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THE PUBLIC DEBT OF UKRAINE: A NEW DIMENSION OF DYNAMICS AND ARCHITECTURE OF THE MODEL FRAMEWORK OF THE MANAGEMENT SYSTEM

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Abstract. The article typifies the fiscal directions of public debt management in Ukraine in the conditions of the new economic normality and financial uncertainty caused by the Russian-Ukrainian war and other macroeconomic shocks. The accelerators of these shocks were the Ukrainian peace formula, the policy of adapting the national economic system to wartime conditions, and the triggers of post-war recovery, including those announced by the President of Ukraine, such as humanitarian demining, the reconstruction of energy facilities, and financial inclusion. The study is based on the author's adjustment model for assessing debt dynamics, which is widely used by the IMF, taking into account national specificities. The *purpose* of the work is to provide a long-term assessment (up to 2029) of fiscal stability, taking into account the invariance of macroeconomic factors and forecasts - GDP growth rates, inflation, exchange rate and debt structure. To this end, two target levels of public debt have been used in the study: 82% of GDP (according to IMF forecasts) and 60% of GDP (according to the Maastricht Treaty). The *research methodology* is based on the application of two empirical methods to assess debt dynamics: through debt issuance and financing needs. A ten-year statistical series (2015-2024) was used to construct scenarios for the evolution of debt dynamics, taking into account likely macroeconomic shocks. The modelling was grounded in the following variables: primary budget balance, effective interest rate, economic growth rate and exchange rate. Fan charts were employed to illustrate the risks and demonstrate the probability of reaching certain debt levels, depending on the invariance of the level of macroeconomic uncertainty. The *findings* of the study suggest that in order to attain the targeted public debt level of 82% of GDP, it is imperative to ensure an annual primary budget surplus amounting to 1.38% of GDP during the 2025–2029 period. To achieve a more ambitious goal involving a 60% of GDP target, it is necessary to establish conditions conducive to an annual surplus amounting to 2.43% of GDP. Utilising the aforementioned scenarios and macroeconomic shocks as a foundation, the article demonstrates that in the absence of fiscal correction measures, the public debt will surpass 100% of GDP by 2029. The principal risk factors identified in the study are as follows: low rates of economic growth, a high level of dependence on foreign aid, demographic challenges and high costs for meeting the needs of the security and defence forces. Empirical evidence has demonstrated that the exchange rate and the real interest rate are the predominant factors influencing debt dynamics, thereby exacerbating the debt burden. The *conclusions* emphasise the necessity to approximate the optimal practices of fiscal consolidation and to implement measures, including those envisaged by the National Revenue Strategy until 2030, in order to increase the revenues of the state budget of Ukraine. In addition, the introduction of a progressive scale of taxation on high incomes is justified and recommended, as are increased tax rates on real estate, rent, and natural resources, as well as increased excise taxes on tobacco, alcohol, and fuel. Furthermore, it emphasises the necessity of a gradual reduction in public expenditures, particularly in the post-war period. The purpose of this article is to provide a systematic overview of the international experience of countries recovering from conflicts. It is argued that in order to ensure the stability of public finances, it is necessary to reduce expenditure on security and defence forces, and on the public sector of the economy. In this context, it is assumed

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that one of the conditions for the successful implementation of the fiscal correction is the completion of the active phase of the war by the end of 2025 and the consideration of additional caveats regarding the maintenance of a high debt burden in the short, medium and probably the long term perspective due to significant budgetary costs for reconstruction of infrastructure, social protection and economic development. Taking into account the new economic normality and the likely risks (threats), the authors propose to revise the macroeconomic forecasts and to develop additional scenarios for fiscal risk management, including during the preparation of public debt management programmes for 2025-2029.

Keywords: public debt, primary balance, fiscal adjustment path, uncertainty, debt dynamics tool.

JEL Classification: E62, H3, H63, J1

1. Introduction

The COVID-19 pandemic is one of the recent events that have caused a significant deterioration in macro-financial and fiscal indicators worldwide. The pandemic led to an economic recession and an increase in public debt due to the implementation of discretionary fiscal measures to support consumer demand and vulnerable populations. The consolidated budget deficit in the EU countries increased from a historical low of 0.5% of GDP in 2019 to 7% of GDP in 2020. At the same time, fiscal indicators in EU countries were expected to improve in the near future. Forecasts by the European Commission predicted a reduction in the aggregate EU government deficit to 4.6% of GDP in 2021 (Directorate-General for Economic and Financial Affairs, 2023).

In Ukraine, gross public debt was 50.6% of GDP in 2019, increased to 60.5% of GDP in 2020, and declined to 50.5% of GDP in 2021.

The initial positive forecasts for economic growth and fiscal sustainability were rendered invalid with the onset of war on the European continent. The Russian invasion of Ukraine in February 2022 constituted a second major shock within two years, resulting in an economic downturn. This shock led to an increase in gross public debt in Ukraine to 77.7% of GDP in 2022 and 82.3% of GDP in 2023.

The modern world is experiencing slowing economic growth and trade, a significant increase in inflationary pressures, debt sustainability challenges and rising interest rates, as well as energy and food crises and escalating geopolitical tensions. The war has put additional pressure on the budgets of European countries hosting refugees from Ukraine and exacerbated the risk of a worsening of Ukraine's demographic problems. An additional destabilising factor for national fiscal systems is the need to ensure energy independence from Russian energy resources, which requires substantial government investment in new energy projects.

The emergence of financial and economic shocks requires the revision of regional and national macroeconomic and budgetary projections that form the basis of fiscal sustainability assessments. The tools for assessing the sustainability of public finance systems remain relevant under conditions of financial and economic instability. However, the more atypical and rare the conditions that trigger a crisis, the more difficult it is to predict its impact on the macro-financial and budgetary environment. Assessments of debt-stabilising fiscal paths during crises are significantly less precise than those made during the post-crisis recovery, when actual data on the economic downturn, the impact of government borrowing and fiscal decisions are finally available.

Over the last two decades, research on the theoretical and methodological foundations of ensuring the sustainability of public finances has intensified. The works of J. Horne (1991) and A. Blanchard (1990) are considered fundamental in this field, offering a general concept of fiscal sustainability and different approaches to its assessment.

In 2004, IMF specialists developed a methodology for assessing debt sustainability (sovereign debt sustainability) (International Monetary Fund and International Development Association, 2004). This methodology underwent further refinement in 2012 and 2017, enhancing its applicability in low-income countries (The Joint World Bank, 2012; International Monetary Fund, 2017).

In Ukraine, the methodology employed by the IMF for assessing debt sustainability has been examined in the works of R. Balakin (2012), T. Bohdan (2014), T. Iefymenko (2012), S. Yerokhina (2014), S. Gasanov (2012), K. Klymenko (2024), O. Karapetian (2008), V. Kudrjashov (2012), and S. Marchenko (2022). The IMF's assessment tools focus on the size and structure of public debt, setting conditions that allow governments to meet their debt repayment, servicing, and refinancing obligations. This approach facilitates the assessment of public debt sustainability by analysing the current debt position and outlining medium- and long-term debt use.

In order to provide support for debt-stabilising fiscal adjustments in Ukraine, the Debt-Dynamics Tool (DDT) is utilised, a tool developed by the IMF.

The DDT is utilised for the following purposes: firstly, to predict the size of public debt in the short and medium term and to identify key factors influencing

changes in public debt; secondly, to assess the magnitude of fiscal adjustments required to achieve specific public debt targets.

Debt projections are made using two equivalent methodologies: the net debt issuance approach and the borrowing requirement approach. These methodologies require the definition of the stock of government debt, debt issuance, amortisation payments, gross financing needs, the general government balance and other net debt-creating flows. The relationships between these components are analysed in order to understand the dynamics of government debt over time.

Gross debt refers to the total value of all outstanding gross financial liabilities of general government at a given date, such as the last day of a financial year. Debt issuance, including the sale of government bonds and loan disbursements by local banks or international financial institutions, increases the debt stock between two dates. Conversely, amortisation or principal repayments reduce the debt stock by meeting borrowing obligations.

The debt stock at the end of period *t-1*, along with projected issuances and amortisations during period *t*, provides the basis for projecting the debt stock at the end of period *t*:

$$\text{Debt}_{(t)} = \text{Debt}_{(t-1)} + \text{Issuances}_{(t)} - \text{Amortizations}_{(t)}, \quad (1)$$

where $\text{Debt}_{(t)}$ is the public debt at the end of period *t*; $\text{Debt}_{(t-1)}$ is the public debt at the end of period *t-1*; $\text{Issuances}_{(t)}$ is the debt issuances during period *t* that increase the debt stock at the end of period *t*; $\text{Amortizations}_{(t)}$ is the amount of amortisation payments or principal payments made in period *t*.

Equation *(1)* shows the evolution of the government debt stock, which is influenced by government debt management decisions, including the issuance of new debt and the amortisation of existing debt, reflecting past debt management decisions.

The dynamics of public debt can be assessed using the government's borrowing needs approach. The equation below shows the government's gross financing needs:

$$\text{Gross Financing Needs}_{(t)} =$$

$$= \text{Amortizations}_{(t)} - \text{Overall Balance}_{(t)} =$$

$$= \text{Amortizations}_{(t)} - \left(\text{Revenues}_{(t)} - \text{Expenditures}_{(t)}\right), \quad (2)$$

where $\text{Revenues}_{(t)}$ is the general government total revenues; $\text{Expenditures}_{(t)}$ is the general government total expenditures.

Debt issuance is defined as the amount used by the government to meet both gross financing needs and other net debt-creating flows, such as asset purchases:

$$\text{Issuances}_{(t)} = \text{Gross Financing Needs}_{(t)} + \text{Other Flows}_{(t)}, \quad (3)$$

where $\text{Other Flows}_{(t)}$ is other net debt-creating flows, that arise from diverse transactions that are not accounted as budget expenditures (e.g., the government may borrow to finance the net acquisition of assets).

The net acquisition of assets has the potential to be expressed as a negative amount. When the government sells liquid assets in order to meet its financing needs, this is reflected as negative other flows. Similarly, debt relief received by the government is also recorded as negative other flows. Conversely, government debt may increase due to the recognition of contingent liabilities, which results in positive other flows.

Using the projections of the government's borrowing needs in period *t* (equation *(2)*) and the government's debt issuances (equation *(2)*), it is possible to project the debt level at the conclusion of period *t*. To this end, equation *(1)* should be rewritten as follows:

$$\text{Debt}_{(t)} = \text{Debt}_{(t-1)} - \text{Overall Balance}_{(t)} + \text{Other Flows}_{(t)}, \quad (4)$$

Equation *(4)* establishes the relationship between the evolution of the public debt stock, government financing policies (reflected in other net debt-creating flows), and fiscal policy (represented by the overall budget balance). It is noteworthy that the approaches employed for projecting public debt in Equations *(1)* and *(4)* are equivalent.

Definitions of the key concepts employed in this study are commonly utilised in debt dynamics research, yet they are not universally accepted. For instance, the current Government Finance Statistics Manual (De Clerck & Wickens, 2015) employs the concept of net lending-borrowing requirements as opposed to the overall budget balance. One potential alternative to the inclusion of transactions related to the use or buildup of assets and the recognition of contingent liabilities in the definition of other flows would be the incorporation of these elements into gross financing needs.

The currency denomination of government debt is crucial for projecting debt dynamics. Public debt often includes foreign currency liabilities, which means that exchange rate fluctuations affect debt projections. The foreign currency debt stock is converted into national currency using the exchange rate at the end of the period, while the foreign currency debt flows (issues and repayments) are converted using the average exchange rate. The average exchange rate is the average of the daily exchange rates over the period in which the flow variable is measured.

Changes in exchange rates between any two dates may alter the local currency value of government debt, even if the underlying amounts of foreign and local currency debt remain unchanged. This phenomenon is known as the valuation effect. Debt projections based on either the net debt-issuances approach or the borrowing-requirements approach need to take account of the valuation effect:

$$\text{Valuation Effect}_{(t)} = \text{Foreign currency Debt}_{(t-1)} \cdot$$

$$\cdot \left(\text{Exchange Rate}_{(t,eop)} - \text{Exchange Rate}_{(t-1,eop)}\right), \quad (5)$$

where $\text{Foreign currency Debt}_{(t-1)}$ is the amount of the public debt denominated in foreign currency at the end of period *t-1*; $\text{Exchange Rate}_{(t,\,eop)}$ is the end-of-period exchange rate in period *t*; $\text{Exchange Rate}_{(t-1,\,eop)}$ is the end-of-period exchange rate in period *t-1*.

If the government issues net debt in foreign currency and there is a difference between the average exchange rate and the end-of-period exchange rate, the debt projection derived from the net debt issuance or borrowing needs method should include not only the effect of valuation but also adjustments to the flow of stocks due to intra-period exchange rate fluctuations:

$$\text{Stock Flow Adjustment}_{(t)} = \\ = \left(\text{Foreign currency Issuances}_{(t)} - \text{Foreign currency Amortsations}_{(t)}\right) \cdot \\ \left(\text{Exchange Rate}_{(t,\,eop)} - \text{Exchange Rate}_{(t,\,avg)}\right) \quad (6)$$

or

$$\text{Stock Flow Adjustment}_{(t)} = \\ \left(\text{Foreign currency Debt}_{(t)} - \text{Foreign currency Debt}_{(t-1)}\right) \cdot \\ \left(\text{Exchange Rate}_{(t,\,eop)} - \text{Exchange Rate}_{(t,\,avg)}\right) \quad (7)$$

Therefore:

$$\text{Debt}_{(t)} = \text{Debt}_{(t-1)} + \text{Issuances}_{(t)} - \text{Amortisations}_{(t)} + \\ + \text{Valuation Effect}_{(t)} + \text{Stock Flow Adjustment}_{(t)} \quad (8)$$

or

$$\text{Debt}_{(t)} = \text{Debt}_{(t-1)} - \text{Overall Balance}_{(t)} + \\ + \text{Other Flows}_{(t)} + \text{Valuation Effect}_{(t)} + \\ + \text{Stock Flow Adjustment}_{(t)} \quad (9)$$

The primary balance is often used for debt projections. Unlike the overall balance, the primary balance excludes interest payments from expenditure. Interest payments are determined by the size of the government's debt stock, which represents funds borrowed in the past, and the interest rates the government has to pay on its various debt instruments.

The debt dynamics equation *(9)* can be recast using the primary balance and the interest expense:

$$\text{Debt}_{(t)} = \text{Debt}_{(t-1)} - \text{Primary Balance}_{(t)} + \\ + \text{Interest Expense}_{(t)} + \text{Other Flows} + _{(t)} \\ + \text{Valuation Effect}_{(t)} + \text{Stock Flow Adjustment}_{(t)} \quad (10)$$

For each currency in which the public debt is denominated, the effective interest rate is defined as interest expense for the year divided by the amount of public debt at the end of the previous year. Accordingly, interest expense is calculated as the product of the effective interest rate and the amount of public debt at the end of the previous year:

$$\text{Interest Expense}_{(t)} = \text{Local Currency Debt}_{(t-1)} \cdot \\ \cdot \text{Interest Rate on Local Currency Debt}_{(t)} + \\ + \text{Foreign Currency Debt}_{(t-1)} \cdot \\ \cdot \text{Interest Rate on Foreign Currency Debt}_{(t)} \cdot \\ \cdot \text{Exchange Rate}_{(t,\,avg)} \quad (11)$$

It is also necessary to consider the share of foreign-currency debt (hereinafter – FCD) and local-currency debt (hereinafter – LCD) in debt dynamics equations. The stock of public debt can be expressed as follows:

$$\text{Debt}_{(t)} = \text{ShareLCD}_{(t)} \cdot \text{Debt}_{(t)} + \text{ShareFCD}_{(t)} \cdot \text{Debt}_{(t)}, \quad (12)$$

$$\text{ShareFCD}_{(t)} = \frac{\text{Foreign Currency Debt}_{(t)} \cdot \text{Exchange Rate}_{(t,eop)}}{\text{Debt}_{(t)}}$$

$$\text{ShareLCD}_{(t)} = \frac{\text{Local Currency Debt}_{(t)}}{\text{Debt}_{(t)}} = 1 - \text{ShareFCD}_{(t)}$$

To project the public debt stock, it's important to know how Debt*(t)* depends on Debt*(t-1)*, where *t* is the first year of projection and *t-1* is the last year for which the debt level is known. Through the application of algebraic manipulation, as outlined in the DDT Technical Note and Manual (Ormaechea, Martinez, 2021), it is possible to re-write the debt dynamics equation, thereby expressing Debt*(t)* as a function of Debt*(t-1)*.

$$\text{Debt}_{(t)} = \frac{\text{Debt}_{(t-1)} \text{-Primary Balance}_{(t)}}{1\text{-K1}_{(t)}} + \\ + \frac{\text{Interest Expense}_{(t)} + \text{Other Flows}_{(t)}}{1\text{-K1}_{(t)}} + \\ + \frac{\text{Valuation Effect}_{(t)} \text{-Debt}_{(t-1)} \cdot \text{K2}_{(t)}}{1\text{-K1}_{(t)}} \quad (13)$$

$$\text{K1}_{(t)} = \frac{\text{ShareFCD}_{(t)} \cdot \left(\text{Exchange Rate}_{(t,\,eop)} - \text{Exchange Rate}_{(t,\,avg)}\right)}{\text{Exchange Rate}_{(t,\,eop)}}$$

$$\text{K2}_{(t)} = \frac{\text{ShareFCD}_{(t-1)} \cdot \left(\text{Exchange Rate}_{(t,\,eop)} - \text{Exchange Rate}_{(t,\,avg)}\right)}{\text{Exchange Rate}_{(t-1,\,eop)}},$$

where K1*(t)* and K2*(t)* are coefficients for stock-flow adjustments due to intra-year exchange rate fluctuations. Without intra-year exchange rate fluctuations these coefficients are zero (Exchange Rate *(t, eop)* = Exchange Rate *(t,avg)*).

The risk of debt distress is evaluated by means of an analysis of two factors: firstly, the government's debt burden, and secondly, its repayment capacity. A common approach involves defining a debt-burden indicator as the ratio between a measure of debt burden and a measure of repayment capacity, known as the public debt ratio. The most widely used debt-burden indicator is the ratio of the public debt stock to GDP. Changes in the public debt-to-GDP ratio over time are influenced by:

The contribution of the public debt stock, the numerator of the ratio, which accounts for Primary Balance(t), Interest Expense(t), Other Flows(t), Valuation Effects(t), and the Stock-Flow Adjustment(t) caused by intra-period exchange rate fluctuations;

the contribution of nominal GDP, which depends on the evolution of real GDP and inflation, measured using the growth rate of the GDP deflator. The GDP deflator reflects the prices of all goods and services produced within the economy.

In order to ascertain the variables and policies that drive changes in the public debt ratio over time, equation *(10)* can be rewritten as follows:

$$\frac{\text{Change in Debt}_{(t)}}{\text{GDP}_{(t)}} = -\frac{\text{Primary Balance}_{(t)}}{\text{GDP}_{(t)}} + \frac{\text{Interest Expense}_{(t)}}{\text{GDP}_{(t)}} + \\ + \frac{\text{Other Flows}_{(t)}}{\text{GDP}_{(t)}} + \frac{\text{Valuation Effect}_{(t)}}{\text{GDP}_{(t)}} + \\ + \frac{\text{Stock Flow Adjustment}_{(t)}}{\text{GDP}_{(t)}} - \\ - \frac{\text{Debt}_{(t-1)}}{\text{GDP}_{(t-1)}} \cdot \frac{\text{GDP Growth}_{(t)}}{(1+\text{GDP Growth}_{(t)})} \quad (14)$$

The final term in Equation *(14)* accounts for and subtracts the effect of changes in nominal GDP. Consequently, the dynamics of the public debt ratio are influenced by the following:

– Fiscal and financial policies that shape the primary balance sheet and other flows that create net debt;
– debt management, nominal interest rates, and exchange rates, which drive the interest expense, valuation effects, and stock-flow adjustments;
– economic growth and inflation.

2. Public Debt Targeting under Uncertainty in Ukraine

In a considerable number of studies, the most frequently employed debt target is 60% of GDP, as stipulated by the Maastricht Treaty. The IMF asserts that there is a justifiable rationale for linking fiscal policy to a debt ceiling of up to 60% of GDP, as evidenced by recent projections of long-term debt levels for both advanced and developing economies (Cottarelli, Moghadam, 2011). However, IMF experts stress that this target should not be seen as an absolute limit, as the specific circumstances of each country need to be taken into account when assessing the sustainability of public finances.

In economic systems where the budget of the general government is susceptible to macroeconomic shocks, specific requirements are imposed on fiscal policy. Alongside the maintenance of long-term fiscal balance, fiscal policy must ensure the availability of sufficient fiscal space to respond to significant macroeconomic turbulence. It is important to note that this implies that public debt should be maintained at a level that is sufficiently low to enable the government to finance planned expenditures in the event of a negative economic shock. This can be achieved by compensating for reduced revenues through increased public debt, while still being able to meet debt obligations and avoid a budget crisis. Moreover, the fiscal framework must engender adequate revenue flows to reduce public debt to its initial level as the economy stabilises.

The greater a country's ability to increase debt without catastrophic consequences, the more resilient its public finances are to potential macroeconomic fluctuations. Consequently, Ukrainian researchers frequently advocate for lower public debt targets, such as 30% or 40% of GDP, given the substantial costs associated with debt servicing (Lunina, 2020).

Empirical evidence suggests that post-war debt levels cannot and should not be brought back to benchmark levels quickly. Recovery requires financial resources, including those obtained through an increase in debt, while GDP (the denominator to which accumulated public debt is related) is gradually growing.

In light of these considerations, this study examines two possible public debt targets to be achieved within five years: 60% of GDP (which is in line with the benchmark but may not be the most realistic) and 82% of GDP (based on IMF staff considerations, 2024).

The Debt-Dynamics Tool (DDT) requires an initial debt stock Debt(t-1) and forecasts of nine macro-financial variables to analyse the dynamics of public debt:

– The end-of-period exchange rate, *Exchange Rate (t, eop)*;
– the average exchange rate, *Exchange Rate (t, avg)*;
– the share of foreign-currency debt in total debt, *Share FCD(t)*;
– the nominal effective interest rates for foreign-currency debt, *Interest Rate on FCD(t)*;
– the nominal effective interest rates for local-currency debt, *Interest Rate on LCD(t)*;
– GDP growth rate, *GDP Growth(t)*;
– inflation, $\pi(t)$ to calculate the real GDP growth rate;
– the primary balance, *Primary Balance (t)*;
– other flows, *Other Flows(t)*.

While a debt implies certainty about the debtor's obligations, a contingent liability is an obligation that arises only if a specific event occurs in the future. An example of an explicit contingent liability is a government guarantee to a state-owned enterprise. The original liability should be attributed to the original debtor (e.g., the state-owned enterprise) and not to the guarantor, unless the guarantee is called. Implicit contingent liabilities include future obligations of a social security system, government financial interventions to maintain the solvency of the banking sector during a financial crisis, and unguaranteed debt of public sector units that would be taken over by the government in the event of default.

Contingent liabilities are not directly influenced by the government's financing needs, in contrast to the evolution of debt, which is based on such needs. The government does not receive any funds due to its contingent liabilities. Given the uncertainty

surrounding the materialisation of contingent liabilities, it is advisable to distinguish them from debt liabilities. However, to assess the risk of debt distress, a broader concept of debt burden is often used, which includes both debt and certain contingent liabilities.

In this forecast, 2024 is considered the most recent year for which the initial debt stock *Debt(t-1)* is available. Projections for nine macro-fiscal variables are provided for the period 2025-2029 (see Table 1).

3. Forecast Results and Decomposition of the Debt Dynamics

The projections of public sector debt dynamics for 2025–2029 (see Table 2) were conducted using the Debt-Dynamics Tool (DDT) and are based on the projections presented in Table 1.

It is projected that, based on the initial debt stock in 2024 and macro-fiscal variable forecasts for 2025–2029, nominal gross public debt will reach 96% of GDP in 2025, 98.2% in 2026, 96.2% in 2027, 92.9% in 2028, and 90.1% in 2029.

The results presented in Table 2 correspond to the baseline scenario, which is predicated on an improvement in the primary balance indicator from 2025 to 2029. In the event of primary balance stagnation, that is, when the primary balance is fixed at the level of the first year of projections (in this case, -2.8% of GDP, see Table 1) throughout the entire fiscal adjustment period (2025–2029), public debt would rise to 101.6% of GDP by 2029. This scenario is referred to as the "constant primary balance scenario", and it is predicated on the assumption that the primary balance will remain at the level observed in the first projection year. It demonstrates the impact on the debt ratio if the government does not continue the fiscal adjustment projected in the baseline scenario. It is assumed that all key macro-fiscal inputs remain consistent with the baseline, with the exception of the primary balance, which, commencing in the second projection year, is set at the level of the first projection year.

The 2025 primary deficit of -2.8% of GDP is contingent on the 2025 GDP growth projection of +6.5% (see Table 1). However, should economic growth in 2025 fail to align with IMF projections, the primary deficit is projected to exceed -2.8% of GDP. For instance, should GDP stagnate at -4% of GDP from 2025 to 2029, public debt is projected to reach 108.5% of GDP in 2029.

In Ukraine, a number of macro-financial and budgetary destabilising factors persist, including: a high degree of reliance on external creditors and grant support for budget revenues; uncertainty surrounding sources of income, such as frozen Russian assets and

Table 1
Initial debt in 2024 and projections of macro-fiscal variables for 2025-2029

Year/Variable	2024	2025	2026	2027	2028	2029
Stock of total gross public debt, % of GDP	94.00		-	-	-	-
Share of foreign currency denominated debt in total debt, % of total debt	77.00	77.20	76.80	77.20	77.00	76.20
Nominal average exchange rate, local currency per unit of foreign currency	41.00	45.80	48.60	50.40	52.10	54.10
Nominal end-of-period exchange rate, local currency per unit of foreign currency	42.30	47.10	49.90	51.70	53.40	55.40
Nominal effective interest rate on local currency denominated debt, %	9.99	8.92	7.18	6.69	6.29	6.69
Nominal effective interest rate on foreign currency denominated debt, %	8.10	5.70	4.60	4.20	4.00	4.00
GDP deflator inflation, %	11.70	10.70	5.50	5.00	5.00	5.00
Real GDP growth, %	3.20	6.50	5.00	4.50	4.30	4.20
Primary balance, % of GDP	-8.20	-2.80	-0.70	0.20	0.80	1.00
Other net debt creating flows, % of GDP	0.30	0.90	2.20	0.00	-0.40	-0.20

Source: compiled by the authors based on the processing of sources (International Monetary Fund, 2024)

Table 2
Public Sector Debt Dynamics

Indicator	Projections				
	2025	2026	2027	2028	2029
Nominal gross public debt, % of GDP	***96.0***	***98.2***	***96.2***	***92.9***	***90.1***
Real GDP growth (%)	6.5	5.0	4.5	4.3	4.2
Inflation (GDP deflator, %)	10.7	5.5	5.0	5.0	5.0
Nominal GDP growth (%)	17.9	10.8	9.7	9.5	9.4
Effective interest rate (%)	6.8	5.3	4.8	4.5	4.7

Source: authors' calculations via DDT

the nationalisation of Russian property in Ukraine; increasing defence and security expenditures; rapid growth of public debt; rising interest rates globally; the uncertain scale of damage to economic, road, and social infrastructure; and the deterioration of demographic indicators. These factors have the potential to precipitate debt-dynamic shocks.

The Debt-Dynamics Tool (DDT) employs fan charts to present debt projections under a wide range of alternative assumptions and to approximate the probability of certain outcomes. The generation of fan charts is achieved by introducing shocks to the four primary variables that determine debt dynamics: real GDP growth rate, real cost of domestic-currency debt, augmented real cost of foreign-currency debt, and augmented primary balance. The DDT accounts for contemporaneous correlations among these variables and creates shocks using historical annual data. The 2015–2024 historical data set is utilised to generate a fan chart for public debt projections for 2025–2029 under uncertainty in Ukraine. The corresponding fan chart is presented in Figure 1.

The fan chart provides a graphical representation of the baseline fiscal adjustment scenario under uncertainty. According to the scenario and the fan chart, the probability of the public debt level in Ukraine being below 94% of GDP in 2029 is 54.2%, and below 82% of GDP is 37.6%.

Changes in the debt ratio can be decomposed (Painchaud, Rayner, Halikias, Kalonji, Miao, Nakatani, Sgherri, Arnold, Giorgianni, & Desruelle, 2013). This decomposition can be further refined into six distinct contributions: the contribution of the real effective interest rate; the contribution of the exchange rate; the contribution of real GDP growth; the contribution of the primary balance; the contribution of other net debt-creating flows; and the contribution of the stock-flow adjustment. As demonstrated in Figure 2, the decomposition of baseline projections into these six contributions is illustrated.

In Ukraine, the most significant debt-reducing flows during 2025–2029 (cumulative) are expected to be real GDP growth and the real interest rate. Conversely, the primary debt-increasing flow is anticipated to be exchange rate depreciation.

Countries with high levels of public debt often plan budget surplus paths to reduce public debt over time and bring it closer to the target. Two public debt targets have been set for 2029: 82% of GDP (according to the IMF Staff Report for 2024) and 60% of GDP (according to the Maastricht Treaty). The annual surplus paths required to reach both targets in 2029 are shown in Table 3.

In order to achieve the 82% of GDP public debt target, it is necessary to achieve a constant annual fiscal surplus of 1.38% of GDP. However, it should be noted that the 60% of GDP debt target will only be met in 2029 if the fiscal surplus remains at 2.43% of GDP throughout the 2025–2029 period. For the 60% of GDP target, certain basic macroeconomic assumptions have been revised in order to make the projections more realistic.

Debt stabilising fiscal paths can be informed by relevant international experience. Countries that have experienced military conflicts have managed to reduce budget deficits in the post-war period by increasing tax revenues (as a result of economic recovery and increased taxation) and reducing two main expenditure

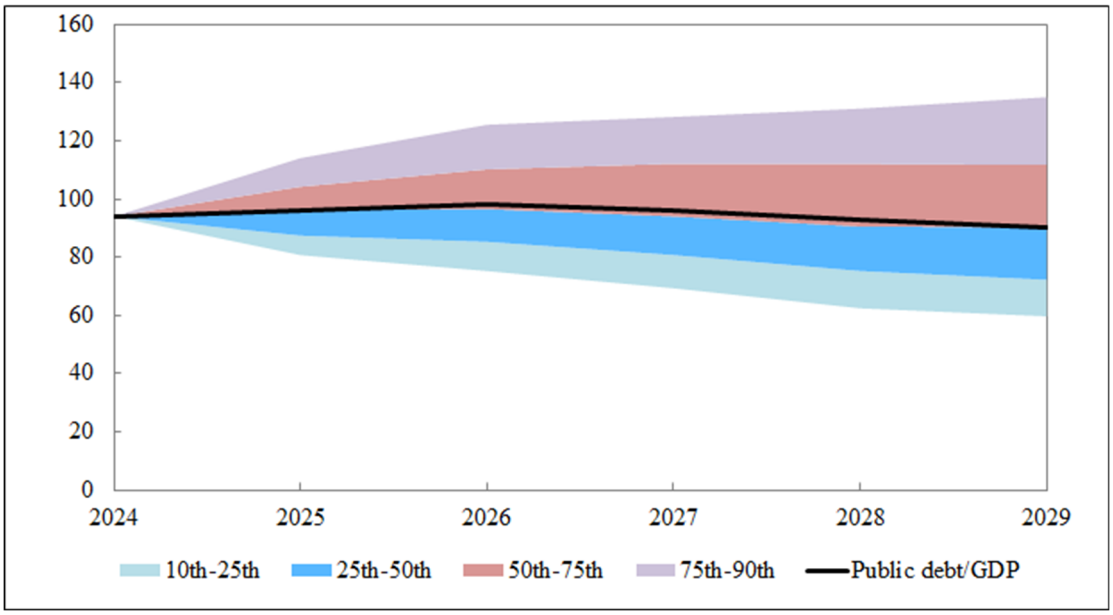

Figure 1. Forecast of debt-to-GDP ratio in the face of uncertainty in Ukraine

Source: authors' calculations via DDT

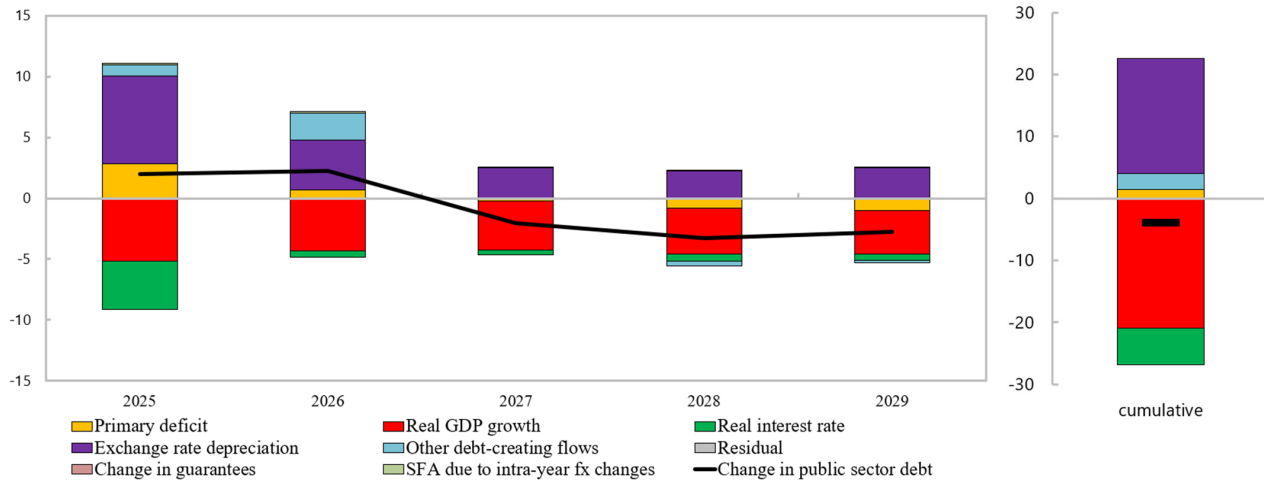

Figure 2. Debt-forming flows in 2025-2029, % of GDP

Source: authors' calculations via DDT

Table 3
Annual fiscal trajectories for different debt targets

Year/Variable	2025	2026	2027	2028	2029
Debt target – 2029 is 82% of GDP:					
Stock of total gross public debt, including uncalled guarantees, % of GDP	91.71	91.87	88.75	85.02	*82.00*
Share of foreign currency denominated debt in total debt, % of total debt	77.20	76.80	77.20	77.00	76.20
Nominal average exchange rate, local currency per unit of foreign currency	45.80	48.60	50.40	52.10	54.10
Nominal end-of-period exchange rate, local currency per unit of foreign currency	47.10	49.90	51.70	53.40	55.40
Nominal effective interest rate on local currency denominated debt, %	8.92	7.18	6.69	6.29	6.69
Nominal effective interest rate on foreign currency denominated debt, %	5.70	4.60	4.20	4.00	4.00
GDP deflator inflation, %	10.70	5.50	5.00	5.00	5.00
Real GDP growth, %	6.50	5.00	4.50	4.30	4.20
Primary balance, % of GDP	*1.38*	*1.38*	*1.38*	*1.38*	*1.38*
Other net debt creating flows, % of GDP	0.90	2.20	0.00	-0.40	-0.20
Debt target – 2029 is 60% of GDP:					
Stock of total gross public debt, including uncalled guarantees, % of GDP	87.53	82.65	74.75	66.79	*60.00*
Share of foreign currency denominated debt in total debt, % of total debt	77.00	75.20	74.80	75.20	75.00
Nominal average exchange rate, local currency per unit of foreign currency	41.00	43.80	43.60	43.40	43.10
Nominal end-of-period exchange rate, local currency per unit of foreign currency	42.30	45.10	44.90	44.70	44.40
Nominal effective interest rate on local currency denominated debt, %	8.92	7.18	6.69	6.29	6.69
Nominal effective interest rate on foreign currency denominated debt, %	5.70	4.60	4.20	4.00	4.00
GDP deflator inflation, %	10.70	5.50	5.00	5.00	5.00
Real GDP growth, %	6.50	5.00	6.50	6.30	6.20
Primary balance, % of GDP	*2.43*	*2.43*	*2.43*	*2.43*	*2.43*
Other net debt creating flows, % of GDP	0.90	2.20	0.00	-0.40	-0.20

Source: authors' calculations via DDT

items: defence and public sector wages. Reducing government spending on public sector wages is a common practice in these countries. Studies of countries such as Albania, Cambodia, the Democratic Republic of the Congo, Mozambique, Rwanda, Sierra Leone and Yemen show that, on average, government spending on public sector wages fell from 6.4% of GDP in the pre-war period to 4.8% of GDP after the end of military operations (Gupta, Tareq, Clements, Segura-Ubiergo, Bhattacharya, 2007). The post-conflict reduction in defence spending has been an important factor in reducing budget deficits. According to the United Nations World Institute for Development Economics Research (WIDER), defence spending in these countries fell on average from 5.2% of GDP during the war to 2.0% of GDP in peacetime. The overall deficit of these countries fell by 90.6% (from an average of 9.6% of GDP to 0.9% of GDP), while real GDP grew by 128%.

Although IMF experts expect the war in Ukraine to end by the end of 2025 in the baseline scenario, significant needs for defence, reconstruction, social

protection and economic development are likely to remain. At the same time, external budget support is expected to decline sharply (International Monetary Fund, 2024).

Under these circumstances, it is necessary to increase revenues. This can be achieved by gradually increasing revenues through tax policy measures. In reforming the tax system, attention should be paid not only to ensuring effective revenue mobilisation, but also to adhering to the principles of tax equity. In particular, this implies increasing taxation on high incomes and high value assets, raising excise duties on petroleum products, alcohol and tobacco, and increasing taxes and fees on natural resource extraction.

A new revenue architecture aimed at overcoming the debt burden is set out in the National Revenue Strategy for 2024-2030 (The Order of the Cabinet of Ministers of Ukraine "On Approval of the National Revenue Strategy until 2030", 2023). The plan for the period up to 2030 includes reforms to the simplified tax system by introducing safeguards to reduce tax abuse, raising the VAT registration threshold and increasing effective tax rates to align them with the general tax system. In particular, the strategy aims to:

– Restore the progressive scale of personal income tax rates combined with socially neutral benefits;
– review/rationalise the current investment incentives under the corporate income tax and define a new cost-based approach, focusing on instant depreciation;
– align VAT with EU legislation, while abolishing reduced rates and benefits not provided for by the EU VAT Directive;
– increase excise duties on fuel, alcoholic beverages and tobacco products to the minimum EU rates;
– increase the rates of the environmental carbon tax;
– introduce real estate taxation based on its assessed value, rather than on the area of real estate.

While the National Revenue Strategy is chiefly concerned with the regulation of fiscal policies within the business sector, the medium-term revenue and expenditure policy of the public sector is delineated in the Budget Declaration. The Budget Declaration for 2025-2027 (The Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Budget Declaration for 2025-2027", 2024) introduces a mechanism for public capital investments and the selection of projects by the Strategic Investment Council. High accountability for decisions on the allocation of resources, including loans that increase public debt, requires transparency in the decision-making process. Given the prevalence of informal rules that emerged in the 1990s, this task is as complex as it is crucial.

4. Conclusions

The present study considers two options for the public debt target to be achieved by 2029: 60% of GDP (in accordance with the Maastricht Treaty benchmark) and 82% of GDP (as per IMF considerations). The 82% of GDP public debt target requires a constant annual budget surplus of 1.38% of GDP. On the other hand, the 60% of GDP target can only be reached in 2029 if the budget surplus remains at 2.43% of GDP throughout the period 2025-2029. The attainment of these targets is contingent upon the GDP growth projections for 2025–2029. In the event of economic growth not materialising during this period, public debt in 2029 is projected to exceed 100% of GDP. This conclusion is supported by the Debt Dynamics Tool (DDT) calculations under uncertainty, as illustrated in the fan chart. Consequently, the probability of the debt-to-GDP ratio in Ukraine exceeding 100% between 2025 and 2029 is projected to be 75-90% when considering the uncertainty surrounding the public debt projections. Conversely, the probability that the public debt level will be below 82% of GDP by 2029 is only 37.6%.

Extraordinary fiscal instruments may be introduced to raise budget revenues. Such fiscal instruments could include, for example, an increase in income tax rates, especially for incomes above the minimum and average levels, as well as an increase in property taxes and rent payments.

The most significant condition for the effective implementation of the scenarios examined in this article is the cessation of hostilities by the end of 2025. It is important to note that, in the context of the ongoing war, there is a high probability of changes in key macro-financial and budgetary indicators. Consequently, assessments and conclusions pertaining to fiscal sustainability in Ukraine must be contingent on these anticipated changes.

The level of public debt and the underlying fiscal paths can be influenced by various factors, which opens up avenues for future research. For example, migration and demographic factors – in particular the outflow of the working-age population, leading to a worsening of the demographic dependency ratio in Ukraine – are likely to increase budgetary spending on pensions and health care. In addition, the global transition to green energy will also affect fiscal paths in the medium term, with potential implications for policy and fiscal planning.

References:

Blanchard, O. (1990). Suggestions for a New Set of Fiscal Indicators. *OECD Economics Department Working Papers*, Vol. 79. DOI: http://dx.doi.org/10.1787/435618162862

Bohdan, I., Konovalenko, D., & Petrukha, S. (2020). Estimation of Ukraine's fiscal balance in compliance with ESA-2010 and GFSM-2014 international standards. *RFI scientific papers*, Vol. 1, p. 20–34. DOI: https://doi.org/10.33763/npndfi2020.01.020

The Order of the Cabinet of Ministers of Ukraine "On Approval of the National Revenue Strategy until 2030" of December 27, 2023 No. 1218-p (2023). Available at: https://zakon.rada.gov.ua/laws/show/1218-2023-%D1%80#Text

The Resolution of the Cabinet of Ministers of Ukraine "On Approval of the Budget Declaration for 20252027" of June 28, 2024 No. 751 (2024). Available at: https://zakon.rada.gov.ua/laws/show/751-2024-%D0%BF#Text

Cottarelli, C., & Moghadam, R. (2011). *Modernizing the Framework for Fiscal Policy and Public Debt Sustainability Analysis.* International Monetary Fund.

De Clerck, S., & Wickens, T. (2015). *Government Finance Statistics Manual 2014*. USA: International Monetary Fund. DOI: https://doi.org/10.5089/9781498343763.069

Directorate-General for Economic and Financial Affairs. (2023). Institutional Paper 199. Debt Sustainability Monitor 2022. Available at: https://economy-finance.ec.europa.eu/publications/debt-sustainability-monitor-2022_en#information-and-identifiers

Gasanov, S., Kudrjashov, V., & Balakin, R. (2012). Formation of the system of fiscal sustainability indicators of the general government. *Finance of Ukraine*, Vol. 9, p. 18–36. Available at: https://finukr.org.ua/?page_id=774&lang=en&aid=525

Gupta, S., Tareq, S., Clements, B., Segura-Ubiergo, A., & Bhattacharya, R. (2007). Postconflict Countries: Strategy for Rebuilding Fiscal Institutions. *WIDER Research Paper*, No. 2007/41. Available at: https://www.econstor.eu/bitstream/10419/63341/1/537367659.pdf

Horne, J. (1991). Indicators of Fiscal Sustainability. *IMF Working Paper*. Available at: https://ssrn.com/abstract=884536

Iefymenko, T. I. (2012). Fiscal space of anti-crisis regulation. Kyiv: SESE "The Academy of Financial Management".

Iefymenko, T. I., Yerokhina, S. A., & Bohdan, T. P. (Eds.). (2014). Debt sustainability of public finances. Kyiv: SESE "The Academy of Financial Management".

Iefymenko, T. (2024). Priorities for ensuring the sustainability of Ukraine's public finance in modern conditions. *Finance of Ukraine*, Vol. 1, p. 7–24. DOI: https://doi.org/10.33763/finukr2024.01.007

International Monetary Fund. (2017). Review of the Debt Sustainability Framework in Low Income Countries: Proposed Reforms. Available at: https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/10/02/pp082217LIC-DSF

International Monetary Fund and International Development Association. (2004). Debt Sustainability in Low-Income Countries – Proposal for an Operational Framework and Policy Implications.

International Monetary Fund. (2024). Ukraine: Fourth Review of the Extended Arrangement under the Extended Fund Facility, Request for Modifications of a Performance Criterion, and Financing Assurances Review. Available at: https://ideas.repec.org/p/imf/imfscr/2024-199.html

International Monetary Fund. (2024). Ukraine: Third Review of the Extended Arrangement Under the Extended Fund Facility, Requests for a Waiver of Nonobservance of Performance Criterion, and Modifications of Performance Criteria. Available at: https://ideas.repec.org/p/imf/imfscr/2024-078.html

Karapetian, O. (2008). Management of public external debt: methodology for assessing debt sustainability. *Young science*, 10, 101–109.

Klymenko, K., Petrukha, N., & Petrukha, S. (2024). The Marshall's "green" plan for Ukraine: the financial, economic and regulatory context. *RFI scientific papers*, Vol. 1, p. 20–49. DOI: https://doi.org/10.33763/npndfi2024.01.020

Lunina, I. (2020). Public finance in the macroeconomic policy of growth. National Academy of Sciences of Ukraine, "Institute of Economics and Forecasting of the National Academy of Sciences of Ukraine". Available at: http://ief.org.ua/docs/mg/339.pdf

Marchenko, S. (2022). Strategic public finance governance: European integration course, international trends, national peculiarities. *Finance of Ukraine,* 1, 7–26. DOI: https://doi.org/10.33763/finukr2022.01.007

Ormaechea, S., & Martinez, L. (2021). A Guide and Tool for Projecting Public Debt and Fiscal Adjustment Paths with Local- and Foreign-Currency Debt. International Monetary Fund. Available at: https://ideas.repec.org/p/imf/imftnm/2021-005.html

Painchaud, F., Rayner, B., Halikias, I., Kalonji, K. D., Miao, Y., Nakatani, K., Sgherri, S., Arnold, N., Giorgianni, L., & Desruelle, D. (2013). Staff guidance note for public debt sustainability analysis in market-access countries. International Monetary Fund. Available at: https://www.imf.org/external/np/pp/eng/2013/050913.pdf

The Joint World Bank (2012). IMF Debt Sustainability Framework for Low-Income Countries. Available at: http://www.imf.org/external/np/exr/facts/pdf/jdsf.pdf

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