2025
Vol.32 No.1

POLISH JOURNAL OF MANAGEMENT STUDIES
Tkacova A., Gavurova B., Toth P.

FROM STABILITY TO RISK: TRAJECTORIES OF FISCAL SUSTAINABILITY IN THE EUROPEAN UNION

Tkacova A., Gavurova B., Toth P.[*]

Abstract: This paper analyses the fiscal sustainability of European Union member states during the period 2015–2024 by applying three core indicators (S0, S1, and S2) published by the European Commission, which capture short-, medium-, and long-term risks. The study combines descriptive analysis, trend assessment, principal component analysis (PCA), and the construction of a synthetic fiscal sustainability index. This multidimensional approach allows us to identify systematic differences among countries, to evaluate their trajectories over two sub-periods (2015–2018 and 2019–2024), and to assess the impact of the COVID-19 pandemic and the energy crisis on fiscal positions. The findings reveal that while short-term risks remain relatively stable across the EU, medium- and long-term risks diverge significantly, with Slovakia, Hungary, and Romania among the most vulnerable, and Nordic countries and Germany maintaining stable positions. The proposed index complements PCA and offers policymakers a transparent tool for identifying high-risk countries. The novelty of the study lies in integrating PCA on both levels and trends of S0–S2 with a newly developed synthetic index, enabling a more nuanced detection of fiscal sustainability trajectories before and after the pandemic.

Keywords: fiscal sustainability; european union; pca; synthetic index; fiscal policy

DOI: 17512/pjms.2025.32.1.16

Article history:
Received July 16, 2025; *Revised* November 23, 2025; *Accepted* November 30, 2025

Introduction

Fiscal sustainability of public finances is one of the key challenges of economic policy in the European Union (EU). Rising public debt levels, demographic changes and repeated economic shocks, including the global financial crisis, the euro area crisis and the COVID-19 pandemic, have significantly tested the ability of Member States to stabilise public finances. Maintaining debt stability is a prerequisite for macroeconomic stability, investor confidence and long-term economic growth (Beetsma, 2022). In response to these challenges, a set of fiscal sustainability indicators has been established in the European context, which are developed by the European Commission (EC) as part of its regular debt sustainability reports

[*]**Andrea Tkacova,** PhD., Technical University of Kosice, Faculty of Economics, Department of Finance, Slovakia, ✉ email: andrea.tkacova@tuke.sk,
ORCID: 0000-0002-6025-1261
Beata Gavurova, Prof., Ph.D**.,** Tomas Bata University in Zlin, Faculty of Management and Economics, Czechia, ✉ corresponding author: gavurova@utb.cz,
ORCID: 0000-0002-0606-879X
Peter Toth, PhD., Technical University of Kosice, Faculty of Economics, Department of Finance, Slovakia, ✉ email: peter.toth@tuke.sk,
ORCID: 0000-0002-5616-5520

(European Commission, 2021; 2023b; 2024; 2025). The three most frequently used indicators are S0, S1 and S2. The S0 indicator focuses on short-term risks that could result in a sudden loss of market confidence. S1 represents the fiscal adjustment needed to reach the 60% of GDP debt reference limit in the medium term. S2 captures long-term challenges and an immediate adjustment to the primary balance that would ensure debt stabilisation in the infinite horizon (EC, 2023a).

The relevance and practical use of these indicators has been repeatedly confirmed in the literature. Berrittella and Zhang (2015) have pointed out that, while short-term risks are important, the main challenges to fiscal sustainability in the EU lie in the medium and long term. Ramos-Herrera and Sosvilla-Rivero (2020) have highlighted that population ageing and long-term expenditure pressures represent the dominant source of risks to public finances in the euro area. Recent empirical work (Afonso and Alves, 2023; Afonso and Coelho, 2025; Afonso, Alves and Coelho, 2025) confirms that the efficiency of public spending, the structure of economic growth and the quality of fiscal institutions significantly determine the ability of countries to maintain debt stability.

The current literature does not focus only on individual indicators, but increasingly uses multidimensional approaches. The use of principal component analysis (PCA) is one of the proven ways to identify common patterns and reduce data complexity (Jolliffe and Cadima, 2016). In the context of fiscal sustainability, PCA allows us to examine which indicators contribute most to divergences between countries and to track the dynamics of their development (Greco et al., 2019).

The aim of this article is to comprehensively empirically analyse the fiscal sustainability of EU Member States in the period 2015–2024 using the S0, S1 and S2 indicators, which represent the EC's standard analytical framework for assessing short-, medium- and long-term risks. The analysis focuses on identifying patterns of similarities and differences between countries and on assessing the dynamics of risk developments over the period under review. The chosen methodological approach combines descriptive statistics, trend analysis and principal component analysis (PCA) applied to both the averages and trends of the indicators. Particular attention is paid to the differences between the periods 2015–2018 and 2019–2024, which allows capturing the specific consequences of the COVID-19 pandemic and the subsequent energy crisis. In addition, the study also introduces a synthetic fiscal sustainability index, which combines information on the level and dynamics of the indicators into a single composite indicator. This index provides a simplified yet practically usable framework for comparing countries and complements the PCA results with a more transparent assessment of risk profiles.

Literature Review

Fiscal sustainability can be defined as the ability of a government to finance public expenditure in the long term without public debt reaching an unsustainable trajectory (Chen, 2014). Classical approaches are based on testing the solvency condition – if public finances do not develop exponentially above the level of GDP in the long

term, budgetary policy is sustainable. However, newer concepts also emphasize fiscal space (Ko, 2020), i.e. the room for maneuver for governments that allows them to respond to crises without losing market confidence.

The determinants of sustainability are multidimensional. Ekonomides and Philippopoulos (2023) point out that a favorable difference between the interest rate and GDP growth (r–g) can stabilize debt in the short term, but its sustainability is endogenously conditioned by the development of the debt itself. Afonso and Alves (2023) highlight the importance of public spending efficiency: countries that are able to deliver public services at lower costs have lower deficits and thus a better fiscal position. Furthermore, Ciaffi, Deleidi and Di Domenico (2024) show that public investment has higher multipliers than current consumption, thus supporting economic growth and, indirectly, debt sustainability. The ECregularly assesses the fiscal sustainability of Member States through three indicators – S0 (short-term risks), S1 (medium-term adjustment) and S2 (long-term gap) (EC, 2023b; 2024). These indicators have become a key element of the EU's analytical framework and provide policymakers with early signals on the need for fiscal adjustment. Their importance is also underlined by academic studies, which show that distinguishing between short-term, medium-term and long-term risks is essential to capture the complex reality of fiscal sustainability (Berrittella and Zhang, 2015; Ramos-Herrera and Sosvilla-Rivero, 2020).

S0 is an index of short-term risk based on a combination of fiscal and macro-financial variables (deficit, debt, r–g differential, banking sector, competitiveness). A value above a set threshold signals possible fiscal stress within a one-year horizon (EC, 2023b). Although it is a useful early warning mechanism, the literature warns that it is too volatile and can generate false signals (Berrittella and Zhang, 2015).

S1 expresses the permanent fiscal adjustment (in % of GDP) needed to achieve a debt of 60% of GDP within a 15-year horizon. It takes into account both the initial budgetary position and the expected costs of ageing (EC, 2024). More recent revisions of the methodology have extended the horizon to 2070 to better capture high debt levels (EC, 2021). However, S1 has the limitation that it is based on a no-policy-change scenario and therefore does not assume adaptive reforms (Afonso and Coelho, 2025).

S2 measures the immediate and permanent adjustment to the primary balance needed to meet the intertemporal budgetary constraint over an infinite horizon. The key inputs are the initial balance and projections of ageing-related expenditure (EC, 2025). This indicator is sensitive to long-term demographic and macroeconomic assumptions (Ramos-Herrera and Sosvilla-Rivero, 2020). Werding (2021) even argues that S2 may lose its interpretative value when $r < g$ in the long run.

Despite their usefulness, the S0–S2 indicators have significant limitations: high sensitivity to input assumptions, dependence on demographic projections, and simplified "no-policy-change" assumptions, i.e. they do not take into account the adaptive behavior of governments in response to increasing debt pressures. However, in practice, governments often adopt additional reforms (e.g. pension

reform, expenditure adjustment) if sustainability deteriorates significantly – the very existence of a high S1 or S2 can trigger fiscal measures. The no-policy-change model also assumes that governments will not implement new spending programs or tax breaks beyond those already approved, which may not be realistic. While this approach allows for comparability (it will exclude the impact of yet unknown future measures), it means that the actual debt trajectory may differ from projections – either positively due to additional savings or negatively due to the impact of new liabilities. Therefore, according to Greco et al. (2019) or OECD/JRC (2008), it is necessary to supplement them with robust scenarios and sensitivity analyses.

Table 1. Comparison of indicators S0, S1 and S2

Criterium	S0	S1	S2
Assessment horizon	1 year (short-term)	approx. 15 years (newer to 2070)	Infinite horizon
Object of measurement	Probability of fiscal stress in the near term	Fiscal adjustment needed to reach 60% of GDP	Immediate and permanent adjustment of primary balance to stabilize debt
Key inputs	Deficit, debt, r–g differential, market spreads, banking sector, macro-financial variables	Initial budget position, growth and interest rate projections, aging costs	Initial balance, long-term demographic projections, r–g differential
Strengths	Captures sudden deterioration in financial stability; uses historically validated crisis predictors	Sets quantified need for adjustment; clear link to debt target	Captures long-term pressure including demographic expenditure; compatibility with IBC theory
Main methodological limitations	Volatility, risk of false signals, limited predictive power	No-policy-change assumption, dependence on horizon and demographic projections	Extreme sensitivity to long-term projections, uncertainty at r < g, simplified models
Selected sources	EC (2023); Berrittella and Zhang (2015)	EC (2021, 2024); Afonso and Coelho (2025)	EC (2025); Ramos-Herrera and Sosvilla-Rivero (2020); Werding (2021)

The S0, S1, and S2 indicators represent a useful tool for quantifying fiscal sustainability and for international comparison of public debt risks. They help identify countries that may face problems in the future and provide policymakers with early signals for timely interventions. However, their methodological

foundations—particularly the reliance on long-term projections and simplified models—imply that the results must be interpreted with caution and in context. As analyses show, a "single number" cannot capture all aspects of fiscal sustainability under conditions of uncertainty (Dönnebrink and Grevenbrock, 2022). Therefore, it is advisable to complement these indicators with more detailed sensitivity analyses, qualitative factors, and expert assessments of future developments. This ensures that policies aimed at safeguarding long-term fiscal stability are based on a robust understanding of both the risks and the limitations of the applied metrics.

Research Methodology

The aim of this study is to empirically analyse the fiscal sustainability of the EUmember states in the period 2015–2024 using the S0, S1, and S2 indicators, to identify patterns of divergence among countries, and to assess the dynamics of short-term, medium-term, and long-term risks through the application of principal component analysis (PCA). Based on this aim, the following hypotheses were formulated:

H1: There are systematic differences in fiscal sustainability among EU member states.

H2: There are differences in the trend developments of the S1 and S2 indicators across EU countries during the observed period 2015–2024.

H3: EU countries display different trajectories of fiscal sustainability between the sub-periods 2015–2018 and 2019–2024.

The data on the S0, S1, and S2 indicators were obtained from the EC's databases – *Debt Sustainability Monitor* and *Fiscal Sustainability Report* – and processed in R-studio. The analysis covered 25 EU member states, excluding Cyprus and Greece. The data for Greece (EL) between 2015–2020 and for Cyprus (CY) in 2015 were unavailable due to their participation in the Economic Adjustment Programme. The observation period spans 2015–2024, which allows capturing developments before, during, and after the COVID-19 pandemic. To verify the robustness of the results, two sub-periods were additionally tested:

- **2015–2018**, representing a period of economic growth and consolidation efforts before the pandemic,
- **2019–2024**, covering the COVID-19 pandemic and the subsequent period of expansionary fiscal policy.

This division makes it possible to capture the potential impact of the COVID-19 pandemic and subsequent expansionary measures on the trajectories of fiscal sustainability. Such an approach allows us to uncover whether countries experienced an acceleration of risks after 2019, which would otherwise remain hidden when analysing aggregate averages.

An initial descriptive analysis of the data was performed. For the individual indicators S0, S1, and S2, boxplots were constructed to illustrate the distribution of values over time and across countries. In this analysis, the critical thresholds defined by the EC were also taken into account, enabling the classification of countries into

low-, medium-, and high-risk bands (Table 2). This procedure made it possible to identify countries with extreme values (outliers) and to track the dynamics of their fiscal risk in relation to the official thresholds.

Table 2. Threshold intervals of the examined indicators

Indicator	Low risk	Medium risk	High risk
Short-term indicator S0	≤ 0.43 (2015) ≤ 0.46 (2016–2024)	–	> 0.43 (2015) > 0.46 (2016–2024)
Medium-term indicator S1 (% GDP) (2015–2021)	≤ 0	0 – 2.5	≥ 2.5
Medium-term indicator S1 (% GDP) (2022–2024, new methodology)	< 2	2 – 6	> 6
Long-term indicator S2 (% GDP)	< 2	2 – 6	> 6

In processing the analysis, several steps were applied to increase the reliability and interpretability of the results. First, we verified the suitability of using principal component analysis (PCA) through standard robustness tests—the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity—which confirmed the appropriateness of applying PCA to our data. Bartlett's test of sphericity was statistically significant ($\chi^2 = 524.6$; df = 36; $p < 0.001$), confirming the presence of sufficient correlations among the variables. These results support the suitability of applying PCA to our data.

PCA is a multivariate statistical technique that reduces the dimensionality of data and reveals hidden structures by transforming the original variables into a smaller number of linearly independent components. This procedure is commonly used in economic and financial analyses (see e.g., Jolliffe and Cadima, 2016). In the context of fiscal sustainability, PCA helps to determine which indicators (S0, S1, S2) contribute most to differences among countries and how their weights change over time. Chen (2014) also emphasizes the importance of trend analysis in testing sustainability, which provides a complementary perspective to static values. Combining PCA with trend analyses can therefore yield a more comprehensive picture of risks and their dynamics.

PCA was applied in two ways:

1. To the average values of the S0, S1, and S2 indicators over the entire observed period and selected shorter sub-periods. This approach allows a comparison of countries in terms of their typical level of fiscal risk.
2. To the trends of the S0, S1, and S2 indicators, which capture the dynamics of development in the three selected periods. The trend was calculated as the slope (β-coefficient) from a linear regression:

$$Y_{it} = \alpha_i + \beta_i t + \varepsilon_{it} \quad (1)$$

where Y_{it} represents the value of the indicator for country *i* in year *t*, β_i is the trend coefficient, and ε_{it} is the estimation error (see Wooldridge, 2016). A standard formula for the regression slope was used:

$$\beta_i = \frac{\sum_{i=1}^{n}(t_i-\bar{t})(Y_i-\bar{Y})}{\sum_{i=1}^{n}(t_i-\bar{t})^2} \quad (2)$$

where t_i are the years (2015, ..., 2024), Y_i are the values of the indicator in these years, $\bar{t}$ is the average of the years and $\bar{Y}$ is the average of the indicator. The slope of the regression line (β_i) was interpreted as the average annual change in the indicator's value as a percentage of GDP during the observed period.

- $\beta>0$ → the indicator shows an increasing trend, i.e., fiscal risk is rising from a long-term perspective.
- $\beta<0$ → the indicator shows a decreasing trend, indicating an improvement in the fiscal position over time.
- $\beta\approx0$ (statistically not significantly different from zero) → no systematic direction exists; the development of the indicator can be considered stable or random.

The statistical significance of the trends was tested using the p-value. In the case of the S0 indicator, it was found that most of the trends are not statistically significant ($p > 0.05$), which indicates the absence of systematic direction in the short term. Therefore, the PCA results that include S0 trends are interpreted with caution. The PCA results allowed us to divide countries into four quadrants according to their average position and the development of the trend in the selected periods.

As an additional method to quantify the overall fiscal risk of EU countries, we constructed a synthetic fiscal sustainability index, which combines the level and dynamics of the S0, S1, and S2 indicators. The calculation procedure was as follows:

1. **Selection of input data:** The input variables consisted of the previously calculated average values and linear trends (β-coefficient) of the S0, S1, and S2 indicators for the periods 2015–2024, 2015–2018, and 2019–2024.
2. **Data normalization:** Since the individual indicators have different value ranges, Min–Max normalization was applied to transform all values into the interval ⟨0, 1⟩:

$$x'_i = \frac{x_i-\min(x)}{\max(x)-min(x)} \quad (3)$$

where x'_i is the normalized value, x_i is the original value, μ is the mean and σ s is the standard deviation.

3. **Calculation of partial scores:** For each indicator, we calculated the partial score as the product of its normalized average value and its normalized trend:

$$Score_{S0}=S0_z \times S0\_trend_z \quad (4)$$

and analogously for S1 and S2.

4. **Aggregation into the synthetic Fiscal Sustainability Index (FSI):** The synthetic index was determined as the sum of the partial scores:

$$FSI=(S0_z \times S0\_trend_z)+(S1_z \times S1\_trend_z)+(S2_z \times S2\_trend_z) \quad (5)$$

5. **Interpretation:** A higher value of the FSI represents worse fiscal sustainability, while a lower value indicates a better position of the country in the observed period.

This approach makes it possible to link both the static and dynamic components of fiscal sustainability assessment into a single indicator and provides a complementary perspective to the PCA results.

Research Results

Descriptive Analysis

Table 3 summarizes the basic statistical characteristics of the fiscal sustainability indicators S0 (short-term risk), S1 (medium-term fiscal adjustment), and S2 (long-term sustainability) for 25 EU countries in the period 2015–2024.

Table 3. Descriptive statistics of S0, S1, and S2

Indicator	count	mean	std	min	25%	50%	75%	max	range	skew	kurtosis
S0	250.0	0.265	0.115	0.0	0.19	0.255	0.34	0.61	0.61	0.325	-0.091
S1	250.0	0.941	3.533	-6.4	-1.8	1.05	3.5	14.8	21.2	0.365	0.206
S2	250.0	2.916	2.699	-2.1	1.0	2.7	4.2	12.1	14.2	0.835	0.833

The Table 3 shows that the S0 indicator has a low average value and low variability, which suggests stable short-term risks and relatively small differences across countries. In contrast, S1 and S2 exhibit significantly higher mean values and dispersion, with S1 reaching both extreme negative and positive values. These results confirm that medium- and long-term risks are the main source of differences among EU member states, while the short-term indicator is relatively homogeneous.

For a more detailed analysis of the input variables, a boxplot analysis of the S0, S1, and S2 indicators was also carried out, highlighting the different nature of fiscal risks in the short-, medium-, and long-term horizons. In the visualization of the data, the risk bands defined by the EC for the 2015–2024 period were also taken into account.

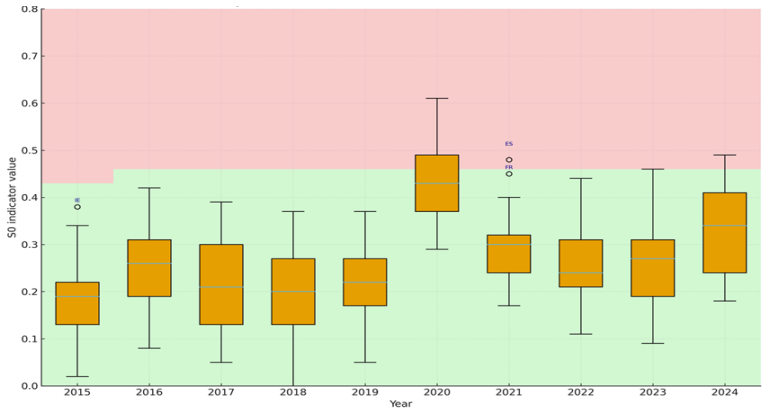

Figure 1: Boxplot of the S0 indicator with risk thresholds, 2015–2024
Note: In 2016, the values for determining the risk band for S0 were adjusted.

The short-term indicator S0 (Figure 1) suggests that most EU member states remained in the low-risk band throughout the entire observed period. More pronounced deviations appeared only in 2020, when the COVID-19 pandemic caused a sharp increase in deficits and debt in several countries. In particular, countries with higher sensitivity to external shocks, such as Spain and France, showed more significant deviations from the average. However, even during this period, the high-risk threshold was not systematically exceeded, which indicates that short-term fiscal stability in the EU has remained relatively robust thanks to the effectiveness of anti-crisis measures and the coordinated response at the EU level.
The medium-term indicator S1 is shown in Figure 2. S1 exhibits substantially greater dispersion across countries. In 2020–2021, during the period of expansionary fiscal policy related to the pandemic, values increased sharply, pointing to greater heterogeneity in fiscal positions. Countries such as Italy and Greece recorded extreme values due to a high debt burden and limited fiscal capacity to respond to shocks without further debt accumulation. Belgium and France also moved into higher risk bands, which can be economically explained by persistently high public expenditures and relatively weak consolidation discipline. In contrast, several Nordic countries and Germany maintained more stable values, thanks to lower initial debt and stricter fiscal policies. In 2020, Romania reached an extreme value, mainly due to a record public sector deficit (-9% of GDP) and expansionary policies already in place before the pandemic (public sector wage growth, pension increases). From 2022, the calculation methodology was revised, shifting the high-risk threshold to 6% of GDP. This change meant that some countries remained in elevated risk, but not in the highest band. For example, Slovakia experienced a significant post-pandemic budget deterioration, with delayed consolidation and the adoption of measures with long-term costs (e.g., social packages), which, even after the revision of the thresholds, placed it among the countries with high medium-term risk. The development of S1 thus makes it clear that the medium-term challenges associated with fiscal consolidation are very unevenly distributed across EU member states.

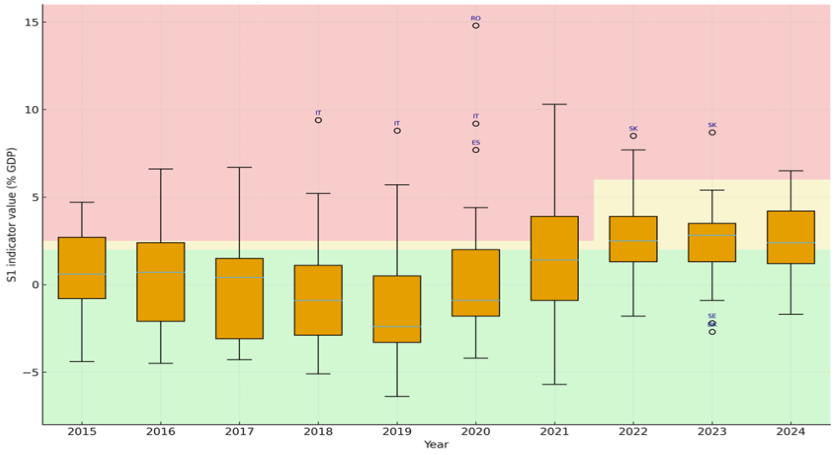

Figure 2: Boxplot of the S1 indicator with risk thresholds, 2015–2024
Note: In 2022, the values for determining the risk band for S1 were adjusted.

The long-term indicator S2, shown in Figure 3, confirms that the outlook of long-term expenditure pressures represents the most significant threat to fiscal sustainability. The values of this indicator are, on average, higher than those of S1, and many countries have long remained in the medium-risk band (2–6% of GDP). High risk (above 6% of GDP) has been repeatedly observed, especially in Italy, Greece, Portugal, and Belgium, reflecting a combination of structural problems: adverse demographic developments (population ageing), high pension and healthcare expenditures, and simultaneously weaker potential growth. In contrast, countries such as Sweden, Denmark, and Estonia show low S2 values, which is related to pension and fiscal reforms that reduced long-term pressures on public finances and strengthened the sustainability of social security systems.

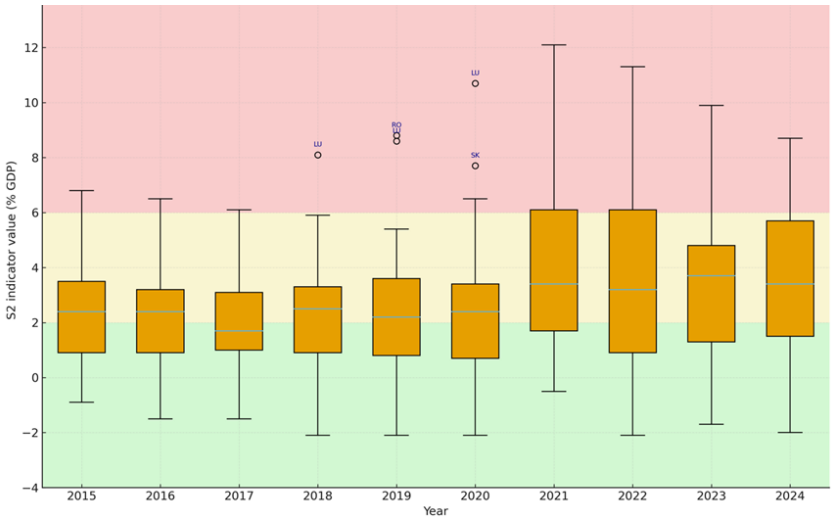

Figure 3: Boxplot of the S2 indicator with risk thresholds, 2015–2024

In summary, it can be stated that short-term risks (S0) are relatively stable within the EU, while long-term risks (S2) represent the most significant problem in terms of public finance sustainability. In particular, countries with high demographic risks and structural imbalances require systematic reforms aimed at reducing long-term expenditure pressures and supporting the growth capacity of the economy.

PCA Results for the Period 2015–2024

Table 4 provides an overview of the average values of the S0, S1, and S2 indicators for EU member states in the period 2015–2024 and also summarizes the results of the trend analysis, including the statistical significance of the estimated coefficients. In this way, not only the level differences between countries are captured, but also the dynamics of their development in the short-, medium-, and long-term horizons. These data represent the input variables for PCA for the period 2015–2024.

Table 4. Average values and trends of the S0, S1, and S2 indicators and their statistical significance (2015–2024)

Country	S0_mean	S1_mean	S2_mean	S0_trend	S0_p value	S1_trend	S1_p value	S2_trend	S2_p value
AT	0.159	0.950	2.930	0.019	0.156	0.316	0.104	0.152	0.011**
BE	0.295	4.920	4.900	0.009	0.521	0.281	0.073*	0.560	0.001***
BG	0.250	-1.780	2.240	0.001	0.928	0.618	0.032**	0.143	0.154
CZ	0.218	0.140	4.490	0.004	0.800	0.776	0.000***	0.255	0.056*
DE	0.144	-0.280	2.120	0.015	0.063*	0.395	0.001***	0.319	0.002***
DK	0.242	-3.590	0.110	-0.002	0.947	0.069	0.683	0.230	0.013**
EE	0.240	-2.800	0.610	-0.001	0.974	0.209	0.230	-0.082	0.177
ES	0.378	4.640	2.230	0.005	0.544	0.500	0.034**	0.561	0.018**
FI	0.244	1.310	3.180	0.001	0.959	-0.085	0.476	0.096	0.269
FR	0.347	4.250	1.060	0.014	0.099*	0.543	0.001***	0.289	0.067*
HR	0.307	0.970	-0.510	0.006	0.561	0.269	0.022**	0.240	0.026**
HU	0.363	1.160	4.020	0.025	0.000***	0.159	0.190	0.392	0.002***
IE	0.265	-0.110	2.550	0.012	0.393	0.276	0.074*	0.520	0.001***
IT	0.350	6.450	0.990	0.005	0.671	0.487	0.021**	0.369	0.012**
LT	0.238	0.340	2.320	0.004	0.785	0.218	0.323	0.233	0.065**
LU	0.204	-2.120	7.050	0.002	0.910	0.731	0.002***	0.573	0.023*
LV	0.312	-1.190	0.660	0.001	0.977	0.178	0.397	0.248	0.015**
MT	0.160	-0.440	6.040	0.005	0.638	0.240	0.207	0.283	0.036**

NL	0.212	0.370	3.940	0.011	0.328	0.362	0.006***	0.340	0.005***
PL	0.299	0.870	3.190	0.008	0.477	0.777	0.002***	0.634	0.001***
PT	0.380	3.180	-0.360	0.003	0.751	-0.596	0.018**	-0.376	0.001***
RO	0.318	4.420	5.050	0.012	0.012**	0.545	0.036**	0.286	0.103
SE	0.201	-3.170	1.100	0.003	0.824	0.411	0.003***	0.461	0.002***
SI	0.177	3.030	6.800	0.008	0.521	0.216	0.317	0.345	0.028**
SK	0.332	2.000	6.190	0.017	0.150	1.328	0.001***	0.993	0.003**
* p < 0,10, ** p < 0,05, *** p < 0,01									

The results show that the S0 indicator has mostly insignificant trends, which confirms its stable character as a short-term indicator. In contrast, S1 and S2 in many cases display statistically significant upward trends, indicating a deterioration of medium- and long-term risks in several member states (e.g., Belgium, the Czech Republic, Poland, and Slovakia). These findings suggest that while short-term risks remain relatively homogeneous, it is the medium- and long-term indicators that reveal growing divergence among countries and are therefore the key source of differentiation in the subsequent PCA analysis.

Based on the results presented in Table 4, the next step applied principal component analysis (PCA). Figure 4 illustrates the loadings of the S0, S1, and S2 indicators on the first two principal components (PC1 and PC2), separately for the use of trends and averages. This view makes it possible to determine which indicators contribute most to the variability explained by the individual components.

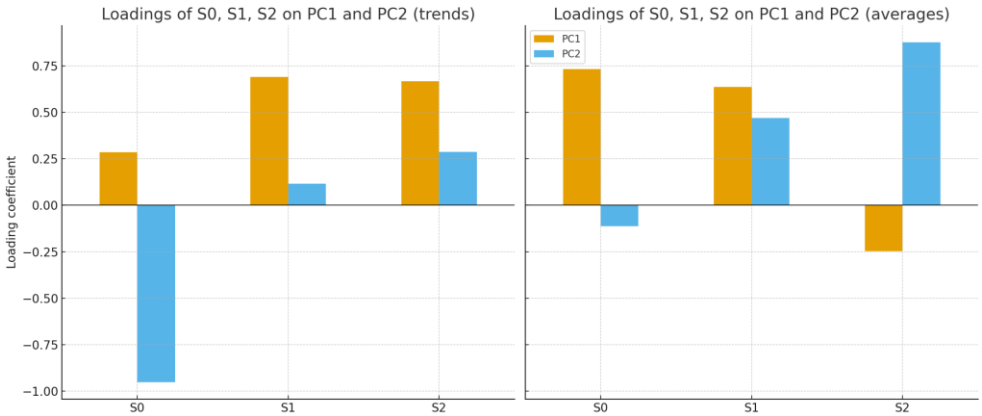

Figure 4: Loadings of S0, S1, and S2 on PC1 and PC2 (trends and averages)

The results show that in the trend analysis, PC1 has a high loading for the S1 and S2 indicators, while S0 has a rather opposite relationship to PC2. This confirms that the dynamics of medium- and long-term risks are the determining factor in the differentiation among countries. In the analysis of averages, the distribution of

contributions is different—S0 and S1 contribute significantly to PC1, while S2 dominates PC2, highlighting its specific character as a long-term risk indicator. These differences underline the importance of combining both approaches (trends and averages) to capture a more comprehensive picture of fiscal sustainability in EU member states. The PCA results based on the average values of the S0, S1, and S2 indicators, shown in Figure 5, provide an important perspective on the fiscal sustainability of EU member states and allow us to test our hypotheses.

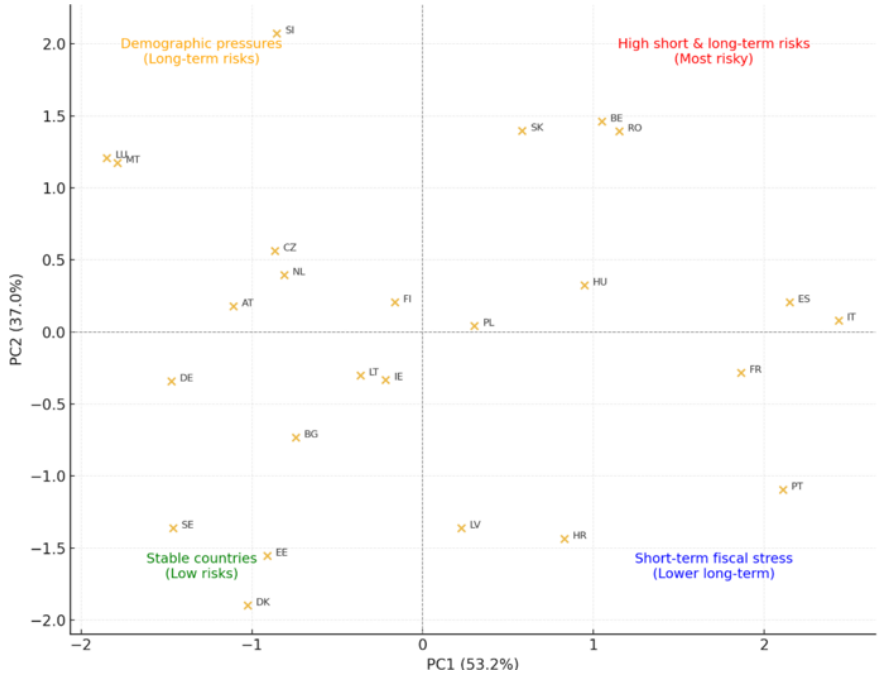

Figure 5: PCA results based on averages of S0–S2 in the period 2014–2025

The analysis shows that the first two principal components capture the majority of variability in the data. PCA makes it possible to distinguish countries according to two key dimensions—current and medium-term pressures on public finances (PC1) and long-term fiscal stability (PC2). From an economic perspective, it appears that countries with higher S2 values (e.g., Belgium, Slovakia, or Luxembourg) are located in quadrants characterized by increased long-term risk. In contrast, countries with low values of S0 and S1 (e.g., Portugal or Sweden) are positioned in the part of the chart associated with lower fiscal stress and overall sustainability. This differentiation has an important political-economic dimension, as it reveals not only current budgetary pressures but also structural challenges related to population ageing, long-term debt, and expenditure trends. With regard to Hypothesis H1 (existence of systematic differences among countries), the results clearly confirm that PCA reveals distinctly identifiable groups of states according to their fiscal

sustainability. The PCA results based on the trends of the S0, S1, and S2 indicators, shown in Figure 6, complement the analysis of averages and provide a more dynamic perspective on the fiscal sustainability of EU member states.

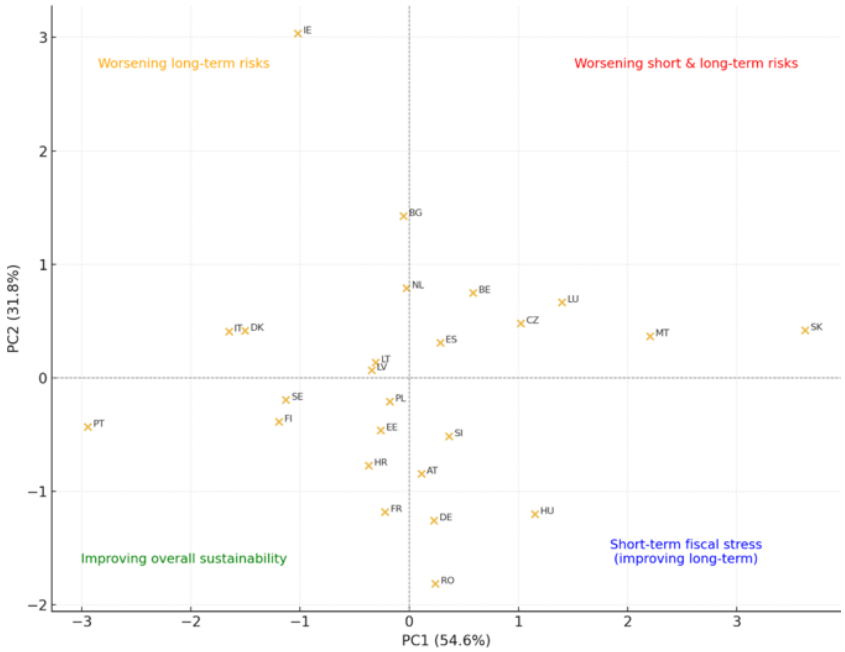

Figure 6: PCA results based on trends of S0–S2 in the period 2014–2025

The first principal component (PC1) primarily captures changes in short- and medium-term fiscal risk, while the second component (PC2) is more strongly linked to long-term sustainability trends. The placement of countries into different quadrants confirms Hypothesis H2, namely that there are differences in the development of S1 and S2 indicator trends depending on the country. From an economic perspective, countries can be divided into four typical groups:

- **Improving overall sustainability** (e.g., Portugal, Sweden, Finland), combining positive trends in both short- and long-term indicators.
- **Worsening long-term risks** (Ireland, Bulgaria), where demographic and expenditure pressures increase future long-term fiscal stress.
- **Combined short- and long-term risks** (Slovakia, Malta, Luxembourg), indicating problems not only in structural but also in immediate fiscal policy challenges.
- **Short-term fiscal stress with simultaneous improvement in long-term outlook** (Hungary, Romania), where current budgetary pressures do not necessarily imply deterioration in long-term sustainability.

While some states have managed to maintain stability or even improve their long-term outlook, others are heading towards increasing risk, which requires immediate reforms (e.g., in pension systems or healthcare).

PCA Results for the Selected Periods 2015–2018 and 2019–2024

Principal component analysis was also applied separately to the periods 2015–2018 and 2019–2024 in order to capture the dynamics of fiscal sustainability over time. This approach makes it possible not only to identify static differences among countries, but also to track trajectories of shifts and thus the direction of their fiscal risks, which is the subject of Hypothesis H3.

Figure 7 presents the PCA results based on the average values of the S0, S1, and S2 indicators for the two time periods—2015–2018 and 2019–2024—and illustrates the shifts of individual EU member states in the space of the first two principal components. The direction of the arrows indicates the movement over time, with countries showing more stable developments remaining close to their original positions, while higher-risk states deviate more significantly. The trend values are presented in Table B and Table C in the Appendix.

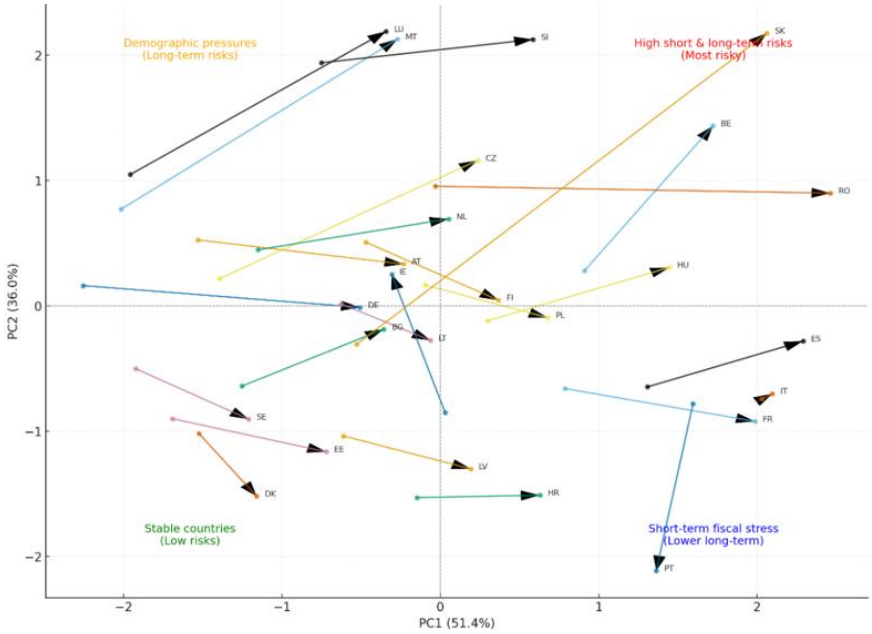

Figure 7: PCA results based on averages of S0–S2 and their shifts between the periods 2015–2018 and 2019–2024

The arrows illustrate the trajectory of changes in fiscal sustainability between the two periods. Countries with stable or improving developments (e.g., Portugal, Sweden, Denmark) move towards the lower-left part of the chart, marked as *Stable countries (Low risks)* or *Short-term fiscal stress (Lower long-term)*. States with increasing long-term risks (Slovenia, Malta, Luxembourg) shift upwards toward the

zone *Demographic pressures (Long-term risks)*, reflecting higher costs mainly associated with demographics and structural expenditures. Countries with combined short- and long-term risks (Slovakia, Romania, Belgium) moved to the upper-right, into the zone *High short and long-term risks (Most risky)*. Some states (e.g., Spain, Italy, France) shift towards higher short-term stress, but without showing a sharp deterioration in long-term indicators. The divergence among countries became more pronounced between the two periods. While some states maintain or improve their position, countries with pre-existing long-term risks face their acceleration.

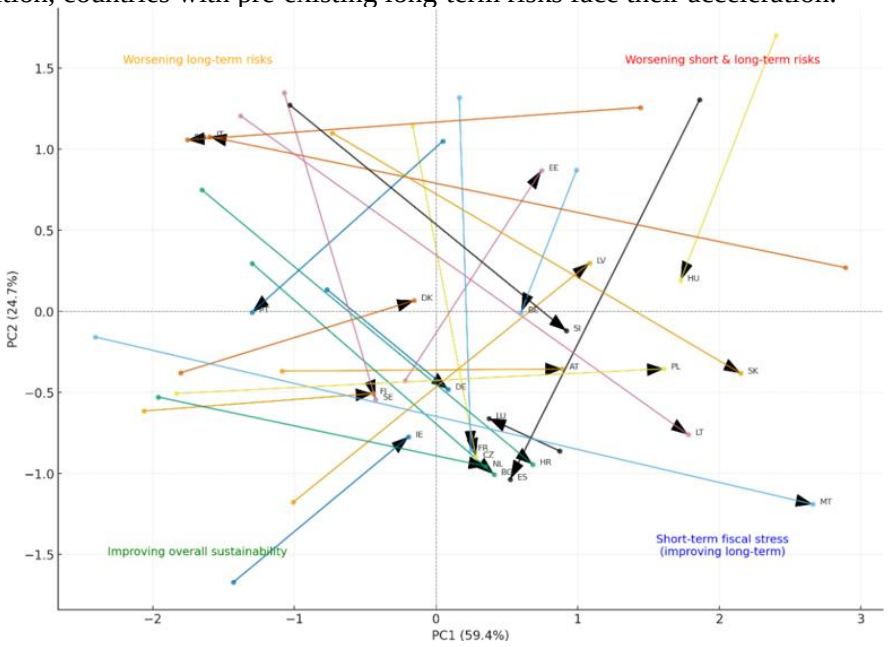

Figure 8: PCA results based on the trends of S0–S2 and their shifts between the periods 2015–2018 and 2019–2024

The arrows in Figure 8 show the direction and intensity of country shifts in the space of the principal components, reflecting the dynamics of fiscal sustainability. Worsening short- and long-term risks are most evident in Slovakia, Hungary, and Poland, which moved into the upper-right quadrant. Significant improvement or stabilization is observed in Portugal, Spain, and Greece, which shift towards the lower-left part of the chart (*Improving overall sustainability*). Divergence among countries became more pronounced in the second period, with some states (e.g., Malta, Slovenia, Estonia) displaying strong and often opposite trajectories compared to the EU core. The findings support Hypothesis H3, that EU countries exhibit different trajectories of fiscal sustainability between the periods 2015–2018 and 2019–2024.

Synthetic Fiscal Sustainability Index (FSI)

In this section, we present the results of the calculation of the synthetic fiscal sustainability index, which was constructed based on a combination of the average

values of the S0, S1, and S2 indicators and their trends in three time periods: 2015–2018, 2019–2024, and the entire period 2015–2024. The proposed index reflects not only the state of public finances in individual countries, but also their trajectory—that is, whether there is gradual improvement or deterioration in long-term sustainability.

Risk categories **for** synthetic fiscal sustainability index were determined based on quartile thresholds of the Fiscal Sustainability Index (FSI):

2015–2018: Low risk ≤ 0.273; Medium risk 0.273–1.016; High risk ≥ 1.016
2019–2025: Low risk ≤ 0.419; Medium risk 0.419–0.822; High risk ≥ 0.822
2019–2024: Low risk ≤ 0.442; Medium risk 0.442–1.009; High risk ≥ 1.009

Table 5. Results of the synthetic fiscal sustainability index

Ranking	2015-2018		2019-2024		2015-2024	
	Country	FSI	Country	FSI	Country	FSI
1	MT	0.130684	SE	0.092655	DK	0.197987
2	DK	0.166223	DK	0.13757	SE	0.201495
3	DE	0.232263	PT	0.191657	DE	0.289178
4	NL	0.233394	IE	0.398778	IE	0.333721
5	IE	0.266067	IT	0.402915	EE	0.361443
6	FI	0.269639	DE	0.414349	BG	0.404201
7	HR	0.272815	BG	0.418628	AT	0.441921
8	SE	0.279722	HR	0.42777	FI	0.531774
9	LV	0.325447	FI	0.431672	LT	0.553934
10	PL	0.342981	EE	0.465815	PT	0.565217
11	EE	0.348614	LU	0.537392	NL	0.590935
12	AT	0.356539	FR	0.553317	LV	0.594228
13	BG	0.364161	RO	0.560142	IT	0.631449
14	LT	0.386797	AT	0.627164	HR	0.648721
15	SI	0.415983	NL	0.649899	CZ	0.810964
16	CZ	0.579665	CZ	0.703671	PL	0.826838
17	SK	0.639983	ES	0.751572	LU	0.851955
18	FR	0.971218	LT	0.767265	SI	0.863788
19	LU	1.016482	LV	0.821529	MT	1.009048
20	PT	1.1123	SI	1.038763	FR	1.070727
21	BE	1.323153	PL	1.106506	ES	1.169394
22	RO	1.352509	BE	1.209152	BE	1.229983
23	ES	1.633131	MT	1.336196	RO	1.371312

24	HU	1.638506	HU	1.724834	HU	1.507711
25	IT	2.084126	SK	2.162555	SK	2.065168

The results of the synthetic fiscal sustainability index in Table 5 highlight significant differences among EU countries and their developments over time. In the period 2015–2018, Malta, Denmark, and Germany achieved the best values, while Romania, Spain, and Hungary ranked among the least sustainable economies. In the period 2019–2024, the position of Slovakia, Hungary, and Romania deteriorated significantly, mainly due to rising public debt and sensitivity to external shocks, while Sweden, Denmark, and Portugal maintained a relatively stable position. Looking at the entire period 2015–2024, Denmark, Sweden, and Ireland consistently performed best, whereas Slovakia, Hungary, and Romania showed persistent risks linked to structural deficits and demographic pressures.

Discussion

The results of the analysis provide several insights into the state and dynamics of fiscal sustainability in the EU countries. The use of PCA and the synthetic index made it possible to capture not only the state but also the development of risks across different time periods, and these findings can be interpreted in the light of the stated hypotheses and in the context of the existing literature.

Hypothesis H1, which assumed the existence of systematic differences among EU countries in short-, medium-, and long-term risks, was confirmed. PCA clearly showed that countries can be grouped according to their fiscal profiles. Nordic states such as Denmark, Sweden, and Finland, along with Germany, exhibited stable results and low risks, whereas Central and Eastern European countries, especially Slovakia, Hungary, and Romania, ranked among the riskiest. This result is consistent with Berrittella and Zhang (2015), who highlight the long-term divergence between old and new EU member states in terms of fiscal discipline. The economic explanation lies in the differing quality of institutions and the ability to respond to structural challenges, particularly in pensions and healthcare. As Afonso and Alves (2023) point out, countries with more efficient public spending have a better starting position in addressing long-term risks.

Hypothesis H2, which assumed that the trends of the S0, S1, and S2 indicators provide additional information compared to average values, was also confirmed. Trend analysis showed that some countries, although having relatively favourable averages, displayed worsening developments—typical examples are Slovakia and Hungary. In contrast, Portugal and Ireland showed improving trends, reflecting their consolidation efforts and public finance reforms. This result supports the importance of the dynamic approach recommended by Ramos-Herrera and Sosvilla-Rivero (2020) in the context of population ageing and its long-term impact on public finances. Trend analysis therefore makes it possible to identify hidden risks that are not visible when comparing averages statically.

Hypothesis H3, which assumed that EU countries follow different trajectories of fiscal sustainability between the periods 2015–2018 and 2019–2024, was also confirmed. The comparison of the two sub-periods showed that the COVID-19 pandemic and the subsequent energy crisis fundamentally affected the fiscal position of several countries. In particular, Slovakia, Romania, and Hungary experienced sharp deterioration, while Portugal and Ireland managed to shift into the group of more sustainable states. These results are consistent with the findings of Zaharieva et al. (2021), who point to increased fiscal vulnerability during crises, as well as Alloza et al. (2024), who stress that shocks have long-term effects on debt sustainability. The division into sub-periods therefore shows that sustainability assessments must be flexible and able to capture exogenous shocks.

The use of the synthetic index, which combines averages and trends of the indicators, confirmed the PCA results but also provided a more transparent and easily interpretable framework. The index showed that countries with persistently weak fiscal discipline and high mandatory expenditures—such as Slovakia, Hungary, and Romania—rank among the riskiest. In contrast, stable economies with a focus on reforms—such as Denmark, Sweden, and Germany—exhibit low risks. This approach is consistent with the recommendations of OECD/JRC (2008) and Greco et al. (2019), who emphasize that synthetic indicators can be a valuable complement to multidimensional methods if interpreted correctly.

The theoretical implications of our results support the claim that the sustainability of public finances is the outcome of a combination of macroeconomic conditions, institutional quality, and the ability to respond to demographic challenges (Economides and Philippopoulos, 2023). They also confirm the importance of fiscal rules, which, according to Onofrei et al. (2020), play a key role in limiting long-term risks. Our research has several methodological limitations that affect the interpretation of the results. First, in the trend analysis of the S0, S1, and S2 indicators, it was found that in the case of S0, most estimated trends were statistically insignificant (p-values often well above 0.1). This suggests that the short-term indicator is not very sensitive to longer-term changes and its use in PCA has limited explanatory power. Second, the methodology based on averages and linear trends simplifies actual developments and may overlook nonlinear dynamics or structural breaks, such as the impact of the COVID-19 pandemic. Third, the S0–S2 indicators themselves are the product of EC projections, which are based on a no-policy-change scenario and may overestimate fiscal risks in countries with frequent reforms. Fourth, in constructing the synthetic index, min-max normalization and equal weights were applied to all components, which ensures transparency and simple interpretation but neglects the differing economic importance of individual indicators. Similarly, the index itself represents a simplified view of fiscal sustainability and does not capture all institutional and structural factors that influence it.

For the future, it would therefore be appropriate to extend the methodology with robust tests of trend sensitivity, alternative statistical approaches to estimating

dynamics (e.g., panel models or nonlinear methods), as well as linking it to institutional indicators of the quality of fiscal rules. Such an approach would make it possible to capture country differences more accurately and strengthen the robustness of conclusions about fiscal sustainability.

Conclusion

The aim of this study was to analyse fiscal sustainability in the EU countries using a combination of methodological approaches. We employed the S0, S1, and S2 indicators published by the EC, which make it possible to assess short-term, medium-term, and long-term public finance risks. Based on principal component analysis (PCA) and the newly constructed synthetic index, we sought to provide a comprehensive view of the development of fiscal sustainability in the period 2015–2024, as well as its changes between the two sub-periods 2015–2018 and 2019–2024. The PCA results confirmed the existence of systematic differences among EU countries. The Nordic states, together with Germany, proved to be countries with relatively stable and sustainable fiscal positions, while Slovakia, Hungary, and Romania ranked among the riskiest economies. These differences were also confirmed in the synthetic index, which demonstrated that fiscal sustainability is determined not only by the current level of indicators but also by their dynamics over time. A particularly important finding came from the comparison of the two sub-periods, which showed that the COVID-19 pandemic and the energy crisis fundamentally affected the fiscal position of several states. Countries such as Slovakia and Hungary recorded a sharp deterioration in sustainability, while Portugal and Ireland managed to improve their position. This confirms that sustainability assessments must be flexible and able to reflect exogenous shocks that can fundamentally alter long-term trajectories. In conclusion, the combination of PCA and the synthetic index offers a novel and useful approach to assessing fiscal sustainability. It provides not only theoretical insights but also a practical tool for policymakers who need to identify the countries most exposed to risks and adopt measures to mitigate them.

Appendix

Table A. PCA results of means and medians of S0–S2 for the period 2015–2024

Indicator/Component	Means_PC1	Means_ PC2	Means_PC1	Means_ PC2
S0	0.73	-0.11	0.70	0.02
S1	0.64	0.47	0.65	0.38
S2	-0.25	0.88	-0.28	0.92
Explained var PC1	0.53		0.55	
Explained var PC2	0.37		0.33	

Table B. Trend results for the period 2014–2018

Country	S0_trend	S0_p value	S1_trend	S1_p value	S2_trend	S2_p value
AT	-0.020	0.487	-0.670	0.034**	0.000	1.000
BE	0.029	0.736	0.060	0.822	0.500	0.199
BG	-0.009	0.712	-0.980	0.124	-0.220	0.524
CZ	0.021	0.298	-0.880	0.0835*	0.150	0.805
DE	-0.006	0.812	-0.490	0.157	-0.080	0.689
DK	-0.028	0.535	-0.590	0.218	-0.510	0.137
EE	-0.011	0.583	0.050	0.896	0.200	0.555
ES	0.048	0.225	0.640	0.368	0.590	0.210
FI	-0.036	0.225	-0.940	0.086*	-0.400	0.051*
FR	0.029	0.400	-0.020	0.912	-0.170	0.560
HR	-0.004	0.859	-1.410	0.016**	-0.390	0.052*
HU	0.062	0.191	0.540	0.142	0.850	0.0102**
IE	-0.051	0.058*	-1.260	0.112	0.590	0.527
IT	0.039	0.438	1.570	0.0462**	1.150	0.056*
LT	0.009	0.225	-0.740	0.261	-0.750	0.273
LU	-0.008	0.887	-0.130	0.677	1.180	0.199
LV	-0.035	0.056*	0.040	0.106	-0.030	0.773
MT	-0.031	0.198	-1.540	0.006***	-0.470	0.073*
NL	-0.033	0.272	-0.770	0.124	-0.460	0.192
PL	-0.031	0.164	-0.630	0.221	-0.460	0.146
PT	0.022	0.602	-0.230	0.615	-0.030	0.865
RO	0.042	0.225	0.170	0.617	0.590	0.192
SE	0.015	0.487	-1.090	0.0169**	-0.410	0.306
SI	0.014	0.333	-0.950	0.008***	-0.430	0.012**
SK	0.014	0.670	-0.710	0.059*	-0.300	0.277
* p < 0,10, ** p < 0,05, *** p < 0,01						

Table C. Trend results for the period 2019–2024

Country	S0_trend	S0_p value	S1_trend	S1_p value	S2_trend	S2_p value
AT	0.004	0.914	1.080	0.006***	0.340	0.016**
BE	0.007	0.813	0.200	0.645	0.497	0.193
BG	-0.015	0.402	1.457	0.019**	0.063	0.797
CZ	-0.014	0.388	1.303	0.021**	0.023	0.943
DE	-0.008	0.794	0.809	0.045**	0.006	0.974

DK	0.001	0.981	0.789	0.034**	-0.349	0.115
EE	0.027	0.368	0.986	0.026**	-0.169	0.162
ES	-0.015	0.422	-0.120	0.818	1.011	0.066*
FI	-0.015	0.624	0.311	0.075*	-0.063	0.295
FR	-0.015	0.488	-0.174	0.627	0.791	0.029**
HR	-0.011	0.783	0.571	0.165	0.703	0.094
HU	0.024	0.179	1.309	0.012**	0.557	0.136
IE	-0.017	0.600	0.706	0.082*	-0.011	0.976
IT	0.003	0.892	-1.606	0.031**	-0.371	0.048**
LT	0.005	0.780	1.331	0.002***	0.940	0.005***
LU	-0.007	0.600	1.951	0.016**	-0.363	0.323
LV	0.019	0.549	0.974	0.001***	0.277	0.161
MT	0.007	0.782	2.206	0.019**	1.203	0.083*
NL	-0.015	0.602	1.057	0.098**	0.223	0.569
PL	0.012	0.612	1.451	0.001***	0.609	0.007***
PT	-0.015	0.611	-0.637	0.343	-0.294	0.181
RO	0.002	0.946	-0.860	0.454	-0.874	0.069*
SE	-0.015	0.432	0.846	0.058*	-0.329	0.260
SI	0.009	0.801	1.086	0.164	0.266	0.771
SK	0.018	0.602	1.809	0.034**	0.780	0.276
* p < 0,10, ** p < 0,05, *** p < 0,01						

References

Afonso. A., Alves. J., (2023). Does government spending efficiency improve fiscal sustainability?. *European Journal of Political Economy*. 102403.

Afonso. A., Coelho. J. C., (2025). Fiscal sustainability. fiscal reactions. pitfalls and determinants. *Applied Economics*, *57*(26), 3560-3571.

Afonso. A., Alves. J. and Coelho. J. C., (2025). Determinants of the degree of fiscal sustainability. *International Journal of Finance and Economics*, *30*(2), 1190-1205.

Beetsma. R., (2022). The economics of fiscal rules and debt sustainability. *Inter Economics*, *57*(1), 11.

Berrittella. M., Zhang. J., (2015). Fiscal sustainability in the EU: From the short-term risk to the long-term challenge. *Journal of policy modeling*, *37*(2), 261-280.

Căpraru. B., Georgescu. G. and Sprincean. N., (2022). Do independent fiscal institutions cause better fiscal outcomes in the European Union? *Economic Systems*, *46*(2), 100973.

Ciaffi. G., Deleidi. M. and Di Domenico. L., (2024). Fiscal policy and public debt: Government investment is most effective to promote sustainability. *Journal of Policy Modeling*, *46*(6), 1186-1209.

Dönnebrink, E., Grevenbrock, N., (2022). Sustainability gap of public debt: importance of interest rates and a new decomposition with premia, *Empirica*, *49*(4), 1009-1030.

Economides. G., Philippopoulos. A., (2023). Fiscal sustainability: Interest rates. growth and debt-based policy rules. *EconPol Forum*, *24*(4), 11-15.

European Commission (EC)., (2021). *Fiscal Sustainability Report 2021*. Brussels: European Commission. https://economy-finance.ec.europa.eu/publications/fiscal-sustainability-report-2021_en

European Commission (EC)., (2023a). *Annual Debt Sustainability Monitor 2022*. Brussels: European Commission. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://economy-finance.ec.europa.eu/system/files/2023-06/ip199_en_UPD.pdf

European Commission (EC)., (2023b). *Debt Sustainability Monitor 2022*. Brussels: European Commission. https://economy-finance.ec.europa.eu/publications/debt-sustainability-monitor-2022_en

European Commission (EC)., (2024). *Debt Sustainability Monitor 2023*. Brussels: European Commission.

European Commission (EC)., (2025). *Debt Sustainability Monitor 2024*. Brussels: European Commission. https://economy-finance.ec.europa.eu/publications/debt-sustainability-monitor-2024_en

Greco. S.. Ishizaka. A., Tasiou. M. and Torrisi. G., (2019). On the methodological framework of composite indices: A review of the issues of weighting. aggregation. and robustness. *Social indicators research*, *141*(1), 61-94.

Chen. S. W., (2014). Testing for fiscal sustainability: New evidence from the G-7 and some European countries. *Economic Modelling*, *37*, 1-15.

Jolliffe. I. T., Cadima. J., (2016). Principal component analysis: a review and recent developments. *Philosophical transactions of the royal society A: Mathematical. Physical and Engineering Sciences*, *374*(2065), 20150202.

Ko. H., (2020). Measuring fiscal sustainability in the welfare state: fiscal space as fiscal sustainability. *International Economics and Economic Policy*, *17*(2), 531-554.

OECD/ Joint Research Centre., (2008). *Handbook on constructing composite indicators: methodology and user guide*. OECD publishing.

Onofrei, M., Bostan, I., Oprea, F., Paraschiv, G. and Lazăr, C. M., (2020). The implication of fiscal principles and rules on promoting sustainable public finances in the EU countries. *Sustainability*, *12*(7), 2772.

Ramos-Herrera. M. D. C., Sosvilla-Rivero. S., (2020). Fiscal sustainability in aging societies: evidence from Euro Area countries. *Sustainability*, *12*(24), 10276.

Werding, M., (2022). Fiscal sustainability and low interest rates: what an indicator can (’t) tell. *Empirica*, *49*(4), 991-1008.

Wooldridge. J. M., (2016). *Introductory econometrics a modern approach*. South-Western cengage learning.

Zahariev. A., Radulova. A., Aleksandrova. A. and Petrova. M., (2021). Fiscal sustainability and fiscal risk in the EU: forecasts and challenges in terms of COVID-19. *Entrepreneurship and Sustainability Issues*, *8*(3), 618-632.

OD STABILNOŚCI DO RYZYKA: TRAJEKTORIE STABILNOŚCI FISKALNEJ W UNII EUROPEJSKIEJ

Streszczenie: Niniejszy artykuł zawiera analizę stabilności fiskalnej państw członkowskich Unii Europejskiej w latach 2015–2024 przy użyciu trzech podstawowych wskaźników (S0, S1 i S2) opublikowanych przez Komisję Europejską, które odzwierciedlają ryzyko krótko-, średnio- i długoterminowe. Badanie łączy analizę opisową, ocenę trendów, analizę głównych składowych (PCA) oraz konstrukcję syntetycznego wskaźnika stabilności fiskalnej. To wielowymiarowe podejście pozwala nam zidentyfikować systematyczne różnice między krajami, ocenić ich trajektorie w dwóch podokresach (2015–2018 i 2019–2024) oraz ocenić wpływ pandemii COVID-19 i kryzysu energetycznego na sytuację fiskalną. Wyniki badania pokazują, że podczas gdy ryzyko krótkoterminowe pozostaje stosunkowo stabilne w całej UE, ryzyko średnio- i długoterminowe znacznie się różni, przy czym Słowacja, Węgry i Rumunia należą do krajów najbardziej narażonych, a kraje skandynawskie i Niemcy utrzymują stabilną pozycję. Proponowany wskaźnik stanowi uzupełnienie PCA i oferuje decydentom przejrzyste narzędzie do identyfikacji krajów wysokiego ryzyka. Nowatorstwo badania polega na połączeniu PCA zarówno na poziomie S0–S2, jak i trendów z nowo opracowanym indeksem syntetycznym, co umożliwia bardziej zróżnicowane wykrywanie trajektorii stabilności fiskalnej przed pandemią i po niej.

Słowa kluczowe: stabilność fiskalna; unia europejska; pca; wskaźnik syntetyczny; polityka fiskalna