











“Assessment of Ukraine’s external debt burden under geopolitical instability”

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ASSESSMENT OF UKRAINE'S EXTERNAL DEBT BURDEN UNDER GEOPOLITICAL INSTABILITY

Abstract

Several specific features and circumstances can characterize Ukraine's policy of external public debt management, and the results are not always unambiguous. The study aims to assess the effect of external public debt on Ukraine's economy from 2014 to 2022, a period that includes the Crimea annexation, the onset of the COVID-19 pandemic, and the beginning of the open Russian military aggression. To analyze the contemporary state of public debt and assess the degree of external debt burden's impact on the country's economy, a factor analysis technique known as the principal components method was used. Via the STATISTICA.12 software, it was substantiated that the debt situation worsens with the growth of debt burden and solvency indicators as their values approach the thresholds. The application of the Kaiser criterion allowed the selection of the most influential indicators (principal components) for assessing the external debt burden. The eigenvalue of the first component (inflation rate) is 4.48, and it explains 50% of the variance; the second component (production of export-oriented goods) has an eigenvalue of 2.43, explaining 27% of the variance; the third component (government spending on military purposes) has an eigenvalue of 1.24, and it explains 14% of the variance.

Keywords

external public debt, debt policy, debt burden, debt management, debt security indicators, Ukraine

JEL Classification

H60, H63, G28

INTRODUCTION

Over the past years, the economy of Ukraine has been developing in conditions of an increasing number of geopolitical and geo-economic shocks. Firstly, there was external encroachment on the country's territorial integrity in 2014–2015. Subsequently, there was a need for deterrence and military counteraction against the Russian Federation in the east of Ukraine. Furthermore, the global situation was complicated due to the coronavirus pandemic in 2020–2022. Since the start of 2022, there have been extensive military operations and an active phase of military confrontation due to Russia's aggression. Along with several internal factors affecting the sustainability of the country's budget, these factors significantly impact the composition and institutional role of Ukraine's external public debt management. International capital is a vital component of the global economic system. At the same time, it is crucial for a country that is reforming its political and economic environment, defending its national interests and European relations, to form its state budget and overcome its deficit.

Nowadays, public debt is a crucial aspect of financial systems in many countries. The formation, repayment, and volume of public debt have a direct and indirect impact on almost all economic processes within

a country. Public debt is essential not only as a means of raising funds to finance public requirements but also as a critical tool for the state's financial policy. Mismanagement of public debt can result in significant complications, leading to a financial crisis.

Preventing such consequences relies on making effective decisions and creating strategic plans (budget policy formation) for managing public funds based on the forecast values of factor analysis indicators. The amount of Ukraine's external public debt depends on numerous factors that directly or indirectly impact its formation and change.

Thus, there is an increasing necessity for efficient external public debt management, which entails assessment of the debt impact on the economy through different indicators.

1. LITERATURE REVIEW

The external public debt of a country is considered a less profitable and riskier method of financing the budget than the internal debt. Therefore, obtaining credit from foreign credit institutions, such as international financial or political organizations (funds, unions, banks), partner governments, or private investors, results in a considerably higher financial burden and elevated credit and exchange rate risks. As a result, the accumulation and repayment of foreign debt diminish the financial capacity of the country and pose macroeconomic risks to its economic growth.

The reasons and consequences of the external public debt, as well as its impact on the country's macroeconomic stability, were profoundly studied by Reinhart and Rogoff (2009). Also, financial crises associated with excessive public debt growth were investigated. Reinhart and Trebesch (2016) analyzed the impact of international financial institutions, i.e., IMF and IBRD, on external public debt management.

Correia and Martins (2019) investigated how external capital affects the resilience of EU nations in the face of the global financial crisis, serving as a significant driver for economic development and the design and execution of state budget policy. Using the example of external financial support to the "peripheral" EU countries (Greece, Ireland, Spain, Portugal, and Cyprus), the study identified positive and negative consequences of the crisis resolution process. The crisis resulted in the aggravation of macroeconomic imbalances, making financial assistance crucial. External financing for these countries was provided on the condition that

they follow strict policies, including reductions in public spending, tax increases, privatization initiatives, and reductions in social assistance to public institution employees. The implemented measures of external financial assistance were the most successful in balancing Spain's external debt.

A study analyzing the factors leading to the establishment and subsequent effects of external debt burdens in a single country (Albania) was conducted by Fejzaj et al. (2021). The researchers state that public debt can have several benefits if utilized appropriately, in reasonable amounts, and toward specified objectives. When examining the relationship between public debt and economic growth, it is evident that the economy tends to decline as the level of public debt increases and vice versa. The impacts of an increase or decrease in public debt on economic development in the long run pass through the debt service costs, net savings, and NCL channels.

The short- and long-run impact of state debt on economic growth in Nigeria and other developing countries was examined by Aiyedogbon et al. (2022).

The period of 2017–2019 resulted in positive trends for Ukraine's debt indices (Stoiko & Shubenko, 2021). However, its values for 2020–2021 show an escalation in debt risks prompted by the decline of the macroeconomic situation, an upswing in the total amount of public debt, and considerable debt repayments.

The issue of public finance destabilization based on the analysis of Ukraine's external debt structure between 2008 and 2018 was studied by Sidorova (2019). In this context, the findings outline sever-

al issues faced by the state, including the absence of a clear policy on managing external public debt, irrational usage of borrowed funds, and an unstable political and economic climate. The study also highlights the risk of a public debt crisis if the state continues to procure large amounts of borrowing from international financial institutions and provides unchecked state guarantees. As a result, this could lead to Ukraine's exclusion from global credit markets and a reduction in foreign trade, as well as halting external financing of the corporate sector and slowing down the domestic credit process. The improvement of the situation and the solution to these issues are tied to ensuring strategic budgetary planning and developing a debt strategy.

The current external public borrowing management policy paradigm, wherein debt policy is subordinate to national economic development's tactical and strategic objectives to counteract economic and pandemic threats, was examined by Moroz (2021). The study proposes implementing a program-targeted approach to managing external public debt, where funds are solely sourced from international financial organizations for specific government initiatives. Based on the results of applying economic and mathematical tools to assess the determinants of Ukraine's external liabilities, the article demonstrates the substantial impact of external public debt, as a macroeconomic policy instrument, on public finance sustainability, price stability, and economic growth stimulation. At the same time, the result notes the temporary nature of this financing source and argues that stabilization and economic growth processes should rely solely on funding consumer spending from the state budget and promoting final household consumption.

The impact of external public debt on Ukraine's economic development indicators (GDP, foreign direct investment, foreign exchange reserves) was assessed by Petrushenko et al. (2022). In order to attain the objective, distributed lag models were used, which allowed the modeling of a country's economic development (according to key indicators) within specific forecast scenarios.

Zhuravka et al. (2019a, 2019b, 2021a, 2021b) studied public debt dynamics, assessed its sustainability, and forecasted Ukraine's public debt using time series analysis. The authors used econom-

ic and mathematical analysis to identify the following: global integration has made both domestic and foreign public debt issues universal. The developed model allows forecasting of Ukraine's public debt for both its internal and external components. At the same time, the forecast indicators' obtained values are based on the country's economic preconditions assuming stability and without considering the impact of external, unpredicted shock factors.

According to the abovementioned, there is an increasing necessity for efficient external public debt evaluation and management, which entails assessment of the debt impact on the Ukrainian economy through different indicators.

Thus, the study aims to assess the impact of external public debt on Ukraine's economy from 2014 to 2022, a period that includes the Crimea annexation, the onset of the COVID-19 pandemic, and the beginning of the open Russian military aggression.

2. METHODS

The research period was defined as the years 2014–2022 during which the development of economic processes in Ukraine was influenced by the direct negative impact of global factors, such as the aggressive actions of a neighboring country and the COVID-19 pandemic. Indicators of the country's debt security were utilized to evaluate the existing properties of the external public debt. The component analysis uncovered implicit, objectively existing patterns that arise from both internal and external factors but cannot be directly measured.

To analyze the present state of public debt and assess the degree of external debt burden's impact on the Ukrainian economy, the factor analysis technique known as the principal components method has been employed. This method is instrumental in minimizing information loss and simplifying multidimensional research. The mathematical basis of the principal component method is the correlation matrix R . The matrix's elements represent correlation coefficients that gauge the links between attributes, resulting from a common root cause for their variation. In the process of conducting component

Table 1. Composition and content of specified components (indicators of debt load)

No.	Indicator designation	Indicator content
1	V_1	Ratio of budget deficit to GDP, %
2	V_2	Ratio of gross external debt to GDP, %
3	V_3	Share of public debt in total external public debt, %
4	V_4	Ratio of external public debt to gross external debt, %
5	V_5	Ratio of external public debt to exports of goods and services, %
6	V_6	Ratio of gold and foreign exchange reserves to external public debt, %
7	V_7	Ratio of external debt service expenditures to Ukraine's budget revenues, %
8	V_8	Ratio of external debt service to exports of goods and services, %
9	V_9	Ratio of external debt servicing to GDP, %

analysis, the complete variation of m major attributes x_i is reallocated among the components G_j , with the variances of the components j being the eigenvalues of the correlation matrix R .

To demonstrate the phenomenon through primary groups (principal components) of the identified time series, the STATISTICA.12 software (using the Factor Analysis module) was employed to conduct component analysis. This analysis of nine debt burden indicators is detailed in Table 1.

Identifying the most significant indicators is accomplished by the Kaiser criterion. Only indicators with eigenvalues equal to or greater than "1" are considered. This means that factors that are determined by the variance equivalent to the minimum variance of one variable are taken into account. In contrast, others are not factored into further calculations or interpretation of results.

3. RESULTS AND DISCUSSION

One of the primary indicators of Ukraine's total debt status is the ratio of total public debt to gross

domestic product (GDP). By evaluating the dynamic values of this indicator, one can determine the level of debt burden on the country's economy and its capacity to repay creditors based on internal economic potential (Table 2).

Table 2 illustrates a gradual increase in the indicator value from 2014 to 2016, reaching its peak at nearly 81% in 2016. This indicator went beyond the allowed permissible limit during these years and in 2017 (71.8%), indicating a potential threat to the country's debt security. The state budget imbalance in Ukraine in various years stemmed from a rise in public spending without a commensurate boost in public revenues, the use of new loans to settle former borrowings, economic stagnation, and a decrease in revenue at all levels compared to expenses due to imbalances in the primary sectors of the economy.

The ratio of total public debt to GDP in Ukraine in 2022 peaked at 87.55%. The Russian Federation's armed aggression against Ukraine and the imperative to offer social support to the populace necessitated increased finances, causing a sizeable expansion in the state budget deficit. In 2022, the Government of Ukraine suspended the statu-

Table 2. Dynamics of individual indicators of the formation of the economic potential of Ukraine for the period 2014–2022

Source: Ministry of Finance of Ukraine (n.d.), NBU (n.d.).

Years	GDP		Budget deficit, UAH million	Public debt (total)	
	UAH million	USD million		UAH million	Relative to GDP, %
2014	1,566,728	131,805	78,052.8	1,100,564.0	70.25
2015	1,979,458	90,615	45,167.5	1,572,180.2	79.42
2016	2,383,182	93,270	70,130.2	1,929,758.7	80.97
2017	2,982,920	112,154	47,849.6	2,141,674.4	71.80
2018	3,558,706	130,832	59,247.9	2,168,627.1	60.94
2019	3,974,564	153,781	78,049.5	1,998,275.4	50.28
2020	4,194,102	155,582	217,096.1	2,551,935.6	60.85
2021	5,459,574	200,090	197,937.4	2,671,827.6	48.94
2022	5,191,028	160,872	914,701.7	4,544,869.1	87.55

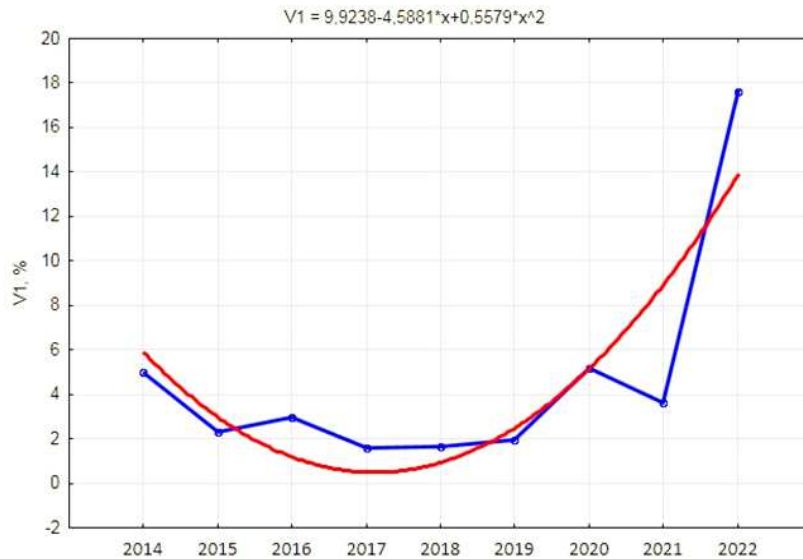


Figure 1. Time series graph of the ratio of the State Budget Deficit to the GDP of Ukraine 2014–2022, %

tory limit on the upper limit of the deficit, which was previously set at 3% of GDP. It formed a state budget with a deficit limit of UAH 1497.2 billion, equivalent to 31.7% of GDP. The government relied heavily on both internal and external borrowing as the main source of financing for the state budget. In 2022, new public borrowings reached UAH 1,309.1 billion.

A visual representation of Ukraine's state budget deficit to GDP ratio dynamics during the study period is shown in Figure 1.

As indicators of debt security, the National Bank of Ukraine calculates the ratios of the country's budget deficit and gross external debt to its GDP, as well as external public debt to gross external

debt. Table 3 shows the initial data and dynamic values of the calculation results. The indicators for the country's public debt, both total and specifically its external component, significantly worsened in the final year of the study period. This is due to a substantial increase in public spending on defense.

At the same time, the revenues of Ukraine's budget decreased due to the forced restriction of economic activity in many regions of the country, energy disruptions, and the massive outflow of working-age people abroad.

Figure 2 presents a graphical illustration of the tendency in the gross external debt to GDP ratio of Ukraine from 2014 to 2022. In 2022, Ukraine's

Table 3. Dynamics of the values of absolute and relative indicators of foreign debt of Ukraine for the period 2014–2022

Source: Ministry of Finance of Ukraine (n.d.), NBU (n.d.).

Years	Gross External Debt (GED)		External Public Debt (EPD), USD million			Share of PD in TA EPD, %	Ratio of EPD to GED, %
	USD million	in % of GDP	total amount (TA EPD)	public debt (PD)	State guarantees		
2014	126,308	95.8	38,792.2	30,809.1	7,983.1	79.4	30.7
2015	118,729	131.0	44,445.4	34,427.0	9,018.5	79.2	36.6
2016	113,518	121.7	45,604.6	36,048.3	9,556.3	79.0	40.2
2017	116,578	103.9	48,989.4	38,490.1	10,499.3	78.6	42.0
2018	114,710	87.7	50,462.5	39,706.6	10,755.8	78.7	44.0
2019	121,739	79.2	48,940.8	39,342.5	9,598.3	80.4	40.2
2020	125,690	80.8	53,720.8	44,510.7	9,210.1	82.9	42.7
2021	129,711	64.8	57,197.0	47,654.7	9,542.3	83.3	44.1
2022	131,998	82.1	71,398.6	63,590.9	7,807.7	89.1	54.1

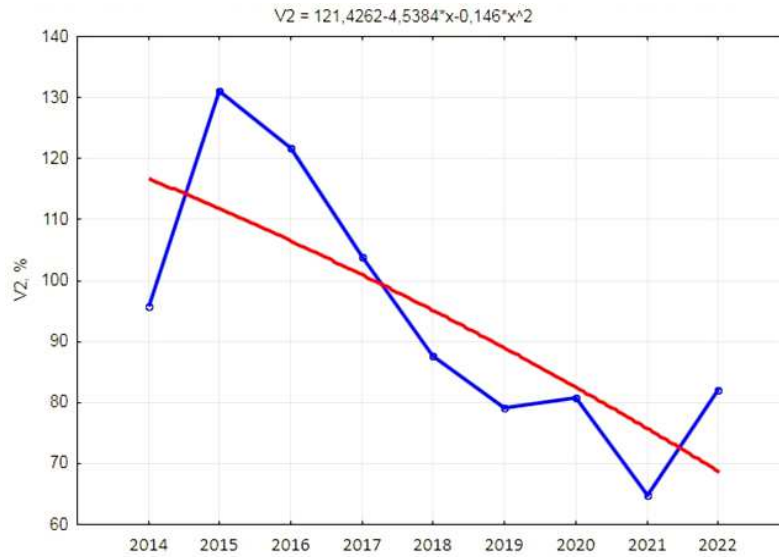


Figure 2. Time series graph of the ratio of Gross External Debt to GDP of Ukraine 2014–2022, %

total public and guaranteed public debts surged by 52.4%, rising from UAH 2.7 trillion to UAH 4.1 trillion compared to 2021 figures. Meanwhile, Ukraine’s real GDP contracted by UAH 0.5 trillion (–11.4%) in 2022, with nominal GDP declining by UAH 0.3 trillion (–5%). The difference between real and nominal GDP as a percentage almost matched the 2015 level (–27.7%), standing at 25.5% (or –1.3 trillion UAH). Consequently, this trend is expected to continue as the requirement for debt financing is set to persist throughout 2023.

In turn, Figures 3 and 4 showcase the dynamics of the proportion of Ukraine’s public external debt in its total and gross external debt from 2014 to 2022.

Table 4 highlights the external debt-to-exports ratio, a critical indicator of debt security that assesses a country’s ability to repay its foreign debt using earnings from goods and services.

In most years during the study period, the ratio of public external debt to exports of goods and services exceeded the maximum allowable limit, ranging from 5.3% (2018) to 45.2% (2022). Figure 5 displays the trends in this indicator.

The analysis of value dynamics indicates that Ukraine’s solvency has been consistently improving in recent years, with indicator values fluctuating between 70-90%.

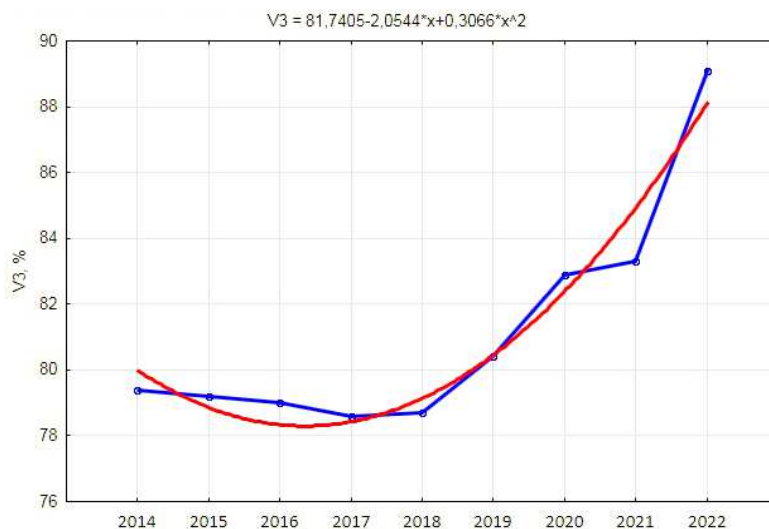


Figure 3. Dynamics of the Specific Weight of the State Foreign Debt in the Total Foreign Debt of Ukraine 2014–2022, %

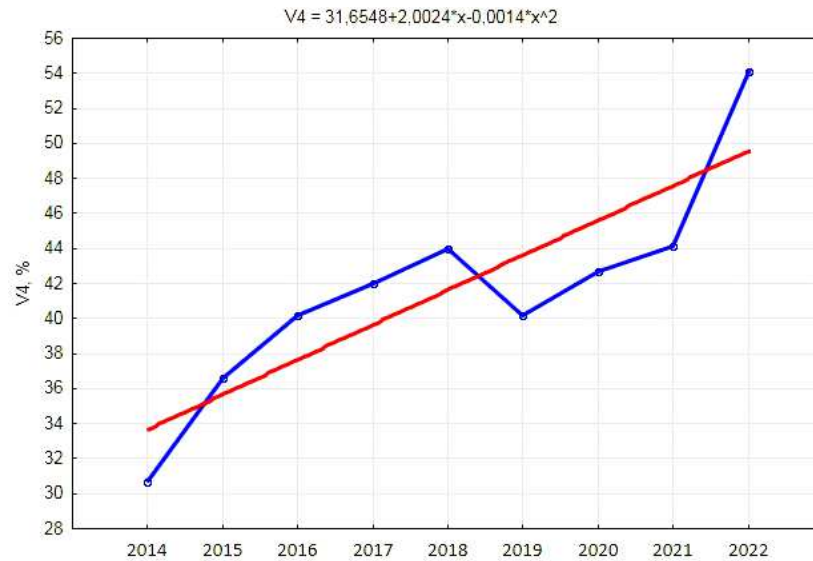


Figure 4. Time series graph of the ratio of External Public Debt to Gross External Debt of Ukraine 2014–2022, %

Table 4. Dynamics of indicators of the security of Ukraine's foreign debt with foreign revenues and reserves for the period 2014–2022

Source: Ministry of Finance of Ukraine (n.d.), NBU (n.d.).

Years	Export of goods and services (EGS)			Foreign exchange reserves (FER)	
	USD million	UAH million	ratio of EPD to EGS, %	USD million	FER to EPD, %
2014	65436	778688.4	59.3	7533	19.4
2015	47862	1043391.6	92.9	13300	30.6
2016	46008	1177804.8	99.1	15539	34.1
2017	53944	1434910.4	90.8	18808	38.4
2018	59177	1609614.4	85.3	20820	41.3
2019	63556	1639744.8	77.0	25302	51.7
2020	60707	1639089	88.5	29133	54.2
2021	81504	2225059.2	70.2	30941	54.1
2022	57018	1841681.4	125.2	28494	39.9

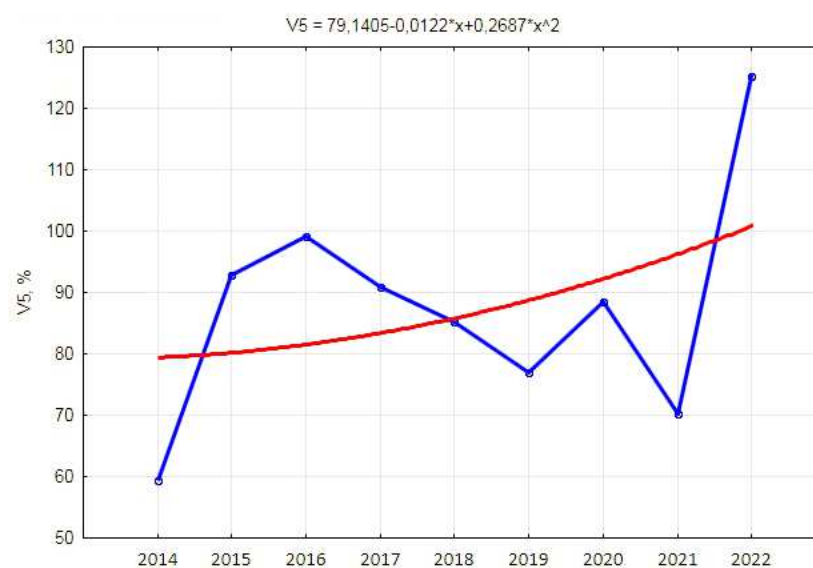


Figure 5. Time series graph of the ratio of External Public Debt of Ukraine to Exports of Goods and Services 2014–2022, %

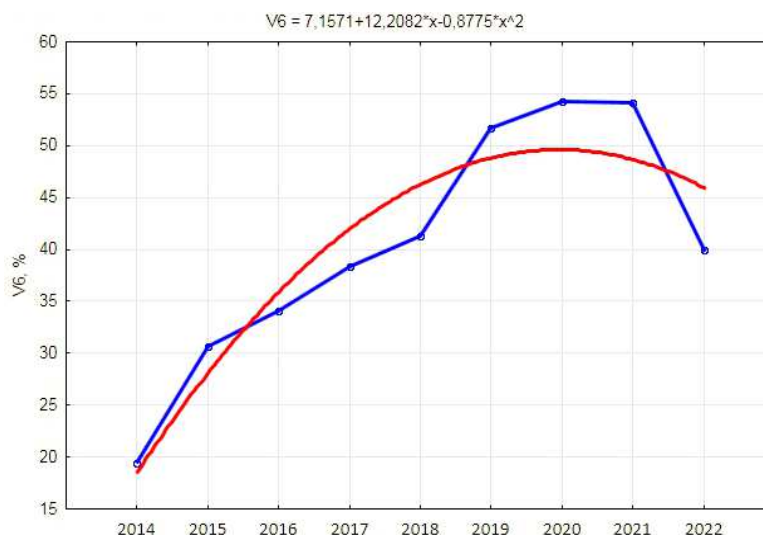


Figure 6. Time series graph of the ratio of Gold and Foreign Exchange Reserves to the External Public Debt of Ukraine 2014–2022, %

The sharp increase in external public debt and its relative value in 2015 can be attributed to several factors. These include the devaluation of the national currency, the ongoing military conflict in the East of Ukraine since 2014, required social payments by the state, meeting the populace's needs for natural gas and electricity, pension payments, and increased defense spending. The servicing of accumulated debt also played a role. The indicator in 2022 increased significantly, reaching more than 125%, due to various factors.

Figure 6 displays the time series graph that shows the ratio of Ukraine's foreign exchange reserves to its external debt.

In the assessment of Ukraine's external debt burden, analyzing the ratio of repayment and servicing costs in relation to GDP, state budget revenues,

and exports of goods and services is crucial. Table 5 presents the ratios for the period 2014–2022.

Table 5 reveals that the ratio of external debt repayment and servicing payments to GDP reflects the cost of national borrowing. The 5% threshold is widely accepted as the indicator's critical level. Throughout the study period, the computed indicator surpassed the critical threshold significantly on one occasion, in 2015, more than three times. The reasons for this were the fulfillment of Ukraine's debt obligations and the reduction of GDP (in dollar terms) by over one-third compared to the previous year, 2014. Figure 7 displays the graphical trends in the indicator's behavior.

The external debt service payments to exports of goods and services ratio enables the determination of the percentage of export revenues that are

Table 5. Dynamics of foreign debt service indicators of Ukraine for the period 2014–2022

Source: Ministry of Finance of Ukraine (n.d.), NBU (n.d.).

Years	External debt service costs, UAH million	The ratio of Ukraine's external debt service costs to		
		state budget revenues, %	volume of exports of goods and services, %	GDP of Ukraine, %
2014	52,775.8	11.6	6.8	3.4
2015	325,421.7	61.22	31.2	16.4
2016	9,036.7	1.5	0.8	0.4
2017	66,472.6	8.4	4.6	2.2
2018	41,730.6	4.5	2.6	1.2
2019	83,799.9	8.5	5.1	2.1
2020	145,600.0	13.7	8.9	3.5
2021	97,600.0	7.5	4.4	1.8
2022	46,600.0	2.6	2.5	0.9

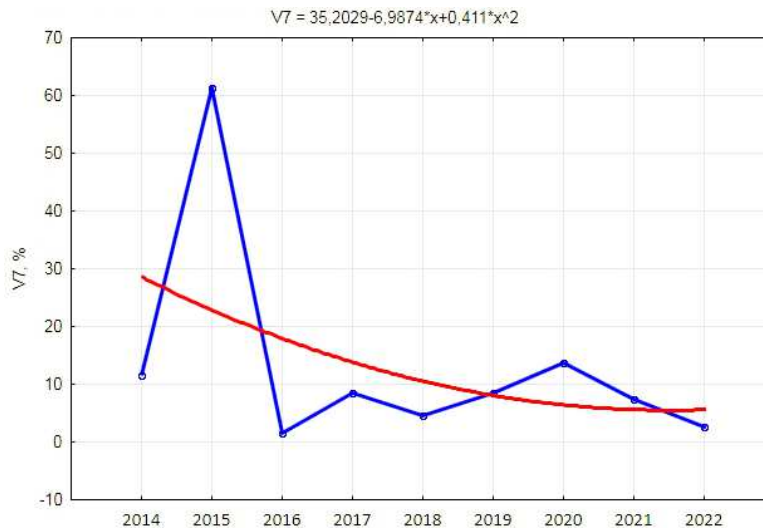


Figure 7. Time series graph of the ratio of external debt servicing costs to revenues of the State Budget of Ukraine 2014–2022, %

allocated to external debt repayment and servicing. It characterizes Ukraine's debt capacity. In 2015, this indicator had a value of 31.2%, surpassing the 30% threshold. The increase in external debt service costs and the significant reduction of exports of goods and services in dollar terms contributed to this outcome. Figure 8 indicates a trend similar to the dynamic level of the previous factor.

According to the national methodology for calculating economic security levels, the critical threshold for the ratio of external debt service payments to state budget revenues is 20%. The most challenging year during the study period was 2015, with the

indicator value being three times higher than the threshold. This increase highlights the significant burden on the country's budget. Figure 9 presents the indicator's dynamics over the analyzed years.

Thus, a comprehensive analysis of Ukraine's external debt burden security, which comprises various indicators, should be conducted through a combination of its main groups (principal components) while minimizing information loss. Table 6 displays the overall factor component matrix. Component analysis was performed using STATISTICA 12 software on the nine external debt burden indicators.

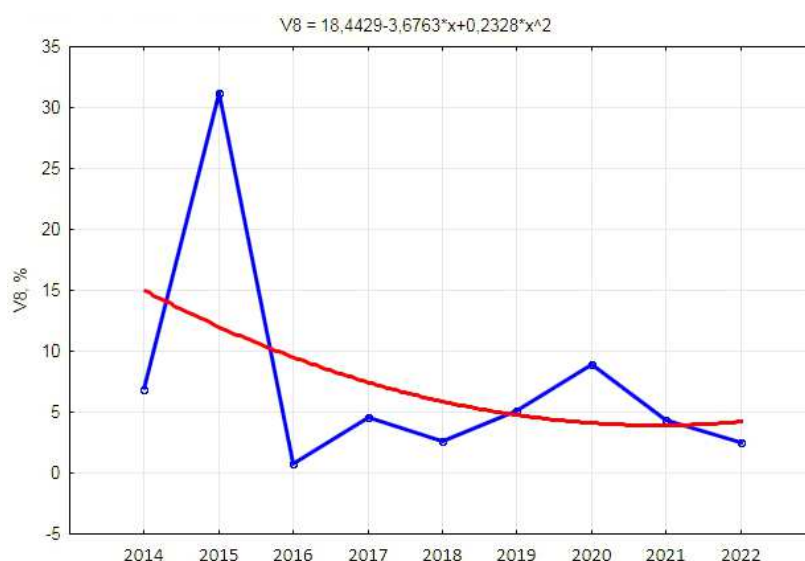


Figure 8. Time series graph of the ratio of the Costs of Servicing the External Debt of Ukraine to the Export of Goods and Services 2014–2022, %

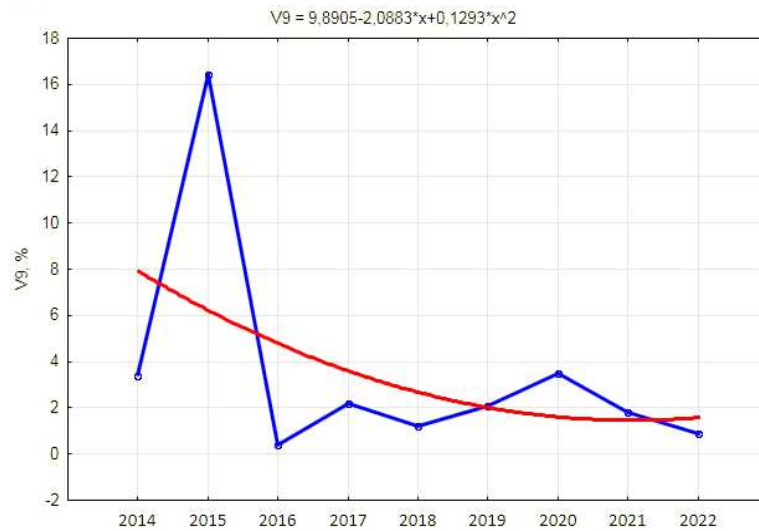


Figure 9. Time series graph of the ratio of External Debt Servicing Costs to Ukraine’s GDP 2014–2022, %

The correlation matrix presented in Table 7 displays the levels of correlation between the selected indicators. It is worth noting that there are correlation coefficients ranging from moderate to strong (correlation coefficient exceeding 0.5), as well as weak correlations (correlation coefficient near “0”). Values close to “1” indicate a robust relationship between indicators.

The principal components method states that the number of factors that can be extracted is no greater than the number of variables. Each factor represents the variance explained by the factor and is referred to as its eigenvalue. Figure 10 shows the components’ factor loadings and contributions to the overall variance.

Table 6. Output matrix for factor analysis

Variable	V1	V2	V3	V4	V5	V6	V7	V8	V9
2014	5.0	95.8	79.4	30.7	59.3	19.4	11.6	6.8	3.4
2015	2.3	131.0	79.2	36.6	92.9	30.6	61.2	31.2	16.4
2016	2.9	121.7	79.0	40.2	99.1	34.1	1.5	0.8	0.4
2017	1.6	103.9	78.6	42.0	90.8	38.4	8.4	4.6	2.2
2018	1.7	87.7	78.7	44.0	85.3	41.3	4.5	2.6	1.2
2019	2.0	79.2	80.4	40.2	77.0	51.7	8.5	5.1	2.1
2020	5.2	80.8	82.9	42.7	88.5	54.2	13.7	8.9	3.5
2021	3.6	64.8	83.3	44.1	70.2	54.1	7.5	4.4	1.8
2022	17.6	82.1	89.1	54.1	125.2	39.9	2.6	2.5	0.9

Table 7. Correlation matrix of debt load indicators

Variable	Correlations matrix								
	V1	V2	V3	V4	V5	V6	V7	V8	V9
V1	1.000	-0.275	0.909	0.654	0.648	-0.028	-0.232	-0.204	-0.214
V2	-0.275	1.000	-0.531	-0.436	0.223	-0.673	0.575	0.544	0.585
V3	0.909	-0.531	1.000	0.762	0.547	0.352	-0.244	-0.209	-0.240
V4	0.654	-0.436	0.762	1.000	0.746	0.537	-0.397	-0.386	-0.402
V5	0.648	0.223	0.547	0.746	1.000	0.055	-0.029	-0.027	-0.023
V6	-0.028	-0.673	0.352	0.537	0.055	1.000	-0.280	-0.257	-0.309
V7	-0.232	0.575	-0.244	-0.397	-0.029	-0.280	1.000	0.998	0.999
V8	-0.204	0.544	-0.209	-0.386	-0.027	-0.257	0.998	1.000	0.997
V9	-0.214	0.585	-0.240	-0.402	-0.023	-0.309	0.999	0.997	1.000

Note: Marked correlations are significant at $p < .05000$. $N = 9$ – Casewise deletion of missing data.

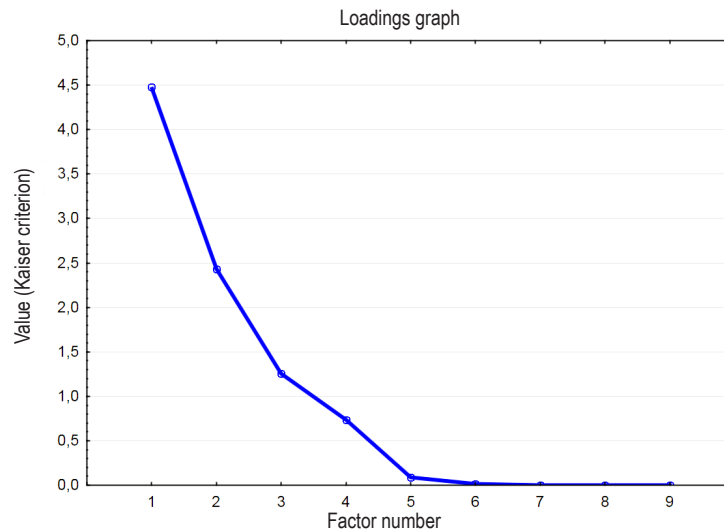


Figure 10. Factor loadings of components (according to the Kaiser criterion)

According to Kaiser's criterion, significant components are those for which the criterion value is greater than 1. In this model, three principal components are identified. The eigenvalue of the first component is 4.48, and it explains 50% of the variance. The second component has an eigenvalue of 2.43, explaining 27% of the variance. The third component has an eigenvalue of 1.24, and it explains 14% of the variance (Table 8).

The final column displays the cumulative percentage of variance, indicating that the principal components account for 90.7% of the variation in the attributes and demonstrating a substantial level of factorization in the model.

Table 9-10 exhibit the factor loadings for the principal components, both before rotation (Unrotated) and after rotation utilizing the Biquartimax normalized procedure.

Table 8. Dispersions and contributions of the main components to the total variance

Value	Extraction: Principal components			
	Eigenvalue	% Total variance	Cumulative Eigenvalue	Cumulative, %
1	4.480811	49.78679	4.480811	49.78679
2	2.428593	26.98437	6.909404	76.77116
3	1.254739	13.94154	8.164143	90.71270

Table 9. Factor loads of the main components, unrotated

Variable	Factor Loadings		
	Extraction: Principal components		
	Factor 1	Factor 2	Factor 3
V1	0.615847	-0.648725	0.219986
V2	-0.734756	-0.287742	0.507296
V3	0.724268	-0.579891	-0.160010
V4	0.805736	-0.464914	-0.100274
V5	0.380643	-0.772485	0.296206
V6	0.537153	0.099701	-0.746346
V7	-0.813035	-0.497616	-0.298570
V8	-0.793086	-0.511263	-0.324086
V9	-0.815150	-0.506803	-0.272745
Expl.Var	4.480811	2.428593	1.254739
Prp.Totl	0.497868	0.269844	0.139415

Note: Marked loadings are > .700000.

Table 10. Factor loads of the main components after rotation

Variable	Factor Loadings (Biquartimax normalized)		
	Extraction: Principal components		
	Factor 1	Factor 2	Factor 3
V1	0.143725	-0.909716	0.016272
V2	-0.462719	0.110897	0.808458
V3	0.098061	-0.856414	-0.378658
V4	0.246811	-0.820472	-0.375926
V5	-0.059308	-0.885924	0.202440
V6	0.114856	-0.110208	-0.911135
V7	-0.980537	0.115541	0.151619
V8	-0.985427	0.097173	0.122056
V9	-0.976408	0.105279	0.176788
Expl.Var	3.207899	3.077384	1.878860
Prp.Totl	0.356433	0.341932	0.208762

Note: Marked loadings are > .700000.

The tables and figures' lower rows display the eigenvalues of the three components and each component's contribution to the total variance. Color highlights high factor loadings.

According to the initial factor loadings, the components have varying interpretations since they each load a different set of attributes. The biquartimax method aims to maximize the sum of the variances of the squared initial factor loadings by both factor and variable concurrently while normalizing factor loadings. After rotation, the values of the factor loadings change, but the total contribution remains unchanged by the rotation procedure.

Therefore, Factor 1, also known as the first component, loads the attributes V7-V9 and is characterized by the level of coverage of a country's external public debt service. On the other hand, Factor 2, known as the second component, loads the attributes V1 and V3-V5 and is primarily responsible for the amount of public debt owed to external creditors. Accordingly, Factor 3 characterizes the significance of the remaining attributes – V2 and V6. This factor is responsible for Ukraine's ability to fulfill its external debt obligations using its GDP and reserve assets (gold and foreign exchange reserves). The loads on the components do not overlap.

The factor loadings of the model indicate that the debt situation deteriorates as the debt burden and solvency indicators increase, approaching the maximum allowable limits. Therefore, to guar-

antee an effective debt policy, it is crucial to decrease the considered debt indicators to safe limits and closely monitor their values in subsequent periods. The payment amount owed on Ukraine's foreign debt impacts its balance of trade, potentially putting pressure on the national currency. Additionally, unfavorable and sudden changes in the exchange rate can result in unregulated price increases, contributing to a significant imbalance in the public sector and further increasing public debt.

A notable rise in both overall public debt and its external component commenced in 2014. This was prompted by the eruption of active hostilities that occurred directly within Ukraine and necessitated a surge in public finance expenditures to address the nation's defense requirements. Structural changes in certain economic and social sectors, which were part of the reform and decentralization of power, did not significantly contribute to the rapid impact and projected revenue generation for the state budget through taxes and fees. From 2014 to 2021, Ukraine's debt dependence increased by 4.6 times. This has caused the country to enter a "debt spiral" (Sochka, 2022). Because of this, the government is compelled to resort to systematic refinancing, attempting to meet previous debt obligations with new loans while underfunding structural reform programs and investment projects. In 2022, the situation of external public debt significantly worsened due to a reduction in domestic revenue resulting from economic activity restrictions in a large portion of the country, as well as energy supply issues and mass migration

of the working population abroad, alongside military mobilization.

Study results confirm the findings of Reinhart and Rogoff (2009) that the utilization of credit resources is a primary driver of economic growth both at the micro- and macro- levels. Business entities are increasingly turning to borrowing to expand or modernize their operations. Additionally, regional and state governments often maintain financial equilibrium between revenue and expenditure components of their budgets by taking loans, including from external lenders.

As Petrushenko et al. (2022) substantiated, public borrowing is a crucial aspect of the financial systems of many countries facing a deficit of financial resources. Nevertheless, an unwarranted spike in debt destabilizes a nation's economy and threatens its economic security. The quantity, pace, and arrangement of public borrowing directly or indirectly impact the complete socio-economic soundness of a nation. For Ukraine, analyzing the

structure of public debt, determining the optimal amount for safety, and evaluating the efficiency of the debt service mechanism are vital in managing financial security.

Russia's military aggression has had a profound impact on the world economy. Due to considerable production destruction, disturbances in logistics, and the undermining of social potential, the country has faced the objective problem of imbalanced public finances. The state budget deficit has steadily grown from 2014 to 2022, and it has now reached a point where it is indisputably necessary to seek assistance from external sources, primarily from the financial support provided by international organizations and foreign partner governments. As a result of Ukraine's active internal restructuring and external stressful events over almost a decade, its public debt has grown to a scale that raises the issue of optimizing its level and the problem of scientifically substantiating external public debt management mechanisms amidst economic instability and military operations.

CONCLUSION

The paper aims to assess the impact of external public debt on Ukraine's economy from 2014 to 2022, a period that includes the Crimea annexation, the onset of the COVID-19 pandemic, and the beginning of the Russian military aggression.

A statistical analysis of Ukraine's debt dynamics from 2014 to 2022 reveals that public debt increased at a rapid pace, causing inflation to rise, the balance of payments to weaken, a decrease in production and private investment, and a reduction in foreign exchange reserves. The primary drivers of Ukraine's unsustainable debt position are chronic deficits in the state budget and imprudent borrowing practices. The most objective country-specific factors are an uptick in government spending on military purposes, a drop in production, a decrease in GDP, a significant surge in inflation (particularly during 2014–2015), a reduction in production capacity, and a decline in the production of export-oriented goods.

In order to decrease the current and enhance the future debt burden, Ukraine should seek alternative forms and methods of collaboration with foreign creditors, including international financial organizations, advanced country governments, and private investors, and employ unconventional financial and credit arrangements on the interstate level.

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