



CBDC and Macroeconomic Stabilisation Governance: Lessons for Wartime Ukraine

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Relevance. The prolonged full-scale war in Ukraine has generated profound macroeconomic shocks, manifested in fiscal imbalances, inflationary pressures, external trade disruptions, and heightened uncertainty. Under such conditions, traditional macroeconomic stabilisation instruments face significant constraints, which increases the relevance of innovative monetary and institutional tools.

The purpose of this study is to substantiate the prospects for the implementation of Central Bank digital currency (CBDC) in Ukraine and its potential role in enhancing the effectiveness of macroeconomic stabilisation policy.

Results. The experience of pioneer economies shows that CBDCs do not yet act as an independent driver of economic growth but can stimulate it when development occurs in stable institutional conditions. The introduction of the e-hryvnia in Ukraine can positively influence key channels of macroeconomic stabilisation. In the monetary sphere, CBDC strengthens the transmission mechanism of monetary policy, improves liquidity management, and enhances control over inflationary expectations. In the fiscal domain, it increases transparency of public expenditures, reduces transaction costs, and improves targeting of social programs. From a structural perspective, the e-hryvnia supports financial inclusion, accelerates digitalisation of economic activity, and reduces the scale of the shadow economy.

Conclusions. The e-hryvnia should be considered not merely as a technological innovation, but as an institutional instrument of macroeconomic stabilisation. Its effective implementation requires a phased approach, regulatory coherence, cybersecurity safeguards, and alignment with fiscal and monetary policy objectives. Under these conditions, it can become an essential component of Ukraine's resilient macroeconomic framework.

Keywords: CBDC, e-hryvna, macroeconomic policy, wartime economy challenges, macroeconomic resilience, stabilisation, digital transformation

CBDC та управління макроекономічною стабілізацією: уроки для України в умовах війни

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Актуальність. Тривала повномасштабна війна в Україні спричинила глибокі макроекономічні шоки, що проявляються у фіскальних дисбалансах, інфляційному тиску, порушеннях зовнішньої торгівлі та підвищеній невизначеності. За таких умов традиційні інструменти макроекономічної стабілізації стикаються зі значними обмеженнями, що підвищує актуальність інноваційних монетарних та інституційних рішень.

Метою дослідження є обґрунтування перспектив впровадження цифрової валюти центрального банку (CBDC) в Україні та її потенційної ролі для підвищення ефективності політики макроекономічної стабілізації.

Результати. Досвід країн-піонерів у запровадженні цифрової валюти центрального банку свідчить, що CBDC поки що не виступає самостійним драйвером економічного зростання, однак може його стимулювати за умов розвитку у стабільному інституційному середовищі. Запровадження е-гривні в Україні може позитивно впливати на ключові канали макроекономічної стабілізації. У монетарній сфері CBDC сприяє посиленню трансмісійного механізму грошово-кредитної політики, покращенню управління ліквідністю та контроль над інфляційними очікуваннями. У фіскальній площині вона може підвищити прозорість державних видатків, знизити транзакційні витрати та покращити таргетування соціальних програм. У структурному вимірі е-гривня має потенціал до покращення фінансової інклюзії, прискорення цифровізації економічної діяльності та зменшення масштабів тіньової економіки.

Висновки. Е-гривню слід розглядати не лише як технологічну інновацію, а як інституційний інструмент макроекономічної стабілізації. Її ефективне впровадження потребує поетапного підходу, узгодженості регуляторної політики, належного рівня кібербезпеки та синхронізації з цілями фіскальної й монетарної політики. За цих умов вона може стати важливою складовою стійкої макроекономічної системи України.

Ключові слова: CBDC, е-гривня, макроекономічна політика, виклики воєнної економіки, макроекономічна стійкість, стабілізація, цифрова трансформація



Introduction.

Ukraine is shaping its economic history in the mid-2020s at the intersection of existential defence and accelerated modernisation. As the country navigates the fourth year of full-scale war, Ukrainian macroeconomic policymakers – the Government and the National Bank of Ukraine (NBU) – are increasingly serving as architects of a digital governance ecosystem. They face a complex problem: maintaining monetary stability amidst fiscal imbalances while preparing the financial architecture for massive post-war reconstruction. Within this matrix of challenges, the Ukrainian digital state model has introduced the e-hryvnia not merely as a payment innovation but as a sovereign institutional framework for macroeconomic stabilisation.

By early 2026, the NBU's task is to define the operational stages for the e-hryvnia pilot project. However, the path to implementation is a matter of governance orchestration. On the one hand, the benefits of a programmable and transparent monetary instrument are evident for the algorithmic management of reconstruction funds and social transfers. On the other hand, the realities of a war budget require careful assessment of opportunity costs. This article provides a comprehensive analysis of the e-hryvnia's prospects as a structural component of digital governance, examining its potential to enhance monetary accountability, fiscal transparency, and institutional resilience within the context of European integration.

The modern scientific discourse on the e-hryvnia has shifted from theoretical explorations of international experience toward the applied analysis of digital monetary governance. Current research priorities focus on the transformation of the monetary transmission mechanism, the stability of the banking sector, and regulatory alignment with European standards.

The purpose of this study is to substantiate the prospects for the implementation of Central Bank digital currency (CBDC) in Ukraine and its potential role in enhancing the effectiveness of macroeconomic stabilisation policy.

Literature Review. Early studies by Khutorna et al. (2021) and Boiko (2021) established the foundation for understanding digital transparency as a governance tool, substantiating the prerequisites for safe implementation. Ryabokin (2022) deepened this by defining CBDC as an evolutionary form of money, emphasising that implementation challenges must be overcome by adapting global governance models to domestic realities. Maslov (2023) further shifted the focus toward the practicalities of functioning within the Ukrainian wartime economy.

Recent research has analysed the potential of CBDCs to transform the institutional architecture of the financial sphere. Shcherbatiykh and Remyha (2024) and Nesterenko (2024) investigate the maintenance of the financial stability framework through a balanced governance design that mitigates liquidity risks for commercial banks.

Pantiukhov (2025) positions the e-hryvnia as an instrument of digital sovereignty, while Latkovskyy (2025) and Kamyshanskyi (2025) highlight its role in optimising cross-border governance and international settlements—critical for post-war recovery. Lavruk et al. (2025) complement this by advocating for the integration of the NBU platform into global digital ecosystems to prevent institutional isolation.

The legal dimension of CBDC governance is also evolving rapidly. Koziy et al. (2025) note that overcoming regulatory uncertainty through harmonisation with European standards (such as MiCA) is a prerequisite for market stability, a view supported by Nanavov and Blyzniuk (2025a, 2025b). Furthermore, Iefymenko and Dmytrenko (2025) consider the integration of digital currencies into the virtual assets market as a cornerstone of a comprehensive digital economy governance.

There is a consensus among researchers that the successful implementation of the e-hryvnia depends on its integration into the existing banking system and alignment with European Union law. At the same time, the findings of recent studies by the International Monetary Fund (IMF) and the Bank for International Settlements (BIS), which examine the global experience of CBDC implementation across various formats, provide grounds for considering the broader economic impact of the e-hryvnia. In the context of prolonged instability, the e-hryvnia offers public authorities new opportunities to ensure sustainable development through data-driven policy-making and enhanced institutional capacity.

Research Methodology. The research is based on the initial hypothesis that a Central Bank Digital Currency (CBDC) can serve as a strategic component of digital state governance, aimed at enhancing the resilience and transparency of macroeconomic stabilisation mechanisms. Accordingly, it is assumed that the e-hryvnia can strengthen Ukraine's governance toolkit, minimising the destructive impact of wartime factors by enhancing transparency and programmable fiscal control.

The methodological framework of this study combines theoretical, comparative, and empirical approaches to assess the role of CBDCs in macroeconomic stabilisation. The first stage involves a structural-functional analysis of CBDC as a governance innovation, exploring its role in streamlining



monetary transmission and government disbursements. Within the comparative approach, the experience of CBDC-pioneer economies (The Bahamas, China, Nigeria, Zimbabwe, India, and Jamaica) is evaluated to identify governance archetypes and their impact on adoption.

The empirical component is built on synthesised datasets from the Atlantic Council (2025) and the International Monetary Fund (2026), covering CBDC volumes in circulation, GDP dynamics, and consumer inflation. Based on these data, we calculate metrics for governance-led adoption (Annual Growth Rate, CAGR) and usage intensity (CBDC-to-GDP ratio, Transaction Share).

Using scatter plot analysis, the study evaluates the relationship between governance-driven adoption dynamics and actual market integration. Furthermore, correlation analysis is employed to assess the interplay between CBDC monetary importance (CBDC-to-GDP ratio), payment integration (Transaction Share), and key macroeconomic variables (Real GDP Growth, Inflation) across pioneer economies. This approach interprets statistical trends as indicators of the effectiveness of digital monetary governance.

This methodical approach allowed for a comprehensive assessment of the scale, intensity, and potential macroeconomic effects of CBDC implementation. Simultaneously, the study is exploring due to the limited sample of pioneer economies and the relatively short observation period. The correlation approach serves as a tool for initial empirical hypothesis testing, and we interpret the results as preliminary statistical findings requiring further verification. The study employs a descriptive and exploratory correlation analysis to address the constraints of a limited sample of pioneer economies.

A distinct methodological block comprises the analysis of Ukraine's macroeconomic risks under full-scale war. The method of factor-based structuring of instability (military-security, fiscal-budgetary, monetary, external economic, socio-economic, structural, and institutional factors) was applied. By synthesising international empirical results with the specifics of the Ukrainian macroeconomic environment, we substantiate the e-hryvnia's potential impact on macroeconomic resilience. This integrated approach provided a basis for justifying the prospects of using a central bank digital currency as an institutional tool for stabilisation governance and for formulating practical recommendations for Ukraine's economic policy.

Results.

CBDC Emergence Case-Study Analysis.

The IMF research defines a Central Bank Digital Currency (CBDC) as a digital form of existing fiat money, issued by a central bank and possessing legal tender status (Mancini Griffoli et al., 2018). From

the perspective of the money hierarchy, a CBDC can be regarded as the highest institutional form of digital money (alongside central bank reserves), which, unlike private forms (deposits, e-money, stablecoins, crypto-assets), combines sovereign status, operational security, and programmability potential. Among other digital currencies, CBDC differs in its ability to serve as a public standard for settlements and as a foundational layer of an interoperable payment infrastructure in the era of tokenisation and financial digitalisation. There are two primary formats of Central bank digital currencies: retail CBDCs, intended for use by households and businesses in everyday payments and savings, and wholesale CBDCs, aimed at interbank settlements, transactions, and clearing among financial institutions.

According to the Central Bank Digital Currency Tracker (Atlantic Council, 2025), in 2025, 137 countries and currency unions, representing 98% of global GDP, were exploring CBDCs. In May 2020, that number was only 35. The Atlantic Council emphasises that there are multiple reasons for considering digital currencies, and the motivations of different countries to issue a CBDC depend on their specific economic circumstances. Some common motivations include: promoting financial inclusion by providing easier and safer access to money for unbanked populations or those with limited access to banking services; introducing competition and resilience in the domestic payments market, which may require incentives to ensure cheaper and more accessible payment options; improving payment efficiency and reducing transaction costs; creating programmable money and enhancing the transparency of financial flows; and ensuring the smooth and efficient implementation of monetary and fiscal policies.

Global experience with central bank digital currencies remains limited, constraining a complete assessment of their economic impact. As of 2025, only The Bahamas, Zimbabwe, Nigeria, and Jamaica have successfully launched retail CBDCs, while no G20 country has completed full-scale implementation. More than 40 countries, including China, India, and the Eurozone, are conducting pilot projects, over 30 are in the development stage, and many others remain at the exploratory phase (Kemmerer, 2025).

The empirical basis of this study focuses on the experience of CBDC pioneer economies to identify and assess the impacts of central bank digital currencies on monetary intermediation, financial inclusion, and other macroeconomic aspects. The analysis examines countries that have officially launched retail CBDCs – The Bahamas, Nigeria, Zimbabwe, and Jamaica – and includes China and India, where digital currencies are being tested through large-scale pilot programs (Table. 1).



Table 1.

Economic Impacts of CBDCs (Evidence from Pioneer Economies)

Country	CBDC (Year)	Monetary Intermediation	Financial Inclusion	Other Economic Effects
Bahamas	Sand Dollar (2017)	<ul style="list-style-type: none"> • Lower loan-to-deposit ratios • Deposit substitution risks 	<ul style="list-style-type: none"> • Stagnant adoption • Low user engagement 	<ul style="list-style-type: none"> • Payment modernisation • Bank liquidity risks
China	e-CNY (2020)	<ul style="list-style-type: none"> • Reduced dependency on Big-Tech • Enhanced PBOC liquidity control 	<ul style="list-style-type: none"> • Rural area penetration • SME integration • Transaction transparency 	<ul style="list-style-type: none"> • De-dollarisation tool • Strengthened monetary control • Trust in GovTech
Nigeria	eNaira (2021)	<ul style="list-style-type: none"> • Minimal systemic impact • Low adoption ceiling 	<ul style="list-style-type: none"> • Critical need for incentives • Mobile money gap 	<ul style="list-style-type: none"> • Insufficient merchant network • Minimal macro footprint
Zimbabwe	ZiG (2021)	<ul style="list-style-type: none"> • Uncertain impact on balances • Trust-dependent stability 	<ul style="list-style-type: none"> • Weak formal inclusion • Massive informal sector (80%) 	<ul style="list-style-type: none"> • High inflation/volatility • 94% value loss • Crisis of trust
India	Digital Rupee (2022)	<ul style="list-style-type: none"> • Limited liquidity impact • Parallel use with deposits 	<ul style="list-style-type: none"> • High rural potential • Improved banking access 	<ul style="list-style-type: none"> • Lower transaction costs • Formalisation of economy • Digital economy stimulus
Jamaica	JAM DEX (2023)	–	<ul style="list-style-type: none"> • Technical barriers (POS/wallets) • Slow onboarding 	<ul style="list-style-type: none"> • Minimal macro effect • High cash demand in crises

Source: developed by the author based on: Chin, G.T., 2025; Chizunza & Chimhofu, 2025; Feingold, 2024; Giraldo-Gordillo & Bustillo-Mesanza, 2026; Jha, 2025; Kushwaha Devashish & Dr Dipti Malpani, 2025; Li, Z., & Li, J., 2025; Meenakshi Mritunjay & Dr. Ranjit Singh, 2025; Ree, 2023; Rose, 2024; Rose, 2025; Tekedia, 2024; Wang & Ghazi, 2025.

A comparative analysis of governance-led CBDC adoption shows that in three of these countries (The Bahamas, Jamaica, and Nigeria) adoption is slow, limiting their macroeconomic effects. Zimbabwe, in contrast, has launched a "structured" gold-backed currency – the token is backed by a basket of assets, including 40% gold reserves and U.S. dollars – but trust vulnerabilities, as well as inflationary and structural risks, remain high. The experience of China and India demonstrates that large-scale CBDC implementation prioritises strengthening monetary control and fostering financial inclusion in rural regions, currently functioning alongside the traditional banking system without destabilising its liquidity.

A synthesis of the experience of CBDC implementation in pioneer economies allows for the following conclusions:

- without a critical mass of users and merchants, the CBDC's economic effects are limited (Jamaica, Nigeria);
- CBDC models, where funds represent a direct liability of the central bank to the public, can drain the deposit base, reducing the credit multiplier in banks (Bahamas);
- in high-inflation environments (Zimbabwe), a digital currency can serve as an institutional stabilisation tool, but dollarisation persists.

The annual reviews of the Bank for International Settlements (BIS) for 2024-2025 also indicate

that the direct macroeconomic impact of CBDCs remains limited and heterogeneous, as most countries are still in the research and development phase, and wholesale CBDC pilots are progressing faster than retail CBDCs (Di Iorio et al., 2024; Illes et al., 2025). Expected channels of impact – payments, financial infrastructure, and monetary sovereignty – have become the primary drivers of further central bank work. BIS reports that 91% of surveyed central banks worldwide are exploring CBDCs, with these currencies contributing to stability in advanced economies (e.g., the UK, Japan) but potentially increasing risks in developing countries due to heterogeneous economic systems.

The IMF views CBDCs as a multifaceted instrument for macroeconomic and financial stabilisation, operating through several key governance mechanisms. According to the CBDC Virtual Handbook (International Monetary Fund, 2025), the expected benefits of CBDC adoption include:

- strengthening monetary transmission by enhancing transmission channels, particularly in environments of low interest rates or financial stress, when the relative value of CBDC increases;
- reducing dependence on foreign currencies and unregulated private crypto-assets, thereby restoring central bank control over the domestic money supply;
- enhancing the resilience of payment systems, achieved through retail CBDCs (rCBDCs)

that offer higher security, is especially critical for macroeconomic stability in conflict-affected or fragile countries;

- improving the efficiency of fiscal instruments, enabled by the programmability (automation) of CBDCs, which allows precise targeting of emergency or stabilisation social transfers to the population;

- tokenisation of reserves using distributed ledger technology (DLT) helps preserve trust in public money and maintain stability within a transforming financial system.

CBDC Governance and Macroeconomic Dynamics: Empirical Data Analysis

The assessment of the role of digital currencies in the macroeconomic stabilisation governance was conducted through a statistical empirical analysis of indicators reflecting the intensity, scale of issuance, and macroeconomic depth of CBDCs in pioneer economies (Table 2). The sample includes both major economies (China, India) and countries with high levels of macroeconomic instability (Zimbabwe, Nigeria), providing a comprehensive understanding of CBDC impact across various stress scenarios. The use of data for the period 2022–2025 allows for covering the most active phase of CBDC testing.

Table 2.

Empirical Analysis of CBDC and Macroeconomic Variables in Pioneer Economies (2022–2025)

Country	Year	CBDC Operational Duration (years)	CBDC Value in Circulation (billions)	CBDC Growth (%)	CBDC Payment Share (%)	CBDC-to-GDP Ratio (%)	Real GDP Growth (%)	Inflation Rate (annual %)
The Bahamas	2022	5	0,0011	–	0,9	0,01	10,9	5,6
	2023	6	0,0017	61,0	0,95	0,01	3,1	3,1
	2024	7	0,0023	37,9	1,5	0,02	3,4	0,4
	2025	8	0,0029	27,0	1,5	0,02	2,2	0,5
China	2022	3	120	–	0,09	0,10	3,1	2,0
	2023	4	1800	1400,0	0,2	1,39	5,4	0,2
	2024	5	6600	266,7	0,5	4,89	4,9	0,2
	2025	6	14200	115,2	2,0	10,15	4,8	0,0
Nigeria	2022	2	3	–	0,09	0,00	4,3	18,8
	2023	3	13,98	366,0	0,2	0,01	3,3	24,7
	2024	4	14	0,1	0,3	0,01	4,1	31,4
	2025	5	14,02	0,1	0,5	0,004	3,9	23
Jamaica	2022	1	46	–	0,1	1,75	6,5	10,3
	2023	2	257	–	0,2	8,58	2,8	6,5
	2024	3	258	–	0,3	8,17	-0,5	5,5
	2025	4	335	622,6	0,5	9,83	2,1	4,2
India	2022	–	–	–	–	–	7,6	6,7
	2023	1	0,002	–	0,0001	0,00	9,2	5,4
	2024	2	0,023	1327,4	0,01	0,0003	6,5	4,6
	2025	3	0,102	334,2	0,05	0,0003	6,6	2,8
Zimbabwe	2022	–	–	–	–	–	6,1	193,4
	2023	–	–	458,7	–	–	5,4	667,4
	2024	1	7,9	0,4	26,0	1,33	1,7	736,1
	2025	2	56,8	29,8	43,0	4,94	6,0	89,0

Source: author calculations based on Atlantic Council (2025) and International Monetary Fund (2026) data.

Note: Growth Rates are calculated as percentage chain indices based on a year-over-year (YoY) comparison.



Based on the calculated growth indices and time-series analysis for pioneer countries, we formulate the following analytical conclusions regarding CBDC adoption dynamics.

First, the overall trend of the Value in Circulation remains upward for all studied countries during the 2022–2025 period. Countries with powerful domestic markets (China, India) demonstrate "explosive" CBDC scaling after 3–4 years of pilot testing (CBDC Growth > 200%), suggesting a critical network effect threshold. In small economies (such as The Bahamas), CBDC volume stabilises (saturates), indicating a need to shift toward intensive demand-stimulation methods.

Second, the dynamics of CBDC integration into the payment space proved to be the most rapid in a crisis economy (Zimbabwe), reaching 43% market share in 2025. It indicates heightened interest in CBDC amid currency imbalances.

Third, the dynamics of the CBDC-to-GDP ratio in more stable economies (e.g., China – up to 10%) are growing faster than their actual use in retail settlements, suggesting the role of CBDCs as a "digital reserve".

The Scatter Plot Analysis of CBDC adoption dynamics and usage intensity in pioneer economies based on 2025 indicators (Fig. 1) allows for the identification of different CBDC development models:

- Rapid Scaling Model (India, China), characterised by high growth rates despite a limited current share in the economy;
- Deep Functional Integration Model (Zimbabwe), characterised by a relatively high share in payment turnover alongside stabilising growth rates;
- Limited Implementation Model (The Bahamas, Nigeria), characterised by low values for both transactional and macroeconomic intensity.

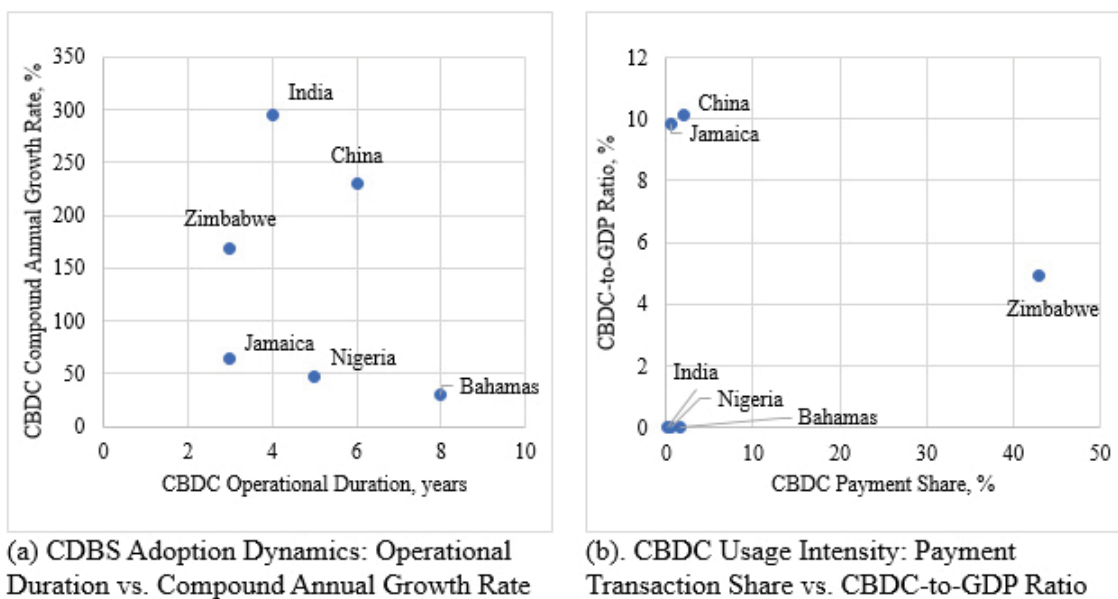


Figure 1. Scatter Plot Analysis of CBDC Adoption Dynamics and Usage Intensity in Pioneer Economies (2025)

Source: developed by the author based on empirical data presented in Table 2.

Note: The indicators "Operational Duration," "Payment Share," and "CBDC-to-GDP Ratio" are calculated as of 2025. The "Compound Annual Growth Rate" is calculated based on "CBDC Value in Circulation" for the period 2024–2025 for Zimbabwe, 2023–2025 for India and 2022–2025 for the rest of the countries.

Indicators of CBDC adoption dynamics (Fig. 1 (a)) demonstrate the absence of a direct correlation between the "age" of a project and its success. Countries with a relatively short Operational Duration (India and China) exhibit the highest growth rates, indicating an active deployment phase. In contrast, economies with a more extended period of CBDC operation (The Bahamas) are characterised by lower growth rates, which may suggest stabilisation or saturation.

Indicators of CBDC usage intensity (Fig. 1 (b))

reveal varying levels of digital currency integration. Some countries show a relatively high share of CBDC in GDP alongside low transactional activity (China, Jamaica), which may reflect specific usage structures or limited penetration into everyday settlements. Other nations (India, Nigeria, The Bahamas) are currently at the stage of building a critical mass of users. Zimbabwe stands out with a high share of CBDC in payment turnover despite a moderate GDP ratio, reflecting its active role as a payment instrument in the formal economy, which

is being crowded out by a significant shadow component.

To perform a preliminary empirical test of the hypothesis regarding a statistical link between indicators of central bank digital currency development and key macroeconomic parameters, we conducted a correlation analysis. This analysis allowed us to assess the direction and strength of the relationships between the dynamics and intensity indicators of

CBDC implementation and macroeconomic variables such as real GDP growth and the inflation rate (Table 3). At the same time, the study is exploratory due to the limited sample of CBDC pioneer economies and the relatively short time horizon of the observations. The results obtained are interpreted as preliminary statistical associations requiring further verification.

Table 3.

Correlation Matrix of CBDC Development Indicators and Macroeconomic Indicators in Pioneer Economies (2022–2025)

CBDC Adoption Dynamics			
	CBDC Growth	Real GDP Growth	Inflation Rate
CBDC Growth	1		
Real GDP Growth	0,48693487	1	
Inflation Rate	0,06581235	0,224358698	1
Payment Integration			
	CBDC Payment Share	Real GDP Growth	Inflation Rate
CBDC Payment Share	1		
Real GDP Growth	-0,017733751	1	
Inflation Rate	0,573972408	-0,232881483	1
CBDC Monetary Importance			
	CBDC-to-GDP Ratio	Real GDP Growth	Inflation Rate
CBDC-to-GDP Ratio	1		
Real GDP Growth	-0,316713115	1	
Inflation Rate	-0,086051271	-0,229584355	1

Source: author calculations based on empirical data, presented in Table 2.

Notes: Calculations cover 2022–2025 for a panel of pioneer economies (The Bahamas, PRC, Nigeria, Zimbabwe, India, Jamaica). Growth Rates are calculated on a year-on-year basis.

To maintain statistical significance in the CBDC Adoption Dynamics correlation analysis, the following periods were excluded due to a lack of a comparison base or insufficient data:

- 2022: Excluded for all countries (base year for growth calculation).
- Zimbabwe (2023–2024): Excluded due to the late launch of ZiG (April 2024).
- India (2023): Excluded due to low transaction volume in the early retail pilot phase.

The obtained results indicate a weak to moderate statistical correlation between CBDC development indicators and specific macroeconomic variables. In particular, the calculations show:

CBDC Adoption Dynamics: The CBDC Annual Growth rate shows a moderate positive correlation with Real GDP Growth ($\approx 0,48$) and has no statistically significant link with Inflation rate ($\approx 0,06$). This result supports the hypothesis that the digitalisation of the monetary sphere can facilitate general economic dynamics. At the same time, its connection to the Inflation rate remains practically unrealised in a statistically significant manner.

CBDC Intensity: The CBDC share in transactions shows no statistically significant correlation with Real GDP Growth ($\approx -0,01$); however, there is a moderate positive correlation with the Inflation rate ($\approx 0,57$). This result suggests that under condi-

tions of traditional currency depreciation and fiscal instability, the population adapts more quickly to using CBDCs as more transparent instruments.

CBDC Macroeconomic Depth: The CBDC-to-GDP ratio shows a weak negative correlation with Real GDP Growth ($\approx -0,31$), suggesting that in economies with low growth rates, excessive "sterilisation" of liquidity in digital assets, without their active use in payments, does not directly stimulate the economy. The link with the Inflation rate is not statistically significant ($\approx -0,08$).

Overall, the weak or statistically insignificant correlations confirm that CBDC macroeconomic integration is in its early stages. Currently, CBDCs do not act as independent drivers of economic growth; however, they can stimulate it if development occurs within stable institutional environments (e.g., China, Jamaica). Nevertheless, the inflationary effect of CBDCs is ambiguous: in stable countries, it



is neutral, while in crisis-prone economies, it may be associated with high inflation, not as a cause, but as a consequence of adaptation. To achieve sustainable stabilisation, it is necessary to reach a critical mass of usage and to deepen the integration of digital currencies into the financial system.

The E-hryvnia as a Macroeconomic Stabilisation Governance Tool in Wartime Ukraine

Amidst systemic wartime pressures – including infrastructure destruction, fiscal deficits, and a 2025 trade deficit surge – Ukraine's economy has transitioned from a sharp 2022 contraction to a fragile recovery, with GDP growth slowing to 1,7–1,8% by late 2025 (Ministry of Economy, Environment and Agriculture of Ukraine, 2025b). Despite this resilience, the economy faces persistent risks from an 8,0% inflation rate, labor shortages, and a high dependence on external financing to cover a budget deficit reaching 37,6% of revenues (National Bank of Ukraine, 2026b). These deep structural imbalances and security-driven shocks limit the effectiveness of traditional stabilisation tools, necessitating the exploration of innovative instruments such as the e-hryvnia to bolster national economic security and institutional transparency.

The introduction of the e-hryvnia represents a natural evolution of Ukraine's national financial system, integrated into the country's advanced digital architecture. Unlike economies that use CBDCs to bypass infrastructural gaps, Ukraine leverages its existing high digital readiness, anchored by the Diia and ProZorro platforms, to position the e-hryvnia as a sovereign mechanism for digital value transfer. Defined as a fiat currency with a 1:1 parity with cash and non-cash money (National Bank of Ukraine, 2026a), it complements digital identity and procurement, lowering adoption barriers for a population already embedded in a digital-first culture.

Ukraine's journey from its first centralised pilot in 2018 (National Bank of Ukraine, 2019) to a 2021 blockchain-based trial on the Stellar network (Stellar Development Foundation, 2021) has shifted the focus from simple digitalisation to "smart

money" functionalities like programmability and interoperability. The testing of programmable payroll systems for state employees demonstrated enhanced fiscal transparency and transaction efficiency. However, as of early 2026, the NBU maintains a cautious approach to large-scale deployment. Amidst wartime fiscal deficits and defense spending, the opportunity cost – including substantial investment in cybersecurity and nationwide infrastructure – is currently assessed against the immediate needs of macroeconomic stabilisation.

The National Bank of Ukraine (2026a) identifies a set of functional characteristics of the e-hryvnia that underpin its systemic stabilisation effect, realised through enhanced financial stability, improved effectiveness of public policy, and mitigation of crisis-related risks in the economy. According to the NBU's expectations (2026a), the e-hryvnia has the potential to exert a comprehensive macroeconomic impact by strengthening trust in the national currency and the financial system, reducing the likelihood of financial panics, and stabilising money circulation and inflation expectations. Features such as restoring access to digital wallets and enabling offline payments increase the resilience of household savings and support consumer demand during crises and wartime shocks. The application of distributed ledger technologies (DTL) enhances the operational reliability of payment infrastructure. It lowers systemic risks, while the programmability of the e-hryvnia broadens the toolkit of fiscal and social policy by reducing transaction costs, improving the targeting of government support, and increasing the stability of budgetary processes.

To substantiate the potential application of these properties of the e-hryvnia to ensure macroeconomic stability in countering the challenges posed by a full-scale war in Ukraine, we analyse a review of the economic situation conducted by the Ministry of Economy, Environment and Agriculture of Ukraine (2025a; 2025b), the results of which are summarised in Table 4.

Table 4.

Matrix of E-hryvnia's Potential Impact on Ukraine's Macroeconomic Stability

Wartime Conditions		E-Hryvnia Impact	
Factors	Macroeconomic Stress	Solutions	Expected Macroeconomic Outcomes
Military & Security	<ul style="list-style-type: none"> Infrastructure destruction Energy sector attacks Supply disruptions 	<ul style="list-style-type: none"> Reserve infrastructure of the NBU Offline payments Tokenised transfers 	<ul style="list-style-type: none"> Continuity of payments during blackouts Resilience of the payment infrastructure Reduced systemic risks
Fiscal & Budgetary	<ul style="list-style-type: none"> Budget deficit Expenditure control needs Corruption risks 	<ul style="list-style-type: none"> Smart contracts for social transfers Transparent fund allocation 	<ul style="list-style-type: none"> Reduced misuse of public funds Increased donor confidence Deficit reduction



Wartime Conditions		E-Hryvnia Impact	
Factors	Macroeconomic Stress	Solutions	Expected Macroeconomic Outcomes
Monetary	<ul style="list-style-type: none"> • Inflation • Unstable expectations • Excess liquidity 	<ul style="list-style-type: none"> • Direct access to central bank money • Real-time monitoring of flows 	<ul style="list-style-type: none"> • Strengthened transmission • Inflation control • Exchange rate stability • Improved predictability
External Economic	<ul style="list-style-type: none"> • Current account deficit • Dependency on aid • SWIFT delays 	<ul style="list-style-type: none"> • CBDC-to-CBDC corridors with EU • Digital export of services 	<ul style="list-style-type: none"> • Accelerated trade • Lower transaction costs • Reduced external imbalances • Export stimulation
Socio Economic	<ul style="list-style-type: none"> • Declining incomes • Unequal access • Social vulnerability 	<ul style="list-style-type: none"> • State digital vouchers • Instant & targeted social payments 	<ul style="list-style-type: none"> • Improved targeting of aid • Social stability • Mitigation of shocks
Structural & Institutional	<ul style="list-style-type: none"> • Labor migration • Shadow economy • EU standards compliance 	<ul style="list-style-type: none"> • Financial inclusion • Asset tokenisation • MiCA alignment 	<ul style="list-style-type: none"> • Formalisation of business activity • Institutional resilience • Investment attractiveness

Source: developed by the author.

Military and Security Factors.

One of the most critical wartime risks is the disruption of energy, communication, and payment infrastructure, which can paralyse financial transactions. CBDCs, including the e-hryvnia, can offer instruments to mitigate these risks through offline functionality and the duplication of payment channels. IMF research on payment resilience in conflict-affected states (Malaika et al., 2025) highlights that CBDCs expand central banks’ capacity to enhance the robustness of payment ecosystems by enabling offline payments, programmable emergency transfers, backup communication channels, autonomous nodes, and decentralised architectures capable of maintaining transaction processing during connectivity outages or infrastructure damage.

The BIS Project Polaris identifies offline payments as a core component of CBDC resilience, allowing payment continuity during power failures, network disruptions, or targeted attacks on critical infrastructure (Bank for International Settlements, 2023a). At the same time, the IMF cautions that CBDC implementation should complement rather than displace cash or existing payment instruments, thereby reinforcing overall financial system resilience and public trust (Malaika et al., 2025, p. 41).

Fiscal and Budgetary Factors.

During wartime, high operational costs associated with multi-layered payment chains and legacy technologies intensify fiscal pressures. The introduction of the e-hryvnia can shorten intermediary chains, accelerate fund circulation, and reduce administrative costs related to budget transfers. Pantiukhov (2025) emphasises that digital currency lowers transaction costs and expands access to financial services – vital for conflict-affected regions and areas with disrupted logistics.

Within the IMF analytical framework, CBDCs are viewed as instruments for integrating digital settlement infrastructures into the national economy and supporting the digitalisation of the monetary cycle (Lannquist & Tan, 2023). While CBDCs are not a "silver bullet", their careful design – especially regarding digital inclusion and accessibility – can reduce government expenditures on payment processing and improve the efficiency of public fund allocation under budget constraints.

A significant wartime fiscal risk is the misappropriation of funds, procurement delays, and corruption-related losses. The programmability of the e-hryvnia enables real-time monitoring of financial flows across the entire payment chain. Lavruk et al. (2025) argue that this significantly enhances fiscal transparency, reduces informal economic activity, and strengthens tax administration, thereby improving budget discipline and fiscal sustainability.

Monetary Factors.

Monetary instability in Ukraine is driven by persistent inflation and fragile inflation expectations. An interest-bearing e-hryvnia would give the National Bank of Ukraine (NBU) additional tools to strengthen the transmission of interest rate policy. IMF research demonstrates that CBDC remuneration directly influences households’ incentives to hold funds in digital wallets rather than in cash or foreign currency (Das et al., 2023).

CBDCs can either strengthen or complicate monetary transmission depending on financial market depth and institutional design. According to Das et al. (2023), CBDCs may enhance interest rate, credit, asset price, and expectations channels, particularly when combined with de-dollarisation and de-cryptisation effects. Their impact is typically moderate under normal conditions but increases substantially



during crises, periods of financial stress, or low-interest-rate environments (p. 3).

Programmability further expands monetary policy capabilities by enabling targeted liquidity operations and real-time interventions. Instruments such as programmable payments, tokenised government bonds, and digital deposit certificates improve the precision of liquidity management and reduce transaction frictions (Maslov, 2023). Tokenisation accelerates securities circulation, enhances transparency, and lowers manipulation risks, making monetary policy more flexible and granular during periods of heightened volatility.

Currency risks intensify during wartime as households shift savings into foreign currencies or crypto assets. The e-hryvnia can stabilise exchange rate expectations by strengthening confidence in a sovereign, state-guaranteed digital instrument. Reduced dollarisation enhances monetary transmission and reinforces the hryvnia's role as a store of value (Das et al., 2023, p. 3).

Moreover, the e-hryvnia provides the NBU with access to aggregated real-time transactions and liquidity data, shortening policy response lags and improving risk assessment. Given Ukraine's advanced payment infrastructure and high cashless transaction penetration, conditions are favourable for effective CBDC implementation (Maslov, 2023).

At the same time, CBDCs may vary bank deposit structures and intensify competition for funding. While this can strengthen interest rate and credit channels, excessive deposit migration to CBDC holdings may increase banks' reliance on wholesale funding, posing financial stability risks (Das et al., 2023). Hence, the net effect depends on the scale and design of CBDC adoption.

External Economic Factors.

The e-hryvnia could facilitate cross-border settlements without reliance on correspondent banking networks or international card schemes, reducing transaction costs for foreign trade. IMF research (Reslow et al., 2024) and analysis by The Payments Association (Iddenden, 2024) show that CBDCs lower settlement risk, remove intermediary layers, and improve speed and transparency in international payments.

While cryptocurrencies can reduce remittance costs, their pseudonymous nature complicates capital flow management and the monitoring of illegal finance. Episodes of capital flight via digital assets in emerging markets have exacerbated currency depreciation and reserve losses (Eichengreen et al., 2023). In contrast, CBDCs provide a regulated alternative that can support external balance and mitigate current account pressures (Pantiukhov, 2025).

Socio-Economic Factors.

The adoption of the e-hryvnia can reduce the shadow economy, which typically expands during crises. Through transaction traceability, programmability, and user identification, CBDCs limit informal payments, increase tax revenues, and alleviate structural budget imbalances (Pantiukhov, 2025; Iefymenko & Dmytrenko, 2025).

CBDCs also promote financial inclusion by enabling digital payments without requiring a bank account, offering low transaction fees, and expanding access in remote or conflict-affected areas (Lannquist & Tan, 2023). Increased financial inclusion broadens the tax base, reduces reliance on informal finance, and strengthens fiscal sustainability (Das et al., 2023).

Labor shortages caused by migration, mobilisation, and infrastructure destruction represent a significant structural constraint. The e-hryvnia can support labor market formalisation through cashless wages, digital contracts, and the integration of internally displaced persons into the formal economy.

CBDCs further enhance market resilience by reducing entry barriers for payment service providers, stimulating competition, and improving interoperability. A more diversified payment ecosystem increases redundancy and accountability, reducing vulnerability to single-platform disruptions (Malaika et al., 2025).

Structural and Institutional Factors.

According to the IMF's CBDC Virtual Handbook (International Monetary Fund, 2025), successful CBDC implementation requires robust institutional frameworks, enhanced transparency, and strengthened central bank governance.

Ukraine's harmonisation of virtual asset regulation with the EU Markets in Crypto-Assets Regulation (MiCA) positions the e-hryvnia as a key element of European financial integration. Compliance with EU standards on transparency, cybersecurity, and oversight enhances institutional credibility and strengthens cooperation with international partners (Nanavov & Blyzniuk, 2025).

The programmability of the e-hryvnia enables targeted social transfers, monitoring of fund usage, and improved efficiency of welfare programs. Empirical research confirms that programmable CBDCs reduce fiscal leakages, improve expenditure targeting, and strengthen social resilience during emergencies (Infante et al., 2022; Malaika et al., 2025).

Finally, CBDC infrastructure contributes to cyber resilience. IMF and BIS analyses emphasise that CBDCs constitute critical national infrastructure requiring advanced security architectures capable of withstanding state-sponsored cyberattacks (Bha-



rath et al., 2024; Bank for International Settlements, 2023b). The BIS Polaris Security Framework outlines seven pillars – Prepare, Identify, Protect, Detect, Respond, Recover, and Adapt – that together form a comprehensive model for CBDC cybersecurity in wartime conditions.

Governance Challenges and Risks.

A central bank digital currency is not a universal solution, and its contribution to economic resilience must be assessed considering substantial risks and constraints. The IMF identifies several key challenges associated with CBDC implementation, including the need to balance decentralisation with operational efficiency, ensure robust cybersecurity, and manage operational and compliance risks – particularly those related to offline functionality and anonymity-enhancing features (Malaika et al., 2025). In wartime conditions, these challenges are amplified by regulatory instability, declining institutional trust, and recurrent disruptions to payment and communication infrastructure.

For Ukraine, a significant risk associated with the introduction of the e-hryvnia is financial disintermediation resulting from a potential reallocation of deposits from commercial banks to the central bank's digital currency. Such a shift can intensify bank run risks during periods of financial stress and constrain credit supply to the real economy (Khutorna et al., 2021; Boiko, 2021). Closely related is the risk of a "flight to safety", in which households and firms increasingly treat CBDCs as risk-free assets.

Volatility in international capital flows constitutes an additional destabilising factor. The global expansion of foreign CBDCs as safe assets may provoke sudden liquidity movements and complicate the conduct of independent monetary policy in open economies (International Monetary Fund, 2025). Furthermore, the uncontrolled spread of foreign-currency-pegged stablecoins reinforces de facto dollarisation and weakens the effectiveness of domestic monetary instruments (Korniivska, 2022; Patsan, 2025).

Ukraine also faces risks associated with the rapid, insufficiently regulated expansion of the crypto-asset market, which complicates the measurement of monetary aggregates and monetary transmission, while increasing cybersecurity vulnerabilities, regulatory uncertainty, and concerns over excessive state control (Korniivska, 2022; Patsan, 2025). To mitigate these risks, the IMF's CBDC Virtual Handbook recommends preventive design solutions, including a two-tier CBDC model, balance and transaction limit, and the absence of interest on retail CBDC holdings (International Monetary Fund, 2025).

A further concern relates to the potential impact

of CBDCs on the velocity of money, which may complicate monetary targeting frameworks based on stable relationships between the monetary base (M0) and broader aggregates (M2). While CBDC adoption may increase transaction frequency by displacing cash, which has high transaction costs, empirical evidence suggests that interest rates and macroeconomic expectations remain the dominant determinants of money velocity. Consequently, the overall impact of CBDCs on velocity is likely to be limited (Das et al., 2023, p. 23).

Policy Recommendations.

IMF research confirms that despite their experimental nature and the limited number of full-scale implementations, CBDCs can enhance economic resilience when designed in a targeted, cautious, and well-structured manner (Malaika et al., 2025). The successful deployment of a CBDC requires strategic planning, technologically robust architecture, national and international coordination, and specialised institutional expertise.

The effectiveness of CBDC use under wartime conditions critically depends on institutional capacity, cybersecurity maturity, regulatory quality, and the ability to balance state oversight with the protection of economic freedoms. Failure to address these prerequisites risks turning CBDC into an additional source of financial vulnerability.

Academic consensus realises the macroeconomic stabilisation potential of the e-hryvnia only under conditions of comprehensive legal regulation of digital currencies and crypto-assets aligned with EU standards (MiCA), continuous development of payment infrastructure and cybersecurity capabilities, and improvements in digital and financial literacy (Nanavov & Blyzniuk, 2025; Lavruk et al., 2025; Kamyshanskyi, 2025; Patsan, 2025).

The e-hryvnia should function strictly as a third form of the national means of payment, fully interchangeable with both cash and non-cash hryvnia. Its issuance should not exceed the M1 monetary aggregate; otherwise, it would cease to operate as a digital equivalent of the national currency and instead become a separate financial instrument with an independent market valuation. The issuance of such instruments falls outside the NBU's statutory mandate and would entail significant legal and institutional risks (Khutorna et al., 2021).

Continuous monitoring of the macroeconomic effects of CBDC adoption is essential. Since CBDCs may either tighten or loosen financial conditions, the central bank must neutralise their impact if they threaten monetary policy objectives (Das et al., 2023). Accordingly, most central banks employ precautionary design features –such as balance li-



mits, transaction caps, and zero or tiered remuneration – to prevent large-scale deposit outflows. Nevertheless, during periods of low interest rates or heightened financial stress, the risk of a "flight to safety" into CBDC increases substantially.

CBDCs are also unlikely to materially affect the effectiveness of foreign exchange interventions under a managed exchange rate regime, except in cases where they significantly liberalise capital flows or expand non-resident access to the national currency. To mitigate such risks, the International Monetary Fund (2025) recommends the use of calibration tools, such as digital wallet limits and flexible fee structures.

Conclusions.

The e-hryvnia represents a promising but inherently conditional institutional framework for macroeconomic stabilisation in wartime Ukraine. Its potential effects arise not merely from its existence as a currency but from its capacity to enhance state governance through payment resilience, algorithmic fiscal transparency, and data-driven monetary policy. Within Ukraine's advanced digital state architecture, the e-hryvnia is positioned as a sovereign mechanism that complements traditional stabilisation tools, strengthening the country's institutional capacity to manage prolonged war-related shocks.

The analysis demonstrates that the e-hryvnia cannot function as an autonomous stabiliser; its effectiveness depends critically on governance or-

chestration. This includes precise design choices, strict regulatory alignment with EU standards, and a robust cybersecurity infrastructure. Under these conditions, the e-hryvnia catalyses institutional resilience, enabling targeted, programmable fiscal transfers while enhancing the precision of monetary transmission through real-time data.

International experience from pioneer economies underscores that CBDCs are primarily long-term structural governance instruments. Early implementations show that without a critical mass of users and a high level of institutional trust, macroeconomic effects remain limited. For Ukraine, this highlights the necessity of a multi-stakeholder governance model – specifically a two-tier distribution architecture – to minimise risks of financial disintermediation and "flight-to-safety" dynamics, while preserving the stability of the commercial banking sector.

Ultimately, the organic integration of the e-hryvnia into the national digital ecosystem (including Diia and ProZorro) offers a unique path to reduce the shadow economy and formalise economic interactions. By institutionalising transparency and reducing cross-border costs, the e-hryvnia reinforces Ukraine's digital sovereignty and aligns it with European standards. It stands as a transformative pillar for both wartime survival and post-war reconstruction, ensuring a more transparent, efficient, and resilient model of macroeconomic governance.

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