Lisbon School of Economics & Management
Universidade de Lisboa

MASTER

MONETARY AND FINANCIAL ECONOMICS

MASTER´S FINAL WORK

DISSERTATION

THE IMPACT OF STOCK-FLOW ADJUSTMENTS AND GOVERNMENT FINANCIAL ASSETS ON FISCAL SUSTAINABILITY IN THE EUROPEAN UNION

LAURA INÊS GINJA SEBASTIÃO CALDEIRA MENDES

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Abstract

This paper examines the relationship between fiscal sustainability and stock-flow adjustments (SFAs) in the European Union, with a focus on the 27 member states from 1980 to 2024. While primary balances are typically used to explain public debt dynamics, this study emphasizes the critical but often underestimated importance of SFAs—the disparities between deficits and changes in debt levels caused by financial asset acquisitions, debt adjustments, and statistical discrepancies. Through a time-varying coefficient model based on Schlicht (2003, 2021), this paper estimates fiscal reaction functions applying Bohn's (1998) framework and the cointegration between government revenues and expenditure proposed by Afonso (2005), to determine the presence of a long-run fiscal equilibrium. The findings indicate that among country groups, SFAs are positively linked with the fiscal sustainability dependent variables in several cases. Furthermore, financial assets, such as currency and deposits, loans, and equity investments, are examined for their impact on sustainability patterns. The results further imply that SFAs can conceal the underlying fiscal position and should be clearly included in debt sustainability evaluations. The study adds to the literature by combining disaggregated fiscal data with dynamic modelling to provide fresh insights into the drivers of fiscal sustainability in the EU.

JEL: C23; E62; G32; H63
Keywords: Fiscal sustainability; Stock-flow adjustments; Public debt; Time-varying coefficients; EU public finances

1. Introduction

A review of economic data from a number of countries reveals a general trend whereby the proportion of government revenues and spending in GDP increased in the post-1970s era. Notably, the growth rate of government spending as a percentage of GDP exceeded the growth rate of government revenues as a percentage of GDP between 1970 and 2003 (Afonso, 2015). The rise in government expenditure and the inability of revenue to keep pace with this growth have resulted in persistent budget deficits, leading to mounting debt that must be serviced with interest costs.

The issue of debt sustainability arises when a country is faced with the prospect pf bankruptcy or the inability to finance the costs associated with the issuance of additional government debt, given the existing debt-to-GDP ratio. The concept of fiscal sustainability is pertinent when it becomes evident that the accumulation of debt could result in a loss of capital assets for future generations. Assessing fiscal sustainability constitutes an effective method for determining whether fiscal policy is on a sustainable long-term trajectory.

Over the past two decades, there has been an ongoing increase in debt levels which has led to the accumulation of significant risks. To illustrate this point, the Global Financial Crisis (GFC) demonstrated the substantial indebtedness of certain European countries and the profound ramifications this can have on entire economies, rendering them remarkably vulnerable. Furthermore, the global pandemic had a detrimental effect on the public finances of most countries. The ongoing war conflicts have led to a state of uncertainty, resulting in countries allocating a greater proportion of their resources to prepare for potential contingencies. This has, in turn, led to a reduction in the availability of resources.

It is vital to acknowledge the significance of stock-flow adjustments (SFAs) in fiscal sustainability analysis, given their impact on debt dynamics, which extends beyond the influence of budget deficits. Maltritz and Wüste (2015) lend support to this latter interpretation, positing that it occurs in instances where budget deficits account for a mere fraction of the variation in debt-to-GDP ratios. The primary driver for SFAs is the Net acquisition of financial assets. SFAs are also the result of Adjustments and Statistical discrepancies (Eurostat, 2020).

As Buti et al. (2007) have observed, governments have been known to employ SFAs as a means of manipulating deficit and debt figures in order to present a favorable picture. This practice serves to mask the true fiscal position, thereby obstructing a comprehensive evaluation of fiscal sustainability. Therefore, it is imperative to grasp the nature of SFAs so as to achieve a thorough understanding of fiscal sustainability. It is important to note,

however, that there is another obstacle that must be considered. In some cases, countries may be reluctant to provide full transparency regarding fiscal reporting, which has the potential to compromise the study of fiscal sustainability.

Despite the extensive literature on SFAs, public debt dynamics and fiscal sustainability (Jaramillo et al., 2017; Afonso et al., 2020; Casalin et al., 2023), the majority of articles are lacking in terms of disaggregated data for stock-flow adjustments. A particular body of literature addresses the aggregation of data or government financial assets (Das et al., 2012; Henao-Arbelaez and Sobrinho, 2017). Additionally, the employment of time-varying coefficients, which have the capacity to capture structural changes, remains unexplored, with the exception of certain general applications, such as the impact of economic episodes in public finances (Baxa et al., 2014; Afonso and Jalles, 2017).

The purpose of this paper is to analyse the behaviour of the SFAs regarding fiscal sustainability in the EU by employing a time-varying model based in Schlicht (2003, 2021). The approach adopted implements two distinct methodologies. Bohns' (1998) fiscal reaction function and the cointegration analysis between government revenues and expenditures are to be used to assess fiscal sustainability (Camarero et al., 2014). The computation of SFAs is achieved using Hagen and Wolff's (2006) formula, complemented by IMF World Economic Outlook (WEO) data, and incorporating the disaggregated data derived from Eurostat concerning financial asset acquisitions, adjustments, and statistical discrepancies. Furthermore, a description is necessary of the evolution and dynamics of the SFAs and its components. In further analysis, patterns within relevant groups of countries will be compared. The data base under consideration covers all 27 member states, with data collected from 1980 to 2024.

The article is structured as follows: section 2 reviews the literature on the subjects of fiscal sustainability, stock flow adjustment and financial assets. Subsequently, a discussion emerges regarding the interaction between all aforementioned elements. The section 3 sets out the empirical approach that was adopted. This approach is first described in terms of the methodology, and then in terms of the database that was used for the analysis. Section 4 presents and analyses the empirical results, outlining the main patterns identified in relation to SFAs and financial assets. In conclusion, section 5 synthesizes the conclusions and proposes some implications for economic policy. It also reflects on the results and suggests directions for future investigation.

2. Literature Review

2.1. Fiscal sustainability

Fiscal sustainability remains a complex and contested concept in economic literature, with no agreed-upon definition. Despite extensive research, scholars have yet to establish a definite benchmark for measuring fiscal sustainability. Balassone and Franco (2000) point out the limitations of partial equilibrium analysis in providing comprehensive insights into fiscal sustainability. As a result, two distinct approaches to examine fiscal sustainability have emerged: forward-looking and backward-looking sustainability tests.

The backward-looking approach, pioneered by Bohn (1998), provides a theoretical framework through the intertemporal government budget constraint (IBC), which specifies the present value of future surpluses and deficits. This approach posits that if the current fiscal policy persists, the government may face insolvency. The fulfilment of the IBC is viewed as the absence of a Ponzi scheme by the government, with unit root and cointegration tests commonly used tools to assess whether the time series is consistent with the intertemporal budget constraint. Camarero et al. (2014) further elaborate on the use of stationarity tests for public debt and cointegration tests between revenues and expenditures to examine long-run fluctuations.

Conversely, the forward-looking approach focuses on the regulation of national debt, emphasizing the importance of maintaining budgetary discipline. For instance, the Stability and Growth Pact (SGP) in the European Union states that member states adhere to specific fiscal limits. Afonso (2005) argues that while the SGP does not explicitly address long-term debt sustainability, it promotes fiscal stability by requiring balanced budgets. This approach, which relies on practical indicators, seeks to anticipate future fiscal conditions and assess the alignment of current and future fiscal policies with the IBC (Afonso et al., 2023). It also enables the recognition of a passive strategy in the event of a future debt reduction resulting from a budget surplus (Afonso et al., 2024).

The importance of cointegration between government revenues and expenditures for fiscal sustainability has been underscored by several studies, including Hakkio and Rush (1991), Cunado et al. (2004), and Brady and Magazzino (2018). These authors argue that the absence of cointegration between revenues and expenditures signals unsustainable fiscal deficits. Bohn (1998) introduces the fiscal reaction function as an alternative method for assessing fiscal sustainability, which examines the relationship between the primary budget balance and past changes in the debt-to-GDP ratio. This approach has been widely adopted in the literature, with studies such as Mendoza and Ostry (2008), Afonso and Rault (2009),

and Ghosh et al. (2013) demonstrating that governments tend to increase primary balances in response to rising debt levels.

The present value budget constraint (PVBC) approach, while theoretically sound, has been criticized for its reliance on sustainability indicators that lack a strong theoretical foundation. Chalk and Hemming (2000) argue that the PVBC criteria can be met by unsustainable fiscal policies, highlighting the limitations of this method. However, the forward-looking approach also has its faults, such as neglecting to consider the past. Consequently, recent research has sought to integrate elements of both approaches to provide a more comprehensive assessment of fiscal sustainability.

Ostry et al. (2010) and Ghosh et al. (2013) adopt another method founded on Bohn's (1998) approach, where they found a new way of understanding the concept of a debt limit, which is to consider the idea of fiscal fatigue. These models suggest a threshold for primary balance where government cannot meet higher interest payments. Schlicht (2003) proposes a Time-Varying Coefficient model (VC) to estimate time-varying fiscal policy parameters, which has been applied in subsequent research to analyse the impact of financial crises on fiscal sustainability (Madsen, 2012; Baxa et al., 2014). The VC model has been particularly useful in identifying the effects of the 2008 financial crisis on public finances, revealing both the challenges and opportunities for fiscal recovery (Afonso and Jalles, 2017).

2.2. Stock-flow adjustments and financial assets

The dynamics of public debt are influenced not only by budget deficits but also by stock-flow adjustments (SFAs), which account for discrepancies between changes in government debt and annual fiscal deficits. Maltritz and Wüste (2015) argue that SFAs play a critical role in understanding debt accumulation, particularly in cases where budget deficits explain only a small portion of changes in debt-to-GDP ratios. Campos et al. (2006), Jaramillo et al. (2017), and Seiferling and Tareq (2023) emphasize the importance of SFAs in explaining within-country variations in debt levels, with Weber (2012) noting that SFAs have a relatively minor impact on debt reductions.

SFAs are typically categorized into three components: net acquisition of financial assets, debt adjustment effects, and statistical discrepancies. The acquisition of financial assets – including currency, deposits, debt securities, and equity – is the primary driver of SFAs (Eurostat, 2020). Governments often engage in creative accounting practices, such as the sale of financial assets, to manipulate deficit and debt figures, particularly during economic downturns or in the lead-up to elections (Milesi-Ferretti and Moriyama, 2004; Buti et al.,

2007). These practices can obscure the true fiscal position, making it difficult to assess fiscal sustainability accurately.

Transparency in government accounting has been shown to reduce the magnitude of SFAs and improve the quality of fiscal data. Campos et al. (2006) and Weber (2012) argue that independent auditing institutions and transparent fiscal reporting can mitigate the risks associated with creative accounting. Furthermore, Seiferling and Tareq (2023) highlight the link between past financial crises and irregularities in financial reporting, underscoring the need for comprehensive fiscal rules based on a balance sheet approach.

2.3. Fiscal sustainability, Stock-flow adjustments and Financial assets

The role of SFAs in fiscal sustainability analysis has been largely overlooked, creating a significant blind spot in the management of fiscal risks. Jaramillo et al. (2016) and Afonso and Alves (2018) argue that the accumulation of illiquid assets through SFAs can lead to persistently high debt levels, making it difficult for countries to reduce their debt-to-GDP ratios. Despite their impact on debt dynamics, SFAs are often excluded from debt sustainability analyses, leading to overly optimistic projections and significant discrepancies between projected and actual debt levels (Campos et al., 2006; Eurostat, 2020).

The Sovereign Asset and Liability Management (SALM) approach provides a comprehensive framework for assessing fiscal sustainability by examining the impact of exchange rates, interest rates, inflation, and commodity prices on government assets and liabilities. Das et al. (2012) argue that SALM can help governments manage debt and asset portfolios more effectively, reducing the risk of fiscal instability. Rutkauskas (2015) highlights the importance of assessing fiscal stability in conjunction with financial stability, particularly in the context of rising private sector debt and its implications for public sector liabilities.

In emerging markets, the role of financial assets in mitigating debt sustainability risks is particularly significant. Henao-Arbelaez and Sobrinho (2017) emphasize the importance of liquidity in reducing borrowing costs and crisis probability, particularly in high-risk markets. The possession of liquid asset buffers can enhance market access and improve the prospects for debt sustainability, underscoring the need for country-specific approaches to asset management.

In conclusion, the integration of SFAs and financial assets into fiscal sustainability analysis is essential for a comprehensive understanding of debt dynamics. Improved forecasting of SFAs and greater transparency in fiscal reporting can enhance the accuracy of

debt sustainability assessments, enabling governments to implement more effective fiscal policies and reduce the risk of fiscal crises.

3. Empirical Approach

3.1. Methodology

The purpose of this paper is to examine the relationship between fiscal sustainability, stock-flow adjustments and government financial assets. The fiscal parameters were computed using a Time-Varying parameter model proposed by Schlicht (2003, 2021). Traditional econometric models typically assume that the relationships between variables remain constant over time. However, economic systems are inherently dynamic, with interactions between variables evolving due to external shocks, policy changes, and structural transformations. These fluctuations require models capable of distinguishing between persistent and transitory factors. A key challenge in modelling such systems lies in identifying and quantifying these variations. Traditional approaches, such as the ceteris paribus assumption, aim to isolate cause-and-effect relationships. However, given the everchanging nature of economic conditions, assuming that all other variables remain equal is often unrealistic.

This limitation underscores the importance of flexible models that accommodate evolving relationships. Time-Varying Coefficient (TVC) models address this issue by allowing coefficients to change over time rather than remain fixed. Unlike static models, TVC models recognize that coefficients follow a stochastic process, often resembling a random walk. While coefficients are not fixed, the process governing their evolution maintains a consistent level of variability, enabling meaningful estimations despite uncertainty. Formally, the evolution of a coefficient can be represented as:

$$\beta_t = \beta_{t-1} + \varepsilon_t, \tag{1}$$

where ε_t is a random disturbance term, and the subscript t signifies temporal, allowing the model to capture structural shifts in relationships.

Regarding the estimation of fiscal sustainability coefficients, the most widely accepted methods in the literature were utilized. The fiscal reaction function, advocated by Bohn (1998), was adapted to the variables in this study:

$$pbalance_t = \alpha_t + \beta_t . debt_{t-1} + \varepsilon_t \tag{2}$$

The estimated coefficient, denoted as β, represents the reaction of primary government balance to the increase of one lagged government debt-to-GDP ratio. In this context, the primary government balance is denoted as $pbalance_t$, while the lagged debt-to-GDP ratio is represented as $debt_{t-1}$, and ε_t denotes the random disturbance. A positive β coefficient is interpreted as a favourable sign, as it indicates that the primary balance improves – either by increasing the surplus or by reducing the deficit – when the lagged government debt-to-GDP ratio rises. The second approach examines the cointegration between government revenues and expenditures, which serves as an indicator of fiscal sustainability:

$$revenues_t = \theta_t + \gamma . expenditures_t + \vartheta_t \quad (3)$$

The estimated coefficient, referred to as cointegration, reflects the response of government revenues to a unit change in government expenditures, and ϑ_t represents the random disturbance. A γ value close to one suggests compliance with the present value budget constraint (Afonso, 2005).

The approach will involve the use of both cointegration and its lagged form, in order to address the potential reverse causality between government revenues and expenditures. Public expenditure can stimulate GDP and, consequently, increase revenues within the same year, while governments may simultaneously adjust expenditures in response to revenue performance. This contemporaneous feedback hinders the identification of the causal relationship between revenues and expenditures. The implementation of a lag structure serves to address this issue by ensuring that while current expenditure has the capacity to influence future revenues, revenues in the future are unable to impact past expenditures. This approach may also be regarded as a robustness check, the purpose of which is to verify whether the long-run relationship persists when accounting for delayed effects.

As for the stock-flow adjustments, they were computed using two different methodologies: one based on the data from the IMF World Economic Outlook (WEO) and the other using Eurostat data. Concerning the first method, the formula proposed by Hagen and Wolff (2006), defines SFAs as the difference between the public debt level in the current period, $debt_t$, and that of the previous period, $debt_{t-1}$, adjusted by subtracting the fiscal deficit of the current period, $gbalance_t$, all of them expressed as percentage of GDP:

$$sfa_{IMF_t} = debt_t - debt_{t-1} - gbalance_t \quad (4)$$

The computed SFAs are represented by the variable sfa_{IMF_t}, while the difference between debt levels is denoted as difference. The second method derives SFAs directly from disaggregated data. This calculation involves summing the values related to total statistical discrepancies, hereafter *statdiscrepancies*, total adjustments, referred to as *totaladjust*, and the net acquisition of financial assets, denoted as *netacqfa*—each of which includes a set of underlying components. The result of this estimation is identified as sfa_{EUR_t} and was provided, in this case, through subtracting the change in general government consolidated gross debt, $grosschange_t$, by the net borrowing or lending of general government:

$$sfa_{EUR_t} = grosschange_t - gbalance_t \tag{5}$$

3.2. Data

This study makes use of a substantial dataset, which has been compiled from two primary sources: the IMF World Economic Outlook (WEO) database and Eurostat. The dataset encompasses key macroeconomic and financial indicators for the 27 European Union (EU) member states, and the selection of these countries was determined by data availability, as the supplementary variables required for the analysis were exclusively accessible to this group. The WEO dataset offers a wide range of macroeconomic indicators from 1980 to 2024. However, the starting years of specific variables vary depending on availability, which is a limitation of the dataset. These indicators provide a comprehensive overview of economic performance, fiscal conditions, and monetary stability within the EU.

Eurostat data serves to enhance the analysis by incorporating detailed fiscal and financial variables, including fiscal discrepancies, financial asset acquisitions, and adjustments. This facilitates a more precise examination of government balance sheets. Some variables have already been presented and identified, but others are still missing. The remaining variables regarding the WEO database are as follows: the output gap as a percentage of potential GDP, total investment as a percentage of GDP, gross national savings as a percentage of GDP, inflation measured by the average change in consumer prices, and the unemployment rate as a percentage of the total labour force.

From the Eurostat database, the variables classified under the category *netacqfa* comprise currency and deposits, known as *currencydep*, and debt securities, listed as *securities*. The category *loans* include disaggregation such as acquisition or increase, labelled *lincreases*, and disposal or reduction, identified as *ldecreases*. Loans are further distinguished by

maturity, with short-term loans referred to as *stloans* and long-term loans as *ltloans*, which also include acquisition or increase, recorded as *ltloansincr*, and disposal or reduction, noted as *ltloansred*.

Equity and investment fund shares or units are captured by *equityinv*, which includes both portfolio investments *(portfolio)*, and other types of investments (*otherinv)*. The latter includes acquisition or increase (*otherinc)*, and disposal or reduction (*otherred)*. Other financial instruments considered are financial derivatives, represented as *fderivatives*; other accounts receivable, noted as *receivable*; and other financial assets.

Variables from the adjustments category include the net incurrence of liabilities in financial derivatives, listed as *derivliab*; other accounts payable, captured by *payable*; and other liabilities, under the variable *othliab*. Additional adjustment variables include issuances above or below nominal value, identified as *issuances*; the difference between interest expenditure accrued and paid, referred to as *interestdiff*; redemptions or repurchase of debt above or below nominal value, recorded as *debtrepurch*; and appreciation or depreciation of foreign currency-denominated debt, through the variable *fxdebt*.

Structural changes are captured by changes in sector classification and structure, using *sectorchange*, while other volume changes in financial liabilities are referred to as *volchange*. Lastly, discrepancy with the budget balance is represented as *discrepancy*, other statistical discrepancies as *otherstatdisc*, and change in consolidated gross debt as *chgdebt*.

Table 1 presents the SFAs and their disaggregated components. The table was developed to provide a clearer overview of the dataset used, given the complexity of the variable names and their inability to be easily adapted into meaningful acronyms. In any case, the variables that are more difficult to interpret will be used solely in the descriptive analysis of the data's historical evolution. They will not be included in the econometric models.

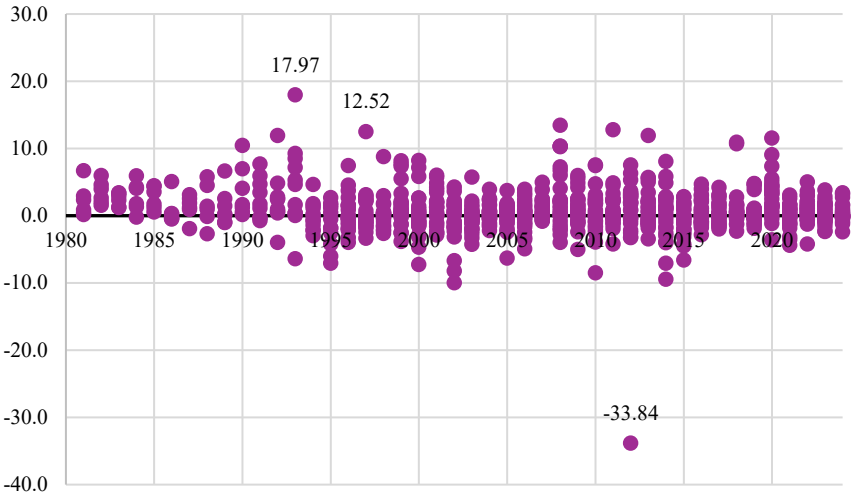
Table 1. Disaggregated Stock-flow Adjustments

Stock-flow Adjustments	*Disaggregated Components*	*Subcomponents*
Net acquisition of financial assets	Currency and deposits	
	Debt securities	
	Loans	Acquisition and disposal
	Short-term loans	
	Long-term loans	Acquisition and disposal
	Equity and investment fund shares/units	Portfolio investments and others
	Financial derivatives	
	Other accounts receivable	
	Other financial assets	
Total adjustments	Net incurrence of liabilities in financial derivatives	
	Net incurrence of other accounts payable	
	Net incurrence of other liabilities	
	Issuances above/below nominal value	
	Difference between interest expenditure accrued and paid	
	Redemptions/repurchase of debt above/below nominal value	
	Appreciation /depreciation of foreign currency debt	
	Changes in sector classification and structure	
	Other volume changes in financial liabilities	
Total statistical discrepancies	Other statistical discrepancies	

The stock-flow adjustments (SFAs), estimated using the formula proposed by Hagen and Wolff (2006), are presented in Figure 1. The dataset reveals that SFAs have remained relatively consistent since 1980 until 2024, with most countries falling within the range of -10 to 10. It appears that most countries within the EU-27 exhibit positive SFAs. The lowest observed value was 17.97, recorded in Greece in 1993, while the highest value was -33.84, also in Greece, in 2012. Starting from the year 2000, there was a slight decline in SFAs, however, a sharp increase can be seen in 2008, likely due to the global financial crisis, with high values sustained until 2015.

Following this period, SFAs began to decrease, only to rise again in 2020. In 2022, the trend reversed again, continuing its downward trajectory. Overall, the number of negative SFA values has diminished over time. The relatively low number of observations in the 1980s corresponds to the limited data availability during that period.

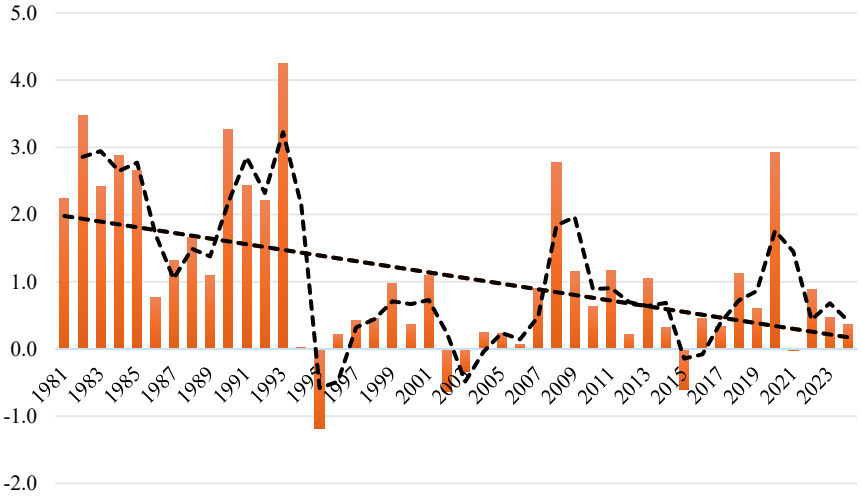
Figure 1. SFAs estimated using the Hagen and Wolff's (2006) formula, 1980-2024



Source: Authors' calculations.

The estimation of the aggregate average SFAs over the period from 1981 to 2023 reveals a value of 0.8. The average was mostly and consistently positive across the countries analysed, except for the years 1995, 2002, 2003, and 2015. Despite significant fluctuations in the values throughout the period, represented by the moving average trend line, a declining linear trend is evident, as the Figure 2 depicts. The same stress periods that were found in Figure 1, are present in Figure 2. The scatter plot reveals some significant heterogeneity among countries, highlighting outliers and diverse individual patterns. In contrast, the aggregated average smooths these variations offering a clearer view of the overall trend.

Figure 2. SFAs estimated using the Hagen and Wolff's (2006) formula: aggregate average and trends, 1981-2024

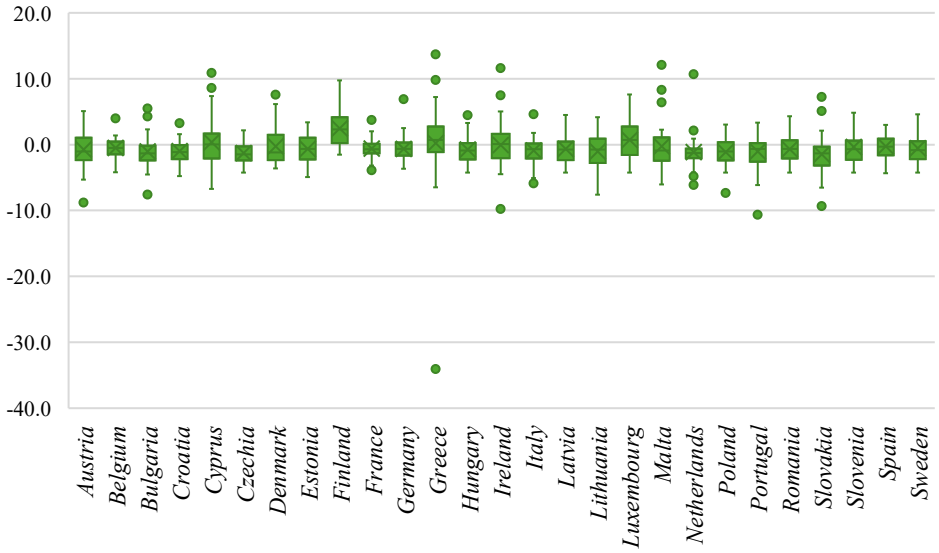


Source: Authors' calculations.

Figure 3 illustrates the outliers identified by calculating the deviations from the mean, both positive and negative. These include Greece, Malta, Portugal, Ireland, Cyprus, Slovakia, Austria, the Netherlands, Finland, Lithuania, Bulgaria, and Poland. The presence of both high and low outliers suggests substantial cross-country variability, potentially driven by structural differences or country-specific shocks. For instance, Cyprus's exceptionally high SFA in 2013 is linked to the Global Financial Crisis and the state's intervention in the banking sector, particularly through recapitalisations that increased debt without affecting the deficit.

Greece's 1990 value likely reflects non-transparent accounting practices and the incorporation of off-budget liabilities. Malta's 1992 spike may stem from structural reforms and debt consolidation measures, which were, in part, a response to excessive public sector wage spending and rigidities in the pricing structure of public utilities. These examples highlight how SFAs can capture significant fiscal operations that are not visible in the conventional deficit figures.

Figure 3. Country deviations from the EU-27 mean

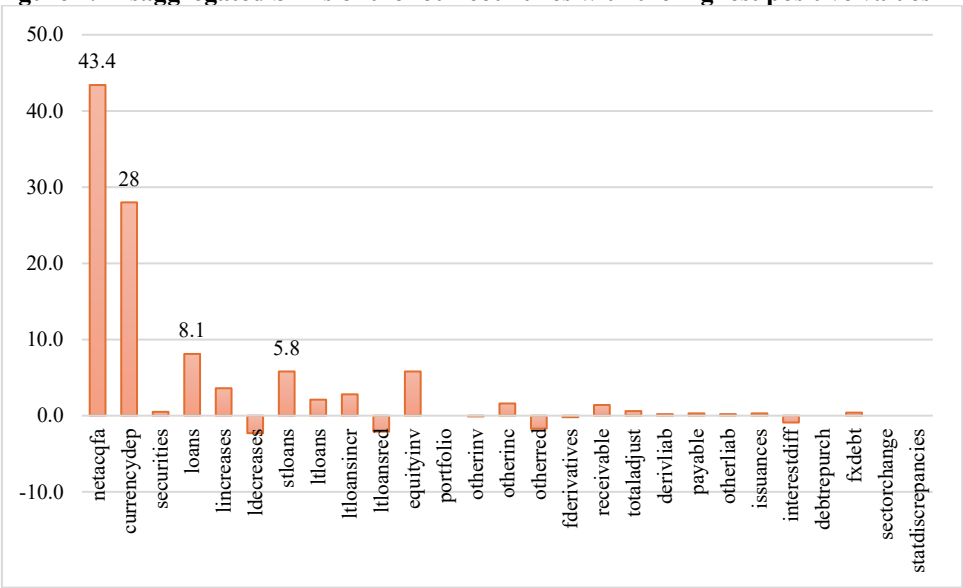


Source: Authors' calculations.

To identify potential explanatory factors for the outliers observed in figure 3, the top and bottom 10% of observations were selected, resulting 20 cases – 10 with the highest positive values and 10 with the most negative. The analysis then focused on those cases where the discrepancy between the calculated SFAs (sfa_{IMF}) and the values reported by Eurostat (sfa_{EUR}) was minimal. Based on this criterion, four countries were selected from each group.

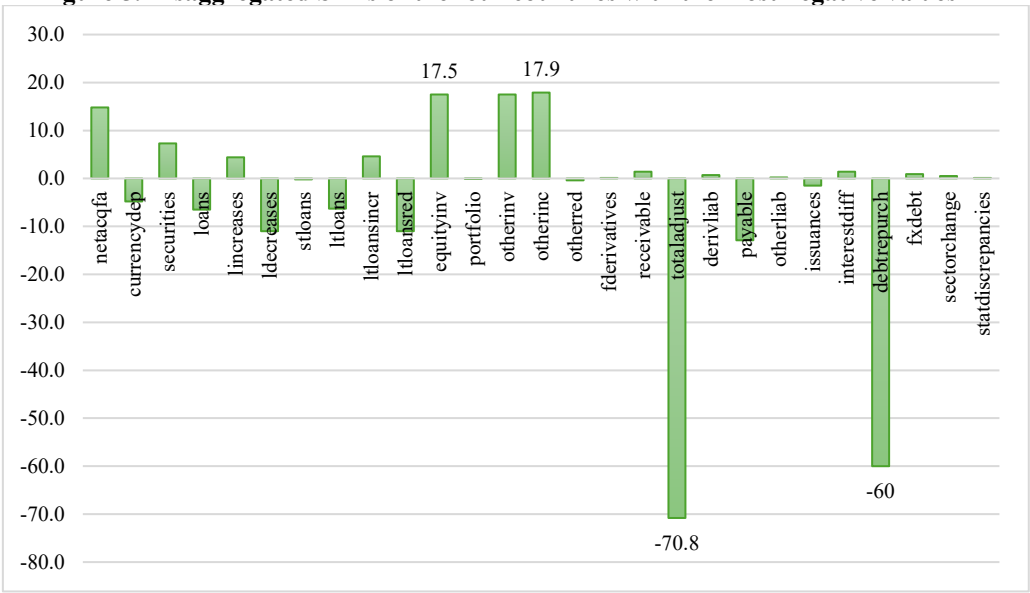
Focusing on the disaggregated data, as shown in Figures 4 and 5, the primary driver behind the extreme positive values was the net acquisition of financial assets. A more detailed examination of the data revealed that the highest contributions came predominantly from currency and deposits, as well as from loans with positive values. Concerning the extreme negative values, in some countries these are explained by negative entries in the same financial assets categories, while in others, they were mainly due to total adjustments – specifically those related to the of the repurchase of debt below nominal value.

Figure 4. Disaggregated SFAs of the four countries with the highest positive values



Source: Authors' calculations.

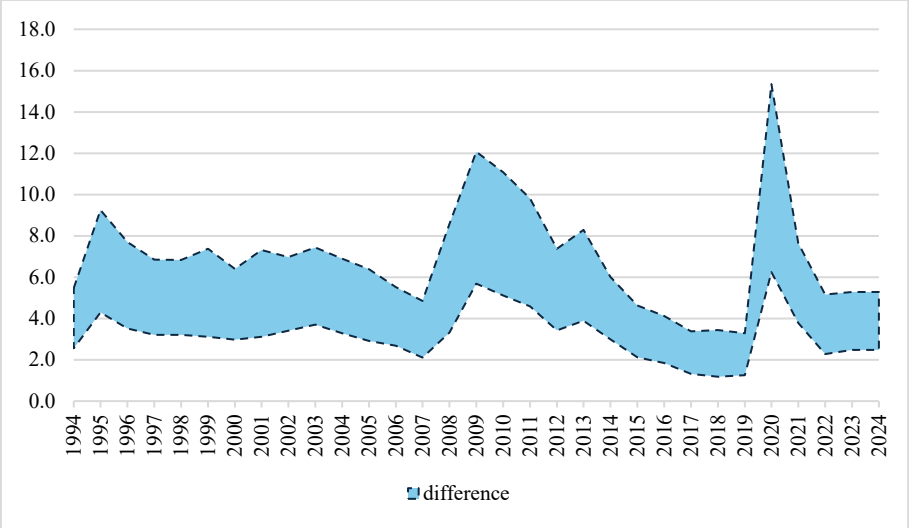
Figure 5. Disaggregated SFAs of the four countries with the most negative values



Source: Authors' calculations.

Figure 6 presents the evolution of the aggregated average $gbalance$ and $grosschange$ for the EU-27 from 1994 to 2024. The sfa_{EUR} is calculated as the difference between these two variables. The difference appears relatively stable between 1996 and 2004. Following this period, a decrease is observed between 2006 and 2008, followed by a sharp increase in 2010, after which it remains relatively stable again between 2014 and 2018, although at a lower level compared to previous years. A new peak in the difference is observed in 2020, the highest recorded in this dataset, followed by a decrease in the subsequent two years.

Figure 6. SFAs estimated as the difference between aggregated average gbalance and grosschange, 1994-2024



Source: Authors' calculations

In table 2, there are some statistics regarding the variables analysed in this study, and, in table 3, there is a correlation matrix between the same variables.

Table 2. Summary Statistics

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
frf	857	.076	.1	-.479	.35
cointegration	954	.207	.159	-.371	.614
cointegrationlag	927	.078	.111	-.221	.467
sfa_{IMF}	889	.787	3.081	-33.835	17.975
sfa_{EUR}	1159	.475	2.314	-36.8	13.4
outputgap	785	-.33	3.29	-18.453	11.362
investment	1119	23.67	4.977	-1.497	53.713
savings	1123	22.584	5.529	1.714	53.273
inflation	1113	9.814	61.392	-1.676	1518.531
unemployment	1086	8.286	4.51	.025	27.475
netdebt	766	42.628	31.443	-32.802	140.755
difference	889	3.662	4.411	-26.989	29.268
currencydep	1113	.509	1.537	-10.2	11.6
securities	698	.138	.905	-6.7	13.8
loans	952	.173	.717	-5.9	6.7
ltloans	951	.234	.641	-5.5	4.2
equityinv	895	-.005	1.117	-10.8	17.3
otherinv	719	-.057	1.098	-11.4	17.3

Note: Author's calculations

Table 3. Correlation Matrix

Variables	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*	*(13)*	*(14)*	*(15)*	*(16)*	*(17)*	*(18)*
(1) frf	1.000																	
(2) cointegration	-0.155	1.000																
(3) cointegrationlag	-0.207	0.448	1.000															
(4) sfaIMF	-0.078	-0.091	-0.010	1.000														
(5) sfaEUR	-0.097	-0.018	0.003	0.612	1.000													
(6) outputgap	0.045	-0.138	-0.215	0.134	0.145	1.000												
(7) investment	0.078	0.031	-0.016	0.001	0.010	0.445	1.000											
(8) savings	-0.269	-0.205	-0.248	0.073	0.025	0.384	0.417	1.000										
(9) inflation	0.144	0.066	-0.033	0.119	0.001	0.218	-0.150	-0.119	1.000									
(10) unemployment	0.122	0.254	0.182	-0.126	-0.093	-0.510	-0.336	-0.433	0.047	1.000								
(11) netdebt	0.155	-0.058	0.064	-0.075	-0.103	-0.281	-0.293	-0.221	-0.145	0.142	1.000							
(12) difference	0.023	-0.082	-0.036	0.590	0.352	-0.222	-0.111	-0.283	0.201	0.177	0.265	1.000						
(13) currencydep	0.034	-0.025	0.040	0.292	0.388	0.019	0.000	-0.110	-0.035	-0.027	-0.023	0.184	1.000					
(14) securities	-0.069	0.119	-0.017	-0.113	0.022	0.034	0.016	0.113	0.009	-0.112	-0.037	-0.081	-0.216	1.000				
(15) loans	0.049	0.144	0.095	0.256	0.470	0.077	0.097	-0.109	-0.001	-0.006	-0.035	0.224	0.140	0.016	1.000			
(16) ltloans	-0.053	0.156	0.151	0.196	0.462	0.065	0.069	-0.114	-0.004	-0.007	-0.034	0.186	0.112	0.063	0.882	1.000		
(17) equityinv	-0.195	-0.049	0.039	-0.046	0.026	-0.057	-0.125	-0.016	-0.010	0.012	0.044	-0.042	-0.016	0.148	0.010	0.005	1.000	
(18) otherinv	-0.159	-0.056	0.024	-0.128	-0.144	-0.066	-0.079	0.068	-0.008	0.006	0.069	-0.088	-0.018	0.325	-0.075	-0.039	0.913	1.000

Source: Author's calculations.

4. Empirical Analysis

4.1. Analysis of the Stock-flow Adjustments Results

Table 4 presents the estimation results for the fiscal reaction functions, the cointegration relationship between revenues and expenditures, and its lagged specification, for the EU-27 countries. In the fiscal reaction function estimations, the coefficients on both SFA variables are positive in models (3) and (4). Theoretically, a negative sign would be expected, lower stock-flow adjustments are usually associated with a stronger fiscal stance. However, the positive coefficients observed suggest that higher SFAs may coincide with improved fiscal positions.

Among the control variables, the positive effect of $investment$ in both models, is consistent with the idea that productive public spending enhances growth and thus strengthens fiscal performance. $Savings$ also positive association with fiscal outcomes in model (4), suggests that higher domestic savings ease fiscal pressures. Conversely, $netdebt$ and $difference$ negative effects, indicate that higher debt levels and debt accumulation are associated with fiscal deterioration, as expected.

In the cointegration models, the estimated coefficients for sfa_{IMF} and sfa_{EUR} remain positive in the models in which they are significant, a result that, although contrary to theoretical expectations, may be interpreted to reflect the structural features of fiscal management systems across the European Union. Regarding the control variables, $savings$ display of a negative coefficient, is unexpected, as higher savings would typically support fiscal sustainability. Similarly, the negative sign associated with $inflation$ is somewhat unexpected, as it is usually predicted to ease the real debt burden.

$Unemployment$ has a negative effect in both models, in line with the idea that higher joblessness worsens fiscal balances through lower revenues and higher social transfers. Interestingly, the positive association of $netdebt$ with the fiscal balance, contradicts theoretical assumptions mentioned earlier. In the lagged cointegration specifications, the coefficients on sfa_{IMF} and sfa_{EUR} remain positive. $Investment's$ negative coefficient in model (12), while theoretically unexpected, could capture either short-term fiscal costs associated with public investment or inefficiencies in the allocation of spending.

Table 4. Results of the EU-27 countries

	Fiscal Reaction Functions				*Cointegration*				*Cointegration - lag*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	0.001		0.007***		-0.001		0.005***		-0.001		0.004***	
	(0.001)		(0.002)		(0.001)		(0.001)		(0.001)		(0.001)	
sfa_{EUR}		0.000		0.002**		0.000		0.004***		0.000		0.003***
		(0.000)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)
outputgap			-0.002	-0.001			-0.000	0.001			-0.000	0.001
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
investment			0.002**	0.001*			-0.001	-0.001			-0.002	-0.002*
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
savings			0.001	0.002**			-0.008***	-0.007***			-0.008***	-0.008***
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
inflation			0.000	0.001			-0.001*	-0.001			-0.001	-0.000
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
unemployment			0.000	-0.000			-0.002**	-0.002***			-0.003***	-0.003***
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
netdebt			-0.000***	-0.000***			0.000***	0.000***			0.001***	0.000***
			(0.002)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
difference			-0.007***	-0.004***			-0.006***	-0.004***			-0.005***	-0.004***
			(0.002)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
Obs.	857	810	550	520	881	906	551	521	879	880	550	520
R^2	0.829	0.828	0.891	0.873	0.868	0.851	0.939	0.934	0.687	0.657	0.862	0.861

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 5 shows the results for the Euro Area (EU) countries. Within the fiscal reaction function (FRF) framework, the results for sfa_{IMF} and sfa_{EUR} are once again positive. The findings suggest that, within the context of the Euro Area's current institutional framework, stock-flow adjustments may serve as a reflection of fiscal efforts, such as asset liquidations or financial engineering, as opposed to fiscal deterioration. This interpretation is consistent with the limited fiscal flexibility permitted by the Stability and Growth Pact (SGP), despite the Pact's lack of an explicit focus on the sustainability of long-term debt, as previously noted by Afonso (2005). Milesi-Ferretti and Moriyama (2004), Buti et al. (2007), mentioned that, in such cases, governments frequently resort to non-deficit channels to influence debt dynamics. Among the control variables, $investment$ evidence of a positive effect, further supports the notion that productive public investment supports growth and, indirectly, fiscal stability.

In contrast, $difference$ and $netdebt$ negative effects, point to the expected fiscal deterioration responses when debt increases, in line with what is theoretical expectations. Within the cointegration model, $inflation$ appears to be negatively correlated, a finding that stands in contrast to the standard view that inflation improves debt sustainability by diminishing the real value of public liabilities. This outcome may be interpreted as an indication of underlying macroeconomic imbalances, where inflationary pressures coincide with fiscal fragility, particularly in peripheral or highly indebted Euro Area members.

The results indicate that $savings$ are negatively associated with fiscal balances, suggesting that although savings may contribute to macroeconomic stability, they can also exacerbate fiscal pressures. This phenomenon may reflect deleveraging if the private sector, characterised by the reduction of debt through reduced spending and increasing savings, on the part of the households and firms. Alternatively, it could be attributed to a heightened degree of precautionary behaviour in response to economic uncertainty, both of which reduce consumption and investment. These dynamics have the potential to result in lower tax revenues and, consequently, higher fiscal pressure.

Additionally, the consistent positive effect of net public debt across models points to a macroeconomic environment where monetary conditions mitigate the short-term fiscal burden of higher debt. For instance, low interest rates might ease the fiscal burden often associated to high debt levels. This interpretation is aligned with the framework developed by Ostry et al. (2010) and Ghosh et al. (2013).

Table 5. Results of the Euro Area countries

	Fiscal Reaction Functions				***Cointegration***				***Cointegration - lag***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	0.001		0.007***		-0.001		0.005***		-0.002		0.004***	
	(0.001)		(0.002)		(0.001)		(0.001)		(0.001)		(0.001)	
sfa_{EUR}		0.000		0.003**		0.000		0.004***		0.000		0.003***
		(0.000)		(0.001)		(0.001)		(0.001)		(0.002)		(0.001)
outputgap			-0.002	-0.001			-0.000	0.001			-0.000	0.000
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
investment			0.002**	0.002**			-0.001	-0.001			-0.001	-0.002
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
savings			0.001	0.001			-0.007***	-0.007***			-0.008***	-0.008***
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
inflation			0.000	0.001			-0.001*	-0.001			-0.001	-0.001
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
unemployment			0.000	-0.000			-0.002***	-0.002***			-0.003***	-0.003***
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
netdebt			-0.000***	-0.000***			0.000***	0.000***			0.000***	0.000***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
difference			-0.007***	-0.005***			-0.006***	-0.004***			-0.005***	-0.004***
			(0.002)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
Obs	631	590	489	459	655	637	490	460	653	619	489	459
R^2	0.790	0.788	0.878	0.858	0.836	0.824	0.937	0.931	0.642	0.634	0.845	0.842

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

The estimation results for the Core countries are presented in Table 6. In the context of the fiscal reaction function models, both sfa_{IMF} and sfa_{EUR}, demonstrate positive effect. This indicates that higher stock-flow adjustments are associated with stronger fiscal positions. Whilst the present result appears to contradict theoretical predictions, which would have predicted a negative correlation, it may reflect the institutional and financial maturity of the Core countries, where SFAs are more likely to be the outcome of strategic fiscal management, as opposed to being passive accounting effects. As

Campos et al. (2006) have argued, there is a correlation between fiscal transparency and a reduction in the risk of creative accounting, thereby enhancing the safety of utilising SFAs.

$Investment$ and $unemployment$ negative coefficients can be interpreted as episodes where fiscal fragility coincides with periods of higher levels of public investment and higher unemployment. Conversely, the positive effect of $inflation$ supports the hypothesis that price increases reduce the real value of public debt. The same sign on $difference$, while less intuitive, it may signify short-term procyclical fiscal responses, potentially driven by market expectations or compliance with EU fiscal frameworks.

Turning to the cointegration analysis, the control variables $savings$ and $difference$ are negative, suggesting that increased savings, and rising debt levels are associated with the deterioration of the fiscal balance. The negative $outputgap$ coefficient suggests that fiscal policy tends to deteriorate during periods of strong economic activity, thereby going against the expected contractionary behaviour of the relationship between the variables. It is notable that the coefficient of $netdebt$ is positive, aligning with the interpretation that these countries, due to the strength of their institutional frameworks, may have greater fiscal space and credibility to operate at higher debt levels without compromising sustainability. This position is consistent with Ostry et al. (2010) and Ghosh et al. (2013) framework.

Table 6. Results of the Core countries

	Fiscal Reaction Functions				***Cointegration***				***Cointegration - lag***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	-0.000		0.005***		-0.000		0.002		-0.000		0.001	
	(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)	
sfa_{EUR}		0.001		0.003***		-0.000		0.002**		-0.001		0.001
		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)		(0.001)
outputgap			-0.000	0.000			-0.003**	-0.002*			-0.003***	-0.003**
			(0.000)	(0.000)			(0.001)	(0.001)			(0.001)	(0.001)
investment			-0.005***	-0.003***			0.001	-0.000			0.001	0.000
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
savings			-0.000	0.001			-0.002**	-0.002*			-0.002**	-0.002*
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
inflation			0.002*	0.001			-0.002	-0.002			-0.002	-0.002
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
unemployment			-0.002**	-0.000			-0.001	-0.001			-0.002*	-0.002*
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
netdebt			-0.001*	-0.001			0.000***	0.000***			0.000***	0.000***
			(0.001)	(0.001)			(0.000)	(0.000)			(0.000)	(0.000)
difference			0.002**	0.001**			-0.003***	-0.002**			-0.001	-0.001
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
Obs	259	225	220	196	274	246	221	197	274	240	221	197
R^2	0.937	0.944	0.945	0.946	0.889	0.829	0.937	0.901	0.657	0.684	0.829	0.832

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 7 presents the estimation results for the Peripheral Euro Area countries. In the fiscal reaction function (FRF) framework, the effects of the stock-flow adjustment variables, sfa_{IMF} and sfa_{EUR}, respectively, suggest that in these economies, higher stock-flow adjustments do not necessarily indicate fiscal slippage. The positive correlation between $savings$ and fiscal balances, is consistent with the notion that stronger private saving can ease fiscal constraints. This is in line with the idea provided by Henao-Arbelaez and Sobrinho (2017), that liquidity is paramount in such economic contexts, as it serves to reduce borrowing costs and therefore enhance fiscal sustainability.

Conversely, both $netdebt$ and the $difference$ variable negative coefficients, reinforce the view that higher debt burdens and rising debt levels trigger fiscal deterioratioon in these countries. In the cointegration models, model (5) which shows a negative coefficient for sfa_{IMF}, implies that, in the long run, increases in stock-flow adjustments may be linked to fiscal stress. Jaramillo et al. (2016) e Afonso e Alves (2018) acknowledge the potential hazards associated with the accumulation of iliquid assets.

As highlighted by Ciżkowicz et al. (2015), these countries benefited from a convergence-driven decline in sovereign bond yields during the early years of the Euro but often delayed or insufficiently implemented structural fiscal adjustments, particularly on current spending and tax policy. The positive SFAs coefficients may reflect temporary improvements in fiscal indicators due to windfall gains, while the negative signs on $netdebt$ and $difference$ point to the underlying vulnerabilities. These findings support the interpretation that favourable financing conditions, enabled by the ECB policy, may have masked underlying fiscal vulnerabilities, contributing to unsustainable fiscal paths during the pre-crisis period.

Table 7. Results of the Peripheral Euro Area countries

	Fiscal Reaction Functions				*Cointegration*				*Cointegration - lag*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	0.001*		0.011***		-0.004**		0.007***		-0.004**		0.005**	
	(0.001)		(0.004)		(0.002)		(0.002)		(0.002)		(0.003)	
sfa_{EUR}		0.001**		0.005**		0.000		0.007***		0.000		0.007**
		(0.000)		(0.002)		(0.003)		(0.002)		(0.003)		(0.003)
outputgap			-0.004	-0.003			-0.002	-0.000			-0.001	0.000
			(0.002)	(0.003)			(0.003)	(0.003)			(0.003)	(0.003)
investment			0.001	-0.000			-0.002	-0.002			-0.003	-0.003
			(0.001)	(0.001)			(0.002)	(0.002)			(0.002)	(0.002)
savings			0.003*	0.003**			-0.015***	-0.015***			-0.017***	-0.018***
			(0.001)	(0.001)			(0.003)	(0.003)			(0.003)	(0.003)
inflation			0.003	0.003			-0.000	0.000			0.001	0.001
			(0.002)	(0.003)			(0.003)	(0.003)			(0.003)	(0.003)
unemployment			0.002	0.001			-0.007***	-0.007***			-0.010***	-0.009***
			(0.002)	(0.002)			(0.002)	(0.002)			(0.002)	(0.002)
netdebt			-0.001**	-0.001***			0.000*	0.000			0.001***	0.001***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
difference			-0.009***	-0.007***			-0.009***	-0.008***			-0.008***	-0.008***
			(0.002)	(0.002)			(0.001)	(0.001)			(0.002)	(0.001)
Obs.	180	176	132	128	188	192	132	128	187	187	132	128
R^2	0.433	0.421	0.774	0.695	0.451	0.427	0.774	0.754	0.158	0.145	0.596	0.588

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 8 reports the estimation results for the Central and Eastern European Countries (CEECs). Within the fiscal reaction function framework, model (2) reveals a negative coefficient for the sfa_{EUR}, variable, thereby aligning with theoretical predictions that associate higher stock-flow adjustments with fiscal deterioration. Conversely, model (3) presents a positive coefficient on sfa_{IMF}, thus indicating a more complex interaction between fiscal policy and debt management. Although this outcome appears to be at odds with theoretical expectations, it its nevertheless compatible with the historical evidence as outlined by Krajewski et al. (2015). A number of CEECs have demonstrated an ability to uphold intertemporal budget constraints, even under adverse external shocks. This may reflect the influence of external anchors, such as EU accession criteria or IMF programs, on fiscal governance.

While the effects of $netdebt$ and $difference$ are aligned with expectations, indicating fiscal fragility in response to rising debt levels, the negative sign on the $outputgap$ may point to procyclical fiscal responses. These issues have been documented in the literature as recurrent challenges in the CEECs, particularly in periods of economic stress when fiscal policy becomes constrained. Also, in model (3), $savings$' positive effect, demonstrates the possibility that fiscal performance tends to improve in periods of higher domestic savings. This is consistent with empirical findings suggesting that CEECs, despite volatility, often adjust fiscal policy in response to long-term sustainability pressures.

The presented findings can be interpreted as a reflection of the structural transformation processes in many CEECs, where debt management, privatization, and institutional reforms played a prominent role in shaping fiscal outcomes beyond short-term budgetary adjustments. Overall, the results are consistent with the findings of the referenced study, which characterizes fiscal sustainability in CEECs as present but weak.

Table 8. Results of the Central and Eastern European Countries

	Fiscal Reaction Functions				***Cointegration***				***Cointegration - lag***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	-0.001		0.011***		0.002***		0.003***		0.003***		0.000	
	(0.001)		(0.002)		(0.001)		(0.001)		(0.001)		(0.002)	
sfa_{EUR}		-0.003**		0.000		0.001		0.001		0.001		-0.002
		(0.001)		(0.003)		(0.001)		(0.001)		(0.001)		(0.002)
outputgap			-0.004***	-0.002			-0.002***	-0.002**			-0.003*	-0.002*
			(0.001)	(0.002)			(0.001)	(0.001)			(0.001)	(0.001)
investment			0.000	-0.000			0.000	0.000			0.001	0.001
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
savings			0.004***	0.004**			-0.001	-0.001			0.000	0.000
			(0.001)	(0.002)			(0.001)	(0.001)			(0.001)	(0.001)
inflation			0.000	0.000			0.000	0.000			0.001	0.001
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
unemployment			-0.001	-0.003**			-0.002***	-0.003***			-0.003**	-0.003**
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
netdebt			-0.002***	-0.002***			0.001***	0.001***			0.001***	0.001***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
difference			-0.012***	-0.005***			-0.003***	-0.001			-0.000	0.001
			(0.001)	(0.001)			(0.001)	(0.001)			(0.001)	(0.001)
Obs.	301	294	84	84	302	325	84	84	302	314	84	84
R^2	0.801	0.808	0.762	0.623	0.952	0.933	0.989	0.988	0.901	0.875	0.973	0.973

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

In the case of the Baltic countries, the estimation results are presented in Table 9. Within the fiscal reaction function models, the coefficients on the stock-flow adjustment variables are generally insignificant, with the notable exception of model (4), where the coefficient of sfa_{EUR} is positive and highly significant. Theoretical predictions would indicate a negative relationship, whereby higher stock-flow adjustments reflect fiscal unsustainability. However, the observed result may instead signify that, within these economies, SFAs are associated with fiscal consolidation or improvements. This interpretation aligns with the historical context of transition to market economies, where privatization processes, often involving foreign strategic investors, contributed to debt reduction and improved fiscal indicators.

Among the control variables, the positive coefficient on the $outputgap$ is coefficient, consistent with countercyclical fiscal behaviour. Conversely, the negative effect on $savings$, although unexpected, may reflect structural characteristics of these smaller, open economies, where high domestic savings coexisted with persistent current account deficits, often financed by foreign direct investment.

A further anticipated result emerges in relation to $unemployment$. The observed positive and intuitive correlation may be attributable to episodes of fiscal deterioration coinciding with periods of labour market stress. Notable examples of such episodes include the post-Soviet transition and in the aftermath of the 1998 Russian financial crisis, during which governments implemented austerity measures to stabilize finances, often at the cost of employment. In the cointegration and lagged cointegration models, the SFAs also yield positive coefficients for sfa_{IMF} and sfa_{EUR}. These findings support the hypothesis that, in the Baltic context, stock-flow adjustments signal proactive debt management rather than fiscal slippage. For instance, in anticipation of European Union and NATO accession, these governments implemented balanced-budget policies and optimised public expenditures to accommodate acquis-related investments and rising defence obligations.

Table 9. Results of the Baltic countries

	Fiscal Reaction Functions				***Cointegration***				***Cointegration - lag***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	0.000		0.000		0.003*		0.000		0.004**		-0.000	
	(0.000)		(0.001)		(0.002)		(0.000)		(0.002)		(0.000)	
sfa_{EUR}		0.000		0.002***		0.002		0.000		0.004*		-0.001***
		(0.000)		(0.001)		(0.002)		(0.000)		(0.002)		(0.000)
outputgap			0.001***	0.001**			0.000*	0.000			-0.000**	-0.000
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
investment			-0.000	0.000			-0.000	-0.000			-0.000	-0.000***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
savings			-0.002***	-0.002***			-0.000***	-0.000***			0.001***	0.000***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
inflation			-0.000	-0.000			-0.000	-0.000			0.000	0.000
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
unemployment			0.001*	0.001**			0.000	0.000			-0.000**	-0.000***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
netdebt			-0.001***	-0.001**			-0.000***	-0.000***			0.000	-0.000
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
difference			-0.000	-0.001**			-0.000	-0.000			0.000	0.000***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
Obs.	80	79	29	29	81	86	29	29	81	83	29	29
R^2	0.993	0.993	0.894	0.932	0.953	0.941	0.856	0.856	0.903	0.886	0.829	0.917

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 10 presents the estimation results for the non-Euro Area countries (NEA). In the fiscal reaction function, only one model reveals a weakly significant and positive coefficient for the stock-flow adjustment variable. In the context of the control variables, the presence of both $netdebt$ and $difference$ negative coefficients suggest a correlation between greater debt levels and increases in debt with fiscal fragility episodes. In the cointegration models, model (7) shows a positive coefficient for sfa_{IMF}. Despite the theoretical inconsistency of a negative coefficient on $investment$, it may be indicative of temporary fiscal burdens or inefficiencies in expenditure. Conversely, the negative

impact of $difference$ (debt accumulation) is consistent with the anticipated response of fiscal inability in the face of escalating debt levels. Interestingly, the display of a positive effect on $netdebt$, implies that debt accumulation reflects financing of sustained fiscal balances, as opposed to deterioration.

Table 10. Results of non-Euro Area countries

	Fiscal Reaction Functions				***Cointegration***				***Cointegration - lag***			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
sfa_{IMF}	0.001		0.006*		-0.000		0.010***		0.000		0.008***	
	(0.001)		(0.004)		(0.001)		(0.003)		(0.001)		(0.003)	
sfa_{EUR}		-0.001		-0.003		-0.000		0.009***		-0.001		0.010***
		(0.001)		(0.005)		(0.001)		(0.003)		(0.002)		(0.003)
outputgap			0.001	0.003			0.004	0.011***			0.006*	0.012***
			(0.004)	(0.004)			(0.003)	(0.003)			(0.003)	(0.003)
investment			-0.002	0.000			-0.011***	-0.009***			-0.012***	-0.011***
			(0.003)	(0.003)			(0.003)	(0.003)			(0.003)	(0.002)
savings			-0.001	0.001			-0.001	-0.001			-0.002	-0.002
			(0.002)	(0.002)			(0.002)	(0.002)			(0.002)	(0.002)
inflation			0.002	-0.001			-0.001	-0.001			-0.001	-0.000
			(0.004)	(0.004)			(0.002)	(0.002)			(0.002)	(0.002)
unemployment			-0.004	-0.010			0.006	0.004			0.007*	0.006
			(0.005)	(0.006)			(0.004)	(0.005)			(0.004)	(0.004)
netdebt			-0.001**	-0.001*			0.002***	0.002***			0.002***	0.002***
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
difference			-0.008*	-0.003			-0.008**	-0.001			-0.006*	-0.000
			(0.004)	(0.002)			(0.003)	(0.002)			(0.003)	(0.002)
Obs.	200	195	61	61	200	237	61	61	200	230	61	61
R^2	0.888	0.889	0.951	0.947	0.933	0.861	0.973	0.970	0.778	0.573	0.955	0.954

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

4.2. Analysis of the Disaggregate Financial Assets Results

The positive values of the currency and deposits effects present in tables 11, 13 and 15, are consistent with the notion that governments with robust fiscal positions accumulate deposits, thereby enhancing debt flexibility. The existence of such deposits serves to reduce the necessity for short-term borrowing, which consequently leads to a decrease in debt servicing costs through liquidity. The data analysis suggests that debt securities exhibit two distinct signals. Within the Euro Area countries, these securities manifest a positive association with fiscal sustainability indicators, as presented in table 12. Conversely, within the core countries (table 13), along with the non-Euro area countries (table 15), a robust negative correlation with fiscal sustainability indicators is observed. The duality of debt securities, functioning as both assets and liabilities, may provide a rationale for this dynamic. The acquisition of debt securities by governments results in obtaining assets that bear interest, thus generating income and providing liquidity. In contrast, the issuance of debt securities results in an increase in public debt. This can potentially compromise fiscal sustainability if implemented to finance persistent deficits.

As depicted in Table 14, the results obtained from the Peripheral Euro Area countries demonstrate a significant association between the variable $loans$ and fiscal sustainability. The correlation between both $cointegration$ and $cointegrationlag$ with $loans$ is positive, which could be explained by a decrease in liability. It is evident that these were loan repayments. The inverse relationship observed within the context of long-term loans may be interpreted as an increase in liabilities, which mean that government loans were granted to non-government units. With regards to the same table, equity and investment fund exhibit a positive coefficient. $Equityinv$ reflects government equity injections, whereby the government functions as a private investor. A positive correlation is to be expected, as governments dispose of equity in corporations, decreasing liability.

As illustrated in Table 15, the negative sign of this last-mentioned variable is evident for the non-Euro Area countries. The potential explanation for this phenomenon is an increase in liability, so an acquisition of equity in corporations. The variable $otherinv$ constitutes a subcomponent of equity and investment fund, which are other than portfolio investments. Consequently, they exhibit the same rationale as mentioned above, whether in positive or negative scenarios (tables 15 and 14, respectively).

Table 11. Results of the EU-27 countries

	Fiscal Reaction Functions		***Cointegration***		***Cointegration - lag***	
	(1)	(2)	(3)	(4)	(5)	(6)
currencydep	-0.000	-0.003	0.005***	0.001	0.005**	0.003
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
securities		-0.006		0.001		0.005
		(0.005)		(0.003)		(0.003)
loans		-0.011		0.024		0.022
		(0.011)		(0.015)		(0.017)
ltloans		0.012		-0.013		-0.011
		(0.011)		(0.014)		(0.016)
equityinv		0.005		0.002		0.001
		(0.006)		(0.005)		(0.005)
otherinv		-0.002		0.000		-0.001
		(0.007)		(0.005)		(0.006)
Obs.	774	245	865	269	841	263
R^2	0.863	0.810	0.861	0.935	0.683	0.832

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 12. Results of the Euro Area countries

	Fiscal Reaction Functions	*Cointegration*	*Cointegration - lag*
	(1)	(2)	(3)
currencydep	-0.003	0.001	0.003
	(0.002)	(0.002)	(0.003)
securities	-0.007	0.004	0.008**
	(0.005)	(0.004)	(0.004)
loans	-0.011	0.032	0.031
	(0.016)	(0.023)	(0.025)
ltloans	0.011	-0.019	-0.019
	(0.017)	(0.020)	(0.022)
equityinv	0.008	0.003	0.001
	(0.010)	(0.006)	(0.006)
otherinv	-0.004	-0.001	-0.003
	(0.010)	(0.007)	(0.007)
Obs.	188	211	206
R^2	0.773	0.923	0.827

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 13. Results of the Core countries

	Fiscal Reaction Functions	*Cointegration*	*Cointegration - lag*
	(1)	(2)	(3)
currencydep	-0.005	0.007*	0.005
	(0.003)	(0.004)	(0.004)
securities	-0.014**	0.012	0.009
	(0.007)	(0.008)	(0.009)
loans	-0.008	0.009	-0.002
	(0.020)	(0.017)	(0.017)
ltloans	0.031	-0.012	-0.009
	(0.019)	(0.019)	(0.022)
equityinv	-0.002	0.003	0.000
	(0.007)	(0.009)	(0.010)
otherinv	0.003	-0.007	-0.007
	(0.008)	(0.009)	(0.011)
Obs.	111	128	125
R^2	0.967	0.865	0.756

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 14. Results of the Peripheral Euro Area countries

	Fiscal Reaction Functions	*Cointegration*	*Cointegration - lag*
	(1)	(2)	(3)
currencydep	-0.002	-0.007	-0.003
	(0.013)	(0.011)	(0.012)
securities	-0.024	-0.015	-0.005
	(0.027)	(0.015)	(0.014)
loans	-0.226	1.121***	1.140***
	(0.276)	(0.241)	(0.222)
ltloans	0.163	-1.102***	-1.107***
	(0.256)	(0.243)	(0.223)
equityinv	0.078	0.090***	0.086***
	(0.057)	(0.025)	(0.022)
otherinv	-0.086	-0.082***	-0.079***
	(0.061)	(0.025)	(0.022)
Obs.	52	58	56
R^2	0.822	0.974	0.966

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

Table 15. Results of the non-Euro Area countries

	Fiscal Reaction Functions	*Cointegration*	*Cointegration - lag*
	(1)	(2)	(3)
currencydep	0.018*	-0.006	-0.009
	(0.010)	(0.009)	(0.012)
securities	0.006	-0.037*	-0.020
	(0.037)	(0.020)	(0.024)
loans	-0.020	0.015	0.005
	(0.020)	(0.013)	(0.018)
ltloans	0.010	-0.009	0.008
	(0.023)	(0.014)	(0.015)
equityinv	-0.034***	0.007	0.020
	(0.010)	(0.031)	(0.039)
otherinv	0.067***	-0.008	-0.025
	(0.021)	(0.038)	(0.046)
Obs.	56	57	56
R^2	0.965	0.983	0.856

Note: * indicates the level of significance of 10%, ** a level of 5% and *** a level of 1%. In brackets we report the robust standard errors. Obs. are the observations for each regression.

5. Conclusions and policy implications

The main purpose of this study was to examine the impact of the stock-flow adjustments and government financial assets on fiscal sustainability in the 27 EU members countries, using the VC model. The findings revealed that SFAs exert generally a positive influence on all the dependent variables employed to assess fiscal sustainability, a result that was not anticipated.

The fiscal reaction function variable results indicate that EU governments generally respond positively to increases in the debt-to-GDP ratio by adjusting their primary balances when SFAs rise. This may indicate that, in certain circumstances, stock-flow adjustments can be a means of debt management as opposed to its deterioration. The results of the analysis of the cointegration and cointegration lag dependent variables imply a long-term relationship between the cointegration of public revenues and expenditures and the SFAs in the majority of the estimated models. Furthermore, the incorporation of the lagged cointegration enables the mitigation of reverse causality, thereby ensuring the robustness of the model over time.

The analysis of regional discrepancies led to the identification of certain patterns. Within the Euro Area, SFAs potentially mirror the institutional constraints imposed by the Stability and Growth Pact, a measure which has restricted fiscal flexibility. In the Core countries, the positive association with SFAs is presumably attributable to the institutional maturity and fiscal transparency characteristic of these countries. In the case of Peripheral countries, it is conceivable that the stock-flow adjustments may have offered a temporary solution to their difficulties, which were subsequently exposed following the sovereign crisis.

Regarding the CEECs, the findings demonstrated an unclear relationship, with most of the models exhibiting positive coefficients; however, one model presented a negative coefficient. The International Monetary Fund (IMF) programmes and criteria for EU membership imply that – even in the event of the SFAs being increased – the necessity for the CEECs to comply with these external anchors requires them the achievement of some goal concerning fiscal sustainability. In the Baltic countries, the positive impact of SFAs on fiscal sustainability may result from the efforts to engage with the EU and NATO, which entailed the management of debt.

The acquisition of financial assets constitutes the most significant component of the stock-flow adjustments. Consequently, their subcomponents were analyzed to understand their impact on fiscal sustainability. The findings of the study revealed that, within the context of the EU-27 countries, the acquisition of currency and deposits exhibited a positive correlation with fiscal sustainability. This association can be attributed to greater fiscal flexibility and financing cost reduction. The results concerning debt securities evidenced distinct behaviors between the respective groups of countries, suggesting either the accumulation of assets or debt. In the periphery countries, loans had a positive association to fiscal balances. Moreover, the results observed in the equity and investment variable were found to be ambiguous, since the reflection of fiscal sustainability is contingent upon whether it is an acquisition or a disposal. It is evident that a thorough understanding of these variables is pivotal for conducting a comprehensive fiscal sustainability analysis.

The present study makes a significant contribution to the existing literature on the subject. Firstly, the paper introduces the disaggregated stock-flow adjustments in their many components, which allows the identification of the main sources of impact in public debts dynamics. Secondly, the time-varying coefficient model (Schlicht, 2003, 2021) was employed. This model enabled capturing structural variation in fiscal policy over time, thus overcoming the limitations of traditional models. Thirdly, the adoption of two distinct methodologies for the estimation of SFAs – one employing IMF WEO data and the other deriving from Eurostat data – serves to enhance the robustness and accuracy of the resulting estimates. Finally, the study categorizes results according to distinct EU groups, thereby allowing the potential implementation of a customized fiscal policy that aligns with the unique characteristics of each country or group.

The results obtained from this research have significant policy implications for economic decision makers. It is vital to emphasize the importance of incorporating SFAs

in fiscal sustainability analyses, as they constitute a substantial component of debt dynamics. Furthermore, the results suggest that stock-flow adjustments may be employed strategically to mask fiscal fragilities, thereby reinforcing the associated risk with their use for creative accounting. Moreover, it is prudent to reinforce the call for enhanced fiscal transparency within the European Union, with the objective of ensuring the veracity and comparability of the fiscal and financial data reported by member states.

It is important to acknowledge the limitations of this paper. The primary obstacle is the scarcity of data, particularly with regard to the 1980s and the disaggregated variables. This has had a detrimental effect on time coverage and, by extension, the results. Moreover, although the implementation of lags was undertaken, it has been demonstrated that this can only serve to mitigate the issue of reverse causality; it does not eradicate it completely, which can have a considerable impact on the robustness of the results. Lastly, it is important to note that there are risks of misspecification when using the VC model, this is the case when the coefficients are constant. Furthermore, an increase in the number of parameters is associated with a heightened probability of distortions and artificial trajectories.

It is recommended that future research efforts concentrate on extending this approach to encompass countries outside the European Union. For instance, it would be of interest to evaluate emerging economies and advance ones with different fiscal structures, so that we can ascertain whether the identified patterns are exclusively due to this context or are universal to other contexts. As Henao-Arbelaez and Sobrinho (2017) have previously expressed, financial assets play a pivotal role in ensuring fiscal sustainability within emerging markets. Consequently, it is anticipated that this area will continue to generate new insights.

Another concept that may be worthy of consideration is the introduction of additional variables into the models, such as indicators of fiscal transparency or the quality of fiscal rules. Afonso et al. (2023) discussed the relevance of government institutions responsible for fiscal policy, suggesting that their inclusion may enable the capture of qualitative domains that can influence the SFAs impact and fiscal response.

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