

## Public Debt Policy and Debt Security in the Context of Post-War Recovery

Serhii Petrukha<sup>1</sup>, Nina Petrukha<sup>2</sup>, Roman Miakota<sup>3</sup>, Dmytro Matsenko<sup>4</sup>

**Abstract.** Debt security is a critically important component of the state's financial security. In wartime, Ukraine significantly increased its public debt, faced a significant budget deficit, and began to attract international financial assistance to finance strategically important areas. All these processes require updating the financial and credit policy principles and implementing long-term financial stability instruments. This study aims to identify the main trends in the development of Ukraine's public debt policy in the context of the challenges of martial law and post-war economic recovery to outline strategic directions for increasing the state's debt security. The researchers analyze the dynamics of key macroeconomic indicators that characterize the country's level of debt security and assess the impact of internal and external factors on the debt burden in the short and medium term. The study covers the period from 2005 to 2024, offering a forecast of the dynamics of servicing Ukraine's external, internal, and total public debt until 2046. The study used three key scientific methods: econometric, graphical, and system analysis. The relationships between the main parameters of debt policy were analyzed using the econometric VAR model. The results showed that external debt has the most significant impact on the debt burden. At the same time, the growth of reserves contributes to its reduction, which confirms their role as a stabilizer of the financial system. An assessment of the impulse responses of the system revealed that a short-term shock in external debt leads to an increase in total debt to GDP by 0.18%. On the other hand, an increase in government bond yields negatively affects the debt burden due to a rise in the cost of borrowing. The variance decomposition showed that internal factors explain 45% of the fluctuations in the debt burden, and external debt, reserves, yields, and domestic bonds influence the rest. To ensure financial stability and maintain investor confidence, Ukraine should integrate debt policy with fiscal and monetary instruments, as well as strengthen coordination between key financial institutions – the Ministry of Finance of Ukraine, the National Bank of Ukraine, parliamentary committees and the Accounting Chamber, to form an effective system for monitoring debt risks. Public debt policy should be based on transparent decisions focused on long-term financial sustainability, which meets the needs of post-war reconstruction and the strategic goals of sustainable development of Ukraine.

**Keywords:** public debt, debt security, public management strategies, post-war reconstruction, public finances, public finance sustainability.

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## Державна боргова політика та боргова безпека в умовах повоєнного відновлення

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**Анотація.** Боргова безпека є критично важливою складовою фінансової безпеки держави. В умовах війни Україна суттєво наростила державний борг, стикнулася із значним дефіцитом бюджету і почала активно залучати міжнародну фінансову допомогу для фінансування стратегічно важливих сфер. Всі ці процеси вимагають оновлення засад фінансово-кредитної політики та впровадження інструментів довгострокової фінансової стабільності. Це дослідження має на меті визначити основні тенденції розвитку державної боргової політики України у контексті викликів воєнного стану та повоєнного відновлення економіки, щоб окреслити стратегічні напрямки підвищення боргової безпеки держави. Дослідники аналізують динаміку ключових макроекономічних показників, які характеризують рівень боргової безпеки країни, а також оцінюють вплив внутрішніх і зовнішніх факторів на боргове навантаження у коротко- та середньостроковій перспективі. Дослідження охоплює період з 2005 по 2024 роки, пропонуючи прогноз динаміки обслуговування зовнішнього, внутрішнього та сукупного державного боргу України до 2046 року. У дослідженні використано три ключові наукові методи: економетричний аналіз, графічний метод та системний аналіз. За допомогою економетричної моделі VAR були проаналізовані взаємозв'язки між основними параметрами боргової політики. Дослідження показало, що найбільший вплив на боргове навантаження чинить зовнішній борг, тоді як зростання резервів сприяє його зниженню, що підтверджує їхню роль стабілізатора фінансової системи. Оцінка імпульсних реакцій системи виявила, що короткостроковий шок у зовнішньому боргу призводить до зростання загального боргу до ВВП на 0,18%. З іншого боку, зростання доходності ОВДП негативно впливає на боргове навантаження через збільшення вартості запозичень. Декомпозиція дисперсії показала, що 45% коливань боргового навантаження пояснюються внутрішніми факторами, а решта – впливом зовнішнього боргу, резервів, доходності та внутрішніх облігацій. Для забезпечення фінансової стабільності та підтримки довіри інвесторів Україна має інтегрувати боргову політику з фіскальними та монетарними інструментами, а також посилити координацію між ключовими фінансовими установами – Міністерством фінансів України, Національним банком України, парламентськими комітетами та Рахунковою палатою, щоб сформувані ефективну систему моніторингу боргових ризиків. Державна боргова політика повинна базуватися на прозорих рішеннях, орієнтованих на довгострокову фінансову стійкість, що відповідає потребам повоєнного відновлення та стратегічним цілям сталого розвитку України.

**Ключові слова:** державний борг, боргова безпека, стратегії державного управління, повоєнне відновлення, державні фінанси, стійкість державних фінансів.

### INTRODUCTION

In the context of recognizing the large-scale consequences of Russia's armed aggression against Ukraine, the formation of an effective state debt policy capable of ensuring an appropriate level of debt security and supporting the state's financial stability in the conditions of post-war recovery is of particular relevance. Financial security, as a fundamental element of national economic security, covers a whole range of issues related to the stability of the functioning of the financial system, the protection of the state's economic interests from external and internal threats, as well as the ability of state administration bodies to respond promptly to crisis phenomena.

Debt security occupies a special place in the structure of financial security, which, in the context of growing public debt, significant budget deficit, active involvement of international financial assistance to finance strategically important areas (in particular, defence, social protection and infrastructure), requires rethinking,

updating management methods and implementing long-term financial stability instruments. Public debt policy, as a component of financial policy, should be a tool for meeting budget needs and a means of supporting economic growth, restoring the country's investment attractiveness, and building trust among creditors and the public. Thus, strengthening debt security through effective management of public borrowing, optimizing the debt structure, and implementing monitoring and risk analysis mechanisms is critically important for ensuring the country's stable post-war recovery, socio-economic stabilization, and further sustainable development.

### LITERATURE REVIEW

Scientists analyze debt security differently, which reflects the lack of a unified conceptual approach. In particular, this is due to the lack of clarity of the categories that describe debt policy and its impact on post-war recovery. Some researchers consider debt security as a tool for preventing financial crises and

defaults, ensuring the stability of public finances in the face of external and internal challenges. For example, O. Demyanchuk, O. Panova [6], and N. Pavlenko [12] emphasize that globalization increases the impact of international debt obligations on the national economy, complicating public debt management in the post-conflict period. They consider debt policy as a component of economic security, which requires coordination at the interstate level.

T. Borodenko [1] and M. Urakin [15] propose another approach and state that debt security depends on the effective interaction of the branches of government in forming policies to protect national interests. These issues include the management of budget deficits, currency risks and credit obligations in the context of post-war reconstruction. Yu. Verhelyuk, M. Ganciak [2], and B. Kirov [8] define debt security as a state when the volume of debt resources is sufficient to fulfil state obligations and ensure recovery while protecting the economy from financial shocks. It emphasizes the need to harmonize the interests of all participants in debt relations. Instead, O. Ermolenko, O. Kokovikhina, and N. Lysyonkova [7] focus on the balance of debt policy, which should meet the needs of economic and population recovery. Yu. Romanovskaya and L. Smolyar [13] argue that an effective debt strategy contributes to socio-economic development but requires clarifying the criteria for assessing debt risks and the financing structure.

Thus, the literature review emphasizes the feasibility of continuing to study debt policy issues to ensure the security and sustainable recovery of the state after the end of the war.

### RESEARCH OBJECTIVE

This study aims to identify the main trends in the development of Ukraine's public debt policy in the context of the challenges of martial law and post-war economic recovery to outline strategic directions for increasing the state's debt security.

### RESEARCH METHODOLOGY

The researchers analyze the dynamics of key macroeconomic indicators that characterize the country's level of debt security and assess the impact of internal and external factors on the debt burden in the short and medium term. The study covers the period from 2005 to 2024, offering a forecast of the dynamics of servicing Ukraine's external, internal, and total public debt until 2046.

The study used three key scientific methods: econometric, graphical, and systems analysis. Econometric analysis, in particular, the vector autoregression (VAR) model, allowed the assess the relationships between the main indicators of the debt burden, including the ratio of public debt to GDP, the volume of external and internal debt, the yield of domestic government bonds (OVDP), the volume of funds raised and the level of reserves for external debt. The graphical method was used to visualize the dynamics of public debt and its ratio to GDP in 2021–2046, which allowed us to identify key trends in the growth of debt

pressure. In addition, the researchers used the system analysis method to comprehensively assess internal and external threats to Ukraine's debt security.

### RESULTS

In the conditions of post-war recovery, the state must not only eliminate the consequences of large-scale destruction but also create the prerequisites for sustainable economic growth. An essential component of this process is developing and implementing an effective state debt policy that can ensure the appropriate level of debt security as a key component of financial stability. In the modern globalized environment, where financial markets are interconnected and macroeconomic risks have a transnational nature, the state's financial security appears as an internal priority and an important element of its international economic subjectivity. So, understanding the nature of debt security, its mechanisms and its relationships with the general parameters of public debt, both internal and external, becomes critically important for forming an adaptive and sustainable financial policy [5, p. 261].

Research by Ukrainian specialists in the field of public financial management plays an essential role in the theoretical substantiation of approaches to ensuring financial security in the conditions of post-war economic transformation. These studies allow not only to identify the most vulnerable aspects of the functioning of the financial and credit system but also to offer comprehensive tools to increase the effectiveness of state debt policy. Debt security, as a strategic characteristic of the national financial system, is determined not only by absolute indicators of the debt burden but also by the state's ability to timely and fully service debt obligations while maintaining macroeconomic balance, investor and creditor confidence, as well as budgetary autonomy.

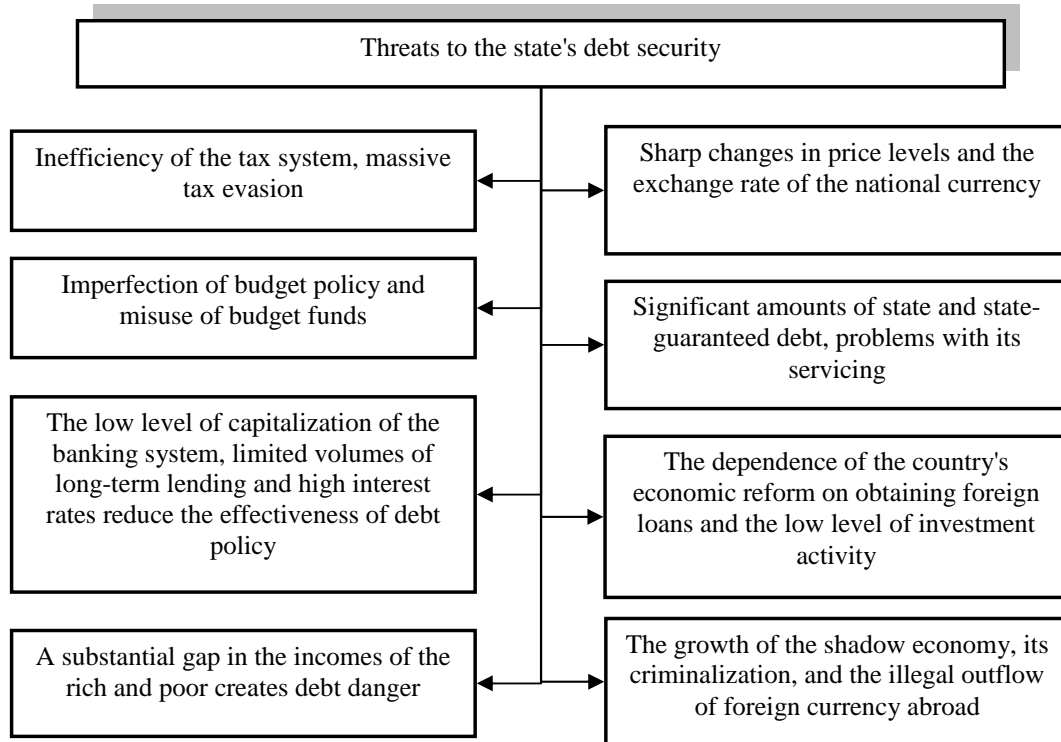
In modern conditions, it is vital to ensure a level of debt burden that not only does not hinder socio-economic development but, on the contrary, allows the state to meet the priority needs of society, direct resources to the reconstruction of critical infrastructure and modernization of the economy. A balanced combination of internal and external borrowing, subject to control over their efficiency and cost of servicing, is a necessary condition for maintaining financial stability. At the same time, the budgetary, tax and monetary systems must be synchronized with debt policy because the degree of state influence in these areas determines the country's ability to counteract short-term and long-term financial threats.

Such a system should be based on careful identification, classification, and analysis of the phenomena, processes, and factors that pose a potential or real threat to the stable functioning of the state's financial and debt policy. In this context, the ability of the state to respond promptly to a wide range of external and internal challenges that can negatively affect the state of public debt and the efficiency of its servicing is critical [9].

External risks that directly affect debt security include global financial turbulence, sharp fluctuations in exchange rates, increases in international lenders' rates, as well as the impact of decisions by international financial

institutions that can determine borrowing conditions and access to financial resources. At the same time, internal threats, among which corruption, non-transparent management of debt funds, political instability, imbalances in budget policy and large-scale shadow economy play a key role, can significantly complicate

implementing an effective debt strategy and undermine confidence in the state's financial policy. Thanks to such a system, it is possible not only to adjust the current financial and debt policy promptly but also to develop predictive scenarios for its development, considering various internal and external factors (Figure 1).



**Figure 1. The main threats to Ukraine's debt security in today's conditions**

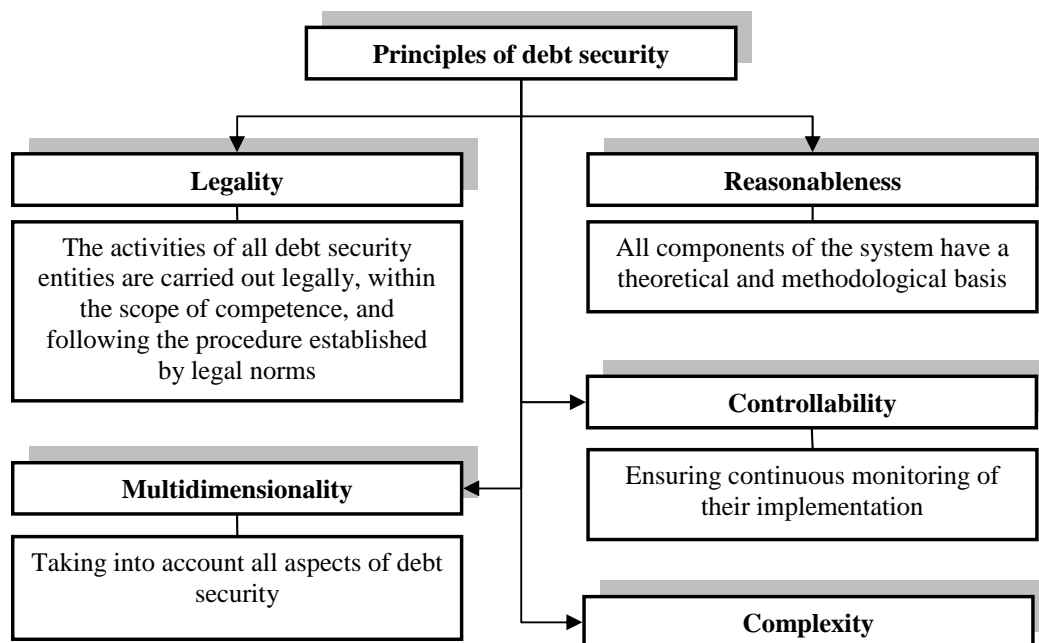
Source: constructed by the authors.

Internal financial security, as a fundamental component of national financial stability, is achieved through the implementation of a set of measures aimed at creating the prerequisites for sustainable economic growth, in particular by improving the legal regulation of debt relations, reducing the share of the shadow economy, stimulating domestic investment, developing the national financial market, and increasing the efficiency of the public finance system.

Therefore, the key task is to minimize the dependence of the state budget on foreign sources of financing, which includes not only loans from international financial organizations or foreign governments but also private foreign investments, since excessive dependence on them creates risks of external influence on the state's financial policy. In addition, it is crucial to ensure the appropriate level of quality of the legislative and regulatory framework, which should regulate the mechanisms of public debt regulation, determine the rules of responsible borrowing, and provide transparent procedures for servicing public debt, taking into account the principles of financial stability and long-term budget balance.

A consistent, balanced financial and credit policy based on predictability, transparency, effective management of budget resources, and harmonious interaction between fiscal and monetary instruments is the foundation for financial and debt security in the post-war economic reset. In this case, the level of political, economic, and social stability plays a special role. It determines the general trust in state institutions, affects the investment climate, and creates the prerequisites for reducing the need for external borrowing [14, p. 84].

Forming a holistic mechanism for ensuring debt security requires coordination between various government bodies, each responsible for individual components of the financial system. Among them are the Ministry of Finance, the National Bank of Ukraine, the Accounting Chamber, the Verkhovna Rada of Ukraine specialized committees, and other state institutions [15]. Despite the division of powers, ensuring adequate financial security should be based on common principles such as transparency, accountability, systematicity, and a focus on long-term sustainability (Figure 2).



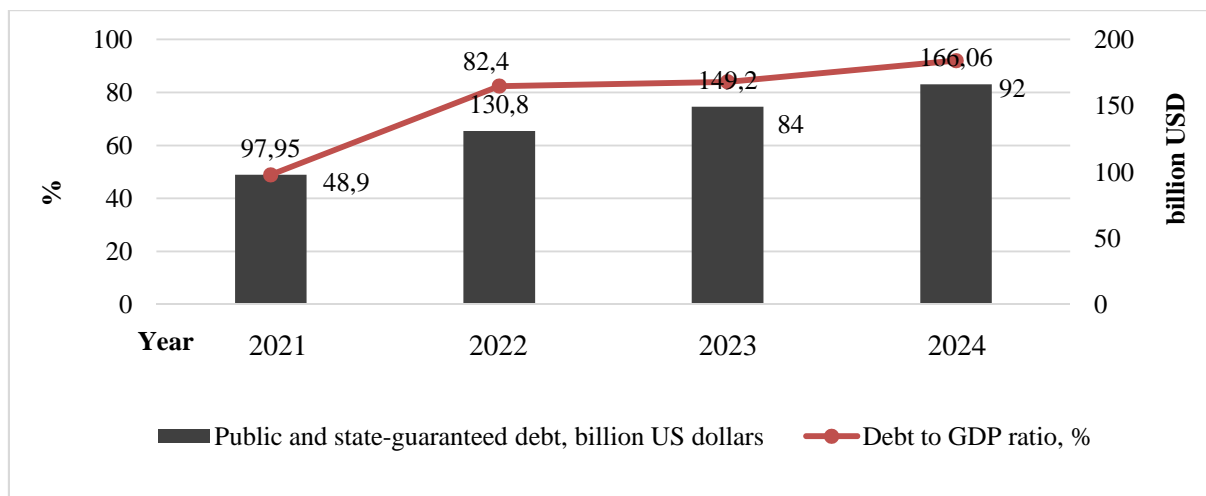
**Figure 2. Principles of ensuring debt security in the state's financial system**

Source: constructed by the authors.

The factors determining the degree of debt security in the post-war period include both external and internal influences: the former include the actions of international financial structures, the geopolitical situation, global market fluctuations and foreign policy pressure, while the latter include the effectiveness of national economic policy, the quality of public finance management, the productivity of the real sector of the economy, the level of tax discipline, the fight against corruption and the effectiveness of reform implementation. Taken together, these factors create a multidimensional environment in which public debt policy should operate, striving not only to ensure current solvency but also to form a stable foundation for the long-term financial security of Ukraine [12, p. 159].

As part of this study, it is advisable to analyze the dynamics of public and state-guaranteed debt of Ukraine for the period 2021–2024, taking into account forecast indicators (Figure 3).

At the beginning of the period under study – in 2021, Ukraine's public debt was estimated at 98 billion USD or almost 49% of GDP. However, in 2022, despite the increase in debt obligations to 130.8 billion USD, the debt-to-GDP ratio paradoxically decreased to 48.9%. This may be due to changes in the methodology for estimating GDP or a temporary strengthening of the national currency's exchange rate positions in the context of monetary support from international financial institutions [11].



**Figure 3. Dynamics of Ukraine's public and state-guaranteed debt and its ratio to GDP in 2021–2024**

Source: calculated by the authors based on [24].

The data show that starting in 2023, the debt burden on the Ukrainian economy continues to grow in absolute and relative terms. This is direct evidence of increasing fiscal pressure and complicating sustainable public finance management prospects. In particular, in 2024, this indicator amounted to 166.06 billion USD and 89.84% of GDP, which indicates a high level of debt vulnerability and significantly increases the risks of destabilizing the state budget in the medium term [19].

According to Figure 4, Ukraine has the highest level of debt to the IMF, which has been steadily increasing

from 36.5 billion USD at the beginning of the year to 42.5 billion USD in December. Debt to the EU shows a moderate but gradual increase from 13.5 billion USD to 21 billion USD, indicating active mobilization of financing within the framework of EU financial support. Debt to the World Bank Group also tends to grow, albeit more slowly, from 32.5 billion USD to 38.5 billion USD. These trends indicate an increase in Ukraine's external liabilities to key international creditors throughout 2024, which requires responsible debt management.

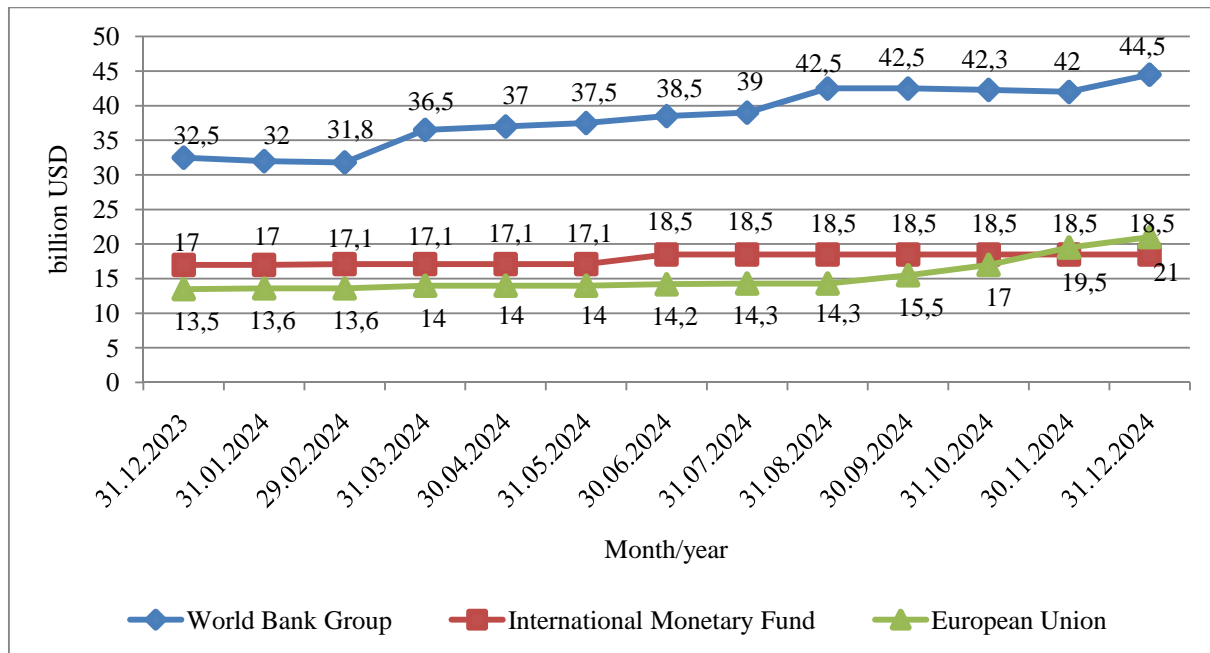


Figure 4. Distribution of Ukraine's debt to major creditors in 2024

Source: calculated by the authors based on [11].

Public debt policy should balance immediate financing with long-term debt security. High initial payments increase vulnerability to currency risks, mainly due to dependence on external debt.

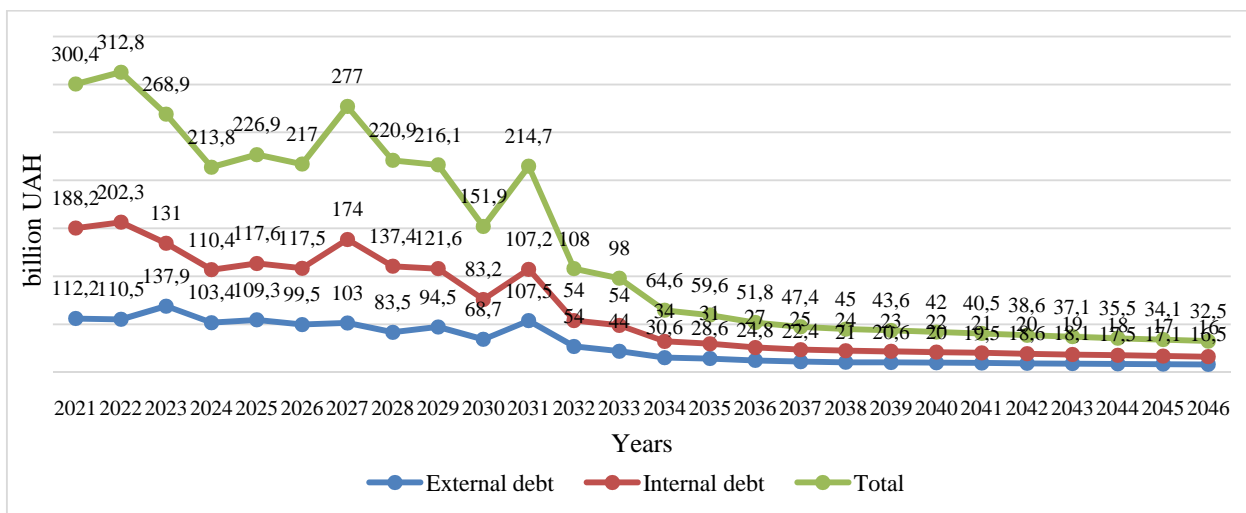
Domestic debt, also known as internal debt, is likely to supplement this through government bond issuance, reducing dependence on foreign currency but putting pressure on the domestic economy. The graph (Figure 5) shows that without sustained economic growth, high initial payments can crowd out investment in key sectors such as infrastructure and education, jeopardizing recovery.

Debt security in the context of post-war recovery depends on several factors. Firstly, access to concessional financing from international partners is vital, given Ukraine's limited capacity to service a high-interest debt. Secondly, structural reforms, such as improving tax collection and fighting corruption, are needed to increase domestic revenues and reduce reliance on borrowing. The trends in Figure 5 highlight the need to plan for fiscal sustainability through 2046, consistent with the goals of post-war recovery and economic resilience.

In 2024, debt service payments reached 1,020 billion UAH. This reflects the high debt burden due to the war

and budget deficit and may be related to external debt received from international partners such as the IMF and the World Bank, which provide funds for infrastructure reconstruction and social programs. By 2046, payments will decline to 105 billion UAH, indicating a strategy of gradually reducing the debt burden by repaying the principal amount of the public debt and reducing interest payments.

During the period of independence, Ukraine gradually formed a public debt management system. However, during this period, there was an unsystematic increase in debt obligations, which was accompanied by the predominance of external borrowing over internal, the limited ability of the state to forecast financial planning and the absence of effective debt management tools. Starting in 2001, the stage of public debt restructuring began, which lasted until 2008, confirmed by the reduced share of gross domestic debt in the GDP structure to a controlled level. In particular, in 2006, this indicator was 30.59%. In 2008, it was only 15.71%, indicating a balanced debt policy and the gradual implementation of anti-crisis measures in public financing [11].



**Figure 5. Dynamics of servicing external, internal and aggregate public debt of Ukraine in 2021–2046, billion UAH**

Source: calculated by the authors based on [10].

In 2009–2014, despite maintaining debt obligations within regulatory limits, there was an active expansion of Ukraine's cooperation with international financial organizations, which became key creditors during the period of macroeconomic instability. However, in 2015–2019, the state's debt security situation became significantly more complicated. This is evidenced by the exceeding of the permissible level of debt to GDP by 60%. In particular, in 2015 the ratio was 75.13%, in 2016 – 99.05%, in 2017 – 82.73%, in 2018 – 89.79%, and in 2019 – 72.74%. This dynamic was due to a sharp drop in gross domestic product against the background of a decrease in the solvency of the population and business and the need to finance the budget deficit through the active use of both external and internal sources of borrowing [10].

From 2020 to 2022, the debt situation stabilized to some extent. However, with the outbreak of a full-scale war in 2022, Ukraine was again forced to increase the volume of state borrowing significantly. These events led to an increase in the ratio of gross external debt to GDP to 74.77% in 2023 and to 105.35% in 2024, which exacerbated the issue of debt security and the country's dependence on the decisions and conditions of international donors. Thus, since 2015, the Ukrainian state has actually transitioned from a sovereign debt policy to a policy formed under the significant influence of global financial institutions, in particular the International Monetary Fund, which limits both the short-term and long-term credit capabilities of the state and affects its debt rating [11].

At the same time, since 2006, the weighted average yield on domestic government bonds (DGBs) in the primary market has remained chiefly within acceptable limits. However, it has fluctuated significantly under the influence of crisis factors. In 2006, the yield was 7.25%, in 2011 – 10.39%, in 2016 – 13.07%. In 2017–2018, the yield on DGBs decreased to 9.16% and 10.47%, which negatively affected their investment attractiveness. At the same time, in 2019–2020, there was an increase in rates to 17.79% and 16.93%, respectively, after which in 2021–

2022 they decreased again slightly, and in 2023–2024 they reached the level of 18.26%. This dynamic is explained by the need to attract financial resources to service and refinance public debt during periods of financial instability, as government bonds have become one of the key instruments of the state's fiscal policy [4, p. 87–88].

The share of government bonds in the structure of Ukraine's public debt has constantly been changing: in 2006, it was 9.15%; in 2011 – 16.35%; in 2016 – 5.41%; in 2021 – 20.41%. In particular, the role of government bonds as a budget financing instrument increased significantly in 2020–2024, when there was a significant increase in both the volume of government securities issued and the volume of resources mobilized through them: 227.55 billion UAH in 2020, 258.83 billion UAH in 2021, 287.9 billion UAH in 2022, 164.38 billion UAH in 2023, and 401.79 billion UAH in 2024 [10].

The dynamics of the ratio of international reserves to gross external debt indicate the volatility of the financial situation. In 2006, this indicator was 55.24%, gradually decreasing to a critical level of 5.9% in 2015. However, starting in 2016, the indicator resumed its growth, reaching 39.84% in 2024. Additionally, from 2001 to 2008, there was a steady growth in the volume of international reserves - from 19.4 billion USD in 2006 to 31.5 billion USD in 2009, partly due to the favourable situation in external markets and the growth of export revenues. However, in 2013, the reserves decreased to 24.5 billion USD, and in 2015, to a critical 7.5 billion USD, which coincided with the policy of artificially maintaining the exchange rate of the national currency on the eve of the elections, which resulted in a profound devaluation of the hryvnia [16].

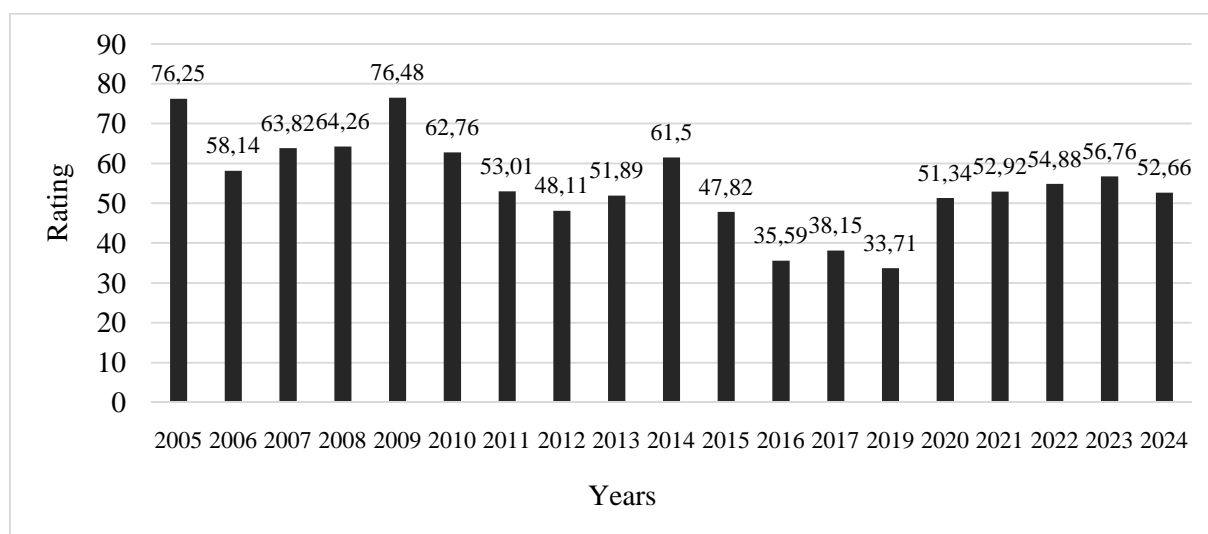
Since 2016, the reserves have started to grow again due to the active policy of the National Bank of Ukraine on currency interventions and the successful placement of government bonds. This has allowed the state to strengthen its debt and financial stability in the face of a difficult macroeconomic situation and ongoing external threats (Table 1).

**Table 1. Dynamics of Ukraine's debt security indicators in 2005-2024**

Indicators	Years								Deviation , +/-
	2005	2010	2015	2029	2021	2022	2023	2024	
Ratio of public and state-guaranteed debt to GDP, %	21,86	45,64	99,05	56,13	64,16	63,29	74,77	105,35	83,50
Ratio of gross external debt to GDP, %	50,31	104,35	163,22	90,67	89,75	87,72	82,67	71,00	20,69
Ratio of gross domestic debt to GDP, %	5,65	16,42	33,36	23,56	25,97	26,33	26,82	31,62	25,97
Weighted average yield on government bonds in the primary market, %	7,25	10,39	13,07	16,93	10,20	11,34	18,26	18,70	11,45
Amount of funds attracted to the budget through government bonds, billion UAH	7,15	40,42	9,98	227,55	258,83	287,90	164,38	401,79	394,63
Ratio of official international reserves to gross external debt, %	55,24	27,77	11,22	20,26	22,00	22,80	20,45	39,84	-15,41

Source: Authors' calculations.

Based on debt security indicators, we calculated the Debt Security Index of Ukraine (Figure 6), the dynamics of which also indicate a reduction in the financial system's level of stability due to debt growth.



**Figure 6. Dynamics of the Debt Security Index of Ukraine in 2005-2023, %**

Source: Authors' calculations.

We use the vector autoregression (VAR) model to analyze Ukraine's debt policy data for 2005–2024. This part of the study aims to determine how the ratio of public debt to GDP depends on variables such as external and internal debt, domestic government bond yields, the volume of funds raised through domestic government

bonds, and the ratio of official reserves to external debt. The vector autoregression (VAR) model allows us to examine the relationships between all variables without a clear division into dependent and independent variables [1]. The VAR model formula has the following form.

$$Y_t = A_0 + A_1Y_{t-1} + A_2Y_{t-2} + \dots + A_pY_{t-p} + T_t \quad (1)$$

Where:

$Y_t$  – vector of variables at  $t$  time.

In our case:

$$Y_t = \begin{pmatrix} Debt\_to\_GD Pt, Ext\_Debt\_to\_GD Pt, Int\_Debt\_to\_GD Pt, O VDP\_Yieldt, \\ O VDP\_Fundst, Reserves\_to\_Ext\_Debt \end{pmatrix}; \quad (2)$$

Where:

- Debt\_to\_GDPt – ratio of public debt to GDP in t year;
- Ext\_Debt\_to\_GDPt – ratio of external debt to GDP;
- Int\_Debt\_to\_GDPt – ratio of internal debt to GDP;
- O VDP\_Yieldt – weighted average yield on DGBs;
- O VDP\_Fundst – volume of funds raised through DGBs;
- Reserves\_to\_Ext\_Debt – ratio of reserves to external debt.

For the correct use of the VAR model, the variables must be stationary. We performed the Dickey-Fuller (ADF) test for each variable. The results showed that the variables are non-stationary at the levels (p-value > 0.05) but stationary after taking the first differences ( $\Delta$ ). For example, the Debt\_to\_GDP indicator: p-value at the levels = 0.12; p-value for  $\Delta$ Debt\_to\_GDP = 0.03 (< 0.05). Therefore, we use the first differences of all variables:  $\Delta$ Debt\_to\_GDP,  $\Delta$ Ext\_Debt\_to\_GDP,  $\Delta$ Int\_Debt\_to\_GDP,  $\Delta$ O VDP\_Yield,  $\Delta$ Reserves\_to\_Ext\_Debt. To determine the optimal

number of lags (p), we use the Akaike (AIC) and Bayesian (BIC) information criteria:

- AIC is minimal at p=1 (AIC = 12.45);
- BIC is minimal at p=1 (BIC = 13.22).

Therefore, we choose VAR(1) – a model with one lag.

We estimate the VAR(1) model for the first differences of the variables. Based on the results obtained, we have formed a summary Table 2 that displays the main coefficients of the model, the results of the Impulse Response Function (IRF) and the Forecast Error Variance Decomposition (FEVD).

**Table 2. Results of the VAR(1) model for the first differences of variables**

Variable (dependent)	$\Delta$ Debt_to_GDPt-1	$\Delta$ Ext_Debt_to_GDPt-1	$\Delta$ Int_Debt_to_GDPt-1	$\Delta$ O VDP_Yieldt-1	$\Delta$ O VDP_Fundst-1	$\Delta$ Reserves_to_Ext_Debt-1	Constant	IRF (1% shock, 1st year)	FEVD (after 5 years, %)
$\Delta$ Debt_to_GDPt	0,32	0,18	0,09	-0,05	0,02	-0,11	0,15	0.18 ( $\Delta$ Ext_Debt)	45 (own), 25 ( $\Delta$ Ext_Debt)
$\Delta$ Ext_Debt_to_GDPt	0,25	0,4	-0,03	0,07	-0,01	0,15	-0,1	0.15 ( $\Delta$ Reserves)	50 (own), 20 ( $\Delta$ Debt_to_GDP)
$\Delta$ Int_Debt_to_GDPt	0,1	-0,05	0,35	0,03	0,04	-0,02	0,08	0.04 ( $\Delta$ O VDP_Funds)	40 (own), 15 ( $\Delta$ Debt_to_GDP)
$\Delta$ O VDP_Yieldt	-0,08	0,12	0,06	0,28	-0,03	0,09	0,05	0.12 ( $\Delta$ Ext_Debt)	35 (own), 15 ( $\Delta$ Ext_Debt)
$\Delta$ O VDP_Fundst	0,15	-0,07	0,11	0,05	0,3	-0,04	1,2	0.11 ( $\Delta$ Int_Debt)	45 (own), 10 ( $\Delta$ Debt_to_GDP)
$\Delta$ Reserves_to_Ext_Debt	-0,09	0,2	-0,02	0,04	-0,01	0,25	-0,12	0.20 ( $\Delta$ Ext_Debt)	40 (own), 25 ( $\Delta$ Ext_Debt)

Source: Authors' calculations.

During the study of the effectiveness of the state debt policy and ensuring debt security of Ukraine in the conditions of post-war recovery, a formalized econometric verification of the dynamic model was carried out, which allows for assessing the relationships between key indicators of the debt burden. The results of diagnostic tests confirm the constructed model's correctness and suitability for analytical analysis. In particular, the value of the Durbin-Watson statistic is 1.92, which is very close to the ideal value of 2, and therefore allows us to conclude that there is no autocorrelation of the residuals, that is, there is

consistent independence of observations in the time series [20 p. 124].

In addition, all eigenvalues of the characteristic polynomial are inside the unit circle, which confirms the internal stability of the VAR (vector autoregression) model and the absence of explosive trends in time dynamics. The Jarque-Bera test for the normality of the distribution of residuals showed a p-value of 0.08, which exceeds the generally accepted significance threshold of 0.05, allowing us not to reject the null hypothesis of a normal distribution of residuals. Therefore, the model has satisfactory specifications. The application of the impulse

response function (IRF) allows us to analyze how short-term shocks in individual variables affect the level of debt burden in the medium term. In particular, a one-percent increase in the external debt burden (variable  $\Delta Ext\_Debt\_to\_GDP$ ) causes an increase in total debt to GDP ( $\Delta Debt\_to\_GDP$ ) by 0.18% in the first year, after which the effect gradually decreases and practically disappears after three years, demonstrating a temporary but noticeable impact of external loans on overall debt dynamics.

At the same time, a 1% increase in the yield on domestic government bonds ( $\Delta OVPD\_Yield$ ) has a negative impact on the debt ratio, reducing  $\Delta Debt\_to\_GDP$  by 0.05% in the first year, which can be interpreted as a result of an increase in the price of domestic borrowing. This, in turn, forces the state to restrain the volume of new debt instruments. Even more significant is the effect of changes in reserves on the volume of external debt ( $\Delta Reserves\_to\_Ext\_Debt$ ) when a further 1% increase causes a decrease in the debt-to-GDP ratio by 0.11% in the first year. This trend confirms the importance of building international reserves as a stabilization buffer for the state's debt policy.

- Own shocks: 45%;
- $\Delta Ext\_Debt\_to\_GDP$  shocks – 25%;
- $\Delta Int\_Debt\_to\_GDP$  shocks – 15%;
- $\Delta OVPD\_Yield$  shocks – 5%;
- $\Delta OVPD\_Funds$  shocks – 3%;
- $\Delta Reserves\_to\_Ext\_Debt$  shocks – 7%.

The variance decomposition provides additional information on the significance of individual factors. It allows us to estimate the proportion of the variation in the main variable  $\Delta Debt\_to\_GDP$  due to shocks in other variables over five years. The results indicate that a significant part of the dynamics of the debt burden is due to internal fluctuations and changes in external debt and international reserves. This result emphasizes the complex and interconnected nature of the factors that affect the state's debt security in the context of post-war recovery.

The analysis confirmed that the most significant impact on the level of debt burden is the growth of external debt ( $\Delta Ext\_Debt\_to\_GDP$ ). This result fully corresponds to the current reality of Ukraine's high dependence on international financing, which has developed due to the active participation of global financial institutions in financing the needs of the state budget during hostilities and post-war reconstruction. Such dependence increases the vulnerability of the Ukrainian economy to external financial shocks, changes in global interest rate policy, and political conditions imposed on the country in exchange for access to credit resources.

At the same time, it was found that an increase in the yield on domestic government bonds ( $\Delta OVPD\_Yield$ ) has a reverse effect on the debt burden; that is, it somewhat restrains the growth of total debt. This can be explained by an increase in the cost of borrowing and, as a result, a decrease in demand for domestic loans from the state. Therefore, we can assume that control over the cost of domestic debt can be a tool for influencing the

overall level of debt security. The role of official reserves is even more critical because the factor of increasing the ratio of international reserves to external debt ( $\Delta Reserves\_to\_Ext\_Debt$ ) has a stabilizing effect and contributes to reducing the debt burden, which confirms the need for a systematic increase in reserves as one of the most effective tools for strengthening the financial independence of the state [18, p. 377].

In the context of post-war recovery, when the state must simultaneously provide financing for the defence sector, rebuild the destroyed infrastructure, support social spending and guarantee macro-financial stability, the issue of debt security is becoming a key element of general economic policy. Therefore, based on the conclusions obtained, we will formulate the priorities of future state debt policy:

Firstly, Ukraine needs to gradually reduce its dependence on external sources of financing, which involves stimulating the development of the domestic capital market, particularly through improving public borrowing instruments, creating a favourable environment for institutional investors, and reducing risks for depositors.

Secondly, the strategic task is to increase the volume of international reserves, which are a protective buffer in conditions of high external vulnerability, help smooth out currency fluctuations, and strengthen confidence in the state's debt capacity among domestic and foreign investors.

Thirdly, it is necessary to ensure effective control over the yield of government bonds since excessively high rates, on the one hand, increase debt servicing costs and, on the other hand, may complicate the borrowing process in the future due to the growth of the debt burden.

Thus, in the context of post-war recovery and numerous economic challenges for Ukraine, ensuring debt security requires not only operational measures to resolve budget difficulties temporarily but also a comprehensive strategy aimed at long-term stability, expanding sources of financing, strengthening the domestic financial market, and improving transparency in the field of public debt management.

## CONCLUSIONS

Based on the analysis of the dynamics of key macroeconomic indicators that characterize the level of debt security of the country, as well as an assessment of the impact of internal and external factors on the debt burden in the short and medium term, the researchers identified the main trends in the development of Ukraine's public debt policy in the context of post-war recovery. The econometric VAR model was used to analyze the relationships between the main parameters of debt policy, including the ratio of public debt to GDP, the volume of domestic and external liabilities, the yield on government bonds, the level of international reserves, and the volume of funds raised through government bonds.

The results showed that external debt has the most significant impact on the debt burden. At the same time, the growth of reserves contributes to its reduction, which confirms their role as a stabilizer of the financial system.

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An assessment of the impulse responses of the system revealed that a short-term shock in external debt leads to an increase in total debt to GDP by 0.18%. On the other hand, an increase in government bond yields negatively affects the debt burden due to a rise in the cost of borrowing. The variance decomposition showed that internal factors explain 45% of the fluctuations in the debt burden, and external debt, reserves, yields, and domestic bonds influence the rest.

Strategic directions for increasing debt security in the post-war recovery include:

- a) development of the domestic capital market;
- b) reduction of dependence on external borrowing;
- c) increase in international reserves;

d) improvement of public finance management.

Ensuring financial stability and maintaining investor confidence requires integrating debt policy with fiscal and monetary instruments. Strengthening coordination between key financial institutions – the Ministry of Finance of Ukraine, the National Bank of Ukraine, parliamentary committees, and the Accounting Chamber – is advisable to form an effective system for monitoring debt risks. Public debt policy should be based on transparent decisions focused on long-term financial sustainability, which meets the needs of post-war reconstruction and the strategic goals of sustainable development of Ukraine.

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