Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Fiscal Rules and Output Volatility in EU Member States: Evidence from a Panel Analysis

Anastasios Pappas
National and Kapodistrian University of Athens
Apostolos Gkrammis
University of West Attica
Dimitrios Dimitriou
ddimitriou@uniwa.gr

University of West Attica

Research Article

Keywords: fiscal rules, output volatility, procyclicality, fiscal policy, European Union, panel data

Posted Date: September 18th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-10969648/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: No competing interests reported.

Abstract

This paper examines the relationship between fiscal rules and output volatility using annual panel data for the 27 European Union member states over the period 2000–2023. We find a positive and statistically significant association between the presence of expenditure rules, budget balance rules and debt rules and output volatility. This relationship remains robust across a series of tests. These findings suggest that numerical fiscal constraints may narrow the space available for countercyclical stabilization, and that the flexibility provisions of the reformed EU fiscal framework — escape clauses, cyclically adjusted targets and investment carve-outs — are important mechanisms through which fiscal credibility and output stability can be balanced.

JEL Classification: E62, E32, H60, C23

1. Introduction

The European sovereign debt crisis and the subsequent COVID-19 pandemic have reignited debate about the appropriate design of fiscal frameworks. At the center of that debate lies a tension. Fiscal rules — expenditure ceilings, budget balance requirements and debt brakes — are designed to discipline policymakers, enhance credibility and promote long-term fiscal sustainability. Yet by constraining the fiscal space needed to counteract downturns, these rules may amplify rather than dampen macroeconomic fluctuations. This possibility, that rules intended to stabilize might themselves be associated with instability, remains empirically underexplored in the European Union, where such rules have become deeply embedded in national and supranational economic governance.

This paper investigates the relationship between fiscal rules and output volatility using annual panel data for the 27 EU member states over 2000–2023. We construct a measure of volatility based on the three-year rolling standard deviation of real GDP growth and examine three types of fiscal rules — expenditure rules, budget balance rules and debt rules.

Our findings show that the presence of fiscal rules is consistently associated with higher output volatility. This positive association holds for all three rule types and survives an extensive battery of robustness tests. Within the procyclicality framework, the result is consistent with the view that fiscal rules may constrain countercyclical policy space, obliging governments to tighten during downturns and thereby amplifying economic fluctuations.

This paper contributes to several literatures. First, it adds to the evidence on the real effects of fiscal rules (Afonso and Jalles, 2013; Gründler and Potrafke, 2020), moving beyond fiscal outcomes to examine output volatility directly. Second, it contributes to the procyclicality debate in the European context (Manescu and Bova, 2020; Larch et al., 2021; Căpraru et al., 2025), providing evidence consistent with concerns that fiscal constraints may amplify economic cycles. Third, it informs policy discussion about the reform of EU fiscal governance, suggesting that the emphasis on numerical rules may carry consequences for stabilization that deserve attention.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature. Section 3 describes the data and methodology. Section 4 presents the baseline results. Section 5 reports the robustness tests. Section 6 discusses the findings and their policy implications. Section 7 concludes.

2. Literature review

Recent empirical research has investigated various determinants of macroeconomic volatility, ranging from financial depth and monetary policy to political and fiscal institutions. Acedański and Pietrucha (2019) examined the impact of financial depth, measured as private credit to GDP ratio, on GDP volatility in a balanced panel of 77 countries from 1970 to 2014. Using dynamic spatial panel models to account for cross-sectional dependence, they found a non-linear relationship where the level of financial depth reduces volatility up to a threshold, but rapid growth in financial depth (credit booms) significantly increases output volatility.

Shifting to institutional determinants, Edwards and Thames (2009) utilized System GMM and 2SLS on a sample of 94 countries between 1974 and 2004 to disentangle the effects of economic and political development. They found that political development reduces volatility with diminishing marginal returns, while economic development exhibits a non-linear, concave-down relationship — initially increasing volatility at low development levels before reducing it significantly at higher levels. Similarly, Badinger and Reuter (2017) explored fiscal institutions in a cross-section of 74 countries over the period 1985–2012. Employing a 2SLS approach with instrumental variables such as checks and balances, government fragmentation and inflation targeting, they concluded that stringent fiscal rules reduce output volatility, though this effect operates indirectly by dampening the volatility of fiscal policy itself. The evidence on output volatility is, however, more mixed, and the European framework has attracted particular attention. Larch, Orseau and Van Der Wielen (2021) ask whether EU fiscal rules support or hinder countercyclical fiscal policy. They find that compliance with the rules is associated with less procyclical policy, but that the rules have often been breached precisely when the cycle would have called for restraint, so that the framework as implemented has not delivered the stabilization its design intends.

Most directly related to our question, Reuter, Tkačevs and Vilerts (2022) examine fiscal rules and volatility in the EU28 over 1996–2015 and find that rules reduce the volatility of discretionary fiscal policy and thereby contribute to macroeconomic stability. Their result is, however, conditional on design. The stabilizing benefit accrues to rules that are acyclical, that is, constructed so as to be unaffected by the current state of the business cycle, and it is stronger the more stringent the rule; they also find that rules exert an influence even where they are not complied with. This qualification is important for the interpretation of our own findings, because it establishes that whether a numerical constraint stabilizes or destabilizes depends on how the rule is built rather than on its presence alone.

The design dimension has consequently become central to the policy literature. Eyraud et al. (2018) set out the case for second-generation rules balancing simplicity, flexibility and enforceability, while

Blanchard, Leandro and Zettelmeyer (2021) argue for replacing numerical rules with fiscal standards assessed through country-specific analysis. Both contributions take as given that first-generation numerical rules impose stabilization costs and ask how those costs can be reduced without sacrificing credibility. In the same vein, Căpraru et al. (2025) examine the EU framework directly and find that a smaller number of well-designed rules outperforms a proliferation of overlapping constraints. Taken together, these contributions suggest that the design of a rule matters as much as its existence: where flexibility provisions such as escape clauses, cyclically adjusted targets or carve-outs for public investment are weak or absent, numerical constraints may carry side effects, among which a procyclical bias in fiscal policy cannot be ruled out.

Regarding monetary determinants, Salisu and Gupta (2021) focused on the United Kingdom using monthly data from 1960 to 2019. Employing constant and time-varying parameter vector autoregressive (TVP-VAR) models with stochastic volatility, they found that contractionary monetary policy shocks increase the volatility of unemployment and inflation, with effects peaking during crisis periods like the Global Financial Crisis.

Finally, while the previous studies treat volatility as the dependent variable, Jalles and Karras (2023) inverted this relationship to examine the consequences of volatility on the current account in a panel of 34 advanced and 136 developing economies from 1970 to 2020. Using rolling window volatility measures, they found that higher volatility improves the current account in advanced economies (precautionary savings channel) but historically had no significant effect in developing economies until the post-2008 period.

3. Methodology and data

To account for the effect of different fiscal rules on output volatility in the EU-27, we estimate a model with country and year fixed effects. The baseline regression takes the following form:

$$\sigma it = \alpha + \beta 1\ FRi,t - 1 + \gamma' Xi,t - 1 + \mu i + \lambda t + \varepsilon it \quad (1)$$

The dependent variable, σ_{it}, is a measure of output volatility for country i in year t. We construct this variable as the three-year backward-looking rolling standard deviation of the real GDP growth rate (GDPGV). This approach smooths short-term fluctuations and captures the medium-term volatility environment. The choice of a three-year window provides a balance between capturing variability and maintaining sample size.

The primary variables of interest are three different indices of fiscal rules. Specifically, the Expenditure Rules Index (ER) is a dummy variable that takes the value of one from the year an expenditure rule is in force onward, and zero otherwise. Similarly, the Budget Balance Rule Index (BBR) and the Debt Rule Index (DR) are dummy variables constructed in the same way. Following the IMF definition, these indicators record the presence of a national or supranational rule, or both. These indices are included in separate regressions.

The vector $X_{i,t-1}$ represents a set of control variables, chosen for their theoretical relevance to output volatility and their use in other relevant studies (Van Bezooijen & Bikker, 2017; Spiliopoulos, 2005; Easterly et al., 2001; Yaya, 2024; Kose et al., 2003). We include GDP per capita (GDP_CAP) to control for the level of economic development, as in theory richer countries have greater fiscal buffers and more diversified economies which help dampen volatility. The unemployment rate (Unemp) is included because it is intrinsically linked to the business cycle and serves as a key indicator of labor market slack, directly affecting macroeconomic stability. Inflation volatility (HICPV) is measured as the three-year rolling standard deviation of the Harmonized Index of Consumer Prices. General government expenditure as a percentage of GDP (GG) measures the size of government, as government expenditures can act counter-cyclically, cushioning the economy from shocks and potentially reducing volatility. The long-term interest rate (Ltir) captures the effect of monetary policy on volatility, as interest rates influence borrowing costs, investment decisions, and overall economic activity. Government effectiveness (Ef_gov) is an institutional variable that proxies for the quality of policy implementation and public services, as more effective governments are better equipped to manage economic shocks. Government changes (gov_chan) accounts for political stability, since frequent changes in government can lead to policy uncertainty which is likely to increase economic volatility. Trade openness (XM), measured as exports plus imports as a percentage of GDP, captures an economy's integration into global markets and serves as a channel for the transmission of external shocks, which can amplify volatility. Finally, credit to the private sector as a percentage of GDP (Credit) captures credit expansion from financial institutions, as credit can act either pro-cyclically or counter-cyclically, influencing the amplitude of economic fluctuations and financial fragility.

The model is estimated using fixed effects (μ_i) to control for all unobserved, time-invariant country-specific heterogeneity. Year fixed effects (λ_t) are also included to account for common global shocks and the business cycle. To address potential heteroskedasticity and serial correlation within countries, we employ robust standard errors clustered at the country level. Finally, to mitigate concerns about simultaneity and reverse causality, all independent variables are introduced with a one-year lag.

The dataset comprises annual observations spanning from 2000 to 2023 for the 27 member states of the European Union. Data are sourced primarily from Eurostat, except for the fiscal rule dummies, which are drawn from the IMF's Fiscal Rules Dataset, 1985–2024 vintage (Alonso et al., 2025); private credit, which is sourced from the IMF's International Financial Statistics; government effectiveness, which is obtained from the World Bank's Worldwide Governance Indicators; and government changes, which are derived from the Comparative Political Data Set by Armingeon et al. (2025) (see Table A1). Descriptive statistics are reported in Table A2, and the year in which each rule came into force in each member state in Table A3. The correlation matrix and variance inflation factors are reported in Tables A4 and A5.

4. Results

The fiscal rule indicators enter with positive and statistically significant coefficients in all three baseline specifications (Table 1), ranging from 0.76 percentage points for debt rules to 1.11 percentage points for

expenditure rules. Relative to the sample mean of 2.52 percentage points (Table A2), these differences correspond to roughly 30 to 44 per cent.

Table 1
Baseline model with country and year fixed effects

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**
	-7.88e-05	**-7.61e-05**	**-8.40e-05***
	(5.14e-05)	(5.34e-05)	(4.96e-05)
Unemp (t-1)	-0.016	-0.00535	-0.00908
	(0.0355)	(0.0334)	(0.0349)
HICPV (t-1)	0.637**	0.591**	0.576**
	(0.266)	(0.259)	(0.259)
GG (t-1)	-0.0281	-0.0178	-0.0219
	(0.0518)	(0.0565)	(0.0549)
Ltir (t-1)	0.0242	0.0656	0.0586
	(0.0651)	(0.0583)	(0.0542)
Ef_gov (t-1)	-1.014	-0.932	-0.984
	(0.835)	(0.812)	(0.807)
gov_chan (t-1)	-0.00724	-0.0219	-0.0175
	(0.0736)	(0.0784)	(0.0798)
XM (t-1)	1.54e-05	-0.000267	0.000768
	(0.00266)	(0.00384)	(0.0041)
Credit (t-1)	-0.0183*	-0.0232**	-0.0229**
	(0.00957)	(0.0095)	(0.00962)
ER (t-1)	1.108***		
	(0.387)		
BBR (t-1)		0.833**	
		(0.340)	
DR (t-1)			0.764**
			(0.336)

Note: Estimation results for the baseline model in Eq. (1). Dependent variable: GDPGV. All specifications include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)
	-7.88e-05	**-7.61e-05**	**-8.40e-05***
Observations	523	523	523
R-squared	0.661	0.653	0.652
Number of countries	27	27	27

Note: Estimation results for the baseline model in Eq. (1). Dependent variable: GDPGV. All specifications include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

Among the control variables, inflation volatility (HICPV) is positive and significant at the 5% level in all three specifications, indicating that price instability accompanies output instability. Credit to the private sector enters negatively and significantly. This sign warrants comment, since the literature on credit booms associates rapid credit expansion with higher volatility (Acedański and Pietrucha, 2019). The distinction is between the level of financial depth and its rate of change: our measure is a level, and a negative coefficient on the level is consistent with deeper financial systems providing greater consumption and investment smoothing capacity, while it is credit growth rather than credit depth that amplifies fluctuations. GDP per capita carries a negative sign throughout, reaching conventional significance only in the debt rule specification, offering modest evidence that wealthier economies experience lower volatility.

The remaining controls are not statistically significant, although their coefficients generally carry the expected signs — negative for government effectiveness, positive for the long-term interest rate. Several of these variables move slowly over time, so once country and year effects are absorbed there is limited within-country variation left to identify them.

5. Robustness tests

The baseline association is subjected to eight sets of robustness tests: controls for euro area membership, controls for cyclical conditions, the treatment of crisis episodes, alternative measures of output volatility, the coding and exogeneity of the fiscal rule indicator, standard errors robust to cross-sectional dependence, an instrumental variable treatment of dynamic panel bias, and winsorisation to limit the influence of outliers. Each is described and reported in turn.

5.1 Euro area membership

Countries sharing the common currency are subject to a uniform monetary policy, which may influence how shocks propagate. We therefore add a dummy for European Monetary Union membership, which varies within countries over the sample period as nine member states adopted the euro after 2000.

Table 2 reports the estimates. The EMU dummy is negative and marginally significant in two of the three specifications, suggesting that euro area membership is associated with somewhat lower output volatility, plausibly through reduced exchange rate uncertainty and more credible policy commitments. The fiscal rule coefficients are essentially unchanged relative to the baseline.

Table 2
Fixed effects estimates with a euro area membership dummy

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**
	-6.52e-05	**-6.51e-05**	**-7.23e-05**
	(5.72e-05)	(5.78e-05)	(5.34e-05)
Unemp (t-1)	-0.0156	-0.00498	-0.00793
	(0.0376)	(0.0347)	(0.0354)
HICPV (t-1)	0.582**	0.539**	0.522**
	(0.240)	(0.234)	(0.231)
GG (t-1)	-0.0117	-0.00365	-0.00696
	(0.052)	(0.0571)	(0.0552)
Ltir (t-1)	0.00116	0.0495	0.0403
	(0.0596)	(0.0522)	(0.0495)
Ef_gov (t-1)	-0.434	-0.434	-0.474
	(0.678)	(0.689)	(0.661)
gov_chan (t-1)	-0.00868	-0.0231	-0.02
	(0.0753)	(0.0798)	(0.0813)
XM (t-1)	0.00198	0.0015	0.00252
	(0.00378)	(0.00536)	(0.00561)
Credit (t-1)	-0.017*	-0.0224**	-0.0221**
	(0.00925)	(0.00921)	(0.0093)
EMU	-1.094*	-0.915*	-0.970
	(0.593)	(0.555)	(0.591)
ER (t-1)	1.202***		
	(0.386)		
BBR (t-1)		0.842**	
		(0.341)	
DR (t-1)			0.850**

Note: Dependent variable: GDPGV. All specifications add a dummy for euro area membership and include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)
	-6.52e-05	**-6.51e-05**	**-7.23e-05**
			(0.359)
Observations	523	523	523
R-squared	0.668	0.658	0.657
Number of countries	27	27	27

Note: Dependent variable: GDPGV. All specifications add a dummy for euro area membership and include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

5.2 Cyclical conditions

Output volatility and the presence of a fiscal rule may both reflect where an economy sits in the business cycle: countries in or near recession experience larger output fluctuations, and periods of cyclical weakness are also periods in which fiscal frameworks become salient. To ensure that the association we document is not simply capturing cyclical position, we add two alternative measures of that position, each entered on its own. The first is the output gap as a percentage of potential GDP, taken from the European Commission AMECO database. The second is an indicator equal to one when real GDP rate of change is negative, which has the advantage of being directly observable rather than resting on an estimate of potential output. The two capture different things: the output gap measures the continuous distance of output from potential, while the recession indicator marks outright contractions, which account for 17 per cent of the estimation sample. The two are correlated at − 0.48, so they are related but far from interchangeable. Both enter with a one-year lag, consistent with the rest of the specification.

Neither measure of cyclical position is individually significant (Table 3), which is unsurprising given that the year effects already absorb the common European cycle. The fiscal rule coefficients are close to their baseline values throughout and remain significant in all six specifications, with the expenditure rule coefficient ranging from 1.070 to 1.170. The association between fiscal rules and output volatility is therefore not accounted for by cross-country differences in cyclical position. An alternative indicator based on the sign of the output gap yields the same conclusions.

Table 3
Fixed effects estimates controlling for cyclical conditions

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	-7.85e-05	**-7.60e-05**	**-8.40e-05***	**-8.38e-05**	**-8.21e-05**	**-8.97e-05***
	(4.95e-05)	(5.28e-05)	(4.94e-05)	(5.12e-05)	(5.30e-05)	(4.91e-05)
Unemp (t-1)	-1.50e-05	-0.00146	-0.00695	-0.0168	-0.00678	-0.0105
	(0.0595)	(0.0578)	(0.06)	(0.0353)	(0.0329)	(0.0346)
HICPV (t-1)	0.644**	0.592**	0.576**	0.634**	0.588**	0.574**
	(0.266)	(0.258)	(0.259)	(0.261)	(0.253)	(0.254)
GG (t-1)	-0.0242	-0.0167	-0.0214	-0.0312	-0.022	-0.0259
	(0.048)	(0.0502)	(0.0485)	(0.0514)	(0.0561)	(0.0545)
Ltir (t-1)	0.0326	0.0681	0.06	0.00333	0.0393	0.0332
	(0.0598)	(0.0577)	(0.0549)	(0.0606)	(0.055)	(0.051)
Ef_gov (t-1)	-1.051	-0.940	-0.988	-1.024	-0.947	-0.991
	(0.841)	(0.810)	(0.804)	(0.831)	(0.807)	(0.799)
gov_chan (t-1)	-0.00478	-0.0215	-0.0172	-0.00694	-0.0209	-0.0163
	(0.075)	(0.0791)	(0.0805)	(0.0711)	(0.0758)	(0.0769)
XM (t-1)	0.0005	-0.000149	0.000841	0.000769	0.000642	0.00166
	(0.00284)	(0.00412)	(0.00432)	(0.0027)	(0.00379)	(0.00402)
Credit (t-1)	-0.0174**	-0.023**	-0.0228**	-0.0198**	-0.0248**	-0.0245**
	(0.0087)	(0.00914)	(0.00922)	(0.00986)	(0.00978)	(0.00989)
Output gap (t-1)	0.0384	0.0091	0.00506			
	(0.082)	(0.0778)	(0.0795)			
Recession (t-1)				0.432	0.509	0.504
				(0.315)	(0.318)	(0.331)
ER (t-1)	1.170***			1.070***		

Note: Dependent variable: GDPGV. Models (1)–(3) add the lagged output gap (percentage of potential GDP, AMECO). Models (4)–(6) instead add a lagged indicator equal to one when real GDP growth is negative. All specifications include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)
	-7.85e-05	**-7.60e-05**	**-8.40e-05***	**-8.38e-05**	**-8.21e-05**	**-8.97e-05***
	(0.424)			(0.393)		
BBR (t-1)		0.841***			0.795**	
		(0.319)			(0.347)	
DR (t-1)			0.767**			0.709**
			(0.331)			(0.334)
Observations	523	523	523	523	523	523
R-squared	0.662	0.653	0.652	0.663	0.655	0.654
Number of countries	27	27	27	27	27	27

Note: Dependent variable: GDPGV. Models (1)–(3) add the lagged output gap (percentage of potential GDP, AMECO). Models (4)–(6) instead add a lagged indicator equal to one when real GDP growth is negative. All specifications include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

5.3 Crisis episodes

The sample spans two major crisis episodes, the global financial and sovereign debt crises and the pandemic, both of which raised output volatility sharply. We address them in two complementary ways, because the two measures of a crisis available to us are identified under different assumptions.

The first is a country-specific systemic crisis indicator taken from the Financial Crises Database of the European Systemic Risk Board[4]. It records for each country the years classified as a systemic financial crisis and equals one in 165 of our 648 country-years. Its timing differs markedly across member states during the financial and sovereign debt crises. For instance, Greece is classified as in systemic crisis from 2010 to 2018 and Cyprus from 2011 to 2016, while Malta is never classified as being in crisis. The pandemic years are a different matter, being recorded for 26 of the 27 member states. Because it varies across countries within a year, it is separately identified alongside the year fixed effects and can be added directly to the baseline. The second is a calendar-year crisis indicator equal to one during 2008–2012 and 2020–2022 for all countries. The end points of these windows follow from the construction of the dependent variable: because volatility is measured over a three-year backward window, a shock in year t raises measured volatility in t, t + 1 and t + 2.[5] Such an indicator takes a common value across countries within each year and is therefore a linear combination of the year dummies: the two are alternative treatments of the same variation and cannot both be included. We therefore report the calendar indicator in place of the year effects, retaining country fixed effects.

Table 4 reports both. In columns (1)–(3) the fiscal rule coefficients remain positive and significant, with the expenditure rule coefficient rising to 1.162 and the budget balance and debt rule coefficients slightly below their baseline values. The systemic crisis indicator itself carries a negative coefficient, marginally significant in one specification. This should not be read as crises reducing volatility. Because the pandemic years are classified as a crisis for 26 of the 27 member states, they are almost perfectly collinear with the corresponding year dummies and contribute virtually nothing to identification; the coefficient is therefore estimated almost entirely from the 2007–2018 period, and it measures the contrast between countries classified as in crisis and other countries in the same year rather than the level effect of crises themselves. Columns (4)–(6) recover that level effect. The calendar crisis indicator enters positively and is highly significant, at between 2.8 and 3.0 percentage points, and the three fiscal rule coefficients are significant at the 1% level, at 1.190, 0.927 and 0.761 respectively. Inflation volatility and private credit remain significant, and government effectiveness becomes marginally significant, reflecting the additional variation available once the year effects are removed.

In both specifications the fiscal rule coefficients remain positive and significant, whether crisis episodes are captured by a country-specific indicator alongside the year effects or by a calendar indicator in place of them.

Table 4
Fixed effects estimates with crisis indicators

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	-7.42e-05	**-7.37e-05**	**-8.08e-05**	**-3.42e-05**	**-1.42e-06**	**-8.01e-06**
	(5.06e-05)	(5.31e-05)	(4.93e-05)	(4.20e-05)	(4.67e-05)	(4.55e-05)
Unemp (t-1)	-0.00412	0.00282	-0.000464	-0.0515	-0.025	-0.0292
	(0.039)	(0.0371)	(0.0389)	(0.0427)	(0.043)	(0.0437)
HICPV (t-1)	0.616**	0.569**	0.555**	0.708***	0.638***	0.624***
	(0.263)	(0.259)	(0.259)	(0.215)	(0.208)	(0.212)
GG (t-1)	-0.0215	-0.0128	-0.0164	0.0426	0.0865	0.0837
	(0.0501)	(0.0552)	(0.0536)	(0.0605)	(0.0614)	(0.0614)
Ltir (t-1)	0.044	0.0833	0.0776	-0.0624	-0.104	-0.111
	(0.0697)	(0.0628)	(0.0586)	(0.0617)	(0.0742)	(0.0737)
Ef_gov (t-1)	-1.071	-0.957	-1.001	-1.303	-1.439*	-1.476*
	(0.830)	(0.806)	(0.807)	(0.792)	(0.755)	(0.757)
gov_chan (t-1)	0.00401	-0.0113	-0.00688	-0.0134	-0.0141	-0.00878
	(0.0732)	(0.0771)	(0.0784)	(0.083)	(0.0918)	(0.0924)
XM (t-1)	-0.00115	-0.000883	5.29e-05	-0.00405	0.00239	0.00418
	(0.00278)	(0.00418)	(0.00445)	(0.00324)	(0.00441)	(0.00454)
Credit (t-1)	-0.0166*	-0.0219**	-0.0216**	-0.0195***	-0.0234***	-0.0224***
	(0.0092)	(0.00928)	(0.00938)	(0.00692)	(0.00702)	(0.00693)
Systemic crisis (t-1)	-0.629*	-0.495	-0.506			
	(0.324)	(0.337)	(0.327)			
Crisis years				3.008***	2.770***	2.777***
				(0.193)	(0.191)	(0.193)
ER (t-1)	1.162***			1.190***		

Note: Dependent variable: GDPGV. Models (1)–(3) add a lagged country-specific systemic crisis indicator and retain country and year fixed effects. Models (4)–(6) replace the year fixed effects with an indicator equal to one during 2008–2012 and 2020–2022 and zero otherwise, retaining country fixed effects. The calendar crisis indicator enters contemporaneously, since it defines the period rather than conditioning on it. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)
	-7.42e-05	**-7.37e-05**	**-8.08e-05**	**-3.42e-05**	**-1.42e-06**	**-8.01e-06**
	(0.379)			(0.287)		
BBR (t-1)		0.753**			0.927***	
		(0.351)			(0.292)	
DR (t-1)			0.679**			0.761***
			(0.328)			(0.281)
Observations	523	523	523	523	523	523
R-squared	0.666	0.656	0.655	0.567	0.551	0.548
Number of countries	27	27	27	27	27	27

Note: Dependent variable: GDPGV. Models (1)–(3) add a lagged country-specific systemic crisis indicator and retain country and year fixed effects. Models (4)–(6) replace the year fixed effects with an indicator equal to one during 2008–2012 and 2020–2022 and zero otherwise, retaining country fixed effects. The calendar crisis indicator enters contemporaneously, since it defines the period rather than conditioning on it. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

5.4 Alternative measures of output volatility

Our preferred measure is the three-year rolling standard deviation of real GDP growth. To verify that the results do not depend on this particular construction, we re-estimate the baseline with two alternatives. The first extends the window to five years. The second replaces the standard deviation with the mean absolute deviation of growth, defined as the absolute difference between real GDP growth in a given year and its average over that year and the two preceding years. The two alternatives vary the window length and the functional form respectively, while measuring the same underlying phenomenon: how far output growth departs from its recent norm.

Both alternative measures leave the fiscal rule coefficients positive and significant (Table 5). Under the five-year measure they are 0.890 for expenditure rules, 0.953 for budget balance rules and 1.232 for debt rules; under the mean absolute deviation they are 0.929, 0.882 and 0.851 respectively. The debt rule coefficient is larger and more strongly significant under the longer window than in the baseline, which is consistent with debt rules constraining a stock and therefore operating over a longer horizon than expenditure or balance rules.

Table 5
Fixed effects estimates with alternative measures of output volatility

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	-3.41e-05	**-3.46e-05**	**-4.07e-05**	**-8.91e-05****	**-8.54e-05****	**-9.20e-05*****
	(4.66e-05)	(4.72e-05)	(4.50e-05)	(3.48e-05)	(3.63e-05)	(3.42e-05)
Unemp (t-1)	0.0384	0.0478	0.0457	-0.0238	-0.0124	-0.0155
	(0.0307)	(0.0322)	(0.0319)	(0.0394)	(0.0367)	(0.0379)
HICPV (t-1)	0.602**	0.561**	0.557**	0.643**	0.608**	0.590**
	(0.265)	(0.258)	(0.257)	(0.267)	(0.254)	(0.254)
GG (t-1)	-0.0397	-0.0326	-0.0365	-0.0284	-0.0173	-0.0214
	(0.0424)	(0.0456)	(0.0446)	(0.0426)	(0.0462)	(0.045)
Ltir (t-1)	-0.0534	-0.0177	-0.0236	0.0576	0.0912	0.0861
	(0.0659)	(0.0626)	(0.0596)	(0.0608)	(0.0557)	(0.0525)
Ef_gov (t-1)	-1.405*	-1.352*	-1.430*	-0.909	-0.882	-0.912
	(0.787)	(0.755)	(0.769)	(0.821)	(0.813)	(0.809)
gov_chan (t-1)	-0.0103	-0.0348	-0.0362	-0.00375	-0.0214	-0.0149
	(0.0633)	(0.0716)	(0.0728)	(0.0773)	(0.0806)	(0.0823)
XM (t-1)	0.00258	0.00308	0.00391	0.00106	0.000184	0.00105
	(0.00498)	(0.00623)	(0.0065)	(0.0032)	(0.00342)	(0.00365)
Credit (t-1)	-0.0151	-0.02**	-0.0198*	-0.0127	-0.0176**	-0.0171**
	(0.0103)	(0.0102)	(0.0103)	(0.00824)	(0.00805)	(0.00814)
ER (t-1)	0.890**			0.929**		
	(0.376)			(0.408)		
BBR (t-1)		0.953***			0.882**	
		(0.309)			(0.352)	
DR (t-1)			1.232***			0.851**

Note: The dependent variable in models (1)–(3) is the five-year rolling standard deviation of real GDP growth; in models (4)–(6) it is the mean absolute deviation of real GDP growth from its average over the current and two preceding years. All specifications include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)
	-3.41e-05	**-3.46e-05**	**-4.07e-05**	**-8.91e-05****	**-8.54e-05****	**-9.20e-05*****
			(0.351)			(0.411)
Observations	492	492	492	518	518	518
R-squared	0.634	0.628	0.630	0.597	0.592	0.591
Number of countries	27	27	27	27	27	27

Note: The dependent variable in models (1)–(3) is the five-year rolling standard deviation of real GDP growth; in models (4)–(6) it is the mean absolute deviation of real GDP growth from its average over the current and two preceding years. All specifications include country and year fixed effects. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

5.5 The fiscal rule indicator and the timing of adoption

This subsection addresses the coding of the fiscal rule indicator over the final years of the sample and the timing of rule adoption relative to output volatility. In the baseline the rules are coded as in force throughout 2020–2023. The general escape clause of the Stability and Growth Pact, activated in March 2020 and in place until the end of 2023, suspended the numerical requirements but did not repeal the rules, which remained in national and EU law. As a check we recoded all three indicators to zero for 2020–2023 and re-estimated the baseline. The coefficients are unchanged. All 27 member states are recorded as having each rule type in force in those years, so the recoding does not vary across countries and is absorbed by the year fixed effects.

A second consideration is that countries experiencing higher volatility may be more inclined to adopt fiscal rules, so that the association runs from volatility to rules rather than the reverse. We test this directly. For each rule type we construct the set of country-years in which a country had not yet adopted the rule and was therefore at risk of doing so, and we regress an indicator for adoption in that year on lagged output volatility in a linear probability model with year effects and standard errors clustered at the country level. Lagged volatility does not predict adoption for any of the three rule types: the coefficients are close to zero, statistically insignificant, and if anything negative (Table A6). Given the limited number of adoption events the estimates are imprecise, but they provide no support for the reverse-causality interpretation.

Several features of the design bear on this consideration more generally. Country fixed effects absorb any time-invariant national characteristics that might jointly determine output volatility and the propensity to adopt rules, which is the most natural form the reverse-causality story would take. Year fixed effects absorb Europe-wide developments affecting all member states simultaneously. All right-hand-side variables enter with a one-year lag, so contemporaneous simultaneity cannot account for the estimates.

5.6 Cross-sectional dependence

In macroeconomic panels, cross-sectional dependence is a standard concern: countries are subject to common shocks and spillovers that correlate the error terms across units. We therefore re-estimate the baseline using Driscoll–Kraay (1998) standard errors, which are robust to general forms of cross-sectional and temporal dependence.

Table 6 reports the result. Under this covariance estimator the expenditure rule coefficient is significant at the 1% level, the budget balance rule at the 5% level and the debt rule at the 10% level. Inflation volatility and private credit remain significant throughout.

Table 6
Panel regression results with Driscoll–Kraay standard errors

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**
	-7.88e-05	**-7.61e-05**	**-8.40e-05**
	(9.98e-05)	(0.000101)	(0.0001)
Unemp (t-1)	-0.016	-0.00535	-0.00908
	(0.0572)	(0.0612)	(0.0602)
HICPV (t-1)	0.637***	0.591***	0.576***
	(0.170)	(0.158)	(0.162)
GG (t-1)	-0.0281	-0.0178	-0.0219
	(0.0406)	(0.0446)	(0.0443)
Ltir (t-1)	0.0242	0.0656	0.0586
	(0.098)	(0.101)	(0.097)
Ef_gov (t-1)	-1.014	-0.932	-0.984
	(0.652)	(0.656)	(0.674)
gov_chan (t-1)	-0.00724	-0.0219	-0.0175
	(0.0585)	(0.0565)	(0.0542)
XM (t-1)	1.54e-05	-0.000267	0.000768
	(0.00961)	(0.00983)	(0.00963)
Credit (t-1)	-0.0183**	-0.0232**	-0.0229**
	(0.00904)	(0.01)	(0.00996)
ER (t-1)	1.108***		
	(0.320)		
BBR (t-1)		0.833**	
		(0.355)	
DR (t-1)			0.764*
			(0.393)

Note: Dependent variable: GDPGV. All specifications include country and year fixed effects. Driscoll–Kraay standard errors, robust to cross-sectional and temporal dependence, in parentheses. Point estimates are identical to those in Table 1 by construction, since the two estimators differ only in the covariance matrix. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)
	-7.88e-05	**-7.61e-05**	**-8.40e-05**
Observations	523	523	523
R-squared	0.661	0.653	0.652
Number of countries	27	27	27

Note: Dependent variable: GDPGV. All specifications include country and year fixed effects. Driscoll–Kraay standard errors, robust to cross-sectional and temporal dependence, in parentheses. Point estimates are identical to those in Table 1 by construction, since the two estimators differ only in the covariance matrix. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

5.7 Dynamic panel bias

Output volatility is persistent, and a specification including the lagged dependent variable is therefore natural. Such a specification is subject to the dynamic panel bias identified by Nickell (1981), since under fixed effects the lagged dependent variable is correlated with the error term. We instrument the lagged dependent variable with its second through fourth lags, which are predetermined (Anderson and Hsiao, 1982), and estimate by Limited Information Maximum Likelihood, which outperforms two-stage least squares when instruments are potentially weak and reduces finite-sample bias (Stock and Yogo, 2005; Baum et al., 2007). Country and year fixed effects are partialled out.

The lagged dependent variable is positive and significant, confirming the persistence of output volatility (Table 7). The three fiscal rule coefficients remain positive and statistically significant, with magnitudes somewhat smaller than, but of the same order as, the fixed effects estimates.

Table 7
Instrumental variable (LIML) panel estimates

GDPGV (t-1)	**(1)**	**(2)**	**(3)**
	0.620* **	**0.634*** **	**0.637*** **
	(0.0738)	(0.0641)	(0.0636)
GDP_CAP (t-1)	-0.000103***	-0.000103***	-0.000108***
	(2.52e-05)	(2.60e-05)	(2.39e-05)
Unemp (t-1)	-0.0624**	-0.0562*	-0.0589**
	(0.0315)	(0.0305)	(0.0300)
HICPV (t-1)	0.416**	0.379**	0.372**
	(0.185)	(0.170)	(0.172)
GG (t-1)	-0.0202	-0.0147	-0.0177
	(0.0278)	(0.0299)	(0.0288)
Ltir (t-1)	0.0925*	0.120***	0.118***
	(0.0476)	(0.0410)	(0.0387)
Ef_gov (t-1)	-0.601	-0.548	-0.563
	(0.549)	(0.543)	(0.541)
gov_chan (t-1)	-0.000976	-0.0190	-0.0164
	(0.0776)	(0.0809)	(0.0809)
XM (t-1)	0.000283	0.000603	0.00131
	(0.00390)	(0.00391)	(0.00394)
Credit (t-1)	-0.0127**	-0.0161***	-0.0157***
	(0.00554)	(0.00534)	(0.00543)
ER (t-1)	0.668**		
	(0.275)		
BBR (t-1)		0.705***	

Note: Instrumental variable estimates using Limited Information Maximum Likelihood. Dependent variable: GDPGV. The lagged dependent variable is instrumented with its second through fourth lags. Country and year fixed effects are partialled out. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively. The Kleibergen–Paap statistics indicate that the models are identified and that the instruments are strong, and the Hansen J statistics do not reject the overidentifying restrictions.

GDPGV (t-1)	(1)	(2)	(3)
	0.620* **	**0.634*** **	**0.637*** **
		(0.239)	
DR (t-1)			0.668**
			(0.277)
Observations	491	491	491
R-squared	0.583	0.580	0.579
Number of countries	27	27	27
Kleibergen–Paap rk LM statistic	16.791	19.058	18.921
(p-value)	(0.0008)	(0.0003)	(0.0003)
Kleibergen–Paap rk Wald F statistic	120.282	140.695	141.826
Hansen J statistic	5.072	4.859	5.124
(p-value)	(0.0792)	(0.0881)	(0.0771)

Note: Instrumental variable estimates using Limited Information Maximum Likelihood. Dependent variable: GDPGV. The lagged dependent variable is instrumented with its second through fourth lags. Country and year fixed effects are partialled out. Robust standard errors clustered at the country level in parentheses. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively. The Kleibergen–Paap statistics indicate that the models are identified and that the instruments are strong, and the Hansen J statistics do not reject the overidentifying restrictions.

5.8 Outliers

To ensure that the results are not driven by extreme observations, we winsorise all continuous variables at the 1st and 99th percentiles, replacing values beyond these thresholds with the values at the respective percentiles, and re-estimate the fixed effects and Driscoll–Kraay specifications. Table 8 reports the results. All three fiscal rule coefficients retain their sign and significance, with magnitudes slightly attenuated relative to the baseline.

Table 8
Estimation results with winsorised variables

GDP_CAP (t-1)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	-9.11e-05**	**-9.00e-05****	**-9.73e-05****	**-9.11e-05**	**-9.00e-05**	**-9.73e-05**
	(4.41e-05)	(4.50e-05)	(4.15e-05)	(9.76e-05)	(9.93e-05)	(9.83e-05)
Unemp (t-1)	-0.0119	-0.00451	-0.00749	-0.0119	-0.00451	-0.00749
	(0.0387)	(0.0369)	(0.0384)	(0.0596)	(0.0646)	(0.0632)
HICPV (t-1)	0.600**	0.556**	0.543**	0.600***	0.556***	0.543***
	(0.250)	(0.245)	(0.245)	(0.146)	(0.132)	(0.136)
GG (t-1)	-0.0429	-0.0306	-0.0345	-0.0429	-0.0306	-0.0345
	(0.0575)	(0.062)	(0.0605)	(0.0427)	(0.0473)	(0.047)
Ltir (t-1)	0.0256	0.0742	0.064	0.0256	0.0742	0.064
	(0.117)	(0.103)	(0.101)	(0.156)	(0.159)	(0.154)
Ef_gov (t-1)	-0.930	-0.891	-0.941	-0.930	-0.891	-0.941
	(0.772)	(0.762)	(0.749)	(0.638)	(0.650)	(0.666)
gov_chan (t-1)	0.00208	-0.0128	-0.009	0.00208	-0.0128	-0.009
	(0.0794)	(0.0827)	(0.0837)	(0.0574)	(0.0555)	(0.0521)
XM (t-1)	0.0014	0.00167	0.00273	0.0014	0.00167	0.00273
	(0.00349)	(0.00322)	(0.00365)	(0.01)	(0.0103)	(0.01)
Credit (t-1)	-0.0179**	-0.0229***	-0.0226**	-0.0179**	-0.0229**	-0.0226**
	(0.0088)	(0.00881)	(0.00893)	(0.00886)	(0.01)	(0.00993)
ER (t-1)	1.031***			1.031***		
	(0.360)			(0.314)		
BBR (t-1)		0.763**			0.763**	
		(0.327)			(0.364)	
DR (t-1)			0.706**			0.706*

Note: All continuous variables are winsorised at the 1st and 99th percentiles. Dependent variable: GDPGV. Models (1)–(3) report fixed effects estimates with robust standard errors clustered at the country level in parentheses; models (4)–(6) report the same specifications with Driscoll–Kraay standard errors. All specifications include country and year fixed effects. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

GDP_CAP (t-1)	(1)	(2)	(3)	(4)	(5)	(6)
	-9.11e-05**	**-9.00e-05****	**-9.73e-05****	**-9.11e-05**	**-9.00e-05**	**-9.73e-05**
			(0.312)			(0.378)
Observations	523	523	523	523	523	523
R-squared	0.672	0.665	0.664	0.672	0.665	0.664
Number of countries	27	27	27	27	27	27

Note: All continuous variables are winsorised at the 1st and 99th percentiles. Dependent variable: GDPGV. Models (1)–(3) report fixed effects estimates with robust standard errors clustered at the country level in parentheses; models (4)–(6) report the same specifications with Driscoll–Kraay standard errors. All specifications include country and year fixed effects. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels respectively.

6. Discussion

Within the procyclicality framework, our results are consistent with the view that fiscal rules may constrain the policy space governments need to counteract downturns. When a recession arrives, binding expenditure ceilings, budget balance requirements or debt brakes may compel consolidation precisely when stimulus would be stabilizing, amplifying the initial shock. The credibility gains from rule adoption, while valuable for anchoring expectations and compressing sovereign risk premia in normal times, would on this reading be insufficient to offset the cost of constrained stabilization during periods of stress. This is consistent with the finding of Larch et al. (2021) that EU rules have often been breached precisely when the cycle called for restraint, and with the evidence of Reuter et al. (2022) that the stabilizing properties of a rule depend on whether it is constructed to be acyclical.

Two features of our results support this reading. The association is largest for expenditure rules, which operate directly on the instrument governments use to stabilize output, and smallest for debt rules, which constrain a stock rather than a flow and therefore bind less immediately during a downturn. And it survives the addition of the output gap, a recession indicator and both country-specific and calendar measures of crisis, which suggests that it is not simply a reflection of the conditions under which rules become salient.

These findings speak to the reform of the EU economic governance framework agreed in 2024, which replaced the previous structure with medium-term fiscal-structural plans built around a single operational indicator, net expenditure growth, anchored to a debt sustainability analysis. The reform retains a numerical expenditure anchor, and it is the expenditure rule that carries the largest association with output volatility in our estimates. The multi-annual horizon of the new net expenditure path is designed precisely to avoid the year-by-year consolidation requirements that generated procyclicality

under the previous framework, and our results suggest that this is the design feature on which the reform will be judged.

The reform also preserves general and country-specific escape clauses. Experience since 2020 indicates that the operative questions here are procedural rather than conceptual: what threshold of downturn activates a clause, who determines it, and how the return to the adjustment path is sequenced. Escape clauses activated late, or deactivated on a fixed calendar rather than in response to economic conditions, provide limited insurance against the mechanism we describe.

The treatment of public investment remains the least settled element. Investment is the most compressible component of expenditure under a binding constraint and the component whose compression is most costly for potential growth. Whether the allowances for reform- and investment-linked adjustment extensions prove sufficient is an empirical question that the coming years will settle, and one against which the framework should be evaluated.

7. Conclusions

This paper has examined the relationship between fiscal rules and output volatility across 27 European Union member states over the period 2000–2023. Using country and year fixed effects and an extensive battery of robustness tests, we document a consistent result: the presence of fiscal rules is associated with higher output volatility, not lower. The association holds for all three rule types examined and persists when controlling for euro area membership, when adding the output gap and country-specific and calendar crisis indicators, when using standard errors robust to cross-sectional dependence, when instrumenting the lagged dependent variable, and when winsorising to limit the influence of outliers.

The pattern is consistent with the view that numerical fiscal constraints narrow the space available for countercyclical stabilization, and it suggests that the design of fiscal rules matters as much as their existence. Rules incorporating flexibility during downturns — escape clauses that respond to economic conditions rather than calendars, cyclically adjusted targets, multi-annual expenditure paths and carve-outs for public investment — offer a more promising route to reconciling credibility with stabilization than numerical tightness alone.

Our estimates identify an association rather than a causal effect. Rule adoption in the European Union is clustered around institutional milestones and therefore carries limited independent information about timing, and while the tests in Section 5.5 find no evidence that volatile countries were more likely to adopt rules, selection on time-varying unobservables cannot be excluded. The results are robust to alternative measures of medium-term volatility, though the overlapping construction of the preferred measure remains a feature of the design. Three directions for further work follow. The most valuable would replace binary indicators of rule presence with continuous measures of stringency and compliance, which vary within countries over time and do not depend on adoption timing for identification. A second would test the procyclicality channel directly, by examining whether the responsiveness of the fiscal balance to the output gap changes with rule adoption or with rule

compliance. A third would extend the analysis beyond the European Union, where a common supranational framework does not confound the treatment, to assess how far the pattern we document generalizes.

Declarations

Author Contribution

A.P. and A.G. estimated the models. All authors contributed to the writing of the main manuscript.

References

1. Acedański J, Pietrucha J (2019) Level and dynamics of financial depth: Consequences for volatility of GDP. Appl Econ 51(31):3389–3400
2. Afonso A, Jalles J (2013) Do fiscal rules matter for growth? Appl Econ Lett 20(1):34–40
3. Alonso V, Arroyo C, Aydin O, Balasundharam V, Davoodi HR, Hegab G, Lam WR, Nguyen A, Ferro S, Sher N, Solovyeva G, A., Tchelishvili N (2025) Fiscal Rules Dataset: 1985–2024. International Monetary Fund, Washington, DC
4. Anderson TW, Hsiao C (1982) Formulation and estimation of dynamic models using panel data. J Econ 18(1):47–82
5. Armingeon K, Engler S, Leemann L, Weisstanner D (2025) Comparative Political Data Set 1960–2023. Zurich/Lueneburg/Lucerne: University of Zurich, Leuphana University Lueneburg, and University of Lucerne
6. Badinger H, Reuter WH (2017) The case for fiscal rules. Econ Model 60:334–343
7. Baum CF, Schaffer ME, Stillman S (2007) Enhanced routines for instrumental variables/GMM estimation and testing. Stata J 7(4):465–506
8. Blanchard O, Leandro Á, Zettelmeyer J (2021) Redesigning EU fiscal rules: From rules to standards. Economic Policy 36(106):195–236
9. Căpraru B, Pappas A, Sprincean N (2025) Fiscal rules in the European Union: Less is more. JCMS: J Common Market Stud 63:320–334
10. Driscoll JC, Kraay A (1998) Consistent covariance matrix estimation with spatially dependent panel data. Rev Econ Stat 80(4):549–560
11. Easterly W, Islam R, Stiglitz JE (2001) Shaken and stirred: Explaining growth volatility. *Annual World Bank Conference on Development Economics*, 191–211
12. Edwards JA, Thames FC (2009) The effects of economic and political development on GDP growth volatility. Global Econ J, 9(2), Article 1.
13. European Systemic Risk Board (2022) Financial Crises Database, version of 20 January 2022. ESRB, Frankfurt am Main

14. Eyraud L, Debrun X, Hodge A, Lledó V, Pattillo C (2018) Second-generation fiscal rules: Balancing simplicity, flexibility, and enforceability. IMF Staff Discussion Note SDN/18/04.
15. Gründler K, Potrafke N (2020) Fiscal rules: Historical, modern, and sub-national growth effects. *CESifo Working Paper* No. 8305
16. Jalles JT, Karras G (2023) Macroeconomic volatility and the current account: Extending the evidence. Econ Model 125:106334
17. Kose MA, Prasad ES, Terrones ME (2003) Financial integration and macroeconomic volatility. *IMF Working Paper* No. WP/03/50
18. Larch M, Orseau E, Van Der Wielen W (2021) Do EU fiscal rules support or hinder counter-cyclical fiscal policy? J Int Money Finance 112:102328
19. Lo Duca M, Koban A, Basten M, Bengtsson E, Klaus B, Kusmierczyk P, Lang JH, Detken C, Peltonen T (2017) A new database for financial crises in European countries. *ECB Occasional Paper* No. 194 / ESRB Occasional Paper No. 13
20. Manescu C, Bova E (2020) National expenditure rules in the EU: An analysis of effectiveness and compliance. *European Economy Discussion Paper* No. 124, European Commission, Brussels
21. Nickell S (1981) Biases in dynamic models with fixed effects. Econometrica 49(6):1417–1426
22. Reuter WH, Tkačevs O, Vilerts K (2022) Fiscal rules and volatility: The role of stabilising properties and compliance. Empirica 49(1):21–52
23. Salisu AA, Gupta R (2021) Dynamic effects of monetary policy shocks on macroeconomic volatility in the United Kingdom. Appl Econ Lett 28(18):1594–1599
24. Spiliopoulos L (2005) What determines macroeconomic volatility? A cross-section and panel data study. SSRN Working Paper
25. Stock JH, Yogo M (2005) Testing for weak instruments in linear IV regression. In: Andrews DWK, Stock JH (eds) Identification and Inference for Econometric Models. Cambridge University Press, pp 80–108
26. Van Bezooijen E, Bikker J (2017) Financial structure and macroeconomic volatility: A panel data analysis. *DNB Working Paper* No. 568
27. Yaya A (2024) Productive capacities, economic vulnerability and growth volatility in Sub-Saharan Africa. *IMF Working Paper* No. WP/24/169

Footnotes

4. The database was introduced by Lo Duca et al. (2017) and is updated periodically.

5. Mean output volatility across the sample is 2.52 percentage points. It stands at 5.52 in 2009, 4.46 in 2010 and 4.55 in 2011, falls to 1.82 by 2013, and reaches 4.29, 5.92 and 6.12 in 2020, 2021 and 2022 respectively.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Appendix.docx