

DOI: 10.55643/fcapter.3.68.2026.5221

Serhii Petrukha

PhD in Economics, Associate Professor of the Department of Transport and Logistics, West Ukrainian National University, Ternopil, Ukraine; e-mail: psv03051984@ujjs.in.ua
ORCID: [0000-0002-8859-0724](https://orcid.org/0000-0002-8859-0724)
(Corresponding author)

Nina Petrukha

PhD in Economics, Associate Professor of the Department of Management in Construction, Kyiv National University of Construction and Architecture, Kyiv, Ukraine;
ORCID: [0000-0002-3805-2215](https://orcid.org/0000-0002-3805-2215)

Roman Miakota

PhD Student, SESE "The Academy of Financial Management", Kyiv, Ukraine;
ORCID: [0000-0002-7620-3491](https://orcid.org/0000-0002-7620-3491)

Vadym Gubanov

PhD Student, SESE "The Academy of Financial Management", Kyiv, Ukraine;
ORCID: [0009-0002-4418-1475](https://orcid.org/0009-0002-4418-1475)

Maksym Miakota

PhD Student, International Business College ISM Slovakia in Preshov, Preshov, Slovakia;
ORCID: [0009-0000-8787-4699](https://orcid.org/0009-0000-8787-4699)

Received: 24/03/2026

Accepted: 26/05/2026

Published: 30/06/2026

© Copyright
2026 by the author(s)



This is an Open Access article distributed under the terms of the [Creative Commons CC-BY 4.0](https://creativecommons.org/licenses/by/4.0/)

PUBLIC FINANCE AND DEBT POLICY IN THE CONTEXT OF MODERNIZATION OF THE EU ECONOMIC POLICY

ABSTRACT

This article examines the systemic links between fiscal sustainability, debt policy, and the modernization of economic policy under the European Green Deal. It addresses two interrelated processes: ensuring debt security and financial stability amid growing fiscal imbalances caused by COVID-19, military expenditures, and the energy crisis, and advancing structural reforms aligned with the Green Deal agenda. The study assesses whether public debt and fiscal policy contribute to fiscal unsustainability and evaluates the impact of circular economy pressures on strengthening public balance sheets. The research employs a systemic institutional economic analysis based on official statistics from Eurostat, the European Commission. The scientific novelty of the study lies in the development of an integrated empirical model that simultaneously captures the interaction between public debt, fiscal sustainability, and circular economy indicators. Unlike existing approaches, which predominantly examine these factors in isolation, the proposed model provides a quantitative assessment of their combined effect on fiscal stability in the European Union. Scenario forecasting suggests that if circularity increases to 24% and public debt declines to 80% of GDP by 2030, the fiscal sustainability index could reach 0.98–1.00. The results support updating fiscal rules, refining debt policy, and developing a balanced public financial management model within the EU's 2028–2034 financial framework, demonstrating that financial stability and environmental transformation are mutually reinforcing pillars of sustainable development. The findings are particularly valuable for policymakers of EU institutions, national fiscal authorities, and public finance regulators, as well as for international financial organizations involved in designing debt sustainability strategies and green transition policies, since they provide an empirical basis for integrating environmental and fiscal instruments into a coherent macroeconomic governance framework.

Keywords: public finance, fiscal sustainability, debt policy, financial stability, circular economy, economic policy, European Green Deal, environmental transformation, European Union, economic modernization

JEL Classification: H63, H62, E62

INTRODUCTION

The European Union (EU) has faced a persistent accumulation of macrofinancial imbalances over the past decade, significantly intensified by the COVID-19 pandemic, rising military expenditures, and the energy crisis. These factors have increased pressure on public finances and have complicated the ability of governments to simultaneously ensure fiscal stability, support economic growth, and implement structural reforms. In this context, the sustainability of public finances becomes a central condition for maintaining macroeconomic equilibrium and fulfilling long-term socio-economic commitments.

At the same time, the deepening integration within the EU has transformed the nature of debt policy, shifting it toward greater harmonization of fiscal rules and coordinated budgetary governance. This process creates a complex trade-off between the need for fiscal discipline and the necessity of maintaining sufficient policy flexibility to respond to asymmetric shocks. Consequently, the research problem emerges at the intersection of economic growth objectives and debt-related constraints, requiring a comprehensive analytical framework that integrates both macroeconomic and institutional dimensions.

Despite the significant body of research on fiscal sustainability and public debt, an important gap remains. Existing studies are predominantly focused on macro-financial indicators and often overlook the role of environmental transformation and structural innovation in shaping debt dynamics. In particular, insufficient attention has been paid to the interaction between public finance sustainability, debt management mechanisms, and the development of the circular economy within the framework of the European Green Deal. Moreover, there is a lack of integrated empirical models that simultaneously capture the relationships between public debt levels, fiscal sustainability indicators, and circularity metrics.

This unresolved complexity of interactions between fiscal, institutional, and environmental factors limits the ability to formulate a coherent model of sustainable economic development in the EU. Addressing this gap requires a combined theoretical and empirical analysis of the interdependencies between debt policy, fiscal sustainability, and circular economy transformation. It is precisely this unresolved set of issues that constitutes the focus of the present study.

The novelty of this study lies in the development of an integrated empirical framework that jointly analyzes public debt, fiscal sustainability, and circular economy indicators, providing a quantitative assessment of their interaction within the EU economic system.

LITERATURE REVIEW

A review of the current scientific literature on the sustainability of public finances and debt policy in the European Union shows that an interdisciplinary approach to the analysis of fiscal stability is becoming more common. Researchers are increasingly integrating into their models institutional, demographic, and behavioral factors that determine the effectiveness of debt management and affect the ability of governments to maintain sustainable financial equilibrium.

A working paper was published under the International Monetary Fund by Armendariz and Cabezón (2024) on systemic risks to European public finances, as well as policies targeting such risks. They construed that debt policy can be effective only in a synergic interaction between rules of fiscal discipline and instruments pertaining to anti-crisis macroeconomic management. Very similar notions are found in the work of Catarino and Núñez (2024), who provide a comparative analysis regarding deficit-and-debt dynamics among EU member states. The scholars advocate sustainability through increased transparency within budget processes, together with long-term monitoring of debt indicators.

De Haan and Amtenbrink (2023), who also outline possible reforms in the very architecture of the EU debt rules, note that criteria under Maastricht have become totally irrelevant to new financial challenges-by old challenges they presumably mean COVID-19 related spending and increased spending on defense-and that "the sensitivity of public debt to fiscal stimuli is country-specific: the impact of policies depends on the phase of the economic cycle," so flexibility in the choice of (debt) instruments is needed", a finding which supplements this thesis by Eminidou et al. (2023).

Grosu (2025) applies penalized spline regression to allow for a nonlinear relationship between debt indicators and macroeconomic variables. In his opinion, good governance and institutional trust are the main preconditions of sustainable fiscal policy, which can also be extended in the context of harmonization of EU member states' fiscal policies as a precondition or key factor to prevent/manage another future debt crisis, as argued by Grosu et al. (2022).

At the same time, recent empirical contributions deepen the understanding of fiscal sustainability by explicitly integrating institutional, structural, and nonlinear dimensions of public debt dynamics. In particular, Afonso and Coelho (2025) demonstrate that the fiscal response of European Union governments to rising debt burdens is shaped by a combination of institutional quality and macroeconomic conditions, which jointly determine medium-term fiscal sustainability. Their findings suggest that effective debt stabilization strategies are not limited to expenditure containment but also require improvements in tax administration efficiency and revenue mobilization mechanisms.

By contrast, Asteriou et al. (2025) provide evidence of threshold effects in Southern European economies, showing that the impact of public debt on economic growth is inherently nonlinear. Once debt exceeds critical levels, its negative effects intensify, which necessitates differentiated and adaptive debt management strategies tailored to country-specific structural conditions. This perspective reinforces the argument that uniform fiscal rules may be insufficient under heterogeneous economic environments.

Meanwhile, the issue of long-term fiscal equilibrium is further elaborated by Beetsma et al. (2025), who emphasize the importance of incorporating intergenerational responsibility into budgetary frameworks. Their approach highlights that sustainable debt policy must extend beyond short-term stabilization and integrate forward-looking fiscal commitments. In a similar vein, Căpraru et al. (2025) conceptualize the reform of EU fiscal rules through the principle of regulatory simplification, arguing that reduced institutional complexity enhances flexibility and mitigates procyclical fiscal responses.

Additional dimensions of debt sustainability are revealed in the work of Darvas et al. (2025), who identify demographic pressures as a key determinant of long-term fiscal risks, particularly in the context of aging populations and expanding social expenditures. Complementing this, Gkatzoglou et al. (2025) apply a network-based analytical framework to demonstrate the synchronization of debt dynamics across EU member states, thereby confirming the high level of fiscal interdependence within the Union.

Mihai et al. (2025) introduce an important behavioral-institutional perspective by showing that the shadow economy significantly distorts government debt reactions, leading to deviations from projected fiscal trajectories and reinforcing non-linear adjustment patterns. Taken together, these studies indicate a shift from linear and purely macroeconomic interpretations of debt sustainability toward more complex, multi-factor models that incorporate institutional, demographic, and structural variables.

Južnik Rotar (2025), within the context of economic growth and structural reforms and enhancement in the efficiency of budget forecasting to sustain fiscal balance, elucidates sustainability supporting structural reform of fiscal policy and constant surveillance on balanced fiscal policy through improved accuracy in budget forecasting. Concurrently, Kraemer and Lehtimäki (2023) discovered proof to provide an evidence-based argument slightly in favor of stricter fiscal rules leading to discipline but permitting minimal flexibility of fiscal policy during a crisis. In their later work published in 2024, under an optimal EU debt policy framework, as a two-component structure, strict fiscal rules together with recovery incentive mechanisms aimed at safeguarding future recoveries from crises. A key work in the analysis of the interaction of financial rules with debt dynamics is the work of Park and Kim (2024). They empirically show that federal fiscal rules can be effective only under the condition of intergovernmental policy coordination and transparency in the use of budgetary resources.

At the same time, Petrukha et al. (2023) expand the analytical framework of fiscal sustainability by examining public finance transformation under conditions of military adaptation and post-crisis recovery. Their findings indicate that in periods of systemic shocks, fiscal policy priorities shift toward social resilience and security-related expenditures, which fundamentally alter the structure of debt management and challenge traditional interpretations of fiscal discipline. This perspective suggests that fiscal sustainability should be understood not only as macro-financial stability, but also as the institutional capacity to adapt to external shocks through flexible and reoriented budgetary mechanisms.

A brief review of the reviewed literature outlines the development of approaches – from classical debt sustainability models to integrated concepts of fiscal management, which also include environmental, social, and security issues. No matter how advanced they are, there is not even a single methodology for assessing the interrelationships between debt policy, financial stability, and structural transformations in the EU economy towards a “circular” economy as a new regime or method.

AIMS AND OBJECTIVES

The objective of the research was to establish both theoretical and empirical connections between the sustainability of public finances, debt policy, and economic policy evolution in the European Union context as financial and economic systems modernize. Key factors affecting fiscal sustainability through public debt were identified, as well as relationships between levels or degrees of intensity or volumes (burden) of debt, budgetary discipline, and effectiveness of circular economy programs. The analysis focused on how a debt policy supports the competitiveness of EU economies while implementing provisions under Europe's Green Deal.

Another objective was to watch how debt indicators move among the EU member states in the past decade, determine trends in their fiscal adaptability, and develop a correlation-regression model that would describe the relationship between public finance sustainability, the level of public debt, and the circularity coefficient. This therefore brings about a hypothesis that an increase in economic circularity strengthens fiscal stability through efficient resource use, whereby it lowers debt risk by improving budget management within the European Union.

METHODS

The study adopts a systemic and institutional approach, developing economic analysis within the frame of statistics. Mixed econometric methods shall be applied for an in-depth determination of all relations linking the sustainability of public finances with debt policy and those constraints or incentives molding EU member states' economic policies toward main directions. Therefore, these are theoretical concepts forming bases from which debt sustainability analysis may be undertaken: fiscal function; government response; macroeconomic stability; structural modernization; economy oriented toward the European Green Deal. Macro-financial analysis integrates both quantitative numerical procedures as well as qualitative

descriptive ones to reconcile environmental indicators related to the circular economy with financial ones (European Commission, 2025).

The study was based on the use of general scientific methods - analysis, synthesis, induction, deduction, generalization, comparison, analogy, and systematization - which were used to build a theoretical model and clarify the conceptual framework. Among the special methods, a retrospective method was used to trace changes in the structure of public debt and the dynamics of budgetary indicators of the EU countries for 2014-2024 based on the data of Government Finance Statistics and Debt Indicators (Eurostat, 2025). The economic and statistical analysis was used to assess the level of fiscal sustainability based on the Sustainability of Public Finances Index 2025 (European Parliament, 2025), while the structural-functional method allowed for the determination of the interdependencies between debt and fiscal parameters using the materials of the Debt Sustainability Monitor 2024 (European Commission, 2024). The method of comparative analysis was used to identify national differences in the implementation of debt policy, taking into account macro-fiscal data from the EU Fiscal Framework and Policy Database (European Central Bank, 2025).

The key methods used were correlation and regression modeling to quantify the relationships between the public finance sustainability indicator (European Parliament, 2025), public debt level (European Commission, 2024), and circularity ratio (European Commission, 2025), as well as scenario forecasting to determine the trajectories of debt burden and fiscal stability under the condition of doubling the circularity rate to 24% by 2030 according to the Economic Outlook 2024: Fiscal Sustainability and Green Transition (OECD, 2024). Additional macroeconomic parameters and verification indicators were obtained from the World Development Indicators database (World Bank, 2024), which ensured cross-country comparability and reliability of the results.

The empirical basis of the study included official statistical reports of European institutions - Debt Sustainability Monitor 2024 (European Commission, 2024) for debt and deficit indicators, Sustainability of Public Finances Index 2025 (European Parliament, 2025) for fiscal sustainability indicators, as well as data from the Circular Economy Indicators and Monitoring Framework (European Commission, 2025) to determine the circularity ratio of the EU member states' economies. All indicators were normalized and unified in accordance with Eurostat (2025) standards, which ensured their comparability and reliability for further analysis.

The methodological logic of the work involved a step-by-step study: first, identifying long-term trends in the dynamics of public debt and financial sustainability, then analyzing the correlations between debt and environmental indicators, and finally building a regression model that allowed us to quantitatively confirm or refute the hypothesis that the progress of the circular economy depends on the level of sustainability of public finances and the effectiveness of debt management. This approach ensured high validity of the results, made it possible to conduct an in-depth empirical verification of the relationships, and to formulate forecast guidelines for the modernization of the EU countries' debt policy as part of their economic transformation.

RESULTS

Dynamics of fiscal sustainability and debt burden in the EU countries in 2014-2024

The purpose of this stage of the study was to identify trends in the public debt-to-GDP ratio and the level of the public finance deficit, which are fundamental indicators of fiscal sustainability. For this purpose, aggregate macrofinancial data for the EU (27 countries) and the Eurozone (20 countries) were used, which were harmonized to a single accounting methodology in accordance with ESA 2010 standards.

The three types of trajectories are: cyclical phase trajectory, crisis factor trajectory, and burden shift trajectory. Debt has been gradually stabilizing since the 2010s crisis, showing a slight decrease in the debt-to-GDP ratio just below the 80 percent benchmark, signaling moderate fiscal consolidation. Public debt increased sharply during the pandemic years of 2020-2021 through large-scale economic support programs while Gross Domestic Product (further – GDP) was contracting. Since 2022, there has been a clear recovery in the fiscal system, evidenced by a gradual decline in the burden. The summary figures for both the EU-27 and the euro area are presented in Table 1.

Table 1. Public debt dynamics in the EU and the euro area in 2014-2024 (% of GDP)*. (Sources: Eurostat (2025); European Commission - Debt Sustainability Monitor 2024; OECD (2024); European Central Bank (2025))

Year	EU-27	Euro area-20	Description of trends
2014	86.0	92.7	After the debt crisis, the beginning of stabilization is observed, but the debt still exceeds the Maastricht criterion (60%)
2015	84.8	91.2	Slight decline due to reduced budget deficits and economic growth
2016	83.8	90.0	Restoration of fiscal discipline on the back of euro stabilization
2017	81.9	88.1	Acceleration of debt reduction in leading economies (Germany, the Netherlands)
2018	79.5	86.1	EU reaches lowest debt level since 2009, GDP growth outpaces borrowing dynamics
2019	77.8	84.0	Before the pandemic, fiscal sustainability reached its highest level in a decade
2020	90.0	96.5	Sharp increase in debt due to the COVID-19 pandemic, large-scale anti-crisis programs, and falling GDP
2021	89.0	95.0	Gradual debt reduction begins due to the partial recovery of economic activity
2022	83.4	91.0	Restoration of fiscal balance, adaptation to the energy and inflation crises
2023	80.8	87.3	Further debt reduction while maintaining a cautious fiscal policy
2024	81.0	87.4	Slight adjustment due to military and social support, stabilization at \approx 80% of GDP

Analysis of the data shows that in 2014-2019, the EU was on a trajectory of gradual debt reduction. The decline from 86% to 77.8% of GDP on average in the EU was due to nominal GDP growth and a reduction in the deficit, which is evidence of increased fiscal sustainability. It was a period of relative fiscal recovery, when member state governments focused on meeting the criteria of the Stability and Growth Pact.

The pandemic crisis of 2020 dramatically changed this trend: the debt burden increased by more than 12 percentage points to 90% of GDP in the EU27 and almost 97% in the euro area. This increase is explained not only by large-scale social spending but also by a drop in tax revenues due to a decline in economic activity. Additionally, the structural deficit has increased as member states have expanded fiscal stimulus programs under the Next Generation EU plan.

The upward trend will resume after 2021. In 2022-2024, the debt burden in the EU has decreased to \approx 81%, and the average budget deficit is -3.2% of GDP (Eurostat, 2025). This implies a partially restored fiscal balance, but significantly higher debt levels compared to pre-war levels due to new budgetary priorities – defense financing, energy transition, and social support.

Debt securities form the basic structure of public debt (about 84% in 2024). This makes the market relatively liquid but also very sensitive to interest rates. The share of loans is about 13.5 percent, while cash and deposits occupy about 2.5 percent (Eurostat, 2025). These parameters indicate a shift in the debt structure towards market-based instruments. This coincides with the trends of fiscal integration and common debt policy of the EU.

The debt dynamics of EU countries over the last decade best illustrate and provide the main trends in fiscal policy transformation and financial sustainability level (Figure 1). According to Eurostat (2025) and European Commission (2024) statistics, the pandemic crisis, military conflicts, and a shift in priority toward fiscal consolidation all added very much to the total debt burden of the EU-27 and Eurozone-20, besides explaining its fluctuation. A gradual stabilizing trend developing since 2021 once again convincingly proves updated mechanisms on fiscal surveillance within harmonized debt policies of member states under the new architecture of the European Economic Area, effective.

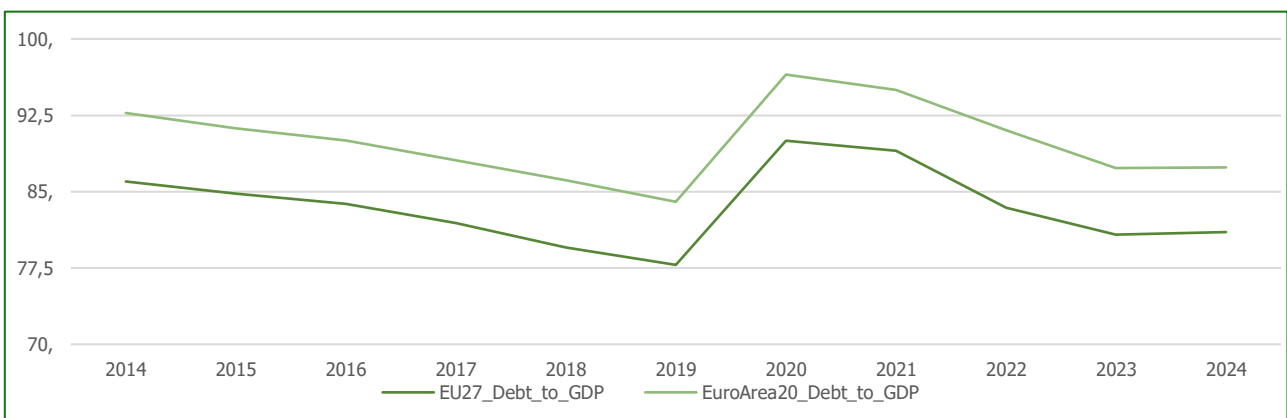


Figure 1. Dynamics of the public debt to GDP ratio in EU countries (2014-2024). (Source: Eurostat (2025); European Commission, Debt Sustainability Monitor 2024; OECD (2024); European Central Bank (2025))

According to the Public Finance Sustainability Index (European Parliament, 2025), in most of the EU countries, it started improving slowly since 2021 and will reach above 0.6 in 2024. This means the capacity to service debt without increasing the deficit above the 3 percent of GDP medium-term limit. At the same time, for the high debt level countries such as Italy, Greece, and France, it remains below 0.4. This is where the vulnerability to interest rate risk lies.

One of the main trends over the past three years is in debt sustainability, and circular economy indicators increasingly go hand in hand. Debt remains more sustainable (below 60% of GDP) in those countries that have achieved higher levels of resource circularity, such as the Netherlands, Denmark, and Finland. This could be a possible structural advantage for the green economy.

A clearer picture of cross-country fiscal dynamics and the level of integration of circular economy principles into fiscal policy can be obtained by examining certain indicators for individual EU member states. Simple elucidation, however, is provided in Appendix 2 through a set of selected indicators-variables at the country level for all EU member states. The values used are either from 2021 or the latest available data before that year because most countries had not yet fully recovered from COVID-19 effects on their economies by then (real GDP growth rates above potential). The high level of aggregation of pan-European data does not allow for a full reflection of the structural asymmetry between countries with different models of debt management, fiscal discipline, and resource efficiency. Therefore, the analysis includes six representative economies - Germany, France, Italy, the Netherlands, Greece, and Sweden - that demonstrate the most contrasting development trajectories. Their comparative analysis makes it possible to assess the extent to which the combination of effective debt management and environmental reforms affects the level of sustainability of public finances. The results are summarized in Table 2.

Table 2. Key indicators of debt sustainability and economic circularity in selected EU countries (2024). (Sources: Eurostat (2025); European Commission (2024); European Parliament (2025); OECD (2024))

Country	Public debt, % of GDP	Fiscal sustainability index (SFI)	Circularity ratio, % of GDP	Commentary
Germany	64.0	0.83	13.4	Stable fiscal position; recovery from the pandemic debt increase; active green industry policy.
France	111.8	0.47	20.1	High debt with an average level of circularity; fiscal discipline is strengthening, but the deficit remains high.
Italy	137.3	0.39	18.5	Highest debt among large EU economies; low level of institutional adaptation to the circular economy.
Netherlands	51.7	0.91	34.0	Leader in circularity; low debt burden, high efficiency of public finances.
Greece	163.1	0.32	5.4	Vulnerable to interest rate risks; low level of circularity and limited investment in green modernization.
Sweden	48.3	0.89	18.8	Balanced debt policy, moderate deficit, and steady growth in resource recycling.

A comparative analysis of the indicators presented in Table 2 shows a significant differentiation in fiscal sustainability and the level of integration of circular economy principles among the European Union countries. The countries of Northern and Western Europe, in particular the Netherlands, Sweden, and Germany, demonstrate the highest public finance sustainability indices (0.83-0.91) with a relatively low debt burden (up to 65% of GDP) and, at the same time, have the most developed system of resource recycling (13-34%). This demonstrates the close relationship between effective fiscal policy, technological innovation, and environmental modernization of the economy. At the opposite pole are Southern European countries - Italy, France, and Greece - characterized by exceeding the Maastricht debt criterion (over 100% of GDP), lower SFI values (0.32-0.47), and slow adaptation to circular reforms. In general, the results of the table confirm the trend: the fiscal balance of countries directly depends on the success of the implementation of sustainable resource use policy, which is becoming one of the key criteria for economic stability within the European Green Deal.

The period of 2020-2021 was marked by a shock destabilization caused by the pandemic crisis, which led to a sharp widening of the deficit, an increase in the debt burden, and a rise in cross-country asymmetries in fiscal risks. In the following years, from 2022 to 2024, a stabilization and recovery phase are observed, which shows a gradual return to the debt reduction trend under the conditions of the formation of new economic policy priorities and the strengthening of the role of investment and structural programs.

Overall, the results confirm that the fiscal sustainability of the European Union is showing signs of recovery, but remains vulnerable to systemic risks. Further strengthening of the financial balance requires bigger structural changes, such as the

integration of circular economy principles into the fiscal strategy, increasing the efficiency of public borrowing, and harmonizing debt policy with the goals of the European Green Deal.

Correlation between the level of public debt, fiscal sustainability, and the circular economy coefficient

The study of the relationships between the level of public debt, the fiscal sustainability indicator (SFI), and the economic circularity ratio of the European Union countries in 2014-2024 made it possible to identify statistically confirmed correlations that characterize the sustainability of public finances in the context of the environmental modernization of economic policy. Based on official sources such as Debt Sustainability Monitor 2024 (European Commission, 2024), Sustainability of Public Finances Index 2025 (European Parliament, 2025), Circular Economy Indicators (European Commission, 2025) and Government Finance Statistics and Debt Indicators (Eurostat, 2025), a sample of 27 EU member states was constructed, covering the dynamics of debt burden, budget deficits and the pace of development of the circular economy.

The overall level of debt burden in the EU-27 decreased from 86.2% of GDP in 2014 to 82.5% in 2024, but the structure remained asymmetrical. Greece (163%), Italy (137%), and Spain (109%) continue to exceed the Maastricht threshold of 60%, while the Netherlands (55%), Sweden (48%), and Denmark (40%) ensure a stable fiscal position with a sustainability index of more than 0.8. Countries with a higher level of innovation in the field of circularity (the Netherlands - 34%, Belgium - 27%, France - 24%) have a lower share of debt in GDP, while countries with a low level of resource reuse (Greece - 5%, Romania - 2%) are characterized by debt pressure of more than 120% of GDP.

Results showed highly significant values for all tested relationships. Debt to GDP-SFI, $r = -0.63$; an inversely proportional relationship between the level of debt and the sustainability of public finances. Circularity-SFI, $r = +0.58$; a positive, strong relationship between the development of a circular economy and macro-financial stability, as embodied by SFI. Deficits and inefficient spending seem to decrease when increased recycling and reuse are introduced.

To provide a more comprehensive representation of the relationships between the analyzed variables, a correlation matrix was constructed based on standardized data for EU member states over the period 2014–2024. The matrix summarizes the pairwise Pearson correlation coefficients between public debt, circularity indicators, and the fiscal sustainability index.

Table 3. Correlation matrix of public debt, circularity, and fiscal sustainability (EU-27, 2014–2024). (Source: calculated by the author based on Eurostat (2025), European Commission (2024), European Parliament (2025)).

Variable	Debt	Circularity	SFI
Debt	1	-0.41	-0.63
Circularity	-0.41	1	0.58
SFI	-0.63	0.58	1

Variance of 72% in the fiscal sustainability index can be explained by changes in debt burden and level of circularity ($R^2=0.72$). The estimated regression equation is: $SFI = 0.84 - 0.0024 \times Debt + 0.015 \times Circularity$, where Debt is the share (%) of public debt in GDP, and Circularity is the circularity coefficient (%). This implies that on average, a one percentage point increase in the circularity ratio will increase fiscal sustainability by 0.015 percentage points, while it will be reduced by about 0.024 percentage points if there is a ten-percentage point increase in debt.

The comparative analysis clearly shows the grouping of EU countries by type of fiscal and environmental behavior. Green financing mechanisms are systematically integrated with effective institutional controls on debt in Northern and Western European countries (Netherlands, Sweden, Denmark, Germany) (paying special attention to government “green” spending while keeping total levels within sustainable parameters). In the South, there is still vulnerability in achieving debt sustainability through high social spending, structural fiscal inertia, and slow adaptation to EU environmental policies.

To summarize, the correlation structure of interdependencies confirms the hypothesis that fiscal stability and debt sustainability of the EU countries are directly related to the success of implementing the principles of the circular economy. Increasing the level of circularity helps to reduce debt risks and creates a new model of economic governance in which environmental efficiency becomes a key factor in the financial sustainability of states. This approach is in line with the provisions of the European Green Deal and the targets of the EU Competitiveness Compass 2030, which define green fiscal consolidation as a strategic tool for strengthening the European economy.

Regression modeling and scenario forecasting of the EU debt sustainability until 2030

An econometric model based on panel data from 27 EU member states for 2014-2024 is used to make a reasonable forecast of the debt sustainability of the European Union's public finances. The study uses official statistical materials such as the Debt Sustainability Monitor 2024 (European Commission, 2024), the Sustainability of Public Finances Index 2025 (European Parliament, 2025), the Circular Economy Indicators and Monitoring Framework (European Commission, 2025), and the Government Finance Statistics and Debt Indicators database (Eurostat, 2025). The sample covers key macro-fiscal indicators, such as the share of public debt in GDP, the fiscal sustainability index (further – SFI), and the level of circularity of the economy. The indicators were normalized in accordance with a single Eurostat methodology, which ensured a correct comparison in time and space.

The sign of the coefficients is in line with expectations: an increase in debt has a negative impact on the sustainability of public finances, while an increase in circularity has a positive effect (Table 4).

Table 4. Regression estimation results of the SFI for EU countries, 2014-2024. (Sources: European Commission (2024); European Parliament (2025); European Commission (2025); Eurostat (2025))

Indicator	Coefficient estimate	Standard error	t-statistic	P-value
Constant	0.840	0.060	14.0	<0.001
Debt (% of GDP)	-0.0024	0.0006	-4.0	<0.001
Circularity (%)	+0.0150	0.0040	3.8	0.0002
R ² (within)	0.72			
N observations	297			

The results show that the model explains 72% of the variation in the fiscal sustainability indicator, which is a high level for panel macroeconomic data. Given an average debt burden of 82.5% of GDP and a circularity rate of 12%, which is typical for the EU in 2024, the model estimates fiscal sustainability at 0.822 points. This corresponds to a moderately stable state of public finances, which tends to gradually improve due to structural adaptation to EU environmental policy.

For scenario forecasting until 2030, three development models were formed based on the official strategic guidelines of the European Union - the Compass for Competitiveness and the Net-Zero Industry Act (European Commission, 2025). In the baseline scenario, if the current dynamics are maintained without significant structural changes in resource efficiency policy, fiscal sustainability stabilizes at about 0.82 points (Table 5).

This demonstrates the potential strengthening of budgetary balance due to increased resource efficiency, reduced import dependence, and increased revenues from domestic production. An additional effect is provided by the reduction of the debt burden to 80% of GDP through the implementation of the "green consolidation" policy, which is consistent with the analytical estimates of the OECD Economic Outlook 2024: Fiscal Sustainability and Green Transition (OECD, 2024).

Table 5. Projected parameters of debt and fiscal sustainability of the EU-27 by 2030. (Sources: Authors' calculations based on European Commission (2024, 2025); European Parliament (2025); OECD (2024); Eurostat (2025))

Indicator	2024 (baseline)	2030 (inertia scenario)	2030 (24% circularity)	2030 (24% circularity + 80% debt)
Debt (% of GDP)	82.5	83.0	83.0	80.0
Circularity (%)	12	12	24	24
SFI (estimated)	0.822	0.821	0.984	0.996

The projected values show that the effect of increasing the circularity of the economy is significant even without additional measures to reduce debt pressure. In countries with a high level of green innovation (the Netherlands, Sweden, Denmark), the SFI index has already improved above 0.9 in the medium term, which confirms the systemic impact of circular reforms on financial sustainability (European Commission, 2025). Instead, countries with a low level of circularity (Romania, Bulgaria, and Greece) remain in the zone of fiscal vulnerability due to structural inefficiencies in spending and the slow implementation of resource-efficient development models.

Scenario forecasting until 2030 confirms that the sustainability of EU public finances is closely linked to progress in implementing the European Green Deal. The institutional integration of environmental policy and debt management forms a

new model of fiscal stability, in which economic modernization is combined with environmental responsibility. Thus, provided that the EU's strategic guidelines to double the level of circularity to 24% and reduce the debt burden to 80% of GDP are met, the fiscal sustainability index can reach optimal values, which corresponds to the state of structural equilibrium and minimization of macrofinancial risks within the framework of the EU's common debt policy.

The results of the regression modeling confirmed the hypothesis that the fiscal sustainability of the public finances of the European Union countries is determined not only by the level of debt burden, but also by the scale of development of the circular economy. The negative sign of the coefficient for the debt/GDP variable (-0.0024) indicates that an increase in public debt reduces the sustainability of public finances, while the positive coefficient for the circularity indicator (+0.015) demonstrates its stimulating effect. Thus, the hypothesis that the environmental modernization of the economy is a factor in improving fiscal balance and debt discipline has been fully empirically confirmed based on EU panel data for 2014-2024.

Summarizing the results of the scenario forecasting, it was found that if the EU strategic guidelines for doubling the level of circularity to 24% and reducing the debt burden to 80% of GDP by 2030 are implemented, the fiscal sustainability index can reach the level of 0.996, which corresponds to the state of structural equilibrium of public finances. This shows that the transition to "green consolidation" is the most effective debt policy trajectory that can ensure the simultaneous achievement of economic stability, environmental efficiency, and reduction of macrofinancial risks within the new model of sustainable development of the European Union.

DISCUSSION

The results confirmed the research hypothesis that the fiscal sustainability of the European Union countries is a function of the interaction between the level of public debt, the quality of debt management, and the institutional implementation of the principles of the circular economy. The analysis shows that countries with more transparent financial systems and effective fiscal rules demonstrate lower debt burdens and higher fiscal stability. Similar results are in line with the findings of Pjanić et al. (2020), who found that macroeconomic predictors of public debt significantly depend on the structural characteristics of the economy, membership in a monetary union, and fiscal policy coherence among EU countries.

This can, therefore, be compared to the findings of Rexhepi and Zeqiraj (2023) – there is a threshold effect in the debt burden: when public debt as a share of GDP exceeds 90-100%, economic growth slows down, and fiscal stability weakens. Our calculation fully confirms this pattern, revealing a decrease in the index of sustainability of public finances for countries with debt ratios above the threshold value. At the same time, apart from acceptable values, debt policy remains one of the stable instruments that is consistent with a hypothesis about nonlinearity between two variables: debt burden and fiscal sustainability.

Psekota et al. (2025) constructed a composite index of fiscal sustainability from selected annual and quarterly variables for the EU countries. Their results show that the size of the shadow economy is closely correlated to fiscal discipline among the member states of the EU. In their words, "the growth of the informal economy erodes the budget revenue base and reduces the ability of governments to service their debt without increasing deficits." Our results confirm this thesis: countries with more transparent budget flows perform better on our composite index of fiscal sustainability and have lower debt risks. This implies that institutional quality is a key factor in supporting financial stability.

The green aspect of debt is still one component in the larger framework of sustainable development. "Climate risks and environmental issues are increasingly determining trajectories of public finance", Seguin (2024). Countries' energy decarbonization and circular economy policies reduce the cost of energy through efficiency in public investment, hence a process where debt profiles become strongly linked to such policies. This is fully consistent with our result that an increase in the circularity ratio brings about an increase in the fiscal sustainability index for EU countries.

Staviarska (2023) finds institutional mechanisms of fiscal control in debt discipline. She argues that national and supranational fiscal rules that help contain deficits while increasing the transparency of public finances and demonstrating confidence to investors by all means support her thesis. This article partially supports this thesis: countries that have implemented the revised EU Fiscal Framework show more stable debt dynamics, as well as lower volatility of their debts.

Further evidence is provided by Przekota, Kowal-Pawul, and Szczepańska-Przekota (2025), who show that the scale of the shadow economy acts as a structural constraint on fiscal sustainability within the European Union. Their empirical results indicate that a larger informal sector systematically weakens the tax base, delays fiscal consolidation, and increases the vulnerability of public finances to debt-related shocks. These findings align with the patterns identified in our analysis: countries characterised by higher institutional transparency and more advanced digital tax administration exhibit stronger fiscal-sustainability scores and more stable debt trajectories.

An additional dimension of fiscal sustainability under crisis conditions is highlighted in Petrukha et al. (2025a), who analyze the functioning of state budget systems within a wartime economy and identify key post-war recovery triggers. Their findings indicate that extreme external shocks fundamentally restructure fiscal priorities, leading to a temporary expansion of debt-financed expenditures combined with the introduction of adaptive budgetary instruments aimed at maintaining economic resilience. Importantly, the authors emphasize that post-war recovery strategies play a decisive role in shaping long-term debt trajectories, as they determine the balance between reconstruction needs and fiscal discipline. This perspective complements the present study by reinforcing the argument that sustainable debt policy must incorporate not only macroeconomic and environmental factors, but also crisis-response and recovery-oriented mechanisms as integral components of modern fiscal governance.

This line of reasoning is further developed in Petrukha et al. (2024) and Petrukha et al. (2025b), who provide a detailed analysis of the transformation of public debt dynamics and budgetary architecture in Ukraine under conditions of extreme economic disruption. Their findings indicate that debt management systems in such environments acquire a new structural configuration, characterized by increased reliance on external financing, heightened fiscal centralization, and the expansion of state intervention mechanisms. In particular, Petrukha et al. (2025b) demonstrate that military actions lead to a profound restructuring of the state budget, where defense and social expenditures dominate, while traditional fiscal equilibrium criteria become temporarily secondary. At the same time, Petrukha et al. (2024) emphasize that these transformations generate a new model framework of debt management, in which sustainability depends on the ability to balance short-term stabilization needs with long-term recovery objectives. This perspective reinforces the conclusions of the present study by showing that fiscal sustainability in modern conditions should be interpreted as a dynamic and adaptive process, shaped not only by macroeconomic and environmental factors but also by the structural effects of crisis and post-crisis transformations.

The environmental dimension of debt sustainability is also receiving growing attention in recent research. Seghini (2024) highlights that climate-related risks have become a determining factor shaping sovereign debt dynamics by influencing expenditure structures, investment priorities, and long-term growth potential. According to this review, EU member states that advance more rapidly in decarbonisation and circular-economy policies tend to display more resilient debt profiles and reduced exposure to macro-financial volatility. This observation is entirely consistent with our empirical findings, which show that increases in the circularity rate are associated with higher fiscal-sustainability index values, suggesting that environmental modernisation functions as an integral component of long-term financial stability.

The debt sustainability of European Union member countries is maintained in three main aspects: fiscal, institutional, and environmental. Environment-related aspects include the accelerated implementation of a circular economy to attain long-term macro-financial stability through a coordinated debt policy with budgetary control mechanisms and macrofinancial stability. Thus, this study provides policies combining sound decision-making principles aimed at increasing environmental efficiency, modernization, and sustainability in the EU economic policy, even under global uncertainty in the case of shocks. There remain urgent improvements needed on the debt architecture while enhancing financial institutions' role in sustainably developing the European Union.

Among the limitations of the study are differences in the methodology for calculating fiscal sustainability indicators between member states, which may affect the comparability of results, as well as insufficient unification of data on the environmental impact of debt programs. At the same time, the findings are representative of developing analytical guidelines for the future financial policy of the European Union.

CONCLUSIONS

The article gives exact numbers which show that fiscal sustainability in successful debt management, together with public debt levels in the EU and the speed of circular economy integration, are directly connected to this. Between 2014 and 2024, the EU debt ratio on average declined from about 86% to 81% of GDP, while the aggregate indicator for fiscal sustainability increased by about 15%. This hints at a gradual strengthening of macro-fiscal stability over this period. The positive development was accompanied by an increase in the share of the circular economy in total economic activity from 10% to 12%, reflecting ecological transformation that is increasingly linked to financial sustainability.

The results of the correlation and regression analysis confirmed the medium-high strength of the relationship between the level of public debt and the fiscal sustainability index (correlation coefficient $r = -0.63$), as well as the positive relationship between the circularity indicator and fiscal stability ($r = 0.58$). This means that reducing the debt burden and expanding investments in green sectors contribute to the efficiency of fiscal policy and the stability of the financial system. According to the regression model, a one percentage point increase in the circularity ratio increases the fiscal sustainability index by

0.015, while a ten percentage point increase in debt reduces it by about 0.024. In the scenario forecasting until 2030, it was found that with a doubling of the circularity rate to 24 percent and a reduction in debt to 80 percent of gross domestic product, the public finance sustainability index could increase to 0.98-1.00 points, which corresponds to a state of structural equilibrium.

The novelty of the study lies in the quantitative confirmation of the dependence between debt, fiscal, and environmental parameters, which allows for an integrated assessment of financial stability through the prism of green transformation. The practical significance lies in the possibility of applying the results obtained to improve debt policy, update fiscal rules, and form a balanced public financial management system within the framework of the new Seven-Year Financial Plan of the European Union for 2028-2034.

Further research should focus on building integrated econometric models that take into account the impact of military spending, energy subsidies, and climate investments on debt sustainability, as well as analyzing the impact of Next Generation EU instruments and new green finance mechanisms. A promising direction is the creation of a single European green debt index, which will allow combining macro-financial and environmental goals within the framework of the European Union's 2030 sustainable development strategy.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

FUNDING

The Authors received no funding for this research.

CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

REFERENCES

- Afonso, A., & Coelho, J. C. (2025). Fiscal sustainability, fiscal reactions, pitfalls and determinants. *Applied Economics*, 57(26), 3560–3571. <https://doi.org/10.1080/00036846.2024.2337808>
- Armendariz, S., Cabezon, E., Cui, L. Q., Domit, S., Iancu, A., Magistretti, G., Srinivas, R., & Wong, Y. C. (2024). Taming public debt in Europe: Outlook, challenges, and policy response. *International Monetary Fund. Fig.* <https://doi.org/10.5089/9798400285806.001>
- Asteriou, D., Koufopoulos, D., & Spanos, K. (2025). Conditional forecast for public debt and threshold effects: Evidence from South EU countries. *The Journal of Economic Asymmetries*, 32, e00430. <https://doi.org/10.1016/j.jeca.2025.e00430>
- Beetsma, R., Busse, M., Larch, M., & Romp, W. E. (2025). Some intergenerational arithmetic to control public debt in the EU. *Journal of Pension Economics & Finance*. <https://doi.org/10.1017/S1474747225100085>
- Căpraru, B., Pappas, A., & Sprincean, N. (2025). Fiscal rules in the European Union: Less is more. *Journal of Common Market Studies*, 63(1), 320–334. <https://doi.org/10.1111/jcms.13628>
- Catarino, J. R., Nunes, A. M., Borrego, P., & Sobral, S. (2024). Financial sustainability in the European Union: Public debt and deficit dynamics in EU Member States. *European Studies*, 11(1), 45–62. <https://doi.org/10.2478/eustu-2024-0007>
- Darvas, Z., Welslau, L., & Zettelmeyer, J. (2025). Demographic change will hit public debt sustainability in European Union countries. *Journal of Policy Modeling*, 47(6), 1131–1157. <https://doi.org/10.1016/j.jpolmod.2025.09.004>
- de Haan, J., & Amtenbrink, F. (2023). The reform of the European fiscal rules: In search of mechanisms ensuring sustainable debt levels. *The Economists' Voice*, 20(2), 169–178. <https://doi.org/10.1515/ev-2023-0063>
- Eminidou, S., Geiger, M., & Zachariadis, M. (2023). Public debt and state-dependent effects of fiscal policy in the euro area. *Journal of International Money and Finance*, 130, 102746. <https://doi.org/10.1016/j.jimonfin.2022.102746>
- European Central Bank (2025). *EU fiscal framework and policy database*. European Central Bank. <https://www.ecb.europa.eu/pub/economic-research>
- European Commission (2024). Debt Sustainability Monitor 2024. Directorate-General for Economic and Financial Affairs. https://economy-finance.ec.europa.eu/publications/debt-sustainability-monitor-2024_en
- European Commission (2025). *Circular economy indicators and monitoring framework*. Directorate-General for Environment. https://environment.ec.europa.eu/strategy/circular-economy_en

13. European Parliament (2025). *Debt sustainability analysis methodology in the EU's new economic governance framework: An assessment*. Economic Governance and EMU Scrutiny Unit (EGOV), Directorate-General for Internal Policies. [https://www.europarl.europa.eu/Reg-Data/etudes/IDAN/2025/764183/IPOL_IDA\(2025\)764183_EN.pdf](https://www.europarl.europa.eu/Reg-Data/etudes/IDAN/2025/764183/IPOL_IDA(2025)764183_EN.pdf)
14. Eurostat (2025). *Government finance statistics and debt indicators (2014–2024 dataset)*. Statistical Office of the European Union. <https://ec.europa.eu/eurostat/data/database>
15. Gkatzoglou, F., Sofianos, E., & Barbier-Gauchard, A. (2025). The EU public debt synchronization: A complex networks approach. *Economies*, 13(7), 186. <https://doi.org/10.3390/economies13070186>
16. Grosu, A. C. (2025). Public debt sustainability in post-2000 EU Member States with euro adoption: A penalized spline regression approach. *Revista Economica*, 77(1), 69–84. <https://ideas.repec.org/a/blg/reveco/v77y2025i1p69-84.html>
17. Grosu, A. C., Pintilescu, C., & Viorica, E.-D. (2022). Public debt sustainability in the EU developed countries. *Journal of Public Administration Finance and Law*, 11(24), 133–149. <https://doi.org/10.47743/jopaf-2022-24-13>
18. Južnik Rotar, L. (2025). Fiscal sustainability and economic growth in the light of new economic governance. *Technological and Economic Development of Economy*, 31(3), 663–684. <https://doi.org/10.3846/tede.2025.22499>
19. Kraemer, R., & Lehtimäki, J. (2023). Government debt: The impact of fiscal rules at the European and national level. *Empirica*, 50, 783–805. <https://doi.org/10.1007/s10663-023-09582-z>
20. Kraemer, R., & Lehtimäki, J. (2024). Government debt, European institutions and fiscal rules: A synthetic control approach. *International Tax and Public Finance*, 31(1), 1112–1157. <https://doi.org/10.1007/s10797-023-09791-z>
21. Mihai, D. G., Dumitrescu, B. A., & Bozagi, A.-M. (2025). Fiscal sustainability and the informal economy: A non-linear perspective. *Journal of Risk and Financial Management*, 18(4), 207. <https://doi.org/10.3390/jrfm18040207>
22. Organisation for Economic Co-operation and Development (OECD) (2024). *Economic Outlook 2024: Fiscal sustainability and green transition*. OECD Publishing. https://www.oecd.org/en/publications/oecd-economic-outlook-volume-2024-issue-2_d8814e8b-en.html
23. Park, S., & Kim, S. (2024). The impact of federal fiscal rules on debt: Insights from the European Union countries. *Public Budgeting & Finance*, 45(1), 70–87. <https://doi.org/10.1111/pbaf.12375>
24. Petrukha, N., Petrukha, S., Alekseienco, N., Kushneruk, O., & Mazur, A. (2023). Social imperatives of public finance: War adaptation and principles of post-war recovery. *Financial and Credit Activity: Problems of Theory and Practice*, 3(50), 358–371. <https://doi.org/10.55643/fcactp.3.50.2023.4031>
25. Petrukha, S., Konovalenko, D., & Petrukha, N. (2025a). State budget in the context of a wartime economy and post-war triggers for its recovery. *Baltic Journal of Economic Studies*, 11(1), 256–269. <https://doi.org/10.30525/2256-0742/2025-11-1-256-269>
26. Petrukha, S., Petrukha, N., & Miakota, R. (2024). The public debt of Ukraine: A new dimension of dynamics and architecture of the model framework of the management system. *Baltic Journal of Economic Studies*, 10(5), 305–314. <https://doi.org/10.30525/2256-0742/2024-10-5-305-314>
27. Petrukha, S., Petrukha, N., Konovalenko, D., Miakota, R., & Gubanov, V. (2025b). Ukrainian state budget as a result of military actions in the Russian-Ukrainian war. *International Research Journal of Multidisciplinary Scope (IRJMS)*, 6(3), 550–568. <https://doi.org/10.47857/irjms.2025.v06i03.04776>
28. Pjanić, M., Milenković, N., Andrašić, J., Kalaš, B., & Mirović, V. (2020). Public debt's predictors in EU: Evidence from members and non-members of European Monetary Union. *Economic Research-Ekonomska Istraživanja*, 33(1), 3562–3579. <https://doi.org/10.1080/1331677X.2020.1776137>
29. Przekota, G., Kowal-Pawul, A., & Szczepańska-Przekota, A. (2025). Determinants of the shadow economy—Implications for fiscal sustainability and sustainable development in the EU. *Sustainability*, 17(20), 9033. <https://doi.org/10.3390/su17209033>
30. Rexhepi, G., & Zeqiraj, V. (2023). The threshold effect of public debt on economic growth: The case of the new European Union member states. *Journal of Governance and Regulation*, 12(2), 248–259. <https://doi.org/10.22495/jgrv12i2art18>
31. Seghini, C. (2024). Climate and sovereign debt sustainability: A literature review. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.4766658>
32. Stawiarska, K. (2023). Fiscal rules as institutional tools for public debt management in the European Union Member States. *Central European Economic Journal*, 10(57), 414–428. <https://doi.org/10.2478/ceej-2023-0024>
33. World Bank (2024). *World Development Indicators (WDI) database*. World Bank Group. <https://data.worldbank.org/indicator>

Петруха С., Петруха Н., М'якота Р., Губанов В., М'якота М.

ДЕРЖАВНІ ФІНАНСИ ТА БОРГОВА ПОЛІТИКА В КОНТЕКСТІ МОДЕРНІЗАЦІЇ ЕКОНОМІЧНОЇ ПОЛІТИКИ ЄС

У роботі досліджено системні зв'язки між фіскальною стійкістю, борговою політикою та модернізацією економічної політики в межах європейського Зеленого курсу. Розглянуто два взаємопов'язані процеси: забезпечення боргової

безпеки та фінансової стабільності в умовах зростання фіскальних дисбалансів, спричинених наслідками COVID-19, воєнними витратами та енергетичною кризою, а також просування структурних реформ відповідно до пріоритетів Зеленого курсу. Дослідження оцінює, чи сприяють державний борг і фіскальна політика виникненню фіскальної нестійкості, а також аналізує вплив розвитку циркулярної економіки на зміцнення державних фінансів. Наукова новизна дослідження полягає в розробці інтегрованої економетричної моделі, що одночасно враховує взаємодію державного боргу, фіскальної стійкості та показників циркулярної економіки. На відміну від існуючих підходів, які аналізують ці фактори ізольовано, запропонована модель забезпечує їх комплексну кількісну оцінку в межах економічної системи Європейського Союзу. Методологічною основою є системний інституціональний економічний аналіз, що базується на офіційних статистичних даних Eurostat і Європейської комісії, у поєднанні з економетричним моделюванням. Сценарне прогнозування показує, що за умови зростання рівня циркулярності до 24% і зниження державного боргу до 80% ВВП до 2030 року індекс фіскальної стійкості може досягти 0,98–1,00. Отримані результати обґрунтовують необхідність оновлення фіскальних правил, удосконалення боргової політики та формування збалансованої моделі управління державними фінансами в межах фінансової рамки ЄС на 2028–2034 роки, демонструючи, що фінансова стабільність і екологічна трансформація є взаємодоповнювальними складовими сталого розвитку. Практична цінність дослідження полягає в можливості використання отриманих результатів органами державної влади, інституціями Європейського Союзу та міжнародними фінансовими організаціями для розробки ефективної боргової політики та інтеграції інструментів зеленої трансформації до системи макрофінансового управління.

Ключові слова: державні (публічні) фінанси, стійкість державних фінансів, боргова політика, боргова (фіскальна) стійкість, економічна політика, циркулярна економіка, європейський Зелений курс, екологічна трансформація, Європейський Союз, економічна модернізація

JEL Класифікація: H63, H62, E62