-day-weighted average rate in force during the month.

The end-of-month policy rate is used as the preferred dependent variable in the first-stage Taylor-type rule estimates in the main text.

A.3 Inflation and Inflation Gaps

Inflation is headline CPI inflation relative to the corresponding month of the previous year:

- `inflation_yoy`: headline CPI, year-on-year percentage change.

Or monthly CPI inflation, retained as:

- `inflation_mom`: headline CPI, month-on-month percentage change.

Two target concepts are constructed. First, `inflation_target_official` follows the formal inflation-targeting period: 12% in 2016, 8% in 2017, 6% in 2018, and 5% from 2019 onward. This variable is left missing before 2016, because the pre-inflation-targeting period should not be treated as if it had a fully comparable numerical target. Second, `inflation_target_longrun_5` is set equal to 5% throughout the sample. This provides a continuous long-run anchor for specifications that require a full-sample inflation gap.

The resulting inflation-gap variables are:

- `inflation_gap_official` = `inflation_yoy` − `inflation_target_official`;

- `inflation_gap_longrun_5` = `inflation_yoy` − 5.

The preferred full-sample specifications use the 5% long-run anchor, while post-2016 robustness specifications use the official target path.

A.4 Real-Activity Gap

The real-activity measure is based on monthly industrial production. The source contains monthly industrial-production indices relative to the previous month. Two methodological vintages are combined:

- the 2010-method series is used through December 2014;

- the 2016-method series is used from January 2015 onward.

The combined monthly growth series is stored as `ipi_mom_used`. A chained log industrial-production index, `log_ipi_chained`, is obtained by cumulating monthly log changes.

Potential activity is estimated using a Hamilton-style filter adapted to monthly data. Specifically, the log industrial-production index at month t + 24 is projected on a constant and 12 monthly lags observed at month t. The activity gap is the forecast residual dated at t + 24 and expressed in percentage log points:

- `industrial_activity_gap_hamilton_pct`.

Because the procedure requires both lagged observations and a two-year forecast horizon, the activity gap begins in December 2011.

A.5 Exchange Rates

Exchange-rate data are average monthly official exchange rates:

- `uah_per_usd`: hryvnia per US dollar;

- uah_per_eur: hryvnia per euro.

Exchange-rate pressure is represented by log changes:

- uah_per_usd_mom_pct, uah_per_eur_mom_pct: monthly log changes;
- uah_per_usd_yoy_pct, uah_per_eur_yoy_pct: year-on-year log changes.

An increase in these variables denotes hryvnia depreciation.

A.6 Labor-Market Variables

Labor-market data are taken from the State Statistics Service of Ukraine (SSSU) unemployment-rate series is available only through December 2018. The full-sample labor-market proxy is registered unemployment:

- registered_unemployed_thsd: registered unemployed persons, thousands;
- registered_unemployed_mom_pct: month-on-month log change in registered unemployment;
- registered_unemployed_3m_pct: three-month log change in registered unemployment;
- registered_unemployed_yoy_pct: year-on-year log change in registered unemployment.

Additional labor-market indicators are also retained where available:

- benefit_recipients_thsd;
- registered_unemployed_per_vacancy;
- unemployed_status_during_period_thsd.

These variables are useful for robustness checks and for the later residual-decomposition stage.

A.7 Regime Indicators

The database includes regime indicators designed for interacted Taylor-type rule specifications:

- pre_it: months before August 2015;
- post_it_aug2015: August 2015 onward;

- `it_pre_fullscale_war`: August 2015 through January 2022;
- `fullscale_war`: February 2022 onward;
- `crimea_donbas_2014_2015`: March 2014 through December 2015;
- `security_risk_2021`: January 2021 through December 2021.

These indicators are intended to avoid fragile subsample regressions while still allowing the reaction function to differ across monetary-policy regimes and wartime conditions.

A.8 Second-Stage Shock Dataset

The second-stage dataset is constructed to explain the estimated-rule residuals. Several humanitarian variables are irregular snapshots rather than strictly monthly observations. For those series, the dataset preserves both the observed monthly value and a latest-available version carried forward from the most recent observation.

Table A1 summarizes coverage for the dependent variable and the main second-stage shock proxies. ACLED (Armed Conflict Location & Event Data: `https://acleddata.com/about-acled`) starts in 2018, UCDP (Uppsala Conflict Data Program: `https://ucdp.uu.se`) currently covers 2014-2024, and humanitarian stock variables are strongest after the full-scale invasion. The latest-available humanitarian stocks are set to zero before February 2022 for regressions that interpret them as post-2022 full-scale-war shock variables.

Table A1: Coverage for the Dependent Variable and the Main Second-Stage Shock Proxies

Variable	Non-missing	First	Last
Estimated-rule residual	172	2011-12-01	2026-03-01
ACLED political-violence events	99	2018-01-01	2026-03-01
UCDP best fatalities	132	2014-01-01	2024-12-01
Refugee stock, latest available	172	2011-12-01	2026-03-01
IOM DTM IDP stock, latest available	172	2011-12-01	2026-03-01
Civilian killed stock, latest available	172	2011-12-01	2026-03-01
Registered unemployment, m/m	172	2011-12-01	2026-03-01

Table A2 lists the raw public sources that were used for the second-stage shock dataset.

Table A2: Public Sources for Second-Stage Shock Dataset

Raw file	Source
unhcr_ukraine_refugee_situation.csv	https://docs.google.com/spreadsheets/d/e/2PACX-1vRzvb2ZKLS95aToa_SBYfsZIFhcL_0rvfir5kSUNzl7KNY8UIAVH9AyBZ2I-d5yAZly4l6S15bCVM_d/pub?gid=2043074349&single=true&output=csv
unhcr_situations_monthly.csv	https://data.humdata.org/dataset/e6320d49-1944-4c80-ad9c-ab83e4239267/resource/a1dc9602-b522-4966-bb59-f4a44d238dd1/download/unhcr-situations.csv
iom_dtm_admin_0_to_1.csv	https://data.humdata.org/dataset/fd8bf6f7-cb5e-4dde-8037-19b5d57ce6ec/resource/820e7059-e484-414b-9ccf-b9ed8b118bb0/download/ukr-iom-dtm-from-api-admin-0-to-1.csv
ucdp_conflict_data_ukr.csv	https://data.humdata.org/dataset/bb30eaae-306d-4d53-8978-998eb8b9a06e/resource/d4c483d4-e8dc-4246-9b6c-3aef8a7b16c6/download/conflict_data_ukr.csv
acled_political_violence_monthly.xlsx	https://data.humdata.org/dataset/7b36830b-c033-4a06-b812-9940baec603b/resource/e122ca1c-9463-4e3a-8731-8a85fab2a15e/download/ukraine_hrp_political_violence_events_and_fatalities_by_month-year_as-of-09jul2026.xlsx
acled_civilian_targeting_monthly.xlsx	https://data.humdata.org/dataset/7b36830b-c033-4a06-b812-9940baec603b/resource/23755ad0-1d81-4b10-9e66-23b784ccd429/download/ukraine_hrp_civilian_targeting_events_and_fatalities_by_month-year_as-of-09jul2026.xlsx
ukraine_key_figures.csv	https://docs.google.com/spreadsheets/d/e/2PACX-1vQIdedbZz0ehRC0b4fsWiP14R7MdtU1mpmwAkuXUPElSah2AWCURKGALFDuHjvyJUL8vzZAt3R1B5qg/pub?output=csv

A.9 Source URLs and Retrieval Notes

Table A3 records the principal public access points used to document the raw data sources. For the Taylor-rule variables, the local workbooks preserve the downloaded source series; for the second-stage shock variables, the exact download URLs are also stored in the raw-data manifest. Because several institutional websites update files in place, the local archived files should be treated as the analysis vintage.

Table A3: Public Access Points Used to Document the Raw Data Sources

Data block	Series or file	URL or access point	Use in the database
NBU monetary policy	Key policy rate decisions	https://bank.gov.ua/en/monetary/archive-rish	Event-date policy-rate series converted to end-of-month and calendar-day-weighted monthly measures.
NBU monetary policy	Inflation target and monetary-policy regime information	https://bank.gov.ua/en/monetary	Official inflation-target path and interpretation of the NBU policy regime.
NBU exchange rates	Official hryvnia exchange rates	https://bank.gov.ua/en/markets/exchangerates	Monthly average official UAH/USD and UAH/EUR exchange rates.
NBU open data	Exchange-rate and interest-rate API documentation	https://bank.gov.ua/en/open-data/api-dev	Reference access point for programmatic retrieval of NBU rates and official exchange-rate data.
State Statistics Service of Ukraine	CPI, industrial production, GDP, employment and unemployment indicators	https://stat.gov.ua/en/economic_and_financial_data_for_ukraine	Macroeconomic and labor-market source for CPI, industrial-production activity, GDP diagnostics, and unemployment variables.
State Statistics Service of Ukraine	Dataset catalogue and metadata	https://stat.gov.ua/en/datasets	Metadata and alternative access point for individual statistical indicators.
NBU balance-sheet data	Consolidated financial statements and management reports	https://data.gov.ua/dataset/f7620976-74c5-4efb-82be-53513df2b9b4/resource/a01b108d-7206-445e-b6c6-146d61334c82?filter=for_month	Annual consolidated statement-of-financial-position items used for balance-sheet decomposition.
UNHCR / OCHA	Ukraine refugee situation	https://docs.google.com/spreadsheets/d/e/2PACX-1vRzvb2ZKLS95aToa_SBYfsZIFhcL_0rvfir5kSUNzl7KNY8UIAVH9AyBZ2I-d5yAZly4l6S15bCVM_d/pub?gid=2043074349&single=true&output=csv	Refugee stock and related humanitarian indicators.
UNHCR via HDX	UNHCR situations monthly file	https://data.humdata.org/dataset/e6320d49-1944-4c80-ad9c-ab83e4239267/resource/a1dc9602-b522-4966-bb59-f4a44d238dd1/download/unhcr-situations.csv	Monthly humanitarian situation data used in the second-stage shock dataset.
IOM DTM via HDX	Ukraine displacement tracking, admin 0 to 1	https://data.humdata.org/dataset/fd8bf6f7-cb5e-4dde-8037-19b5d57ce6ec/resource/820e7059-e484-414b-9ccf-b9ed8b118bb0/download/ukr-iom-dtm-from-api-admin-0-to-1.csv	IDP stock variables and latest-available displacement measures.
UCDP via HDX	Ukraine conflict events and fatalities	https://data.humdata.org/dataset/bb30eaae-306d-4d53-8978-998eb8b9a06e/resource/d4c483d4-e8dc-4246-9b6c-3aef8a7b16c6/download/conflict_data_ukr.csv	Conflict-event and fatality indicators.
ACLED via HDX	Political violence events and fatalities by month-year	https://data.humdata.org/dataset/7b36830b-c033-4a06-b812-9940baec603b/resource/e122ca1c-9463-4e3a-8731-8a85fab2a15e/download/ukraine_hrp_political_violence_events_and_fatalities_by_month-year_as-of-09jul2026.xlsx	Monthly political-violence event and fatality variables.
ACLED via HDX	Civilian-targeting events and fatalities by month-year	https://data.humdata.org/dataset/7b36830b-c033-4a06-b812-9940baec603b/resource/23755ad0-1d81-4b10-9e66-23b784ccd429/download/ukraine_hrp_civilian_targeting_events_and_fatalities_by_month-year_as-of-09jul2026.xlsx	Monthly civilian-targeting event and fatality variables.
OCHA / humanitarian key figures	Ukraine key figures	https://docs.google.com/spreadsheets/d/e/2PACX-1vQIdedbZz0ehRC0b4fsWiP14R7MdtU1mpmwAkuXUPElSah2AWCURKGALFDuHjvyJUL8vzZAt3R1B5qg/pub?output=csv	Civilian casualties, refugee, IDP, and other humanitarian stock indicators.

Notes: URLs were checked for accessibility during the July 2026 revision. The HDX and Google-sheet links reproduce the source files stored locally under Data/Second-stage shocks/raw. The NBU and State Statistics Service entries identify the public source pages or API documentation from which the stored macroeconomic series are drawn.