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Original scientific paper
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ANALYSING OF GOVERNMENT'S FISCAL BEHAVIOUR IN THE EU MEMBER STATES THROUGH CLUSTERING PROCEDURE

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Abstract

The typical behaviour of EU Member States over the past decades has been to spend more public money than revenue earned by the government to finance programs with more or less important impact on society. Budget deficits and public debt have become important issues for EU countries, especially since a common currency, combined with very different tax regimes, can give rise to dangerous and unfair behaviours.

The study proposes a new research technique for the fiscal behaviour of EU Member States. In the first stage of the research, a number of variables related to structural imbalances were defined. We assumed that EU Member States can be grouped into clusters according to these variables by which we characterize disciplined or undisciplined fiscal behaviour. We used Kmeans cluster analysis in order to establish if there are some clear patterns of fiscal behaviour among EU members. The research findings indicate that the research technique for the fiscal behaviour of Member States we proposed might be developed so as to allow identifying the Member States facing or likely to face problems in terms of public finances sustainability.

Keywords: election cycle, fiscal sustainability, Kmeans cluster analysis.

Jel Classification: E62; H60

INTRODUCTION

The issue of fiscal behaviour concerning the EU Member States and in particular identifying the fiscally undisciplined states is of great interest, given the fact that more and more countries have opined that they are no longer willing to bear the consequences of other states' fiscal indiscipline. Through Directive 2011/85/EU on requirements for euro area countries' budgets, EU Member State governments have to have specific fiscal

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rules in order to make sure that the public administration budget as a whole complies with the European standards, in order to avoid budget deficit or excessive public debt. The first part of the work aims to present these fiscal rules, in terms of contents and results of their application, noticing that even if in recent years progress has been made in terms of fiscal discipline of Member States however the risks concerning the sustainability of the public finances remain (European Commission 2011).

The fiscal behaviour of EU Member States is influenced, among others, by the financial forecasts in the field of public finance. Within the budget planning process, Member States are obliged to use realistic and unbiased forecasts. The financial forecast in the field of public finances plays a very important role: (1) it can quantify the future impact of decisions, programmes and public policies; (2) it can identify and analyze the options regarding the adjustment of revenues and expenditure in order to cancel the difference between revenues and government expenditure.

The forecasts of the European Commission and the data regarding the models they are based on can provide the Member States with a useful benchmark for their most likely macro budgetary scenario, enhancing the validity of the forecasts used for budgetary planning (Council Directive 2011/85/EU of 8 November 2011 on Requirements for budgetary frameworks of the Member States). Also, the forecasts of the European Commission represent the basis for various fiscal surveillance procedures. Over time, there have been differences between the European Commission forecasts and a series of macroeconomic indicators, many authors pointing out that the forecasts of the European Commission have been systematically too optimistic (Marinheiro 2010; Frankel and Schreger 2013). However, a simple review of the projected and actual macroeconomic indicators of the Member States reveals numerous situations in which the general government gross debt as % of GDP or the general government net lending /net borrowing as % of GDP stood above the forecasts of the European Commission.

The purpose of the study was to introduce a new research technique for analyzing the fiscal behaviour of the EU members, generating new relevant indicators (variables) in this sense. Moreover, in our research we designed a scaling procedure for measuring the proposed indicators (variables) for analyzing the fiscal behaviour. Also, we used clustering procedure in order to establish some fiscal behaviour patterns among EU members taking into account the variations (positive or negative) from a “logical” or “normal” evolution path of different macroeconomic indicators. A secondary research question is whether there is a statistical connection between the fiscal indiscipline (the negative deviation from the evolution projected by the European Commission) and the election cycle. This question was prompted by the numerous disputes arising in election and pre-election years when the media and the civil society complain about unjustified increases in government expenditure in terms of necessity and effectiveness, as well as about the adoption of fiscal relaxation measures that generate lower than scheduled government revenues.

The study results show that the research technique for analyzing the fiscal behaviour of the EU Member States proposed by us might be the starting point for new approaches to identify the Member States facing or likely to face problems in terms of public finances sustainability.

1. FISCAL RULES AND FISCAL GOVERNANCE IN THE EUROPEAN UNION

By the Maastricht Treaty and Stability and Growth Pact, EU Member States have agreed to implement a series of rules to avoid excessive deficits and increases of the public debt, which could have generated price instability, interest rate increases and other issues more difficult to settle given an economic and monetary union. The financial instability that has characterized the global economy in recent years has generated the intensification of the debates on the need to strengthen the economic governance in the European Union and enlargement of the concerns of the European Commission to strengthen budgetary discipline in the Member States. The term “fiscal governance” has emerged in this context. The European Commission defines fiscal governance as those rules, regulations and procedures that influence on how budgetary policy is planned, approved, carried out and monitored. This includes particularly: (a) numerical fiscal rules which “set in stone” quantitative thresholds for budgetary aggregates; (b) independent fiscal institutions which inter alia provide or assess the quality of macroeconomic and budgetary forecasts, and monitor compliance of budgetary planning and execution with the requirements of national fiscal rules; (c) medium-term budgetary frameworks promoting a more long-term oriented fiscal planning (European Commission 2015).

The main objectives of the fiscal governance are reducing budget deficits and public debt, reducing fiscal policy cyclicalities and improving the efficiency of government expenditure.

At the level of the European Union, the tools ensuring the fiscal governance are as follows:

- *The Treaty on stability, coordination and governance within the Economic and Monetary Union*, signed in 2012 by 25 Member States of the European Union, known as the “Fiscal Compact”. The treaty aims to strengthen fiscal discipline in the signatory states by including the rule according to which national public budgets should be balanced or meet surplus. This rule will be met if the annual structural budget deficit does not exceed 0.5% of GDP. The annual structural budget deficit may reach 1% of GDP if the public debt is significantly below 60% of GDP and the risks to long-term sustainability of the public finances are low.
- *2 packs of regulations and directives* known as the “six-pack” and “two-pack”. The two main objectives of the six-pack and two-pack reforms in the area of fiscal surveillance were (1) a strengthened and deepened budgetary surveillance by making it more continuous and integrated, also via an intensified sanctions mechanism; and (2) an additional surveillance for euro area Member States to ensure the correction of excessive deficits and an appropriate integration of EU policy recommendations in the national budgetary preparation (European Commission 2014).

In order to assess the fiscal governance a synthetic indicator of the fiscal results has been developed, called Fiscal Rule Index. It is calculated on an annual basis (starting with 2006) based on surveys carried out at all governance levels. The questionnaire covers all types of numerical fiscal rules: budget balance rules, debt rules, expenditure rules and rules concerning the revenue side of the budget. The analysis of the Fiscal rules database (available on the European Commission site) points out that, in recent years, in

all the member states of the European Union (except for France, the Czech Republic and Slovenia), the Fiscal Rule Index has increased, which indicates the increase of the numerical fiscal rules. In 2014 compared to 2013, the largest increases in the Fiscal Rule Index can be seen in the following states: Bulgaria, Italy, the Netherlands and Romania.

The most important component of the fiscal governance is represented by the fiscal rules, but the introduction of fiscal rules, as the only set of measures against fiscal indiscipline, is insufficient. Tapsoba (2012) states that in order to guarantee their effects fiscal rules have to be accompanied by fiscal transparency, fiscal responsibility, enforcement mechanisms, sanctions and independent fiscal institutions (fiscal councils). Kopits reached similar conclusions in 2001, and so did Nerlich and Reuter (2013).

Kopits and Symansky (1998) define fiscal rules as a permanent constraint on fiscal policy, expressed in terms of a summary indicator of fiscal performance. Although in the specialized literature there have been few timid attempts to show that EU fiscal rules would not generate the expected positive effects (Artis and Onorante 2006; Soukiazis and Castro 2005; Hein and Truger 2005; Bruck and Zwiener 2006), most authors argue that these rules are important in promoting fiscal consolidation and necessary to ensure economic stability, the main prerequisites for long-term sustainable economic growth (Castro 2011; Beetsma and Debrun 2007; Argimon and de Cos 2012; Christofzik and Kessing 2014; Krogstrup and Wälti 2008; Iara and Wolff 2014; Bergman et al. 2013; Schaechter et al. 2012; Christofzik and Kessing 2014). The effects of introducing fiscal rules have been extensively analyzed in the specialized literature some of the main results of the researches in this field are presented below:

- fiscal rules have an effect on the fiscal aggregates to which they refer (Milesi-Ferretti and Moriyama 2006; Heinemann et al. 2016);
- reducing the public debt level generates positive long-term effects, since the government will no longer be obliged to allocate public financial resources for the payment of the public debt service. A welfare loss results if the debt level when the rule is imposed lies in the support of the long-run distribution associated with the unconstrained equilibrium (Azzimonti et al. 2016);
- the introduction of fiscal rules does significantly change the behaviour of fiscal policy. Fiscal rule leads to a twice as strong reaction of the fiscal variables to high levels or noncompliance with the fiscal rules (Reuter 2015);
- national fiscal rules are very effective in reducing procyclicality of policy once a minimum threshold of government efficiency/quality has been reached (Bergman and Hutchison 2015);
- fiscal rules constraining the value of fiscal deficit tend to destabilize fiscal policy, while rules constraining the value of public debt have an opposite result – they tend to have a stabilizing effect (Brzozowski and Siwinska-Gorzela 2010);
- the application of fiscal rules generates the reduction of the share of social transfers in total government expenditure, especially in countries with relatively weak legal protection to social rights (Dahan and Strawczynski 2013);
- fiscal rules seem to reduce government manipulation (through the Ministry of Finance) with regard to the revenue projections, aimed at influencing fiscal policy (Chatagny 2015).

- deficit projections become more accurate with fiscal rules (Luechinger and Schaltegger 2013);
- fiscal decentralization will have the expected effects if fiscal rules are adopted and the enforcement procedures are improved (Neyapti 2013).

A meaningful assessment of the effects of applying the provisions of the Fiscal Compact is difficult to carry out due to the short period of time elapsed since their implementation. Various authors have captured the potential positive and negative effects concerning the implementation of the Treaty. Thus, Kukk and Staehr (2015) believe that using the structural budget balance as an operational objective of the budget policy has the advantage of reducing the risk related to the implementation of pro-cyclical fiscal policies by the Member States. On the other hand, the uncertainties related to the calculation and forecasting of the cyclically adjusted balance and the possibilities for discretionary adjustments of the structural budget balance could distort the targets set by the Fiscal Compact. Creel et al. (2012) have criticized the proposal regarding the debt “at an average rate of one-twentieth per year as a benchmark” by the countries whose public debt exceeds 60% of GDP, considering that this measure will result in worsening the GDP gap and the inflation rate. According to the evaluations carried out, the current EU fiscal framework is dominated by the golden rule of public finance, which allows governments to take up debt only to finance public investments.

In an analysis of the fiscal framework of the European Union (European Commission 2015) it is highlighted that in recent years, most Member States have established new fiscal measures or have strengthened the existing ones in order to reduce structural budget deficits. Also, the medium-term budget planning has been upgraded taking into account the fiscal governance rules within the European Union. In this context and amid the improvement of the performances of the Member States' economies, the structural budget deficit in the EU went down from -6.4% of GDP in 2010 to -3.0% in 2014. On the other hand, a recent study (Andrle et al. 2015) points out that the compliance and implementation of the fiscal governance framework of the European Union are low, despite its complexity. Given the persistence of high levels of public debt of the Member States, the authors recommend restructuring the fiscal governance framework to prevent the accumulation of fiscal imbalances and to create a better support for the measures concerning the macroeconomic sustainability. They proposed: (a) a simplified fiscal framework centering on a single fiscal anchor (public debt-to-GDP) and a single operational rule (an expenditure growth rule, possibly with an explicit debt correction mechanism); (b) a greater automaticity in enforcement; (c) a more credible set of sanctions; (d) a better coordination of fiscal policy monitoring. Similar opinions were issued by Eyraud and Wu (2015) who believe that the preventive measures of the instruments ensuring fiscal governance in the European Union should be strengthened as the prevention of fiscal imbalances is more efficient and sometimes easier than correcting them ex-post (because preventing the emergence of fiscal imbalances is more effective and sometimes easier than correcting them ex-post).

Within specialized literature, fiscal indiscipline is sometimes related to the political budget cycles. The aspects concerning the political environment influence the impact of fiscal rules on the sustainability of public finances. Hallerberg et al. (2007) and Foremny (2014) demonstrated that the choice of institutions to strengthen fiscal discipline and

their impact, as well as the proper choice of fiscal arrangements depends critically on the type of government and, hence, the political environment and constitutional characteristics such as the electoral system. Shi and Svensson (2006) found out that government fiscal deficit increases by almost 1% of GDP in election years. The correlation is much stronger in developing countries than in the developed countries. Ehrhart (2013) found out a robust evidence of lower indirect taxes being applied by incumbent governments in the period just prior to an election. Even in the case of the Economic and Monetary Union countries it has been pointed out that the fiscal stance is worsened in the presence of parliamentary elections (Schalck 2014). Political budget cycles have been emphasized both in the case of government finance, as well as in the case of local government finance (i.e. Foremny and Riedel 2014; Veiga and Veiga 2007). Fiscal rules should cut down politicians' appetite for electoral benefits based on budget deficits. The presence of fiscal rules helps dampen the magnitude of the political budget cycle in Low-Income Countries (Ebeke and Olçer 2013).

2. RESEARCH DESIGN METHODOLOGY

Data collecting procedure: In the first step of the research we collected the data using the EUROSTAT statistics and the European Commission fall forecasts (for the next year) regarding some selected indicators in our study: general government gross debt as % of GDP, general government net lending/net borrowing as % of GDP, general government total expenditure as % of GDP and general government total revenue as % of GDP. The data were collected for each country member, during 2002–2016 (14 years). Each country member was introduced in our database according to the number of years in which the official statistics were available. Because of the low statistics availability, Croatia was excluded from our analysis.

New variables and scaling procedure: Because the values of general government gross debt as % of GDP and general government net lending/net borrowing as % of GDP depend on the values of general government total expenditure as % of GDP and general government total revenue as % of GDP, we decided to use in our analysis of the fiscal behaviour the last two indicators (variables). In order to have a better insight of the fiscal behaviour we used variable 1 entitled “expenses gap”, reflecting the difference between the realized level and the forecast level of government expenses as share of GDP and variable 2 entitled “revenue gap”, reflecting the difference between the realized level and the forecast level of government revenues as share of GDP.

Scaling method for “expenses gap”: A positive difference between the realized level and the forecast level indicates caution in the use of public money. The respective countries have been characterized as very predictable in terms of taxation. A statistical series has been built for the negative values representing the difference between the realized level and the forecast level of government expenditure as share of GDP over the analyzed period (2001–2015). By means of the quartile, the statistical series was divided into four equal parts. Thus, countries that have made government expenditure as share of GDP higher than the forecast of the European Commission have been classified as

follows: predictable if the difference ranged from 0.1–0.7 percentage points, less predictable if the difference ranged from 0.8–2 percentage points, unpredictable if the difference ranged from 2.1 and 4.2 percentage points and very unpredictable if the difference was higher than 4.3 percentage points;

Scaling method for “revenue gap”: the difference between the realized level and forecast level of the government revenue as share of GDP. A negative difference between the realized level and the forecast level indicates a revenue collection higher than the forecast of the European Commission. The respective countries have been characterized as very predictable in terms of taxation. A statistical series has been built for the positive values representing the difference between the realized level and the forecast level of government revenues as share of GDP corresponding to the analyzed period (2001–2015). With the help of the quartile, the statistical series was divided into 4 equal parts. Thus, countries that have earned government revenues as share of GDP higher than the forecast of the European Commission have been classified as follows: predictable if the difference ranged from 0.1–1 percentage points, less predictable if the difference ranged from 1.1–2 percentage points, unpredictable if the difference ranged from 2.1 and 3.5 percentage points and very unpredictable if the difference was higher than 3.6 percentage points.

Data analyzing procedure: Considering the large data basis, we used Kmeans cluster analysis in order to establish if there are some clear patterns of fiscal behaviour among EU members. There were used the two variables – I1 and I2 based on which the clustering was done. The number of initial clusters (pre-defined by researcher) was 4. The initial centroids of the clusters were a random choice made by SPSS after which within each reiteration the grouping of the cases was made according to the closest Euclidian distances to the centroid of the recalculated clusters. Practically, within this algorithm, one focuses on the minimization of the variation inside the cluster and the maximization of the differences between the clusters. After four reiterations, the final convergent value was reached as is presented in *Annex no. 1–3*. Also, using crosstabs we have profiled the fiscal behavior of each analyzed country and we conducted additional statistical analysis for finding out reliable answers to the research questions.

The correlation between the pre-election and election years and the years in which the fiscal behaviour of the Member States is characterized by unpredictability has been analyzed running Pearson's Correlation Analysis. The years in which the fiscal behaviour of the Member States is characterized by unpredictability were considered the years in which the “government budget deficit gap” and “general government gross debt gap” recorded negative deviations from the evolution projected by the European Commission. The variables “government budget deficit gap” and “general government gross debt gap” have been established according to the methodology described above.

Pearson's Correlation Coefficient measures the association between two variables: the variable x, reflecting the type of election year (including neutral years in terms of the electoral cycle, pre-election and election years) and variable y, reflecting the type of year in terms of fiscal predictability:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{N}}{\sqrt{\left(\sum X^2 - \frac{(\sum X)^2}{N}\right) \left(\sum Y^2 - \frac{(\sum Y)^2}{N}\right)}} \quad (1)$$

A correlation coefficient ranging from +/-0.5 to +/-1 indicates a high correlation; a correlation coefficient ranging from +/- 0.3 to +/-0.5 indicates a medium correlation, and a correlation coefficient ranging from +/- 0.1 to +/-0.3 indicates a low correlation. The variable y was considered as: y1 – the type of year in terms of the predictability of the government budget deficit and y2 – the type of year in terms of the predictability of the general government gross debt. In order to determine Pearson's Correlation Coefficient, the variables x and y were numerically coded.

3. DATA ANALYSIS

After the outbreak of the international financial crisis in 2008, the average level of the general government gross debt in EU Member States has significantly risen surpassing by far the threshold limit of 60% of GDP. The fiscal governance strengthening measures adopted in recent years, and the improvement of the international economic conditions have led to the slowdown in the pace of growth of the general government gross debt as % of GDP in EU Member States and even to its decrease in year 2015 (figure 1). Few Member States register a very high level of the general government gross debt as % of GDP (for example, Greece, Italy, Portugal), and in the Member States with a general government gross debt as % of GDP reduced before 2008 (for example, Romania, Luxembourg, Bulgaria, Latvia, Slovenia) it increased by 2–4 times, before 2015. In year 2015, more than half of the Member States did not meet the requirement regarding the maintenance of the general government gross debt as % of GDP under the alert threshold of 60%.

With regard to the average level of the general government gross debt as % of GDP, the European Commission forecasts were more optimistic only in the years 2008–2009, not reflecting the statistics, a normal situation given the period of economic and social instability. Regarding the particular situation of each Member State, one may find significant differences. For example, in Belgium and Greece the European Commission forecasts did not confirm in 10 of the 15 analysis years and the average exceeding percentage of the general government gross debt as % of GDP against the forecast was 4.5%, respectively 13%. In contrast, in the Netherlands or the United Kingdom, the forecasts of the European Commission did not confirm in only 3 of the 10 years of analysis and the average exceeding percentage of the general government gross debt as % of GDP compared to the forecast was 7%, respectively 6%.

Except for the period 2008–2014, the average level of the general government net lending (+) /net borrowing (-) in EU Member States remained above the threshold of -3% of GDP (figure 2). In year 2015, only 7 Member States (Greece, Spain, France,

Croatia, Portugal and United Kingdom) failed to fulfill the requirement regarding the maintenance of the general government net lending (+) / net borrowing (-) as % of GDP below the alert threshold set through the Treaty on the European Union.

Regarding the average level of the general government net lending (+) / net borrowing (-), the European Commission forecasts were more optimistic for longer periods of time (2001–2005, 2008–2009 and 2012–2014), not reflecting the statistics. For instance, in Portugal the forecasts of the European Commission did not confirm in 13 out of the 15 analysis years, the average exceeding percentage of the general government net lending (+) / net borrowing (-) compared to forecast being of around 2.5% while in Germany the European Commission forecasts did not confirm in 5 out of the 15 analysis years, the average exceeding percentage of the general government net lending (+) / net borrowing (-) compared to the forecast being of 1.4%.

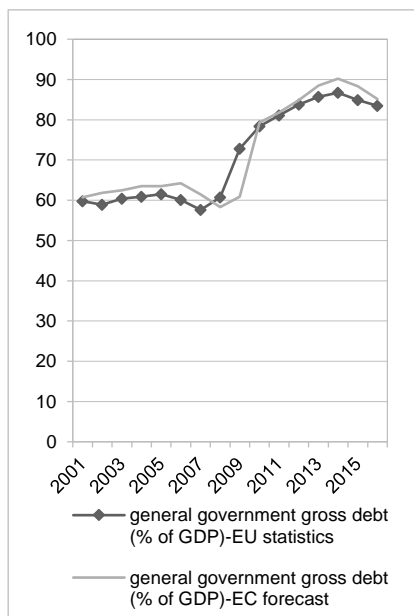


Figure 1. Differences between the average level of the general government gross debt (% of GDP) in EU Member States and EC forecast

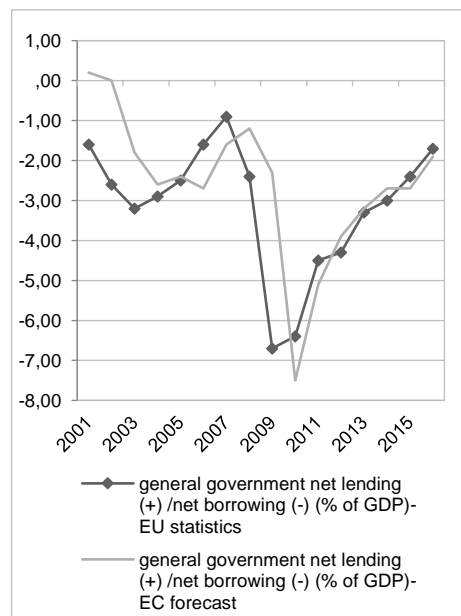


Figure 2. Differences between the average level of the general government net lending (+) / net borrowing (-) (% of GDP) in EU Member States and EC forecast

Taking into account a non-compliance rate with the fiscal rules (budget balance rule and debt rule), calculated reporting the number of years in which fiscal rules thresholds were exceeded to the total number of analyzed years, EU Member States can be included in the following matrix (table 1, authors' calculation, based on data analysis 2001–2016):

Table 1. Matrix of the EU Member State according to the non-compliance rate with the fiscal rules

rule debt rule	budget balance									
	0-10%	11-20%	21-30%	31-40%	41-50%	51-60%	61-70%	71-80%	81-90%	91-100%
0-10%	DK, EE, LU, FI, SE			CZ, LV, BG	LT, SK	RO				PL
11-20%					SI					
21-30%										
31-40%			NL		IE					
41-50%						ES, CY		UK		
51-60%										
61-70%										
71-80%										PT
81-90%					DE			FR		
91-100%	AT			BE	MT		IT, HU			GR

The darker the colour of the matrix, the higher the non-compliance rate with the fiscal rules. The fiscal surveillance of the Member States has focused more on budget deficits than on the high level of public debt. The large number of states that are included in the dark gray area of the matrix in terms of failing to comply with the debt rule requires shifting the center of attention on reducing the level of the public debt.

In all EU Member States, the international financial crisis caused a steep rise in government expenditure, accompanied by a slight decrease in the government revenue. After 2012, the situation began to normalize, meaning that the gap between the government revenues and government expenditure was reduced. The years 2014–2016 marked a slight decrease in both government expenditure and government revenue (figure 3).

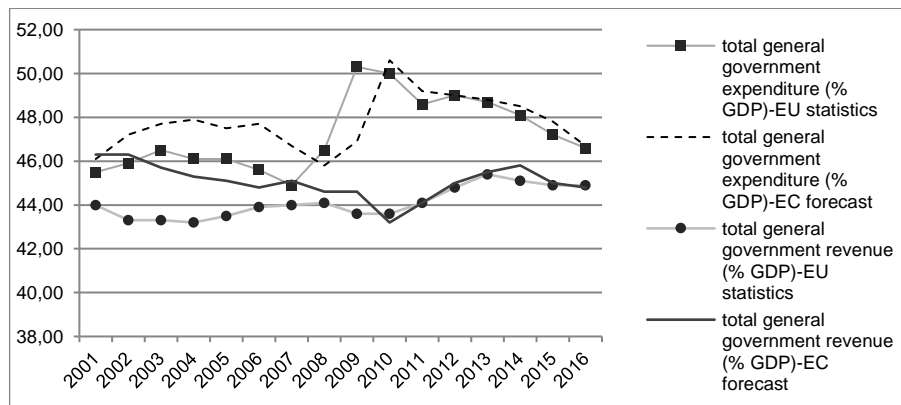


Figure 3. Differences between the average level of the total general government expenditure and revenue (% PIB) in EU Member States and EC forecast

With regard to the average level of total general government expenditure (% GDP), the European Commission forecasts were more optimistic in 2008–2011 and 2013–2015, not reflecting the statistics; however, the differences between the optimistic forecasts and the statistics were low. In some Member States the number of years in which the European Commission forecasts were not confirmed is very low (for example, two years in Sweden), while in others it is very high (for instance, Greece and Hungary).

With regard to the average level of the total general government revenue (% GDP), the European Commission forecasts were more optimistic almost throughout the analyzed period, not reflecting statistics. The differences between the optimistic forecasts and the statistics were higher in 2001–2009.

Grouping the Member States according to the 2 variables described in the Methodology has generated 4 clusters. The presence of the Member States in the 4 clusters is presented in Figure 4.

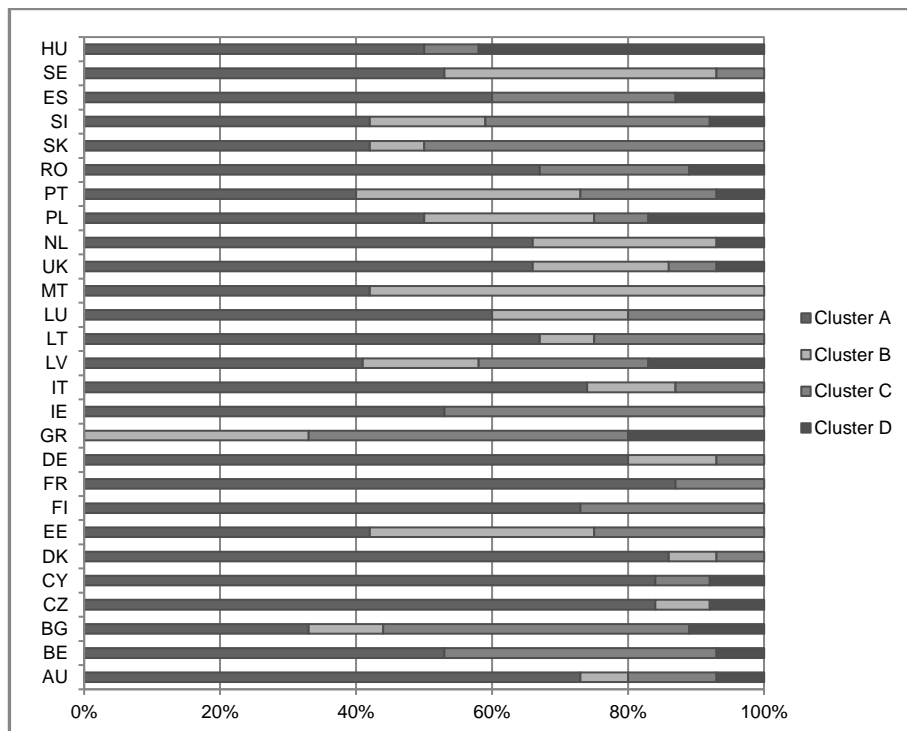


Figure 4. Presence of the EU Member State in clusters

Interpretation:

Cluster A comprises states with very predictable fiscal behavior in terms of expenditure, and predictable in terms of government revenues.

Cluster B comprises states with very predictable fiscal behavior in terms of expenditure, and unpredictable in terms of government revenues.

Cluster C comprises states with unpredictable fiscal behavior in terms of expenditure, and very predictable in terms of government revenues.

Cluster D comprises states with unpredictable fiscal behavior in terms of expenditure, as well as in terms of government revenues.

CONCLUSION

The study introduced new variables for the analysis of the fiscal behaviour of the European Union member states, with the help of which 4 clusters were outlined. Cluster A (countries with very predictable fiscal behaviour in terms of expenditure, and predictable from the government revenue point of view) includes Austria, the Czech Republic, Cyprus, Denmark, Finland, France, Germany, Italy, Lithuania, Luxembourg, Great Britain, the Netherlands, Poland, Romania, Spain and Sweden. Cluster B (states with very predictable fiscal behavior in terms of expenditure, and unpredictable in terms of government revenues) includes Estonia, Malta and Portugal. Cluster C (countries with unpredictable fiscal behavior in terms of expenditure, and very predictable in terms of government revenues) includes Belgium, Bulgaria, Greece, Ireland, Latvia, Slovakia, Slovenia and cluster D (states with unpredictable fiscal behaviour both in terms of expenditure and government revenues) includes Hungary.

At EU level there has not been identified a correlation between the pre-election and election years and the years in which the fiscal behaviour of Member States is characterized by unpredictability in terms of general government gross debt. The correlation between the pre-election and election years and the years in which the fiscal behaviour of Member States is characterized by unpredictability in terms of the government budget deficit is low (*annex 4*). Considering only the EU Member States in clusters B, C and D one can notice an average intensity connection between the two variables.

Therefore, at the level of the European Union, the electoral cycle does not influence the fiscally undisciplined behaviour in terms of general government gross debt. For some Member States, the research results revealed a certain connection between the electoral cycle and the fiscally undisciplined behaviour in terms of the government budget deficit.

Also, the cross tabulation process has pointed out a differentiated fiscal behaviour of the Member States in pre-election and election years. In most of the EU Member States in clusters B, C and D we can notice an unpredictable fiscal behaviour in terms of “expenses gap” and “revenue gap” (*annex 5*).

The issues highlighted above and the fact that the classification of the Member States into clusters largely corresponds with the matrix of the EU Member States according to the rate of non-compliance with fiscal rules are arguments in favour of the statement that the research technique of the fiscal behaviour of Member States proposed by us could be developed so as to allow the identification of the member states facing or likely to face problems in terms of public finances sustainability.

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Annex 1: Kmeans cluster analysis — Initial Cluster Centers

	Cluster			
	1	2	3	4
Variable 1	1,00	1,00	5,00	4,00
Variable 2	1,00	5,00	1,00	4,00

Annex 2: Kmeans cluster analysis — Iteration History^a

Iteration	Change in Cluster Centers			
	1	2	3	4
1	,839	,537	,610	,267
2	,210	,000	,578	,000
3	,032	,000	,067	,000
4	,000	,000	,000	,000

a. Convergence achieved due to no or small change in cluster centers. The maximum absolute coordinate change for any center is ,000. The current iteration is 4. The minimum distance between initial centers is 3,162.

Annex 3: Kmeans cluster analysis — Final Cluster Centers

	Cluster			
	1	2	3	4
Variable 1	1,28	1,02	3,79	3,79
Variable 2	1,75	4,46	1,15	3,83

Annex 4: Correlations between the type of election year (variable x) and year type in terms of the predictability of the government budget deficit (variable y1)

Correlations – EU Member States				Correlations – EU Member States in clusters B, C and D			
		Variable x	Variable y1			Variable x	Variable y1
Variable x	Pearson Correlation	1	,124*	Variable x	Pearson Correlation	1	,384**
	Sig. (2-tailed)		,018		Sig. (2-tailed)		,001
	N	363	363		N	129	129
Variable y1	Pearson Correlation	,124*	1	Variable y1	Pearson Correlation	,384**	1
	Sig. (2-tailed)	,018			Sig. (2-tailed)	,001	
	N	363	363		N	129	129

*. Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Annex 5: Cross tabulation (Year * Cluster Number of Case * Country)

Country	Year	Cluster Number of Case				Unpredictable fiscal behaviour in terms of "expenses gap" in pre-election and election years	Unpredictable fiscal behaviour in terms of "revenue gap" in pre-election and election years
		A	B	C	D		
Austria	neutral year	7	0	1	1	7%	7%
	pre-election year	3	0	0	0		
Belgium	election year	1	1	1	0		
	neutral year	4	0	3	0	27%	7%
Bulgaria	pre-election year	2	0	1	1		
	election year	2	0	2	0		
Czech Republic	neutral year	2	1	1	0	44%	11%
	pre-election year	1	0	1	0		
Cyprus	election year	0	0	2	1		
	neutral year	5	1	0	0	8%	8%
Denmark	pre-election year	2	0	0	1		
	election year	3	0	0	0		
Estonia	neutral year	5	0	1	1	0%	0%
	pre-election year	3	0	0	0		
Finland	election year	2	0	0	0		
	neutral year	4	0	0	0	0%	7%
France	pre-election year	4	1	0	0		
	election year	4	1	0	0		
Germany	neutral year	2	2	2	0	8%	33%
	pre-election year	1	2	0	0		
Greece	election year	2	0	1	0		
	neutral year	3	0	4	0	0%	0%
Ireland	pre-election year	4	0	0	0		
	election year	4	0	0	0		
Italy	neutral year	7	0	2	0	0%	0%
	pre-election year	3	0	0	0		
Latvia	election year	3	0	0	0		
	neutral year	7	0	0	0	7%	13%
Lithuania	pre-election year	3	1	0	0		
	election year	2	1	1	0		
Luxembourg	neutral year	0	2	2	1	47%	33%
	pre-election year	0	2	3	0		
Malta	election year	0	1	2	2		
	neutral year	4	0	4	0	20%	0%
Netherlands	pre-election year	3	0	1	0		
	election year	1	0	2	0		
Great Britain	neutral year	6	1	1	0	7%	7%
	pre-election year	2	0	1	0		
Great Britain	election year	3	1	0	0		
	neutral year	2	2	1	1	33%	0%
Great Britain	pre-election year	2	0	0	1		
	election year	1	0	2	0		
Great Britain	neutral year	5	0	1	0	25%	8%
	pre-election year	2	0	1	0		
Great Britain	election year	1	1	1	0		
	neutral year	6	2	1	0	13%	7%
Great Britain	pre-election year	2	0	1	0		
	election year	1	1	1	0		
Great Britain	neutral year	3	5	0	0	0%	17%
	pre-election year	1	1	0	0		
Great Britain	election year	1	1	0	0		
	neutral year	5	2	1	0	7%	13%
Great Britain	pre-election year	1	1	0	1		
	election year	4	0	0	0		
Great Britain	neutral year	5	2	0	0	7%	20%
	pre-election year	2	1	0	1		
Great Britain	election year	3	1	0	0		

Annex 5: (continued)

Country	Year	Cluster Number of Case				Unpredictable fiscal behaviour in terms of "expenses gap" in pre-election and election years	Unpredictable fiscal behaviour in terms of "revenue gap" in pre-election and election years
		A	B	C	D		
Poland	neutral year	4	1	1	0	17%	33%
	pre-election year	0	1	0	2		
	election year	2	1	0	0		
Portugal	neutral year	2	2	1	0	20%	27%
	pre-election year	3	1	1	0		
	election year	1	2	1	1		
Romania	neutral year	2	0	1	1	11%	0%
	pre-election year	2	0	1	0		
	election year	2	0	0	0		
Slovakia	neutral year	3	0	2	0	33%	8%
	pre-election year	1	0	3	0		
	election year	1	1	1	0		
Slovenia	neutral year	3	1	1	0	33%	17%
	pre-election year	1	1	0	1		
	election year	1	0	3	0		
Spain	neutral year	5	0	2	1	20%	7%
	pre-election year	3	0	1	0		
	election year	1	0	1	1		
Sweden	neutral year	4	3	0	0	7%	20%
	pre-election year	2	1	1	0		
	election year	2	2	0	0		
Hungary	neutral year	4	0	0	2	25%	25%
	pre-election year	0	0	1	2		
	election year	2	0	0	1		