Paweł PIĄTKOWSKI, PhD
University of Bialystok
e-mail: p.piatkowski@uwb.edu.pl
ORCID: 0000-0003-0560-6290

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DETERMINANTS OF STOCK-FLOW ADJUSTMENT IN EUROPEAN UNION COUNTRIES[1]

Summary

Purpose – The stock-flow adjustment variable is rarely discussed among the variables considered in the assessment of the sustainability of public finances. First of all, it is an expression of the extra-budgetary financial operations that cause a change in the size of the public debt. The purpose of this article is to evaluate the impact of fiscal variables, such as the fiscal balance and government debt, on the size of the stock-flow adjustment.

Research method – The article uses statistical analysis and panel data modelling. The study covers the period from 2002 to 2022. Eurostat data for 27 European Union countries were used.

Results – The study found a statistically significant relationship between the stock-flow adjustment and three variables. The size is influenced by public debt, budget deficit and GDP dynamics. The variables indicate the effect of economic improvement on reducing the size of the stock-flow adjustment. On the other hand, an increase in public debt and an improvement in the budget balance contribute to an increase in the size of SFA.

Originality/value/implications/recommendations – In general, the literature concerns the components of the stock-flow adjustment and the causes of its formation. It's mainly concerned with the nature of the transactions that cause the rise or fall of public debt. Particular attention is paid to creative accounting. In contrast, the study presented in this article allowed us to demonstrate the relationship between the size of the public debt, the budget balance and the dynamics of GDP with the size of the stock-flow adjustment.

Keywords: stock-flow adjustment, public debt, fiscal policy

JEL classification: H63, H30

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1. Introduction

Nowadays, fiscal policy is heavily influenced by public debt. It was sanctioned as an instrument of this policy by J.M. Keynes. It affects both the expenditure side of state budget, by generating expenditure for debt servicing and repayment, and the revenue side of the budget, by providing a source of financing for additional spending as an alternative to tax increases. The build-up of public debt has continued since the 1950s and is now a significant problem in many countries, especially in the highly developed ones.

The European Union monitors the level and sources of public debt, due to its strong impact on the sustainability of public finances. The stock-flow adjustment (SFA) is one of the variables analysed in the so-called excessive deficit procedure. This variable is relatively rarely presented as a factor in debt sustainability analysis. However, data analysis suggests that its impact can be significant, reaching more than twenty percent of GDP.

The literature focuses on the sources of the stock-flow adjustment and the nature of the operations that lead to its creation. In particular, the role of creative accounting in the creating the stock-flow adjustment is emphasized. Therefore, the aim of this paper is to assess the impact of selected economic variables on the size of SFA. To this end, a panel model based on data for 27 countries of the European Union was used. The analysed period covers the years 2002–2022.

2. Stock-flow adjustment as an instrument of fiscal policy

The stock-flow adjustment is a category of fiscal policy that is relatively little discussed in the literature. However, it has a significant impact on the sustainability of public finances, which is reflected in its inclusion in the excessive deficit procedure. The stock-flow adjustment is closely related to the dynamics of the public debt. Public debt is the cumulative nominal value of unpaid liabilities of the public sector. It aggregates the liabilities of entities included in the public finance sector, although it should be emphasized that the list of these entities is a matter of convention, usually defined by the public finance law. Its main source is the financing of budget deficits, defined as the difference between budget revenues and expenditures in a given period. Deficits are therefore a flow of funds needed to finance budget revenue shortfalls. Debt, on the other hand, is a resource value that reflects the stock of liabilities incurred to finance the deficit and refinance the rollover of previous liabilities [Wernik, 2011, pp. 13–14].

The dynamics of public debt can be presented in the following formula [Hall, Taylor, 2000, s. 357]:

$$B_t = B_{t-1} + G_t + rB_{t-1} - T_t,$$

where:
B_t – public debt in year t;
G_t – budget expenditures;
T_t – budget revenues;
r – interest rate.

The definition indicates the source of the debt, which is the budget deficit. It should be emphasized that the components of government expenditure are state purchases and transfers. In addition, interest on public debt is distinguished separately. Taking account of the latter component also allows for the separation of another important category, namely the primary balance. This is the difference between budget revenue and its expenditure, excluding expenditure on debt servicing. These figures can be presented as follows:

$$S_t = G_t - rB_{t-1} - T_t,$$

where:
S_t – primary balance in period t.

Taking into account the primary balance, the public debt changes according to the following formula:

$$B_t = B_{t-1} + S_t + rB_t.$$

The relationship between the level of debt in year t and the deficit in the same year can be expressed as follows [Maltritz, Wüste, 2015, s. 226]:

$$B_t = B_{t-1} + D_t$$

so:

$$\Delta B_t = D_t,$$

where:

D_t _ budget deficit in period t;
ΔB_t – the change in public debt in period t ($\Delta B_t = B_t - B_{t-1}$).

According to the formula, the public debt in year *t* depends on the size of the debt in year *t-1* and the size of the budget deficit in year *t*. The change in the debt in year *t* should be identical to the budget deficit in year *t*. However, the observations made by von Hagen and Wolf [Hagen, Wolf, 2004; Hagen, Wolf, 2006] show that in the 30 years analysed by them, the difference (both positive and negative) between the increase in the debt and the deficit is significant. The difference can be presented as follows:

$$\Delta B_t \neq D_t.$$

This difference was noted in the excessive deficit procedure. At that time, the following elements were distinguished, which made up the change in public debt in a given year [European Commission, 2019, pp. 111–112]:

- primary balance of the state budget – expresses the difference between budget revenues and expenditures after excluding the cost of servicing the public debt;
- snowball effect – expresses the effect of the difference between the nominal interest rate on public debt and the nominal GDP growth rate;
- stock-flow adjustment – similar to the previous approaches, but covering transactions in financial assets that are not included in the primary budget balance.

SFA can be defined as follows, taking into account that the size of government debt, deficit and SFA is most often expressed in relation to GDP [*Stock-flow adjustment (SFA) for the Member States*…, 2018, p. 1]. This difference can be defined by the following formula:

$$B_t = \left(1 - g\right) B_{t-1} + D_t + SFA,$$

where:
g – growth rate in period *t*.

Taking into account the fact that the size of public debt, deficit and SFA are most often expressed in relation to GDP, SFA can be defined as follows [Maltritz, Wüste, 2015, s. 226]:

$$sfa_t = b_t - b_{t-1} - d_t$$

or

$$sfa_t = \Delta b_t - d_t$$

where:
sfa_t – SFA to GDP ratio in year *t*;
b_t – public debt to GDP ratio in year *t*;

d_t – budget deficit to GDP ratio in year t;
Δb_t – change in debt to GDP ratio in year t.

The stock-flow adjustment category is defined in order to reconcile flows (deficits) with changes in debt resources. It indicates that this value would not occur if the fiscal policy gave a full picture of the state of public finances in the budget deficit, which in such a situation would be referred to as "clean". However, the deficit that occurs in practice is "dirty". It is necessary to add this value by SFA [Irwin, 2015, pp. 17–24].

Stock-flow adjustment can take the following values [Rybacek, 2015, s. 6–15]:
- SFA = 0 – then the change in debt exactly corresponds to the budget deficit;
- SFA > 0 – the increase in the level of debt is higher than the level of the budget deficit;
- SFA < 0 – the increase in debt is lower than the budget deficit.

Due to the nature of the operations that contribute to the creation of the SFA, its interpretation is not unambiguous. A positive SFA value implies a higher increase in the value of public debt than that resulting from the deficit (which is usually interpreted negatively), which may be due to temporary factors, such as changes in exchange rates. A negative SFA value indicates a smaller increase in the value of debt than that resulting from the deficit, which does not always imply positive changes in public debt (e.g. a shift of debt outside the public sector).

The SFA structure includes all changes in the debt level resulting from factors other than the budget deficit. Therefore, it is a broad category. In order to organize its analysis, Eurostat has defined three basic groups of components included in the SFA [*Stock-flow adjustment (SFA) for the Member States*…, 2017, s. 3]:
1. net acquisition (+) of financial assets,
2. adjustments,
3. statistical discrepancies.

The operations within the net acquisition of financial assets concern cash and deposit operations related to the regulation of liquidity in the context of public debt management. They are aimed at smoothing the burden between years and at taking advantage of interest rate differential. Transactions in shares and stocks, on the other hand, result for example from the creation or recapitalization of state-owned companies, or from acquisition of shares. The amount of capital involved in these operations is not included in the deficit by governments and is not directly disclosed. Therefore, not all the reasons for the increase in public debt depend on deliberate decisions of politicians [Jaramillo et al., 2016].

Adjustments include changes related to factors that are difficult to predict or even random, such as changes in the exchange rates. They affect the change in the value of the debt converted into the domestic currency and are difficult to plan. This category also applies to operations on securities related to the roll-overs at a price higher than the nominal debt or the issue of securities at a discount, which leads to an increase in debt greater than the one resulting from the deficit [Weber, 2012, pp. 4–5].

Statistical discrepancies include changes due to differences in the classification of individual categories. Individual countries calculate budget deficit, public debt and SFA independently. Therefore, there are changes in the classification of individual expenditures for various reasons. In addition, the size of the public finance sector varies between countries. Some countries report quite significant values here [European Commission, 2019, p. 80].

The stock-flow adjustment is sometimes considered in the economic literature as an insignificant element in the dynamics of public debt. Such an approach would be justified if the SFA values were small and their sum approached to zero in the long term. However, observations of the values recorded in the euro area suggest that this is not the case. There are SFA values that exceed 10% of GDP. Moreover, usually there is also an imbalance between positive and negative values. Over the period 1991–2005, the average nominal value of all observed SFA values was 0.8% of GDP, and the average absolute value was already 1.8% of GDP. The values would probably be less significant if they were the result of random changes due, for example, to changes in the exchange rate. However, as studies show, they are very often the result of deliberate decisions by the fiscal authorities [Buti et al., 2007, p. 1009].

3. Literature review

The literature emphasises several important elements of the functioning of the stock-flow adjustment. First, the impact of the stock-flow adjustment on debt dynamics is considered. Afonso and Tovar Jalles have analysed this issue and concluded that SFA has a very strong impact on public debt. However, they point out that there is no direct relationship between individual fiscal rules and the use of SFA. They also point out that the governments they analysed often used SFA to reduce the level of public debt [Afonso, Tovar Jalles, 2019, pp. 1–24]. Also, Bachleitner and Prammer emphasize the role of SFA in public debt dynamics. The authors rank SFA as one of the crucial elements of public debt dynamics

[Bachleitner, Prammer, 2024]. On the other hand, Weber shows that there are significant discrepancies between the size of cumulative budget deficits and the change in public debt. The author also proves the relationship between significant values of stock-flow adjustment and below-average fiscal transparency. Such a situation leads to the conclusion that less public control over public finances encourages off-budget activities [Weber, 2012, pp. 1–18]. This thread is developed by Buti, Nogueira Martins and Turrini, who argue that tightening fiscal rules and applying rigid rules encourages governments to use SFA. The authors show that governments prefer to hide their liabilities by shifting them from budgetary policy to operations classified as SFA. This is done even though it is necessary to correct the size of the debt [Buti et al., 2007]. Campos, Jaimovich and Panizza point to the tendency of politicians to hide some parts of the debt by incurring off-budget liabilities and using conditional instruments. These operations are reported as stock-flow adjustments. Such operations are considered politically advantageous because politicians are held accountable for the level of the current deficit and not for the ex-post estimated level of SFA and the resulting public debt [Campos et al., 2006]. Recent studies indicate that SFA is also used in a similar way by local governments in Japan, who reduce the size of their deficits through off-budget operations to meet fiscal rules. Indeed, the use of SFA is related to the level of compliance with fiscal rules [Hirota, Yunoue, 2022].

Studies on SFA also show that this category reflects the "hidden" deficit/surplus of the public finance sector. The category includes changes resulting from the transfer of debt to entities outside the budget (which do not affect the budget deficit) but included in the public finance sector (whose liabilities are included in the public debt) [Chojna-Duch, 2007, p. 166].

Regarding the relationship between SFA and economic variables, M. Banaszewska's research shows a negative relationship between the level of debt and the size of SFA. The panel analysis was carried out on a research sample covering the years 2005–2016. However, the relationship with other variables turned out to be ambiguous [Banaszewska, 2019]. Sopek, on the other hand, shows varied results regarding the relationship between SFA and the state budget balance. On the one hand, it indicates a strong negative correlation between the state budget balance and the size of stock-flow adjustment in Croatia. On the other hand, the results for 10 European Union countries indicate a small but positive correlation between these variables. In addition, this author indicates that the data for Croatia confirm the positive correlation between the size of SFA and the primary balance [Sopek, 2011]. On the other hand, Beetsma, Giuliodori and Wierts prove that the level of ambition of budget assumptions has a statistically significant impact

on the size of the SFA. The greater the difference between the actual and planned assumptions used in the budget, the higher the value of SFA. Thus, they consider SFA as a specific response to the use of overly ambitious budget assumptions. They also find that left-wing governments are slightly more likely to use SFA [Beetsma et al., 2009].

Casalin, Cerniglia and Dia have also analysed the factors affecting the size of the SFA. They mention the level of public debt among them but point to a non-linear relationship in its case. They also show that this relationship differs between countries with high and low levels of public debt. They also attribute great importance to debt management operations aimed at reducing debt servicing costs. In addition, they point to the impact of interest rates in the US on the size of the SFA [Casalin et al., 2023].

The studies presented above point to a variety of factors that influence the size of SFA. Also, the results obtained by the authors are sometimes contradictory. For these reasons, the aim of this study is to try to find an answer to the question about the factors shaping SFA. In addition, the following study takes into account more recent trends, for example, by considering the period of the COVID-19 pandemic and its impact on fiscal policy.

4. Methodology

A panel model was used to analyse the factors influencing SFA. This model analyses data in two dimensions: time and space. The period analysed covers the years 2002–2022. The period was chosen based on availability of data of SFA. Data for earlier years is incomplete. In the spatial dimension, 27 countries of European Union were selected for analysis. The above panel is balanced. Data obtained from the Eurostat database and studies published by this institution were used to build the model. The panel model with fixed effects used in the article has the general form [Marcinkiewicz, 2017, p. 33]:

$$y_{it} = \alpha_i + \chi_{it}\beta_{it} + \varepsilon_i$$

where:
α_i – individual effect;
χ – vector of explanatory variables;
β_{it} – parameter vector;
ε_i – pure random error.

The model assumes that individual effects α_i are not random and can be estimated [Maddala, 2006, p. 644]. According to Baltagi, the use of panel models allows for taking into account the diversity of individual countries. They are usually not a homogenious group in terms of the impact of individual variables on each other. The author also points out that panel data provide more information, greater variability, less collinearity of variables, more degrees of freedom and greater efficiency. Moreover, they allow for the construction of more complex models than those based on simple time series or univariate data. Panel models with fixed effects allow for the identification of relationships that cannot be identified using simpler models [Baltagi, 2005, pp. 4–6]. A fixed-effects model applies when a specific group of objects is studied, while a variable-effects model applies when a sample selected from the entire population is studied [Muszyńska, 2006]. The panel model with fixed effects was chosen based on the assumption above and the results of F test (Chow test). The H_0 hypothesis was rejected and fixed model was chosen. The panel model is used to assess the impact of the analysed factors on the size of SFA. The analysis is not based on a single country, but on a broader group. The impact of selected variables on SFA is analysed based on the countries of the European Union.

The approach adopted in the article relates to the approach taken by Banaszewska [Banaszewska, 2019], presented above. Among other things, it adopts a similar range of variables included in the analysis, including the same set of control variables: unemployment rate, GDP dynamics and inflation rate. However, it expands them using a longer analysed period, which covers the years 2002–2022. This allows for the inclusion of two business cycles. A slightly different set of variables whose impact on SFA was examined in the model was extended in the analysis. The primary balance was included as a quantity that is important for assessing debt sustainability. It is used, among others, by Bohn [2008], who includes this variable in the model-based approach. The primary balance reflects the health of the state budget, or the public finance sector more broadly, and can be a factor in the application of the SFA. In addition, budget revenues were taken into account as a factor influencing the sustainability of the public finance sector. A low scale of public revenue may make it difficult to finance the expected amount of public expenditure and thus induce the use of SFA.

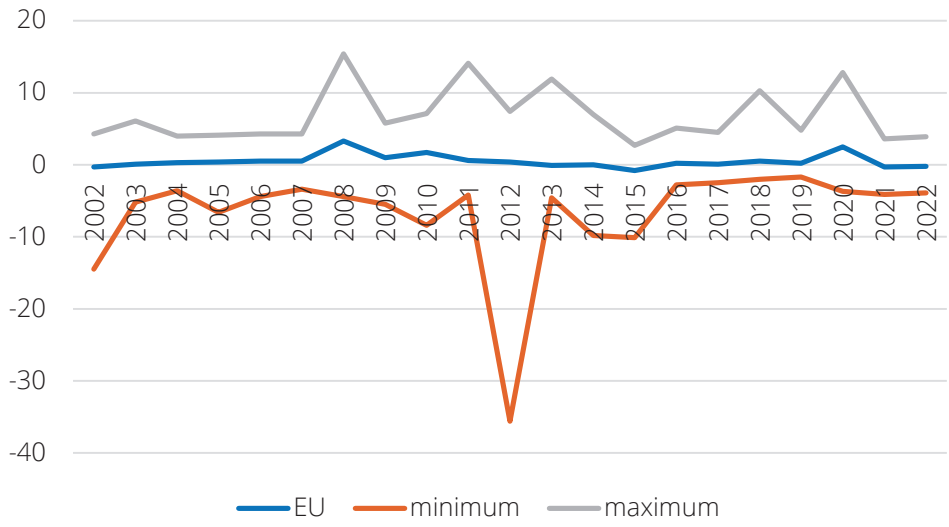
5. The influence of selected variables on the value of stock-flow adjustment

The stock-flow adjustment is an economic category with relatively high variability. The values of this variable for individual countries ranged from -35.6% of

GDP to 15.4% of GDP over the period analysed. Chart 1 shows average values for the European Union as a whole and the minimum and maximum value for individual years.

CHART 1

Average, minimum and maximum value of SFA in the European Union (in % of GDP)



Source: [*Stock-flow adjustment (SFA) for the Member States*..., 2005–2023].

The data presented in Chart 1 shows that the SFA does not show a clear trend over the analysed period. The average value for the entire European Union ranged from -0.8% of GDP in 2015 to 2.5% of GDP in 2020. The average values were stable until 2007 but increased significantly in 2008. In the following years, the values decreased until 2015. From that year onwards, the values started to increase again, reaching a maximum in 2020. However, the variation was much higher in individual Member States. The lowest value of -35.6% of GDP was reached by the SFA for Greece in 2012. This was linked to the redemption of part of that Greek public debt. On the other hand, the highest value of 15.4% of GDP was recorded for the Netherlands in 2008. The level and fluctuations of the SFA for individual countries are very individual. This raises the question about the factors shaping the size of SFA.

Seven potential explanatory variables were selected for the panel model: budget balance, public debt, primary balance, debt service costs, budget revenue

and budget expenditure. The descriptive statistics of the variables are shown in Table 1.

The budget balance (surplus (+)/deficit (-)) is one of the elements of fiscal policy that can strongly influence the size of the SFA. The budget imbalance is subject to strict limits. The limit resulting from the Maastricht Treaty sets the deficit limit at 3% of GDP. When a country approaches the limit, policymakers look for alternative sources to finance expenditure. As a result, the deficit does not increase, but the public debt does. A positive value of the SFA then appears.

The size of the public debt can also affect the size of the SFA. The more indebted a country, the more difficult the current situation of the budget, which is usually burdened with high debt servicing costs. In such a situation, policymakers turn to non-standard solutions that increase the level of SFA (e.g. by shifting debt to earmarked funds) or reduce the level of SFA (e.g. by shifting debt outside the public sector). The variable is used in most of research, for example Banaszewska [2019] and Buti [2007].

The primary balance is another variable that can affect SFA. The primary balance depends on the size of budget deficit and interest rates of the public debt. The smaller it is, the more difficult it is to increase expenditure. Financing additional expenditure through operations classified as SFA then becomes one of the options chosen by policymakers. Bohn [2008] shows a significant influence of primary balance for sustainability of public debt. That is one of the reasons why it can also influence the condition of public finance and using SFA to follow the fiscal rules.

The impact of budget revenues on the size of the SFA has also been assessed. These variables are of considerable importance both for the balance of the public finance sector and for the scope of public functions performed. In the case of high levels of budget revenues, problems may arise with their further increase. In such cases, operations classified as SFA are an alternative to increasing the tax burden. In the case of budget expenditures, they may be subject to restrictions related to fiscal rules. In such a case, policymakers often use operations that increase the SFA.

The dynamics of GDP can also be a factor influencing the size of the SFA. An improvement in the economic situation has a positive impact on the state of the public finances. This makes it easier to meet the requirements of the fiscal rules. It can therefore be assumed that higher GDP dynamics reduce the willingness of politicians to use SFA as a tool to finance public expenditure.

TABLE 1

Descriptive statistics of potential explanatory variables (% of GDP)

Year	Surplus/deficit		Interests of public debt		Public debt		Primary surplus		GDP dynamics		Budget revenue		Budget expenditure	
	average	standard deviation	average	standard deviation	average	standard deviation	average	standard deviation	average	standard deviation	average	standard deviation	average	standard deviation
2002	-2.60	2.92	2.71	1.45	48.77	26.66	0.11	2.76	3.20	2.26	41.57	6.55	44.18	6.29
2003	-2.88	2.98	2.47	1.34	48.93	26.51	-0.41	2.59	3.19	2.80	41.66	6.45	44.52	6.64
2004	-2.19	2.92	2.33	1.31	48.46	26.85	0.14	2.45	4.37	2.28	41.57	6.31	43.76	6.57
2005	-1.58	2.93	2.20	1.30	47.66	28.29	0.63	2.36	4.00	2.64	42.02	6.35	43.58	6.42
2006	-0.93	3.22	2.07	1.26	45.57	28.27	1.14	2.69	5.18	2.46	42.07	6.00	42.99	6.11
2007	-0.27	2.90	2.04	1.30	43.50	28.10	1.78	2.53	5.14	2.82	42.35	5.84	42.60	5.62
2008	-2.01	3.24	2.05	1.34	46.36	28.79	0.04	3.07	1.33	3.11	42.07	6.13	44.07	5.14
2009	-6.29	3.68	2.20	1.23	55.15	30.46	-4.09	3.49	-5.36	3.97	41.81	6.37	48.11	5.13
2010	-6.24	5.99	2.24	1.27	60.65	32.64	-4.00	5.72	1.67	2.82	41.75	6.18	47.97	6.53
2011	-4.63	3.49	2.47	1.53	65.15	37.05	-2.16	2.90	1.70	3.08	42.07	6.37	46.69	6.05
2012	-3.81	2.79	2.54	1.40	68.73	36.81	-1.26	2.27	-0.14	2.88	42.76	6.68	46.54	6.92
2013	-3.64	3.62	2.44	1.32	72.40	39.36	-1.21	3.13	0.37	2.22	43.48	6.66	47.10	7.83
2014	-2.92	2.49	2.34	1.31	73.36	39.08	-0.58	1.96	2.20	2.31	43.59	6.45	46.50	6.83
2015	-1.88	1.75	2.10	1.17	71.13	38.59	0.22	1.28	3.64	4.61	43.43	6.69	45.29	7.24
2016	-0.90	1.61	1.90	1.08	70.31	38.83	1.00	1.43	2.57	1.31	42.74	6.91	43.64	7.25
2017	-0.20	1.79	1.68	1.01	67.50	38.46	1.48	1.63	3.96	2.47	42.59	7.05	42.80	7.33
2018	-0.19	1.64	1.53	0.96	65.59	39.80	1.34	1.53	3.31	1.93	43.02	6.80	43.22	6.85
2019	-0.03	1.78	1.41	0.88	63.39	38.80	1.38	1.68	3.03	1.61	42.98	6.82	43.02	6.75
2020	-6.31	2.53	1.33	0.89	75.37	44.15	-4.98	2.04	-4.31	3.71	42.93	6.99	49.25	7.38
2021	-3.94	3.00	1.18	0.84	72.16	41.14	-2.76	2.60	7.26	2.94	43.19	7.08	47.12	7.48
2022	-2.24	2.88	1.24	0.93	67.59	37.76	-1.00	2.47	3.86	2.25	42.87	6.92	45.12	7.54

Source: [Eurostat database, https://ec.europa.eu/eurostat/databrowser/view/gov_10dd_edpt1/default/table?lang=en, date of access: 24.07.2024].

A panel model was constructed on the basis of the above variables. It included 27 countries of the European Union. The study period was 2002–2022. The data presented in Table 1 show a high variability of all the variables analysed. On the basis of the above variables, an attempt was made to construct a model in the form of:

$$sfa_t = \alpha_0 + \alpha_1 s_t + \alpha_2 d_t + \alpha_3 g_t + \alpha_4 rev_t + \alpha_5 b_t + \alpha_6 inf_t + \alpha_7 unp_t + \varepsilon$$

where:
sfa_t – primary balance in period t (in % of GDP);
d_t – budget balance in period t (in % of GDP);
g_t – GDP dynamics in period t;
b_t – public debt in period t (in % of GDP);
inf_t – inflation in period t (in % of GDP);
rev_t – budget revenues in period t (in % of GDP);
unp_t – unemployment in period t (in % of GDP).

First, a fixed effects model was constructed. Time shifts were not taken into account. The results of this model indicated that only two variables had a significant impact on the size of SFA. The results of the panel model estimation for these variables are presented in Table 2.

TABLE 2

Estimation results of the SFA panel model (static model, fixed effects)

Variable	Coefficient	Standard error	t-Student	p-value
const	10.1547	3.11714	3.258	0.0012 ***
s_t	-0.143766	0.199037	-0.7223	0.4704
d_t	0.308299	0.205389	1.501	0.1339
g_t	-0.216084	0.0387137	-5.582	3.80e-08 ***
rev_t	-0.194252	0.0757908	-2.563	0.0107 **
b_t	0.0242608	0.00972448	2.495	0.0129 **
inf_t	0.0129483	0.0473177	0.2736	0.7845
unp_t	-0.200810	0.0506603	-3.964	8.38e-05 ***
Test statistics: F(7, 533) = 7.96853 p-value = P(F(7, 533) > 7.96853) = 3.23982e-009				
Test statistics: F(26, 533) = 1.56178 p-value = P(F(26, 533) > 1.56178) = 0.0389617				

Source: own calculations.

The above data indicate that three variables have a statistically significant impact on SFA. The first one is the budget revenue. The coefficient of this variable is negative. This means that as the variable increases, the size of the SFA decreases. This is an interesting observation because as the disposable amount of money in budget increases, the size of SFA decreases. Larger revenue of state budget results in less money going outside the budget.

The level of public debt was the second variable that showed a statistically significant influence on the size of SFA. The coefficient of this variable in the model has a positive sign, which means that as GDP dynamics increases, the value of SFA increases. This direction of dependence is in opposition to research of Banaszewska [2019], although it may be justified by the temptation to undertake extra-budgetary activities in the context of growing public debt. This is justified by the fact that as the level of debt increases, it becomes increasingly difficult for governments to finance an additional deficit. Politicians then look for alternative ways to finance the growing expenditure.

Budget revenue is the third variable that shows a statistically significant effect on SFA. A negative coefficient value indicates that as this variable increases, the value of the SFA decreases. This may be due to the fact that additional revenue to the state budget makes it easier to comply with fiscal rules, and the risk of resorting to off-budget operations is reduced. Such a relationship is a valuable observation, as it indicates the important role of an improved revenue situation of the budget on reducing the size of the SFA and increasing the transparency of fiscal policy.

Next, the use of a panel model with lagged variables was considered. The analysis of individual variables and different possibilities of time lags showed that the most significant change concerned the impact of public debt on the size of the SFA. The results of the panel model with lagged variables are presented in Table 3.

The most significant result of the estimation is the fact that public debt lagged by one period affects the size of SFA. The coefficient of this variable indicates a negative relationship between SFA and public debt. This direction of dependence is in contradiction with the previous version of the model. At the same time, however, it is consistent with the results obtained by Banaszewska [2019].

The primary balance is another variable whose lagged value has a significant impact on the level SFA. The direction of the relationship is negative. As the primary balance increases, the value of SFA decreases. Such a relationship seems logical because an improvement in the primary balance reduces the need to use off-budget operations to circumvent fiscal rules.

TABLE 3

Estimation results of the SFA panel model (model with lagged variables, fixed effects)

Variable	Coefficient	Standard error	t-Student	p-value
const	0.885196	3.34054	0.2650	0.7911
s_{t-1}	-0.589046	0.212215	-2.776	0.0057 ***
d_{t-1}	0.549826	0.219407	2.506	0.0125 **
g_{t-1}	0.0551435	0.0398191	1.385	0.1667
rev_{t-1}	0.0652803	0.0809207	0.8067	0.4202
b_{t-1}	-0.0259829	0.0105360	-2.466	0.0140 **
inf_{t-1}	0.0270141	0.0493707	0.5472	0.5845
unp_{t-1}	-0.116722	0.0530212	-2.201	0.0282 **
Test statistics: F(7, 506) = 6.27987 p-value = P(F(7, 506) > 6.27987) = 4.43253e-007				
Test statistics: F(26, 506) = 1.20314 p-value = P(F(26, 533) > 1.56178) = 0.0389617				

Source: own calculations.

The state budget balance lagged by one period is the third variable that has a significant impact on the size of the SFA. Importantly, the direction of the relationship is opposite to the primary balance. These values differ by the size of the costs of servicing the public debt. This difference means that an increase in the value of the state budget balance results in an increase in the size of the SFA. On this basis, it can be concluded that the improvement in the state budget balance occurs at the expense of an increase in the value of off-budget operations, which increase the value of the public debt.

6. Conclusions

The values of the stock-flow adjustment reflect the impact of extra-budgetary operations on the level of public debt. The experience with such operations in Polish public finances after the COVID-19 pandemic shows that they can have a significant impact on the level of public debt. Over the period analysed, the average values of SFA are relatively low at 0.5% of GDP. However, extreme values reach more than 20% of GDP. This fact alone is already a significant factor

in the increase or decrease of public debt. Therefore, understanding the factors influencing the SFA allows us to draw attention to potential threats to the stability of public finances.

The analysis in this article shows that three variables have a statistically significant impact on the size of the SFA. The relation between public debt and SFA is not clear because using current value and lagged values gives opposite results. The growth in debt also contributes to the growth in the size of the SFA. It becomes a way of circumventing the fiscal rules that are supposed to limit the dynamics of debt. Therefore, the size of the SFA and its influence on the level of public debt should be analysed more carefully during periods of significant deterioration in the economic situation. At such times, policymakers are more likely to resort to off-budget operations. On the other hand, the improvement in the budget balance also turns out to be a factor that results in an increase in the value of the SFA. This relationship is the most surprising and requires further research. The other variables analysed did not have a statistically significant impact on the variable analysed in the sample.

Relative to the approaches presented earlier, this one also failed to confirm the dependence of the SFA on the budget deficit. In contrast, the model indicated a statistically significant dependence on the lagged value of the government budget balance and the primary balance. An improvement in the primary balance may therefore be a factor in reducing the pressure on fiscal policy resulting from the fiscal rules. In addition, an improvement in the primary balance improves the assessment of the sustainability of fiscal policy and thus reduces the need to use off-budget operations. However, this dependence requires further research, e.g. extending the analysis to the issue of the impact of public debt servicing costs. The analysis also indicates the negative relation of SFA and budget revenues. This fact suggests the significant role of increasing budget revenue on decreasing SFA. Thus, a fiscal policy that ensures an adequate level of government revenue will contribute to reducing the use of off-budget operations and reducing the size of the SFA. The analysis of impact of public debt on the SFA resulted in contradictory results. In the case of non-lagged values, the model indicates a small positive dependence, while the dependence on the lagged value is also statistically significant, albeit with a negative sign. Therefore, the dependence of the size of the SFA on the size of the public debt requires further analysis. Moreover, an analysis for other countries can widen the discussion.

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