Public Debt Dynamics Versus the Value of Stock-Flow Adjustment in the European Union

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The debt crisis forced the European Union to reform the Stability and Growth Pact. The aim of the paper is to evaluate the influence of the reform on the dynamics of public debt and its correlation with stock-flow adjustment in the European Union. The undertaken analysis was based on the TOPSIS method. The synthetic measure was based on chosen variables which reflect the public debt dynamics. An analysis of correlations was also performed to find relations between the debt dynamics and stock-flow adjustment. The undertaken analysis has shown that the majority of EU countries reduced public debt in the analyzed period. We can also observe that there is a strong correlation between public debt and stock-flow adjustment in the group of the most successful countries in the area of public debt dynamics. The article introduces a synthetic measure of public debt dynamics which is wider that a change of public debt. Moreover, the relation between public debt dynamics and stock-flow adjustment was analyzed.

Keywords: public debt, Stability and Growth Pact, stock-flow adjustment.

Dynamika długu publicznego a wielkość Stock-Flow Adjustment w krajach Unii Europejskiej

Kryzys zadłużeniowy wymusił na Unii Europejskiej podjęcie reformy Paktu Stabilności i Wzrostu. Celem artykułu jest ocena wpływu tej reformy na dynamikę długu publicznego oraz jej wpływu na wielkość SFA w państwach Unii Europejskiej. Przeprowadzona analiza wykazała, że dług publiczny w większości krajów spadał w analizowanym okresie. Jednocześnie uzyskano wyraźny związek pomiędzy dynamiką długu a SFA w krajach o najlepszej sytuacji w zakresie dynamiki długu publicznego.

Słowa kluczowe: dług publiczny, pakt stabilności i wzrostu, *stock-flow adjustment.*

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1. Introduction

The debt crisis in the European Union began the enhanced discussion on the coordination of fiscal policy in the euro area countries and in the entire EU. Greece and later on also other countries faced the perspective of insolvency. This situation resulted in the decisive actions aiming at reinforcing the fiscal discipline and counteracting further crises. The regulations adopted by the EU (referred to as six-pack and two-pack) constituted noticeable reinforcement of the position of the European Commission within the excessive deficit procedure. The actions taken by the Member States and the improvement of the economic situation contributed to the fact that the fiscal situation of most countries has clearly improved although the progress was uneven.

However, the research shows that the increasingly restrictive character of fiscal rules results in the escape towards the activities bordering on creative accounting and other ways of circumventing restrictions (see: e.g. Hagen & Wolff, 2006). Such activities do not cause increased deficit, i.e. their effects are visible ex post in an increase in public debt. The value that expresses the effects of such activities is stock-flow adjustment (SFA). The aim of the paper is to answer the question of to what degree the activities taken within the framework of the *Stability and Growth Pact* contributed to the improvement of the situation of the European Union countries in terms of debt dynamics. Furthermore, the aim of the paper is to assess the impact of the public debt dynamics in the years 2010–2017 on the value of SFA in the European Union countries. The first part of the paper presents the reform of the Stability and Growth Pact. Further on, stock-flow adjustment is characterized as an economic category. Additionally, debt dynamics is analyzed in the EU, using the TOPSIS method. The last part of the paper includes the evaluation of the relation between SFA and debt dynamics in the European Union countries.

2. The Solutions Stabilizing Public Finance Versus the Stability and Growth Pact Reform

The economic crisis in the years 2007–2009 caused considerable worsening of the state of public finance in the European Union countries. It resulted from unprecedented intervention actions and from revenue reductions as a result of the recession. The effect of the worsening situation of public finance in most countries of the European Union was the debt crisis which directly resulted from the hazard connected with the insolvency of Greece. It made the EU countries aware of the consequences of incurring excessive debt and forced them to undertake actions with the intention of improving the situation. These activities were necessarily directed at immediate assistance and at structural solutions improving the state of public finance and counteracting the emergence of the debt crisis.

The countries facing the crisis of public finance have several solutions to choose from. The basic one is the fiscal consolidation which, in a general view, is specified as the activities from the domain of economic policy that reduce the budget deficit and decrease the level of public debt (OECD, 2011, p. 17). These activities include an increase in taxes which results in the stabilization of the debt level (further: Rzońca, 2004), a reduction of expenditures or the so-called debt outgrowing thanks to making economic growth more dynamic (see: Postuła, 2014, p. 29). The research presented in the literature shows that considerably better results are achieved due to the limitations in terms of expenditures than due to increasing revenues. An increase in taxation has negative impact on the level of demand in economy and encounters considerable resistance of citizens. It may also result in increasing the expenditures in subsequent periods. A reduction of expenditures enables the achievement of more stable improvement of the budget balance because it is connected with reforms that in a stable manner reduce the budget burdens (Fatás & Summers, 2018; Nickel, Rother, & Zimmermann, 2010; Alesina, Favero, & Giavazzi, 2012; Yang, Fidrmuc, & Ghosh, 2015). The experiences connected with introducing fiscal consolidation are diversified. On the one hand, there are cases of a negative impact of fiscal consolidation undertaken during the crisis on the rate of economic growth (Fatás & Summers, 2018). On the other hand, there were cases of non-Keynesian effects in the form of accelerating an increase in GDP despite the implemented fiscal consolidation (Rzońca, 2007; Balcerzak, Pietrzak, & Rogalska, 2014).

Another possibility is *fiscal adjustment*, the effects of which (as the research shows) are more beneficial for economic growth than those achieved owing to fiscal consolidation. They enable higher economic growth in the medium term (Baldacci, Gupta, & Mulas-Granados, 2014). They recognize the actions aiming at ensuring stable and sustainable economic growth (IMF, 2006, p. vii). These activities have a much wider scope than in the case of fiscal consolidation. The turning point was a reduction of expenditures of non-priority type and the protection of growth-oriented investments. Additionally, specially selected activities of income type are undertaken which ought not to have any negative impact on consumption and labor market but are focused on eliminating ineffectiveness and abuses (e.g. elimination of preferences, reduced tax rates, lower estate taxation instead of labor tax) (Baldacci, Gupta, & Mulas-Granados, 2014).

Another solution stabilizing public finance are fiscal rules. Their extreme form are *balanced budget rules* (BBRs) which, in practice, are observed rather infrequently because they require chiefly a reduction of expenditures. Fiscal rules introducing limitations in the level of deficit or public debt are slightly more delicate. The application of fiscal rules causes certain controversies because the results of the research do not show clearly their positive impact on economic growth. Some of them indicate the worsening of the rate of economic growth while others point at positive effects of

using them (Groneck, 2010; Stone, 2016). The elimination or considerable reduction of budget deficit may be necessary owing to the loss of trust of investors or to a high rate of treasury bonds. Budget balancing reduces government spending in the short term and for this reason it is not popular from the perspective of elections. However, in the long term, savings connected with lower costs of public debt servicing partly compensate for the loss of expenditures.

Another solution used in the situation of worsening state of public finance is the improvement of transparency of government actions related to public debt and budget policy and the establishment of independent fiscal institutions. The research shows that the transparency of public finance noticeably lowers the level of deficit and debt. The improvement of transparency and debt management constitutes an essential element of improving the state of public finance (Alt & Lassen, 2006), and independent fiscal institutions ensure the highest degree of transparency and debt management. The applied solutions include consulting institutions that provide opinions and either confirm or make independent decisions. Transferring the decision concerning fiscal policy and public debt management to such institutions aims at making fiscal policy independent from the political cycle (Maltritz & Wüste, 2015). Governments deciding to establish, among others, fiscal councils are perceived as more credible and this is reflected in the price of money obtained on the market. Among independent fiscal institutions, there are examples of effective institutions (Kopits, 2011).

Facing the crisis, the European Union decided to introduce solutions aiming at stabilizing the fiscal situation and reducing the level of public debt. Firstly, the *European Financial Stabilisation Mechanism*, the *European Financial Stability Facility* and the *European Stability Mechanism* (ESM) were established. The aim of these facilities was to offer assistance for those euro-area countries that had temporary difficulties (Trzcińska, 2013). Secondly, a package of five regulations and one directive[1], referred to as six-pack, was passed. These acts aimed at increasing the transparency of conducted financial operations and at specifying the excessive deficit procedure. Additionally, they introduced considerably more severe sanctions (that were easier to apply) for not complying with the principles or for not abiding by the rules. Thirdly, in order to complement the adopted solutions, in 2013 the so-called two-pack was introduced. It included two regulations[2] concerning the reinforcement of economic and budget supervision of the Member States from the euro area that were either affected or threatened by serious difficulties with regard to their financial stability and common regulations regarding the monitoring and evaluation of the projects of budget plans and ensuring the correction of excessive deficit in the Member States from the euro area.

The aforementioned solutions created the frameworks for pursuing a more stable fiscal policy in the European Union countries. Thanks to

the application of them, the EU was supposed to overcome the difficulties and in the longer term permanently improve the situation and also prevent the occurrence of debt crises in the future.

3. Stock-Flow Adjustment as the Factor Destabilizing Public Finance

The category referred to as stock-flow adjustment (SFA)[3] was defined as a result of the observation showing that the increase in public debt considerably differed from the value of budget deficit during a certain year (Hagen & Wolff, 2006). The difference is so crucial for the stability of public finance that the European Union analyzes it within the *Excessive Deficit Procedure* (EDP). Eurostat defines stock-flow adjustment as the difference between the increase/decrease in the public debt level and the value of budget deficit/budget surplus of the public finance sector in a certain year (Eurostat, 2019, p. 1). According to Maltritz and Wüst (2015, p. 226), SFA may be defined using the following formula:

$$\Delta B_t = D_t + SFA$$

and in detail:

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

where:
ΔB_t — the change of public debt in year t ($\Delta B_t = B_t - B_{t-1}$),
B_t, B_{t-1} — public debt in t and $t-1$ periods respectively
D_t — budget deficit.

SFA comprises changes resulting from various reasons, apart from the budget deficit. Owing to this, SFA reflects random factors as well as the elements connected with financial operations, the changes of exchange rates, statistic discrepancies and all the actions that result in the increase in the public debt level[4].

Stock-flow adjustment may assume the following values (Rybacek, 2015, p. 8):
- SFA = 0 – which means that a change of debt corresponds exactly to budget deficit. Such a value is neutral for public finance.
- SFA > 0 – an increase in the debt level is higher than the level of budget deficit. It may result from such temporary factors as changes of exchange rates or operations of entering into commitments that are made outside the state budget.
- SFA < 0 – a debt increase is lower than budget deficit. A negative SFA may result, among others, from debt restructuring, the disposal of some

assets (e.g. stock, shares, state property) or from a change of exchange rates. It may also be a consequence of remitting bonds (e.g. taking over pension funds from capital pillars), which ought to be assessed negatively.

To sum up, several most important characteristics of stock-flow adjustment may be listed. Above all, it comprises the elements that are not included in the budget, but are visible in the value of public debt. Therefore, they are not subject to the budget procedures that guarantee the transparency of budget management. Moreover, SFA is the category calculated *ex post*. Therefore, it presents the real debt instead of the plans included in the budget. Another characteristic feature of SFA is its connection to creative accounting, i.e. the concealment of real expenditures so as not to violate the fiscal rules. Hence, SFA constitutes an essential element of the evaluation of the public debt dynamics.

4. The Dynamics of Public Debt and Budget Deficit in the European Union in the Years 2010–2017[5]

The level of public debt in the countries of the European Union considerably increased as a result of the economic crisis. At the beginning of the analyzed period (in 2010), the average value for the entire EU increased by 79% of GDP. However, in particular countries it was particularly diversified. The largest public debt was recorded in Greece (146.2% of GDP), Italy (115.4% of GDP), Belgium (99.7% of GDP) and in Portugal (96.2% of GDP). It is worth emphasizing that the sources of debt in these countries were different, but in all of them the largest increases took place during the economic crisis. Among the remaining countries, significant debt levels occurred in those countries where governments had to provide substantial support for the economy after the crisis (e.g. in Spain – the crisis on the real estate market, in Ireland – the crisis in the banking sector). However, in some countries increases in debt were moderate. The smallest debt was in Estonia (6.6% of GDP), Bulgaria (15.3% of GDP) and Luxembourg (19.8% of GDP). As a consequence of the debt crisis and the undertaken reforms, the debt level underwent substantial changes that are presented in Figure 1.

The level of debt in the European Union was increasing till 2014 and achieved the level of 86.5% of GDP, but it began to decrease after that year. In 2017, it decreased to the level of 81.6% of GDP. It shows that simultaneously with the improvement of the economic situation the undertaken reforms enabled the reversal of the unfavorable tendency of debt increase. Among 28 countries of the European Union, ten countries reduced the debt level in the analyzed period. Particularly large reductions were in Ireland (18.1% of GDP), Germany (16.8% of GDP) and Malta (16.7% of GDP). As can be observed, in most countries (in 18) the

level of public debt increased. The average level of increase amounted to 16% of GDP. It increased considerably in Cyprus (by 41.2% of GDP), Spain (by 38.2% of GDP), Slovenia (by 35.2% of GDP), Greece (by 32.4% of GDP) and Portugal (by 29.5% of GDP). Interestingly, a major debt increase took place in the years 2010–2014, when only 5 countries reduced the debt level (on average by 4.4% of GDP). In the subsequent three years, 23 countries reduced the debt level (on average by 4.2% of GDP), while in others the increases were insignificant (they did not exceed 3.3% of GDP). Hence, the situation was truly diversified in particular countries.
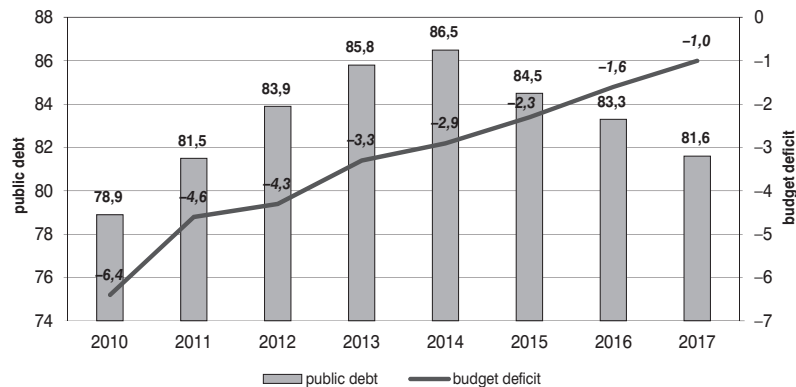

Fig. 1. The level of public debt and budget deficit for 28 countries of the European Union (in % of GDP). Source: Own elaboration on the basis of data from Eurostat (Eurostat, n.d.; Eurostat, 2005–2019).

In terms of the budget deficit, the situation in the European Union improved systematically. While in 2010 the average deficit was at a very high level of 6.4% of GDP (it was higher only in 2009, when it amounted to 6.6% of GDP), in subsequent years it gradually decreased to the level of 1% of GDP in 2017. In fact, most countries (with the exception of Estonia) improved their budget condition. On average, the budget balance in the analyzed period improved by 6.0% of GDP. The largest increase was observed in countries that had the highest deficit, e.g. Ireland (the deficit decrease of 31.8% of GDP) and Greece (12% GDP). The improvement was considerably more uniform in the analyzed period than in case of public debt. In the years 2010–2014, the deficit on average decreased by 3.3% of GDP, while in subsequent years it decreased by 1.7% of GDP. In 2010, Estonia as the only EU country recorded a budget surplus, while Sweden had a balanced budget, whereas in 2017 as many as 12 countries achieved a budget surplus and one country (Slovenia) had a balanced bud-

get. Therefore, one may observe clear improvement of the budget situation in the European Union.

The improvement of budget balances as well as the decreasing level of public debt resulted in reducing the budget burdens in the form of the costs of servicing public debt. In the European Union, average rates paid by the governments in 2010 amounted to 2.7% of GDP, whereas in the subsequent two years they increased to as much as 2.9% of GDP. However, in the further part of the analyzed period they were decreasing systematically and in 2017 they amounted to 2.0% of GDP. In the European Union, twenty countries reduced the value of the costs connected with servicing their debt. The other eight countries included those that were considerably affected by the debt crisis, e.g. Spain, Portugal, Slovenia and Cyprus. In those countries, the costs of servicing debt increased considerably. In other four countries, the worsening was only insignificant. In general, a larger reduction was observed in the costs of servicing debt than the decrease in the public debt level implied. It reflected the improvement of perspectives and the reduction of the risk connected with debt. The situation revealed the benefits resulting from the improvement of the budget balance and a gradual reduction of the debt level.

In order to fully assess the debt dynamics of particular countries, their fiscal situation and the lack of budget balance, a synthetic indicator was constructed, using the TOPSIS method. For this purpose, six indicators were used:

1. the change of public debt – the difference between public debt in 2017 and 2010 (in % of GDP) – this indicator shows how the debt level changed in the analyzed period; it enables the identification of countries where the scale of debt reduction was the greatest;

2. the level of public debt (in % of GDP) – debt value indicates the debt level and the scale of risk connected with financing it. The indicator complements the previous indicator because even a considerable reduction of the debt level is more frequent in countries with a high debt level and does not fully reflect the problem in its entirety;

3. the accumulated balance of budgets in the years (in % of GDP) – expresses the scale of budget imbalance in the entire period. The accumulated deficits are the basic factor that increases public debt and destabilizes public finance;

4. the budget balance in 2017 (in % of GDP) – expresses the scale of the lack of budget balance and constitutes an essential element of assessing the risk connected with public finance;

5. the primary balance (in % of GDP) – reflects the state of public finance after deducting the costs of servicing public debt. It is the evidence of the structural balance of public finance;

6. the value of debt interest rates during a year (in % of GDP) reflects the burden of public finance with the costs connected with servicing

public debt. A high value of this indicator additionally exacerbates the imbalance of the state budget.

The aforementioned set of variables more fully reflects both the situation of public finance in 2017 and the change of the situation in the analyzed period.

The data concerning the aforementioned variables was obtained from the Eurostat database for the years 2010–2017. All the variables are characterized by a certain level of changeability. The variables were divided into stimulants, destimulants and nominants. Among the aforementioned variables, three appeared to be stimulants, while other three – destimulants. In the next stage, their values were normalized, taking into consideration the character of the variables. Later on, the values of the synthetic measure (MS) were specified for the European Union countries.

On the basis of the obtained values of the synthetic measure, a ranking of countries was prepared (Table 1). On its basis, one may state that the situation in terms of the level and dynamics of debt was very diversified. The values of the synthetic measure oscillated from 0.13 in the case of Portugal to 0.86 in the case of Luxembourg. The average value (and median) amounted to 0.55. The scale of divergences of extreme values shows to what degree the situation of European Union countries was different. Therefore, in order to prepare a more detailed analysis, the countries were divided into 4 groups. The criteria for making the division were the average value of the synthetic measure ($\overline{MS}$) and standard deviation (s_{MS}).

The first group (a high level of the synthetic measure) included 7 countries having the value of the synthetic measure higher than the average sum and standard deviation ($\overline{MS} + s_{MS} \leq MS_i$). The group includes the following countries: Luxembourg, Malta, Sweden, Germany, Estonia, Denmark and the Czech Republic. In those countries, the values of the synthetic variable oscillated from 0.75 to 0.85. The analysis showed that there are two countries with a low level of debt that increased insignificantly in the analyzed period (Luxembourg, Estonia), three countries with a moderate level of debt and stable fiscal situation (Czech Republic, Denmark, Sweden) and two countries have a high initial debt level which considerably improved their fiscal situation (Germany, Malta). Hence, the group is diversified and their common feature is a positive attitude to the issue of debt (stabilization in the case of low or average values of debt or clear improvement in the case of high levels). These countries very effectively made use of the period of changes and in subsequent periods their situation ought not to get worse.

The second group (average higher level of the synthetic measure – ($\overline{MS} \leq MS_i < \overline{MS} + s_{MS}$) also includes seven countries. The level of the synthetic measure oscillated from 0.55 to 0.74. The situation of these countries was less favorable than in the countries from the first group. Above all, it is necessary to refer to the example of Ireland, which recorded very high deficits at the beginning of the analyzed period. In subsequent years, Ire-

Group	Country	Synthetic measure (without a unit)	SFA in 2017 (in % of GDP)	Accumulated SFA (2010–2018) (in % of GDP)
The first group	Luxembourg	0.856076	4.6	33.9
	Malta	0.822436	3.2	10.3
	Sweden	0.789465	1.6	19.7
	Germany	0.78366	–0.4	16.5
	Estonia	0.767573	0.1	12.9
	Denmark	0.762957	0.9	12.4
	Czech Republic	0.746939	1.5	–4.7
The second group	The Netherlands	0.74032	–1.4	6.5
	Bulgaria	0.702251	–1.4	1.5
	Latvia	0.661616	2.1	8.4
	Lithuania	0.6441	3.2	8.0
	Finland	0.563937	0.0	30.3
	Austria	0.554535	–2.2	11.1
	Ireland	0.548161	–0.1	5.7
The third group	Poland	0.545096	–1.8	–9.7
	Slovakia	0.539999	0.3	–14.3
	Belgium	0.486797	–0.1	6.4
	Croatia	0.471966	1.2	2.7
	Romania	0.46874	–1.1	–3.2
	Hungary	0.422442	1.1	8.8
	Cyprus	0.404351	–1.8	22.0
	Slovenia	0.402613	0.3	16.8
	France	0.377088	0.3	–0.9
	Great Britain	0.368957	0.8	7.9
The fourth group	Italy	0.2758	0.2	7.2
	Spain	0.250347	0.1	1.6
	Greece	0.241364	2.2	–38.9
	Portugal	0.132326	–2.1	13.5

Tab. 1. The values of the synthetic measure and SFA and accumulated SFA. Source: Own elaboration on the basis of data from Eurostat (Eurostat, n.d.; Eurostat, 2005–2019).

land systematically reduced the budget deficit to the level of 0.3% of GDP in 2017. However, it has never achieved a budget surplus. Nevertheless, after the initial considerable increase, public debt was reduced much more considerably. One may clearly observe the role of non-budget factors having influence on the debt level (included in SFA). In the successive years, three countries (Austria, the Netherlands and Latvia) managed to slightly reduce the level of public debt while maintaining a high level of accumulated deficits. Three other countries (Bulgaria, Lithuania and Finland) in the analyzed period increased the debt level, but to a smaller degree than the accumulated budget balances implied.

The third group (average lower level of the synthetic measure) included countries with the value of the synthetic measure oscillating at $\overline{MS} - s_{MS} \leq MS_i < \overline{MS}$. The group includes ten countries where the value of the synthetic measure oscillated from 0.34 to 0.54. The countries from the group were mostly characterized by high levels of public debt (with the exception of Romania). Additionally, they revealed high accumulated budget deficits (more than 20% of GDP). In the vast majority of countries, the level of their public debt in the analyzed period increased (with the exception of Poland and Hungary). The major group of these countries showed budget deficits in 2017 despite the prosperity in the European economy.

The fourth group (low level of the synthetic measure) includes countries with the value of the synthetic measure oscillating at $MS_i < \overline{MS} - s_{MS}$. The group includes only 4 countries: Italy, Spain, Greece and Portugal, the countries with the most difficult situation in the analyzed period. All these countries were characterized by very high debt levels, considerable debt increases and very high accumulated budget deficits. The situation of these countries did not improve in terms of the public debt level after the implementation of the Stability and Growth Pact. Solely the level of budget deficits was reduced (Greece began to achieve even budget surpluses). However, because of the highest costs of debt servicing among all the European Union countries the debt was still increasing (only in Spain has it slightly decreased in the last two years).

To sum up, one may state that in the analyzed period the financial situation of most Union European countries improved. This fact may be explained by both the reforms being implemented and by the favorable economic situation. However, not all the countries achieved the aims foreseen by the reform of the Stability and Growth Pact.

5. The Analysis of the Relation Between Stock-Flow Adjustment and the Dynamics of Public Debt in the European Union

Another step of the analysis presented in the paper is the evaluation of the relation between the dynamics of public debt (assessed using the aforementioned synthetic measure) and the value of stock-flow adjustment

(assessed through the prism of the value of SFA in 2017 and the accumulated value of SFA for the years 2010–2017).

In the first place, the relation between the synthetic measure and the value of SFA was analyzed for all the European Union countries. Figure 2 presents the position of variables. The coefficient of the correlations between SFA and the synthetic measure amounted to 0.349099. The correlation ought to be evaluated as weak. The obtained relation between the variables is statistically insignificant and is as follows:

$$SFA = -1.22 + 2.966\ MS, \qquad R^2 = 0.122$$
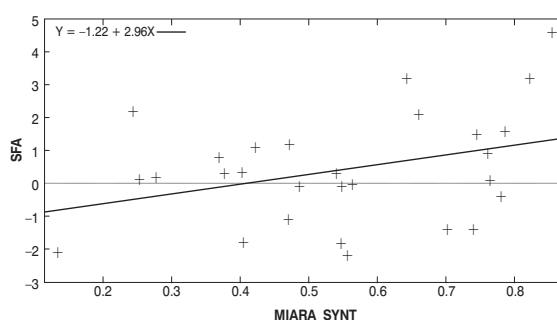$$(0.91)\ (1.56)$$

Fig. 2. The distribution of the values of SFA (2017) and synthetic measure in the European Union countries. Source: Own elaboration on the basis of data from Eurostat (Eurostat, n.d.; Eurostat, 2005–2019).

Therefore, it was decided to make an analysis of the relation between SFA and the synthetic measure in particular groups. The distribution of variables in particular groups is presented in Figure 3. As regards the first group, the level of correlation between the variables was high and amounted to 0.8085. The relation between the variables is described using the following formula:

$$SFA = -27.9 + 37.4\ MS, \qquad R^2 = 0.6536$$
$$(9.62)\ (12.178)$$

The obtained results show that the relation between the variables is important in statistic terms. It is an interesting result because it implies that the higher the value of the synthetic measure is, the higher the value of SFA. It seems to be a contradiction because it appears that countries with the best situation in terms of the dynamics of debt will not need to use SFA in order to increase debt. However, as Hagen and Wolff proved (2006), the more severe the fiscal rules are, the greater the tendency to
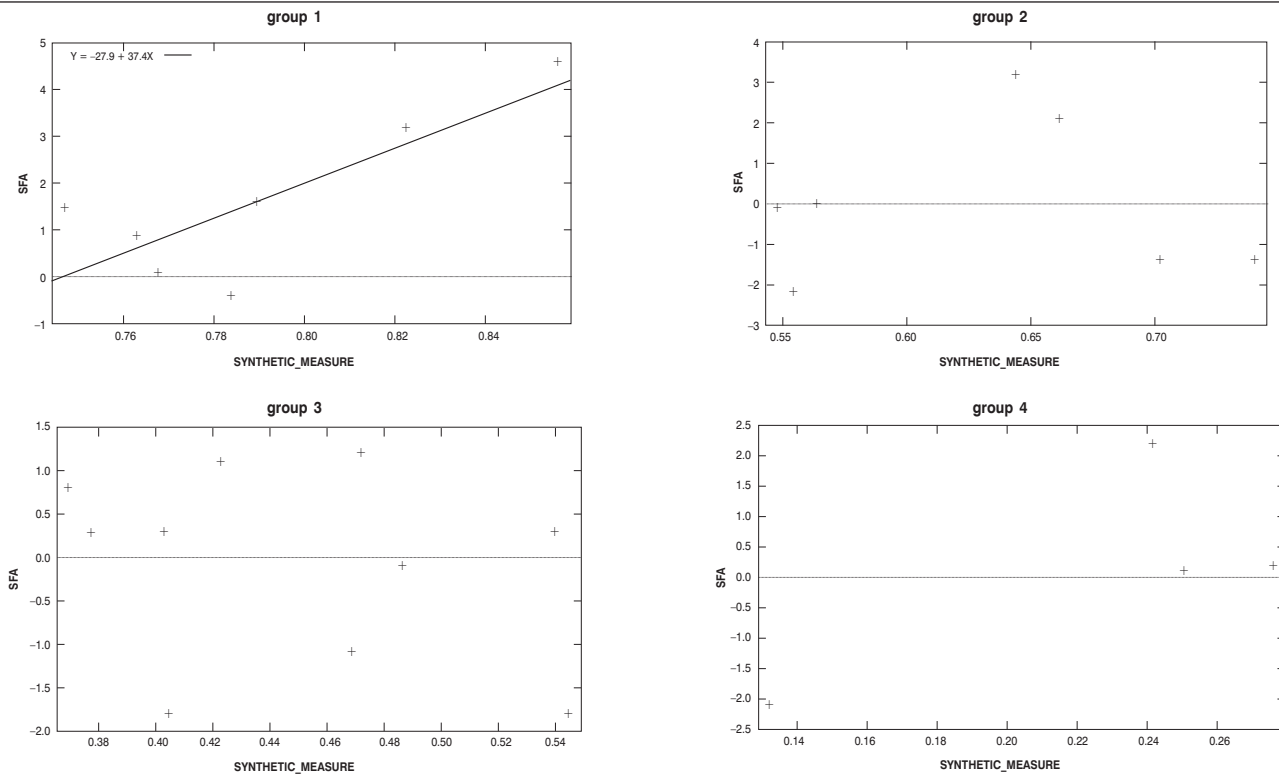
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Fig. 3. The distribution of SFA values (2017) and synthetic measure in particular groups of countries. Source: Own elaboration on the basis of data from Eurostat (Eurostat, n.d.; Eurostat, 2005–2019).

use non-budget forms of incurring debt. The results obtained in this case show that the countries with the best situation in terms of debt dynamics and budget imbalance have high levels of SFA. Therefore, the compliance with budget rules takes place at the cost of non-budget actions.

As regards the second and third groups, very low correlation coefficients were observed – they amounted to 0.0333 and –0.3014 respectively. The first value shows the lack of correlation, whereas the second indicates a very weak correlation (interestingly, negative). It would suggest that with an increase in the value of the synthetic measure the value of SFA decreases. However, the correlation coefficient is too low to confirm the dependence. In the situation of the fourth group, the situation is unambiguous. As regards countries with the largest debt, the correlation coefficient is rather high and amounts to 0.7276. It also indicates that simultaneously with an increase in the value of the synthetic measure the values of SFA increase. However, in the case of these countries it was impossible to obtain significant values of regression function parameters. Probably the number of countries in the group is too small to obtain reliable dependencies.
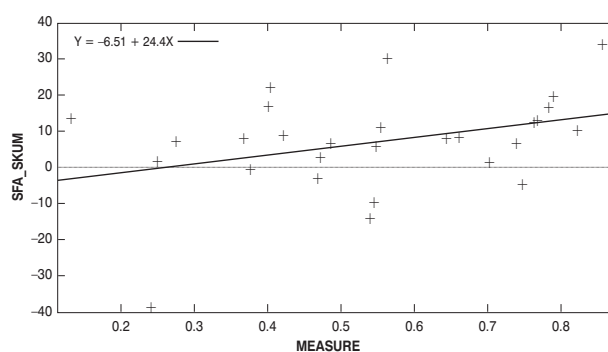

Fig. 4. The distribution of values of accumulated SFA (2010-2017) and synthetic measure in the European Union countries. Source: Own elaboration on the basis of data from Eurostat (Eurostat, n.d.; Eurostat, 2005–2019).

In order to better verify the observed relations, also the relation between the value of accumulated SFA from the years 2010–2017 and the values of the synthetic measure was analyzed. In the first place, the correlation coefficient for these variables was analyzed for all the countries of the European Union. It amounted to 0.3497 and was very close to the values obtained for SFA from 2017. The analysis of the relations between the variables may be described using the following formula:

$$SFA = -6.51 + 24.4 \text{ MS}, \qquad R^2 = 0.1222$$
$$(7.46) \quad (12.83)$$
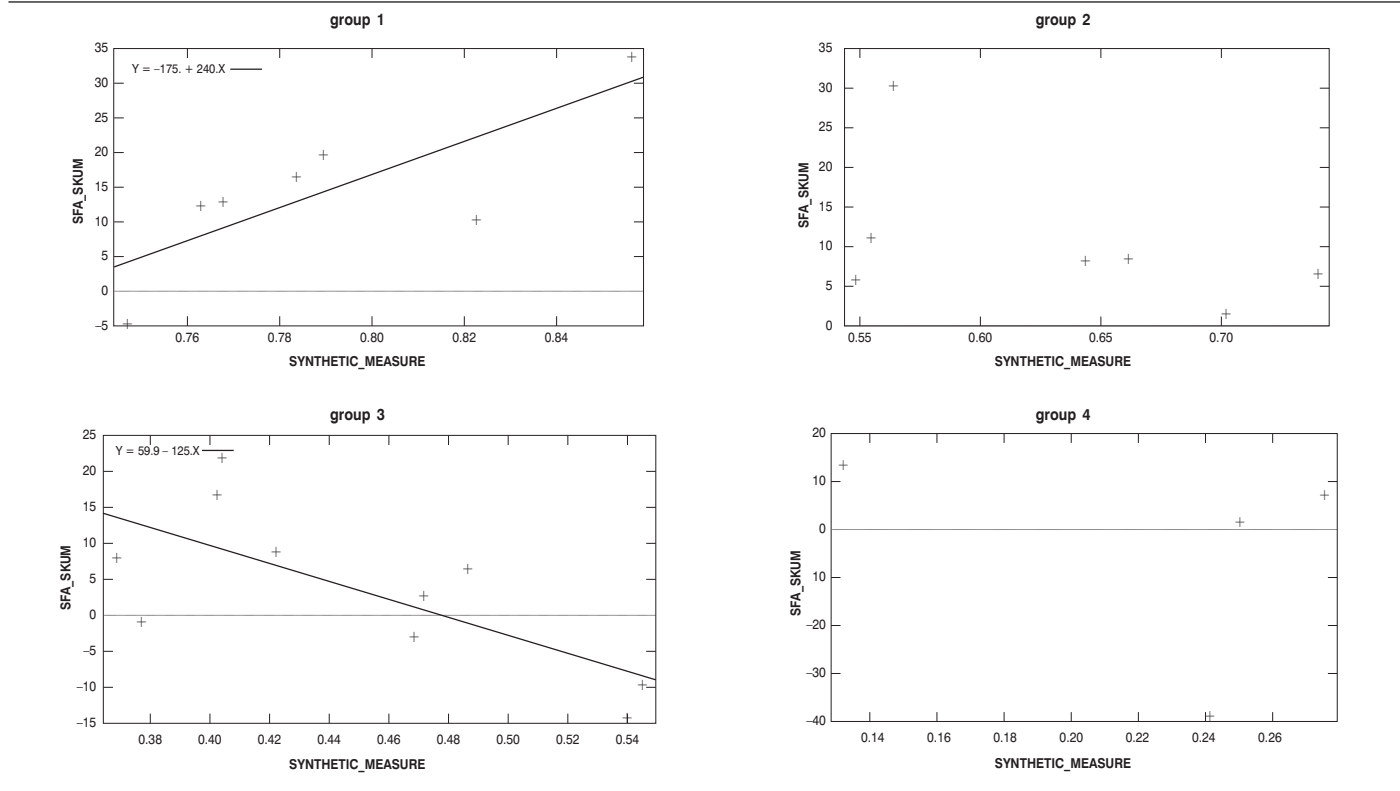
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Fig. 5. The distribution of the accumulated value of SFA (2010-2017) and synthetic measure in particular groups of countries. Source: Own elaboration on the basis of data from Eurostat (Eurostat, n.d.; Eurostat, 2005–2019).

Hence, similarly to the previous analysis, the parameters proved statistically irrelevant, while the relation between the variables – relatively weak.

Therefore, it was decided to make a new analysis on the groups of countries. In the first group (identically as in the previous analysis) a strong correlation between accumulated SFA and the synthetic measure was observed – the correlation coefficient amounted to 0.7835. The distribution of the values of variables in this group is presented in Figure 5. As is apparent, the relation between the variables is also essential and may be shown using the following formula:

$$\text{SFA} = -174.98 + 29.798 \text{ MS}, \qquad R^2 = 0.61$$
$$(67.2)\ (85.05)$$

Hence, there is confirmation of the thesis that an increase in the value of the synthetic measure occurs simultaneously with an increase in the SFA value in the group of countries with the best situation in terms of debt dynamics.

In other groups, the obtained results are slightly different. Chiefly in groups 2, 3 and 4, the obtained values of correlation coefficients are negative. It indicates that an increase in the value of the synthetic measure occurs simultaneously with a decrease in the SFA value. However, in the case of the second and fourth groups, correlation coefficients are not high and they amount to –0.500 and –0.329 respectively. Additionally, the obtained relations between the variables proved to be statistically inessential. However, in the case of the third group the correlation coefficient is relatively high and amounts to –0.710. Additionally, a statistically essential dependence between variables was observed that could be presented using the following formula:

$$\text{SFA} = 59.90 - 125.34 \text{ MS}, \qquad R^2 = 0.504$$
$$(19.89)\ (43.95)$$

The results of this group indicate that in the third group the countries with the weakest results to a larger degree made use of non-budget activities included in SFA. The countries with a better value of the synthetic measure were capable of financing their needs from the demonstrated deficits, while their levels were satisfactory to attain the objectives.

6. Conclusions

The analysis presented above shows that the implemented reforms of the Stability and Growth Pact and the improvement of the economic situation contributed to reducing the dynamics of public debt in the European Union. However, the situation of particular countries was diversified. The countries from the first group had the best debt dynamics. However, at

the same time a strong correlation was observed between the value of the synthetic measure used here and SFA (both for 2017 and accumulated). It may confirm the fact that compliance with the strict fiscal rules of the Stability and Growth Pact reform does not fully reduce an increase in debt, but chiefly shifts the burden of the increase from budget activities to non-budget activities. In other groups, the results are less unambiguous and partly negative. However, a relatively insignificant value of correlation coefficients and statistic unimportance of most estimated parameters do not enable unambiguous confirmation of these relations.

Endnotes

1 They include: Regulation (EU) No 1175/2011; Regulation (EU) No 1173/2011; Regulation (EU) No 1177/2011; Regulation (EU) No 1176/2011; Regulation (EU) No 1174/2011 of the European Parliament; Council Directive 2011/85/EU.

2 It is necessary to mention: Regulation (EU) No 472/2013 of the European Parliament and of the Council; Regulation (EU) No 473/2013 of the European Parliament and of the Council.

3 Until now there is no Polish equivalent of the term *stock-flow adjustment*. There is a term 'zmiana rezydualnej wartości długu publicznego', but it is used very seldom.

4 The full structure of SFA was presented in the following elaborations: Piątkowski, 2018, pp. 128–129; Banaszewska, 2012, pp. 420–421.

5 Data on the basis of: Eurostat (n.d.).

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