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From Liquidity Crisis to Sovereign Debt Crisis

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This paper summarizes the results of empirical research on European Union's evolution in terms of macroeconomic stability in a period in which member countries crossed from a liquidity crisis to a sovereign debt crisis. So, the evolution of the EU member countries is analyzed as the sovereign debt crisis has worsened and has become increasingly dangerous for the stability of the European economy. The research that is the subject of this paper aims to segment the EU member countries according to the degree of macroeconomic stability. Also, this segmentation process is performed according to two indicators that are highly important for macroeconomic stability, namely the sovereign debt, expressed as public debt to GDP, and fiscal and budgetary discipline, expressed by the ratio of budget balance to GDP.

Keywords *: macroeconomic stability , sovereign debt , budget deficit*

JEL Classification*: H63*

1. Introduction

In his transition from Federal Reserve Governor to a private life, Alan Greenspan (2008) provided in a singular image on an increasingly turbulent world. Greenspan (2008) analyzes the causes that led to the collapse of the markets and the evolution of the global crisis.

Turmoil in financial markets around the world began in the summer of 2007, when French bank BNP Paribas suspended trading for three of its mutual funds, stating that it can no longer assess the assets of these funds, because the market for them had evaporated. In just a few hours, short-term credit markets worldwide had practically experienced a seizure. Despite the efforts of all the world's major central banks to pump liquidity worth billion dollars into the banking system, the first full-fledged financial crisis of the twenty-first century was triggered. When investors realized that an indefinite amount of commercial paper was backed by subprime mortgages, they did not stop to examine the situation and got rid of all the sorts of this short term commercial paper in bulk, and this triggered the global credit crisis (Greenspan, 2008).

2. Literature Review

With the governments' implementation of massive recovery programs to overcome the financial crisis emerged worldwide and, mainly, in Europe, as new major problem emerged, namely the problem of

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sovereign debt. Thus, by the end of 2009, the economic crisis increased by 45% the sovereign debt worldwide, according to estimates by Moody's rating agency.

Of course not only the economic recovery programs determined the increased sovereign debt, as some states have yet to implement these programs. In fact, these are the effects of expansionary fiscal policies in recent years and especially the negative effects of governments' inability to apply early action to avoid the crisis. The direct effects of the crisis and the increased sovereign debt can be seen in increased investment risk in the affected countries.

These measures reveal another important component that affected macroeconomic stability, and the size of budget deficit. Thus, the budget deficit indicates a surplus of expenses in relation to definitive budgetary or of uses in relation to resources. Total budget deficit includes structural deficit and cyclical deficit. The structural deficit is the deficit that the budget would record if the economy would increase to the level of the potential GDP. Thus, when the economy grows faster (as in the past years), the budget deficit is lower than the structural deficit. Cyclical deficit is the price of loans needed during crises, namely when unemployment is high, public revenues are declining, and there is higher social spending. Economic theory says that the deficit will be amortized by the cyclical surplus that will occur during economic boom. The problem of budget deficits affected countries across Europe and the risk of these deficits has come to determine concern, due to the difficulty that European states have faced in the funding their negative balances of their budget balances.

In this contextual framework, the sovereign debt issues were the subject of several research papers. Thus, Tomz and Wright (2013) review the empirical literature about sovereign debt and default.

Mentzen (2012) summarizes "the results of empirical studies on the effects of sovereign debt, deficit and default on the economy. The obtained results shows that excessive debt and deficit are very harmful for economic growth, as opposed to default, which tend to heal the economy and usually is the end of crisis."

Manasse and Roubini (2009) investigated "the economic and political conditions that are associated to the occurrence of a sovereign debt crisis".

Kirsch and Ruhmkorf (2013) constructed "a quantitative model of endogenous credit structure and sovereign default that allows for self-fulfilling expectations of default".

Muellbauer (2013) proposes "that all new euro area sovereign borrowing be in the form of jointly guaranteed Eurobonds".

Afonso and Gomes (2010) observed "an overall downgrading in sovereign debt ratings from the computed predictions in the period 2009-2011. Therefore, fiscal worsening, together with less optimistic macro scenarios are indeed translated into lower sovereign ratings".

3. Research and Methodology

In this paper, the relationship between different levels of debt in EU countries and their budget deficit is analyzed. Thus, the two variables (public debt and budgetary balance) are expressed as shares in GDP, based on annual data from Eurostat.

The data obtained are analyzed and processed with SPSS 20, aiming at segmenting the EU countries by two indicators for each of year in the 2008 to 2012 timeframe, and then analyze the evolution of EU countries in the considered period.

The main objective of the research is the segmentation of EU countries according to the macroeconomic stability given by the weight of public debt in GDP and situation of budgetary balance.
Segmentation involves grouping of the states based on a rating resulted by the degree of economic stability (marked with the letters A, B and C) determined by the level of debt in the economy, which is expressed by the ratio of government debt to GDP, and fiscal and budgetary discipline, which is expressed by the share of budget deficit in GDP.

Thus, after the study, EU countries will be classified into the following clusters:

Rating	Characterization	Features
A	High Macroeconomic Stability	Low degree of debt High level of fiscal and budgetary discipline
B	Medium Macroeconomic Stability	Medium degree of debt Medium level of fiscal and budgetary discipline
C	Low Macroeconomic Stability	High degree of debt Medium level of fiscal and budgetary discipline

4. Analysis and Results

4.1. EU Segmentation in 2008

Using the Two Step Cluster method with SPSS software, the first segmentation is conducted in year 2008 and targets the situation in the first year of the economic crisis. The analysis is focused on the segmentation of the EU countries based on the debt level and fiscal and budgetary discipline in the context of the European Union threatened by a liquidity crisis. Thus, the following situation was obtained for the year 2008:

Cluster	3	2	1
Label	B	C	A
Description	Medium Macroeconomic Stability	Low Macroeconomic Stability	High Macroeconomic Stability
Size	42.9% (12)	35.7% (10)	21.4% (6)
Inputs	d2008 29.32	d2008 77.11	d2008 30.52
	b2008 -3.92	b2008 -2.96	b2008 2.60

Figure 1. *Clusters of EU Countries in 2008*

The situation, resulted from the segmentation process of the indicators from 2008, is transposed in figure 2, which shows the map of the European Union according to the obtained segments in relation to the level of macroeconomic stability.

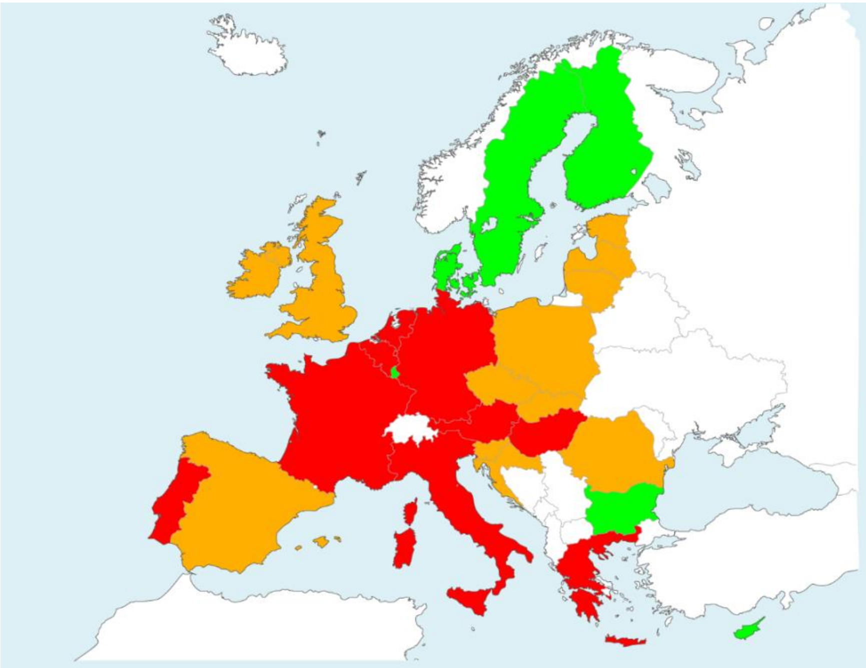

Figure 2. *EU Clusters Map in 2008*

Figures 1 and 2 show that in year 2008 macroeconomic stability was concentrated in northern Europe (Denmark, Finland and Sweden) and conjecturally in Bulgaria and Cyprus. At the same time, the instability was concentrated in central and southern Europe as a result primarily of the high level of public debt, while the budget deficit was in a normal range, like it was the case with the other two groups of countries.

4.2. EU Segmentation in 2009

Using the Two Step Cluster method with SPSS software, the second segmentation is conducted in year 2009 and the following situation was obtained:

Cluster	1	2	3
Label	A	B	C
Description	High Macroeconomic Stability	Medium Macroeconomic Stability	Low Macroeconomic Stability
Size	50.0% (14)	32.1% (9)	17.9% (5)
Inputs	d2009 31.91	d2009 77.84	d2009 79.78
	b2009 -5.11	b2009 -5.09	b2009 -12.38

Figure 3. *Clusters of EU Countries in 2009*

The situation, resulted from the segmentation process of the indicators from 2009, is transposed in figure 4, which shows the map of the European Union according to the obtained segments in relation to the level of macroeconomic stability.

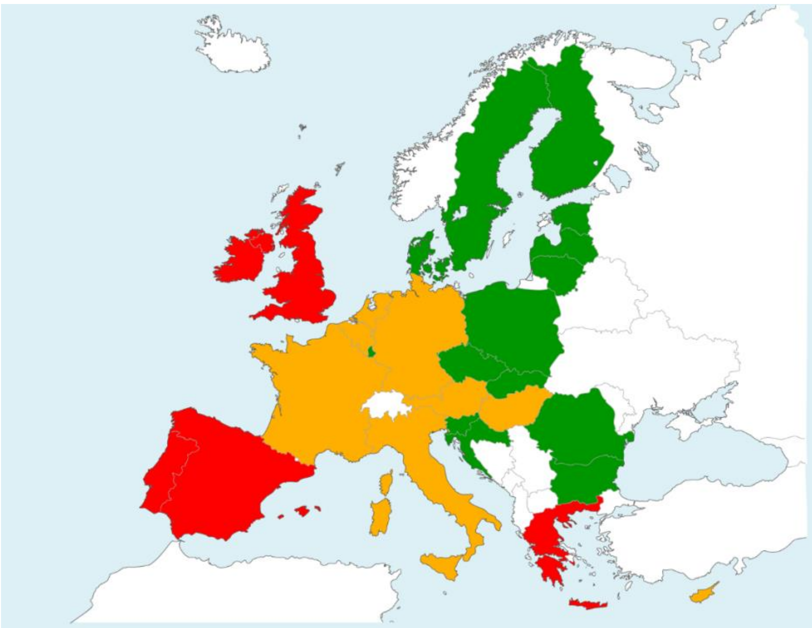

Figure 4. *EU Clusters Map in 2009*

The first aspect that can be observed in Figures 3 and 4 is the negative impact of the crisis on European economies. The savings have been adversely affected, as this aspect is noticeable from the depreciation of the analyzed indicators, hence resulting in an depreciation of the macroeconomic stability.

In this context, the crossing of one group of countries from cluster B in 2008 in cluster A in 2009 is because the savings' stability of cluster A in 2008 have depreciated much faster and they reached the situation in which they displayed similar characteristics with a group of countries that have experienced the effects of the economic crisis much slower.

Thus, in cluster A were further added other countries, but with poor results, countries such as Poland, Czech Republic, Slovakia, Slovenia, Croatia and Romania, while the economic stability of Cyprus was heavily damaged. Countries in cluster A can be characterized since 2009 as countries with a high level of stability, but with a negative outlook.

Another important observation refers to the fact that the economic stability of Ireland, United Kingdom, Spain, Portugal and Greece was strongly affected by the sovereign debt crisis and the sovereign debt of these countries have reached alarming levels since 2009.

4.3. EU Segmentation in 2010

Using the Two Step Cluster method with SPSS software, the third segmentation is conducted in year 2010 and the following situation was obtained:

Cluster	1	2	3
Label	A	B	C
Description	High Macroeconomic Stability	Medium Macroeconomic Stability	Low Macroeconomic Stability
Size	53.6% (15)	42.9% (12)	3.6% (1)
Inputs	b2010 -4.61	b2010 -6.44	b2010 -30.60
	d2010 37.67	d2010 87.25	d2010 91.20

***Figure 5.** Clusters of EU Countries in 2010*

The situation, resulted from the segmentation process of the indicators from 2010, is transposed in figure 6, which shows the map of the European Union according to the obtained segments in relation to the level of macroeconomic stability.

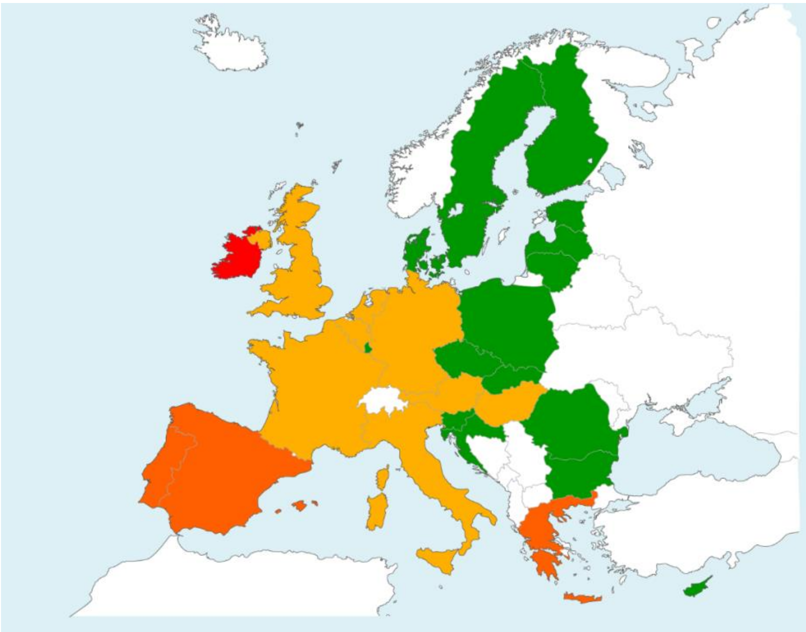

Figure 6. *EU Clusters Map in 2010*

The year 2010 was characterized by a tightening of the economic conditions and a strong evolution of the sovereign debt crisis. Thus, in year 2010 the economic stability of Ireland reaches alarming rates, and the disequilibrium of the budgetary balance is obvious after recording a value of 30.60% of GDP. This worsening of the situation allows other countries that were part of cluster C (Spain, Portugal, Greece, United Kingdom) to cross in cluster B, formed of countries with a medium level of economic stability, but with a negative outlook. The situations remain similar in terms of segmentation for the rest of the EU, but with a depreciation of the indicators for different countries.

4.4. EU Segmentation in 2011

Using the Two Step Cluster method with SPSS software, the fourth segmentation is conducted in year 2011 and the following situation was obtained:

Cluster	2	1	3
Label	B	A	C
Description	Medium Macroeconomic Stability	High Macroeconomic Stability	Low Macroeconomic Stability
Size	42.9% (12)	39.3% (11)	17.9% (5)
Inputs	d2011 57.58	d2011 47.37	d2011 120.26
	b2011 -6.01	b2011 -0.80	b2011 -6.92

Figure 7. *Clusters of EU Countries in 2011*

The situation, resulted from the segmentation process of the indicators from 2011, is transposed in figure 8, which shows the map of the European Union according to the obtained segments in relation to the level of macroeconomic stability.

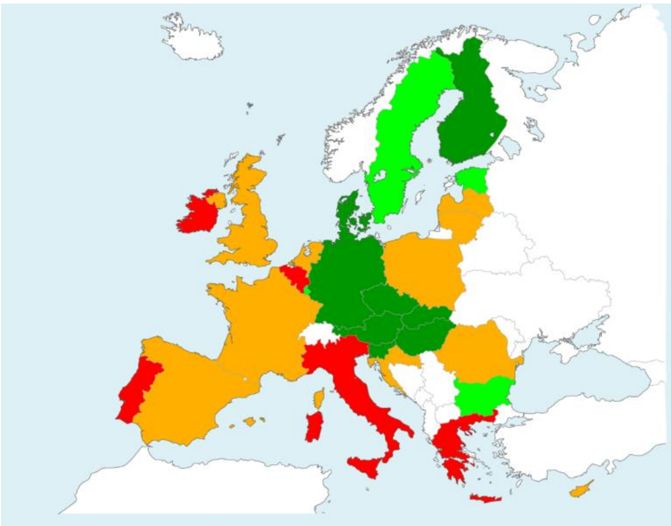

Figure 8. *EU Clusters Map in 2011*

Year 2011 is characterized by an acceleration of the sovereign debt crisis, as the macroeconomic stability of the countries in cluster C (Ireland, Portugal, Italy, Greece, Belgium) reaches alarming levels with possible negative effects for the entire community.

Also in 2011, the measures taken by the EU governments cause a change in the structure of clusters A and B. Thus, in cluster A, Sweden, Luxembourg, Estonia and Bulgaria strongly reduce their budget deficits, although public debts denote a slight increase but remain under control. At the same time, another group of countries leave cluster A and move to cluster B, which characterizes economies with an average level of macroeconomic stability. The measures of the economies in central Europe (Germany, Austria, Czech Republic, Slovakia, Slovenia) have results and allow them to record positive outlook.

4.5. EU Segmentation in 2012

Using the Two Step Cluster method with SPSS software, the fifth segmentation is conducted in year 2012 and the following situation was obtained:

Cluster	2	3	1
Label	B	C	A
Description	Medium Macroeconomic Stability	Low Macroeconomic Stability	High Macroeconomic Stability
Size	50.0% (14)	32.1% (9)	17.9% (5)
Inputs	d2012 58.49	d2012 108.52	d2012 25.76
	b2012 -3.26	b2012 -6.50	b2012 -0.70

Figure 9. *Clusters of EU Countries in 2012*

The situation, resulted from the segmentation process of the indicators from 2012, is transposed in figure 10, which shows the map of the European Union according to the obtained segments in relation to the level of macroeconomic stability.

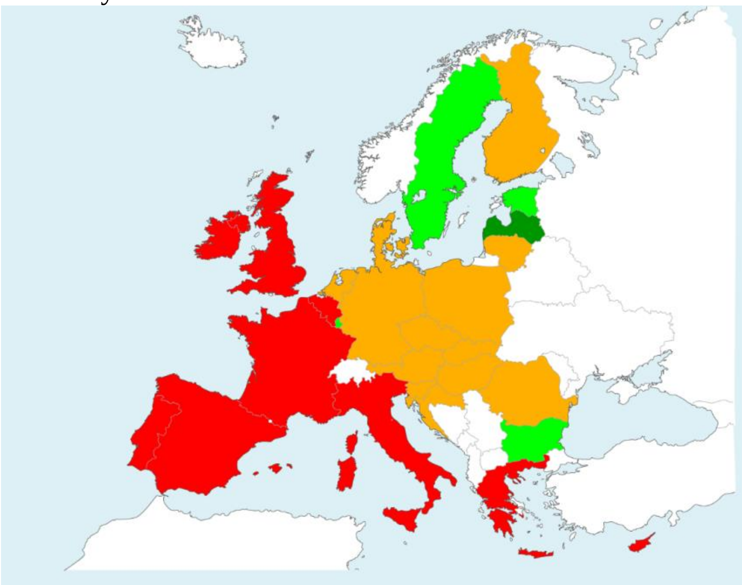

Figure 10. *EU Clusters Map in 2012*

5. Conclusion

The following table (Table 2) summarizes the situation at the European level in terms of macroeconomic stability.

Also, it is observed that the share of public debt in GDP is growing at an EU level (regardless of segment), while the budget deficit is on a downward trend after it peaked in 2009 (for clusters A and B) and in 2010 (for cluster C).

Table 2. *: Table summarizing the situation of clusters and evolution of the EU member states*

Clusters 2012	Country	D 2008	D 2009	D 2010	D 2011	D 2012	B 2008	B 2009	B 2010	B 2011	B 2012
A	Bulgaria	13.7	14.6	16.2	16.3	18.5	1.7	-4.3	-3.1	-2.0	-0.8
	Estonia	4.5	7.1	6.7	6.1	9.8	-2.9	-2.0	0.2	1.1	-0.2
	Latvia	19.8	36.9	44.4	41.9	40.6	-3.0	-6.8	-8.1	-3.6	-1.4
	Luxembourg	14.4	15.5	19.5	18.7	21.7	3.2	-0.7	-0.8	0.1	-0.6
	Sweden	38.8	42.6	39.4	38.6	38.2	2.2	-1.0	0.0	0.0	-0.5
	Mean	**18.2**	**23.3**	**25.2**	**24.3**	**25.8**	**0.2**	**-3.0**	**-2.4**	**-0.9**	**-0.7**
B	Austria	63.8	69.2	72.3	72.8	74.0	-1.0	-4.1	-4.5	-2.4	-2.5
	Czech Republic	28.7	34.6	38.4	41.4	46.2	-2.2	-5.8	-4.7	-3.2	-4.4
	Denmark	33.4	40.7	42.7	46.4	45.4	3.3	-2.8	-2.7	-2.0	-3.9
	Croatia	36.6	36.6	44.9	51.6	55.5	-5.3	-5.3	-6.4	-7.8	-4.9
	Finland	33.9	43.5	48.7	49.2	53.6	4.3	-2.7	-2.8	-1.0	-2.2
	Germany	66.8	74.5	82.5	80.0	81.0	-0.1	-3.1	-4.2	-0.8	0.1
	Hungary	73.0	79.8	82.2	82.1	79.8	-3.7	-4.6	-4.4	4.2	-2.1
	Lithuania	15.5	29.3	37.8	38.3	40.5	-3.3	-9.4	-7.2	-5.5	-3.3
	Malta	60.9	66.5	66.8	69.5	71.3	-4.6	-3.7	-3.5	-2.8	-3.3
	Netherlands	58.5	60.8	63.4	65.7	71.3	0.5	-5.6	-5.0	-4.3	-4.0
	Poland	47.1	50.9	54.9	56.2	55.6	-3.7	-7.5	-7.9	-5.0	-3.9
	Romania	13.4	23.6	30.5	34.7	37.9	-5.7	-9.0	-6.8	-5.6	-3.0
	Slovenia	22.0	35.2	38.7	47.1	54.4	-1.9	-6.3	-5.9	-6.3	-3.8
	Slovakia	27.9	35.6	41.0	43.4	52.4	-2.1	-8.0	-7.7	-5.1	-4.5
	Mean	**41.5**	**48.6**	**53.2**	**55.6**	**58.5**	**-1.8**	**-5.6**	**-5.3**	**-3.4**	**-3.3**

C	Belgium	89.2	95.7	95.7	98.0	99.8	-1.1	-5.6	-3.9	-3.9	-4.1
	Cyprus	48.9	58.5	61.3	71.5	86.6	0.9	-6.1	-5.3	-6.3	-6.4
	France	68.2	79.2	82.4	85.8	90.2	-3.3	-7.6	-7.1	-5.3	-4.8
	Greece	112.9	129.7	148.3	170.3	156.9	-9.9	-15.6	-10.8	-9.6	-9.0
	Ireland	44.2	64.4	91.2	104.1	117.4	-7.4	-13.7	-30.6	-13.1	-8.1
	Italy	106.1	116.4	119.3	120.7	127.0	-2.7	-5.4	-4.3	-3.7	-2.9
	Portugal	71.7	83.7	94.0	108.2	124.1	-3.7	-10.2	-9.9	-4.3	-6.5
	Spain	40.2	54.0	61.7	70.5	86.0	-4.5	-11.1	-9.6	-9.6	-10.6
	United Kingdom	51.9	67.1	78.4	84.3	88.7	-5.0	-11.3	-10.1	-7.7	-6.1
	Mean	**70.4**	**83.2**	**92.5**	**101.5**	**108.5**	**-4.1**	**-9.6**	**-10.2**	**-7.1**	**-6.5**

The situation resulted in 2012 splits the European Union map in two large groups of countries. The first group is composed of clusters A and B, considering the fact that the countries in cluster A (Sweden, Estonia, Latvia, Bulgaria and Bulgaria) have a high level of stability caused by the low level of public debt (25.76% of GDP) and a very low budget deficit (-0.7% of GDP) compared with the situation in cluster B where public debt records an average of 58.49% of GDP and an average deficit of 3.26% of GDP.

The second group is characterized by a low level of macroeconomic stability. This cluster records a 108.5% share of GDP for public debt and a share of -6.5% of GDP for budget deficit. Both values are at levels of alert and due to this cluster's countries it raises the level of risk for the European Union.

If we analyze the comparative maps in the 2008-2012 period, a paradox is observed: countries that were included in cluster C follow an ascending trend and, geographically, they tend to cover the largest area of the map in 2012, although the indicators show an improvement from year to year starting with 2010. This paradox shows that the risk in terms of a negative evolution of macroeconomic stability at the EU level is high and should be analyzed from the perspective of other indicators.

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