

FLAWS IN THE EUROPEAN MONETARY UNION.
DOES THE EMU NEED A SOLUTION?

*LAS CARENCIAS DE LA UNIÓN MONETARIA EUROPEA.
¿NECESITA LA UEM UNA SOLUCIÓN?*

Alina Stundžienė

Kaunas University of Technology
alina.stundziene@ktu.lt

Antonio Mihi-Ramirez

Universidad de Granada
amihir@ugr.es

Margarita Navarro Pabsdorf

Universidad de Granada
Pabsdorf@ugr.es

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ABSTRACT

Our study aims to reveal whether there are differences between the Eurozone and non-Eurozone countries in terms of their compliance with the variables established in the Maastricht criteria (inflation, public deficit, and public debt) to which we extend unemployment and the long term bond yields of countries that joined the common currency and those that did not. The results show that, in general terms, the non-compliance has been most hurtful in the Eurozone countries, especially in terms of deficit and unemployment.

Keywords: European economic integration; inflation; Treaty of Maastricht; Maastricht criteria; unemployment; long term bond yields.

RESUMEN

Nuestra investigación pretende revelar si existen diferencias entre los países de la zona euro y los de fuera de ella en cuanto al cumplimiento de algunas variables relevantes establecidas en los criterios de Maastricht (inflación, déficit y deuda pública). También examinamos las consecuencias del incumplimiento de uno o varios de estos criterios, incluyéndose el desempleo, relacionándolo con el rendimiento de los bonos a largo plazo de los países que se incorporaron a la moneda común con los que no lo hicieron. Los resultados muestran que, en términos generales, el incumplimiento ha sido más perjudicial en los países de la Eurozona, especialmente en términos de déficit y desempleo.

Palabras clave: integración económica europea; inflación; Tratado de Maastricht; criterios de Maastricht; desempleo; rendimiento de los bonos a largo plazo.

Clasificación JEL / JEL classification: F02; F15; N14.

1. INTRODUCTION

Though problems have arisen in the construction of the monetary union throughout the past decades, the last crisis has revealed the weakness of the institutional processes in the European Union (EU) (Bagnai and Mongeau, 2017; Ferreiro et al., 2014).

The design of the Euro was based on the compliance with certain macroeconomic criteria such as inflation, public deficit, and sovereign debt. However, disparities in other key variables such as unemployment, that could affect the stability of the system, were not taken into account. There was not enough discussion about how to manage the effects of potential asymmetric shocks (Bird and Mandilaras, 2013; Hallett and Richter, 2011; Krugman 1999). Nor was there an exhaustive debate about how to counteract their effects.

The extent of the economic imbalances and the lack of adequate solutions to the problems that arose during the last crisis, highlighted the need to put into effect political, economic, and social reforms to restore calm in the markets. The future of the economic and monetary union in Europe depends on the ability to respond sufficiently to the challenges.

Given that not all the EU countries assumed the Euro discipline at the same time, it is difficult to find a suitable method of assessing these criteria. For this reason, we had to apply different tests to measure more effectively the impact that non-compliance with the aforesaid criteria has had on certain countries.

During the first years of the running Euro, there was a growing interest in measuring the positive effects of the discipline imposed on the Eurozone (EZc) and non-Eurozone countries (n-EZc) (Wohrmann, 1999). The first conclusions were that there was a high degree of non-compliance with one or more of the Maastricht criteria for the EZc and the n-EZc. Thus making it necessary to analyse the impact of non-compliance with any of these criteria.

Our comparison between the EZc and the n-EZc referenced the evolution of the 10-year bond yields for each country when they met the criteria and when they did not. The results will help us to suggest more accurate measures to:

- reduce the rigidity to deal with economic imbalances, and
- help to develop specific policies according to the disparities in the EZc.

Overall, this article aims to determine whether the Maastricht criteria are an adequate response to the current economic challenges, and to facilitate the stability and economic viability of the Eurozone.

We also have examined the consequences of not meeting these criteria during the period 2002-2015, comparing the EZc countries with those which are not part of it (e.g. Balduzzi et al. 2001; Wohrmann, 1999; Favero et al., 1996).

In essence, we analyse if the Maastricht criteria have been sufficient to deal with current economic problems, as well as the impact of breaching any of these criteria through the comparison of the EZc and the n-EZc over time.

The content of the article is divided in four sections as follows:

First, we review the origins of the European monetary cooperation, the literature dealing with how to achieve a monetary union and its difficulties in accordance with the Treaty of Maastricht, and the validity of the Maastricht criteria at present.

We also seek to measure the effectiveness of the set-out criteria and the differences in their compliance in the EZx and the n-EZc for the mentioned period. Additionally, we will analyse the differences between countries that faithfully met the foregoing criteria and those that did not (described further below).

Finally, the last section outlines the main findings, constraints, and proposals for future researches.

2. THEORETICAL BACKGROUND

The euro zone makes up a vast and varied space where the European institutions attempt to control, among other variables, inflation, public deficit, public employment, and at the same time try to ensure economic growth. The single currency was a symbol of unity, but the question that arose was if the euro would work in a group of countries that did not conform an optimal currency area (Szemplér, 2009; Mongelli 2008; Krugman 1999, 1990).

To assess its success, we should need to analyse a full business cycle in which all the economies that joined the project were working with a single monetary policy, and how the EU respond to the economic conjuncture and the structural reforms needed (Andrés et al. 2008).

Economists and multilateral institutions have repeatedly denounced the large imbalances that some countries had been accumulating and the need to change patterns in businesses, labour regulations and other general aspects. For a group of experts, the monetary and fiscal policies could successfully manipulate, aggregate demand to offset private sector shocks (Ferreiro et al., 2014, Cuenca et al., 2013).

By contrast, another group defend the long-run ineffectiveness of monetary policy (Barro and Gordon 1983; Calvo 1978). These approaches raise two important questions: are the Maastricht criteria inadequate in view of the EU's current economic challenges? And, furthermore, what is the impact of the non-compliance with the convergence criteria on the crisis-affected countries?

For the monetarist, policymakers primarily choose a rate of inflation rather than a desired level of unemployment or economic activity. Hence, from this standpoint, the cost of losing direct control over national monetary policy to undertake business-cycle stabilization in a monetary union is low. However, Emerson et al. (1992) demonstrated that, in the long run, relatively higher inflation does not yield any macroeconomic benefits in terms of unemployment or growth. On the contrary, higher inflation is associated with higher unemployment and relatively lower levels of real per capita income (Issing et al. 2001).

The costs of losing direct control over national monetary policy seemed rather low. For a country with a track record of relatively higher inflation, a way to immediately gain low inflation credibility is to 'tie its hands' by abandoning national monetary sovereignty and establishing a complete monetary union with low inflation (Giavazzi and Giovannini 1989).

However, in the EZx inflation differentials were quite persistent over long periods. In fact, inflation in most of the EZc showed significant differences for relatively long periods that reflected structural rigidities among them.

This leads us to formulate the following hypothesis:

a) H1. The imbalances between the EZc and the n-EZc in terms of their compliance with the inflation criterion set out in the Maastricht Treaty is reflected in their countries' long-term bond yields.

In addition, the implementation of the Stability and Growth Pact (SGP) in 1996 in the EZc tried to prevent excessive budget deficits after the implementation of the euro (Ferreiro et al., 2014).

The public deficit limits established in Maastricht did not prevent financial problems in some countries, therefore the maximum deficit established in the Treaty was found unsustainable. Substantial efforts were necessary to maintain the credibility of the system, but with the existing mechanisms they were not able to compensate the effects of the crisis on the production. Thereby, the financial markets started to punish the EZc failing to comply with the deficit limit and fuelling the sovereign debt crisis (Mathieu and Sterdyniak, 2014).

b) As a result, we propose the hypothesis 2

H2. The imbalances between the EZc and the n-EZc in the fulfilment of the public deficit criterion affect their long-term bond yields.

The financial crisis had an important impact on the real economy in Europe (Ferreiro et al., 2014; Szemplér, 2009). To spur the growth, the ECB fixed interest rates at 1.5 per cent, the lowest rate since the creation of the monetary union. However, inflation remained above its target and the EZc had to confront the debt crisis (Hartwell et al., 2017; Quaglia et al., 2009). But the interest rate of the ECB over the period 2000 to 2011 favoured Germany and France, the core countries in the euro, considering that the crisis was purely of liquidity, and that a lower interest rate should give rise to greater liquidity in European capital markets and should ensure stability.

On the other hand, Greece, Ireland, Portugal and Spain required higher interest rates for different reasons, it was an inappropriate interest rate policy of ECB for these countries over the years; the ECB had neglected the smaller nations. After 2008, the economies of Spain, Portugal, Greece, and Ireland went into an economic depression combined with a debt crisis. (Hartwell et al., 2017).

The insufficient reaction of the European institutions when the markets began to speculate against its weaker countries worsened the situation. The European Union, as a supranational organization of economic integration was failing due to the lack of a clear political desire to lessen the effect of the crisis as well as the limited institutional capacity to stop speculation on the capital markets.

As a result, it was necessary to modify Article 136 of the Treaty of Lisbon to establish a permanent mechanism to guarantee financial stability in the EZ. The creation of the European Stability Mechanism (ESM), was difficult because the rules of the European Economic and Monetary Union, (EMU), did not allow a permanent euro rescue fund.

Arriving to this point, raised the question about the effect of the high public debt on potential growth (Sosvilla-Rivero and Gomez-Puig, 2019). Kumar and Woo (2010), and Reinhart and Rogoff (2010) find that beyond a certain threshold (about 80-90 percent of GDP) higher public debt lowers potential growth.

So, since May 2010, the EU has been working on a reform of the SGP to provide it real power.

c) Hypothesis 3

H3. Differences between the EZc and the n-EZc in the implementation of the debt objective affect their long-term bond rates.

As far as unemployment is concerned, the crisis entailed a number of important reforms (Turrini et al., 2015). Although the intensity of these reforms vary widely between the Member States, there was a general tendency to reduce the rigidity to create employment and apply incentives to rise production by controlling wage growth and improving competitiveness (Turrini et al. 2015). (Høj et al., 2006).

These reforms were not implemented simultaneously and had not addressed the same issues. In countries such as Germany, the focus was on working hours and social benefits, while in southern countries on the employment protection. In contrast, the northern countries had carried out the least reforms (Dilma et al., 2013). Some of these reforms had led to a reduction in wage costs, with impacts on the relocation of production and investments, and an impact on productivity (Bagnai and Mongeau, 2017).

d) Hypothesis 4

H4. The imbalances in unemployment rate between the EZc and the n-EZc affect their long-term bond rate.

3. METHODOLOGY

SAMPLE

We use annual data from 28 European countries concerning: inflation, deficit, sovereign debt and unemployment, from Eurostat and the IMF (2017). The analysis period ranges from 2002 to 2015, taking into account whether or not the country belongs to the eurozone. So, it could be considered three periods:

1. From 2006 to 2006: Twelve UZc: Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, and Greece.

And, on the other hand: Slovenia, Malta, Cyprus, Estonia, Latvia, Lithuania, Denmark, Bulgaria, Croatia, Hungary, Poland, Czech Republic, Sweden, United Kingdom (EU members that were not in Eurozone at that time).

2. From 2007 to 2010: The previous twelve plus: Slovenia, Malta, Cyprus, Slovakia (EZc).

And, on the other hand: Estonia, Latvia, Lithuania, Denmark, Bulgaria, Croatia, Hungary, Poland, Czech Republic, Sweden, United Kingdom (EU members but not of the Eurozone at that time).

3. From 2011 to 2015: The previous sixteen plus: Estonia, Latvia and Lithuania (EZc).

And, on the other hand: Denmark, Bulgaria, Croatia, Hungary, Poland, Czech Republic, Sweden, United Kingdom (EU members but not of the Eurozone).

Methods

To test the above hypotheses regarding the variables of our analysis (inflation, public deficit, sovereign debt and unemployment), our methodology includes several steps (Table 1).

TABLE 1. SUMMARY OF METHODOLOGY

Step	Goal	Method	Scope
1	to find potential differences between variables	model-based cluster-analysis	EZc
2	find out how many different groups of countries are	Cluster-analysis. linear mixed models (MM-GLMM)	EZc and nEZ
2	Checking typical statistics problems	Markov-Chain Monte-Carlo techniques. invariance-problems; Stephens methods	EZc and nEZ
3	Test the differences in the fulfilment of Maastricht criteria	Segmented regression mixed models	EZc and nEZ
4	Measure the economic impact of the non-compliance of Maastricht criteria	mixed regression analysis	EZc and nEZ

A detailed description of each step is given below:

We first carried out a cluster analysis for the 28 European countries in order to find potential differences in inflation, public deficit, unemployment and sovereign debt for the period 2002 - 2015.

At this stage, we have applied a cluster analysis to assess whether it is better to examine them together or separately in groups (Muggeo et al. 2014). According to the statistical law of parsimony, when there are alternative explanations of events, the simplest one is likely to be correct. The results obtained show to be the easiest way to proceed with our analysis, therefore we studied the evolution of the four variables for the countries that had adopted the euro and the ones that had not.

Our reasoning is that if we only analysed the Eurozone, or if we included more than 4 variables in the model, it would become more complex, but not clearer or more accurate; since these countries, even if they showed specific differences, followed the same rules, and consequently exhibiting similar trends.

Standard cluster-analysis techniques could not be applied due to the longitudinal nature of the data. Thus, we apply a *model-based cluster-analysis* more suitable for these longitudinal characteristics of the data. As a first step, an analysis was carried out with countries belonging to the Eurozone. That is, countries having joined the euro from the beginning, while for the countries joining the euro later on, we only consider the years in which they were members.

As a second step, a cluster-analysis including all EU member countries was carried out to find out in how many different clusters the countries were grouped. Since data were of longitudinal nature, we applied a model-based clustering approach using a mixture of multivariate generalized linear mixed models (MM-GLMM) proposed by Komárek and Komárková (2013).

In the present application, for each variable a generalized linear mixed model (GLMM) is used with a Gaussian response. For the slope of year, we may use a random or a fixed effect¹. Intercepts are all modelled using a random effect. To achieve $k = 1 \dots K$ clusters, for each variable k different GLMMs are allowed representing the different clusters. By means of a set of weights for the different variables a mixture distribution is constructed. For further details, we refer to the literature (Komárek and Komárková, 2014, 2013; Stephens, 2000). In the current application we will consider up to three clusters, that is $K = 3$.

The approach uses Bayesian estimation methods and simulations using Markov-Chain Monte-Carlo techniques. To increase robustness of the model we subtract from the variable “year” the value 2000 which has a similar effect then

¹ The slope of a regression line represents the rate of change in y as x changes. The x -intercepts are where the graph crosses the x -axis, and the y -intercepts are where the graph crosses the y -axis. Once we have calculated the slope and y -intercept to form the best-fitting regression line in a scatterplot, we can then interpret their values.

centring the variable year. In order to avoid invariance-problems we apply the relabelling-method proposed by Stephens (Komárek, 2009; Plummer, 2008). Furthermore, the analysis was repeated for all observations of the dataset in order to compare findings.

The first findings got the empirical confirmation about the non-compliance of Maastricht criteria for the analysed sample and period, therefore the next step, 3, should analyse the differences in the fulfilment of these criteria by the EZc and the n-EZc. We attempt to find out whether those variables were sufficient enough to meet the challenges posed by the European Monetary Union (EMU).

Therefore, a more detailed analysis of the individual economic variables was considered. The trend of the performance along the years for the countries were analysed in order to check differences between data when the country belongs to or not to the Eurozone for the period 2002 - 2015. The longitudinal nature of the data suggests using standard repeated measurement models. Since a pre-analysis of data indicated changes in the overall trend within the observation period, a model accounting for these changes had to be employed.

Segmented regression mixed models were applied to fit the data and to test differences between the EZc and the n-EZc, as well as to find a change point in the evolution of the results along time.

For this analysis, an adjustment of the Eurozone indicator was tested in order to check differences in the variables that are considered (Muggeo et al., 2014). General description of the inflation, public deficit, sovereign debt and unemployment are provided for each country along the period of time.

Segmented mixed regression model with random country intercept, time, changepoint and slope, as well as a fixed effect for Eurozone indicator, polynomial function of order 3 of time and random covariates that influence the change point and slopes were fitted. Goodness of fit of the model was based on the residual's distribution as well as on the AIC criteria².

The results provide us with information regarding a change point along time, and magnitude of differences if the country belongs to the Eurozone or not. The detailed results are shown in section 4.

In step 4, we analyse the differences in the valuations of each country in the market, depending on the degree of compliance with the precedent criteria. In other words, our goal is to determine whether the EZc and the n-EZc were rated differently according to the degree by which they had met the convergence criteria. The differences are shown in the evolution of the long-term bond yields in each country. Accordingly, our objective was to uncover which group of countries showed better results and whether their valuation in the financial markets could be somehow tied to the compliance with the preceding criteria.

² The Akaike information criterion (AIC) is an estimator of the relative quality of statistical models for a given set of data.

A higher bond rate would imply more fiscal benefits, implying greater incentives for companies and investors. Subsequently, we analysed this rate for in the EZc and the n-EZc when they failed to comply with the criterion 2, 3 or 4.

Therefore, a further analysis of the association of the economic variables (inflation, deficit, public debt and unemployment) and the bonds yields was also made taking into account the countries' status (EZc and n-EZc) and the Maastricht' criteria³.

For the EZc, four new indicators were defined for each country and year; 0 if they did not reach the criterion and 1 if they did.

The times that each criterion was unfulfilled per country is provided, as well as the number of criteria unfulfilled in relation to the total years within the eurozone.

The association of the economic variables with the bonds yields was analysed. In addition, another variable classified the data as:

- non-Eurozone,
- Eurozone fulfilling the criteria for the year,
- Eurozone unfulfilled 1 criterion,
- Eurozone unfulfilled 2 criterion,
- and Eurozone unfulfilled 3 criterion or more was defined in order to test for differences in the bonds yields depending on the status of the country in the year analysed.

Thus, associations between bonds yields and the rest of variables was analysed using mixed regression analysis with country-intercept random effect, a polynomial function of order 3 of time and Eurozone classification as defined as fixed effect (McCulloch et al., 2008). The results are shown below.

The statistical analysis was performed in R-software and the test were carried out at 5% significant level.

4. RESULTS

We show our results in three blocks:

A cluster analysis to test group of countries with similar behaviour in the trend of inflation, deficit, unemployment and sovereign debt.

Each of the variables was modelled assuming a Gaussian response. The country intercept was modelled using random effects; for the slope parameter, a random effect is used for inflation, while for all other indicators a fixed effect was used.

³ Inflation (HICP) cannot be greater than 1.5% compared to the average of the three states with the lowest inflation Eurozone

• Deficit (cannot represent an amount greater than 3% of GDP)

• Public debt (gross debt) cannot represent an amount greater than 60% of GDP

• Unemployment: although not an explicit criterion, a level not higher than average EMU is recommended.

Selection for fixed or random effects for slope-parameters were based on preliminary analysis.

Model-estimation was then carried out using the MCMC-simulation method implemented in the package (Komárek and Komárková, 2014; Komárek, 2009). The model was estimated for up to three clusters, $K = 1, 2, 3$, and as criterion for model selection we used the penalized expected deviance (PED) suggested by Plummer. A lower PED indicates a more appropriate model choice.

The procedure used a burn-in of 1000 simulations and a thinning of every 10-th value was applied; the final number of simulated values entering the analysis was $n = 5000$. Values of the PED for the three models were as follows (table 2):

TABLE 2. RESULTS FOR THE THREE MODELS

K	PED
K = 1	1973.92
K = 2	2511.65
K = 3	3741.51

Therefore, the best results are those with only one cluster, indicating no significant differences between countries within the EZc based on the variables analysed and using the fore-mentioned criterion.

To understand whether the n-EZc differ from the EZc, we repeated the same analysis using the entire database with all (28 countries).

The results show that, based on the (lowest) PED, the best results are those with one cluster: ($K = 1$, PED = 4070.0), ($K = 2$, PED = 4136.52), ($K = 3$, PED = 6841.65). These results indicate that no clear differences between the n-EZc and the EZc can be made if we consider the four indicators at the same time. Therefore, based on the trend of the four variables we do not have sufficient evidence to use different clusters for every country, (even if for some subsets of the indicators a significant difference may be identified). Consequently, our analysis was focused on the EZc and the n-EZc, in particular, on the variations in inflation, public deficit, sovereign debt and unemployment.

b) A more detailed analysis was focused on each variable. Segmented mixed models with random change points fitted for each variable and adjusted for the Eurozone indicator. The results for each variable were as follows:

The adjusted average of inflation in the EZc was approximately -1.88 (-2.58, -1.19) units, lower than the n-EZc ($p < 0.001$), the changepoint for inflation was in 2008 ($p < 0.001$), with an average adjusted difference in the slope of 0.39 (0.212, 0.568) lower for the n-EZc ($p < 0.001$).

For the sovereign debt, a difference between the EZc and the n-EZc was detected, with an overall adjusted difference of 13 (-18.05, -7.78) unit lower in the EZc. A change point in 2007 was found significant $p < 0.001$, with an increase in the debt of 11 (8.57, 13.44) points after that year ($p < 0.001$).

For the public deficit no overall imbalance was found between the EZc and the n-EZc ($p=0.686$), a change point in 2009 was found significant $p<0.001$, with increasing values of the deficit after 2009 with an overall change in the slope of 2.02 (1.309, 2.742) units ($p<0.001$).

For unemployment, there were no clear difference between the EZc and the n-EZc was found ($p=0.245$). A change point in the tendency of unemployment was found after 2007 $p<0.001$, with an increasing slope of the tendency of 4.54 (3.927, 5.168) after that year ($p<0.001$).

TABLE 3. AVERAGE IMBALANCES BETWEEN THE EZc & THE n-EZc BEFORE AND FROM ECONOMIC RECESSION

Variable	Average imbalance EZc vs n-EZc before the economic recession	Average imbalance EZc vs n-EZc during the economic recession
Inflation	-1.88	0.39
sovereign debt	13	11
public deficit	--	2.02
Unemployment	--	4.54

According to these results, we observe that the Maastricht criteria proposed are not sufficient to build an economically stable zone.

c) Bond yields and the Maastricht criteria

In order to check the association of the criteria analysed, a mixed regression model was adjusted using a polynomial function of order 3, as well as an indicator of Eurozone status was fitted, including random effect over the time and per country. Log-transformation was applied to the yields values in order to fit the regression model and meet the normality assumption of the residuals.

Regarding the inflation, no interaction or association effect between the EZc was found ($p=0.733$, $p=0.760$, respectively). Therefore, we don't have enough empirical evidence to confirm hypothesis 1.

No significant association or interaction of public deficit with bond yields was found, in the EZc ($p=0.325$, $p=0.101$).

No association or interaction of the sovereign debt in the EZc was found with bond yields values ($p=0.430$), ($p=0.1961$). Ensuing not enough empirical evidence to confirm hypotheses 2 and 3.

Yet, unemployment was significantly associated with the bond yields values, increasing unemployment enhanced the bond yields, for each increasing unit of unemployment in the n-EZc raised bond yields 1.5% (95% C.I.: (0.5%, 2.6%)) ($p=0.045$), which confirms hypothesis 4.

However, in the EZc was found significant, per unit increased of unemployment, bond yields grew up 5.6% (95% C.I.: (2.9%, 8.4%)) ($p<0.0001$); the effect of unemployment on bond yields is higher within the EZc than in the n-EZc.

Overall, lower values of bond yields were found for the EZc, for those countries the values of bond yields were 0.647 times the values in the n-EZc, in other words, the yields are 35% (95% C.I.: (24.8%, 44.2%)) lower than in the n-EZc.

BREACHES OF THE MAASTRICHT CRITERIA IN DETAIL

Regarding the breaching of the criteria within the EZc, a further model for the bond yields was applied to find out the differences in the fulfilment of objectives between the EZc and the n-EZc when they fulfilled all objectives and when they breached 1, 2 or 3 objectives.

A significant difference was not found in the bond yields when the EZc fulfilled all objectives vis-à-vis the n-EZc ($p = 0.785$) showing similar results in both groups.

However, as soon as the EZc breached the criteria, lower significant bond yields were observed in comparison with the non-EZc. When the EZc fulfilled 3 of 4 criteria the bond yields were 20% (95% C.I.: (5.1%, 33.7%)) lower than in the n-EZc ($p = 0.015$). When the EZc fulfilled 2 of 4 criteria the bond yield was 40% (95% C.I.: (30.5%, 49.9%)) lower than the non-EZc ($p < 0.001$) and when fulfilled only 1 of 4, the bond yield was 65% (95% C.I.: (33.2%, 82.5%)) lower than the non-EZc ($p < 0.001$).

Finally, in order to test which of the breached criterion have a greater effect on the long-term bond yields rates, a mixed regression model was applied for each unfulfilled criterion (1,2,3,4). No association was observed between breached inflation criterion with bond yields ($p = 0.909$), nor with the sovereign debt ($p = 0.155$). An association was found with the breach of public deficit criterion 22.2% (95% C.I.: (11%, 34.6%)) ($p = 0.0001$); when the deficit is not fulfilled, the bond yields increases. Also, for those countries breaching the unemployment criterion, a higher bond yield was observed in 32% of its value (95% C.I.: (10%, 59%)) ($p = 0.0027$).

5. DISCUSSION OF RESULTS

The results of our study show that the EZc are much more susceptible to the non-compliance with one of the convergence criteria since their long-term bond yields fall much more than those of the n-EZc (in non-compliance situation).

They also indicate that differences in long term bond yields have very negative consequences, especially for the EZc, leading in some cases to their inability to meet these criteria (as was the case for the period 2000-2015), even in an expansionary phase of the economic cycle.

A key fact is that during the last crisis, when all the criteria were not met at the same time, the consequences of such situation were not significantly different for the n-EZc. In any case, it is clear that the existing criteria and re-balancing measures need to be reviewed in the light of the differences between EU countries.

Our results clearly show that during the crisis, the n-EZc were better assessed by the financial markets (as evidenced in their long-term bond yields) even when they do not fulfil one of the convergence criteria. Moreover, they recovered earlier from the crisis.

Analysing the effects of non-compliance with each criterion separately, the most harmful effects in all the countries were those resulting from the non-compliance with unemployment. That is why policies to reduce unemployment are much needed, particularly in the EZc.

Altogether, the Maastricht criteria did not take into account specific differences between countries, and the EU had insufficient mechanisms to deal with economic shocks, which were attempted to be corrected by reforms implemented in each country on an individual basis, which finally failed to reduce the unemployment differences, with a deep impact on growth and convergence (Mayes 2018; Bagnai and Mongeau, 2017; Turrini et al. 2015).

To summarise, our results show that the impact of non-compliance with the convergence criteria vis-à-vis the bond yields in each country is deeper when the unemployment rates are significantly different. Therefore, it appears clearly that the longer these criteria are set aside, the greater the damage will be to the European countries that were affected the most by the economic crisis, particularly those belonging to the Eurozone.

For the above reasons, we propose firstly, to review the employment policies and the labour market reforms, which would facilitate the formulation of a new criteria at the EU level, according to the differences between countries.

Secondly, the non-compliance with the public deficit criterion, also turned out to be harmful to the EU countries, particularly in the EZc. Hopefully, the new Stability and Growth Pact, which adds this criterion in the Member States' Constitutions, will facilitate its implementation.

The remaining criteria (debt and inflation) do not change significantly between the EZc and the nEZc. The current crisis and the evolution of the monetary union in Europe have clearly demonstrated the need for greater cooperation on European financial policy. The current system is not working, and the EU needs a deeper integration. A system based purely on inter-government cooperation has not worked in the past and will not work in the future.

To sum up, we believe that in order to tackle the economic imbalances of the considered variables, the euro system needs more precise and binding rules accompanied by solidarity mechanisms, and more economic coordination and employment support. These mechanisms cannot involve quantitative objectives but must allow more flexibility and sensitivity to the challenges of the weaker economies (Mathieu and Sterdyniak, 2014).

6. CONCLUSIONS

This research tackles a fundamental and highly topical issue: the consequences of the design of the euro, centred on the fulfilment of macroeconomic objectives, but without considering other key variables such as unemployment. This system has flaws that have intensified with the last major recession and are affecting the stability of the participating countries.

One of the relevant aspects of the paper consists of the contribution of empirically tested results for a relatively long period for a wide sample that includes 28 European countries. Thus, the Maastricht objectives are analysed during the most important stages in the European enlargement process (2006, 2007-2010, 2010-2015).

The analysis also includes a cost-effectiveness perspective, studying the benefits of decisions on whether or not to comply with the criteria as they were designed. This shows how the differences in market ratings of their 10-year bonds in each country have very negative effects, especially for Eurozone countries.

The results of this research show that when the Maastricht criteria were established, the disparities between countries were not taken into account, nor was the EU sufficiently prepared to deal with the possible economic shocks that subsequently occurred.

In addition, it highlights how the reforms carried out in each country to correct the situation have not managed to attenuate the gaps in the unemployment rate, which has important consequences on growth and convergence.

The consolidation of the Monetary Union needs a high commitment among its member countries. However, the different periods that the common currency has crossed have shown that these commitments have not been fulfilled by all the countries, which is why the question was raised of whether the criteria required to join the euro and become a member of the Eurozone are suitable and whether the existing mechanisms are sufficient to deal with extreme situations, such as those experienced in recent years.

The results show that the Maastricht commitments were not appropriate under the situation of the European economies and underline the need to make progress towards other criteria such as greater coordination of the economic and budgetary policies in Member States, greater convergence in employment, and greater sensitivity to singular cases.

Imbalances in compliance with selected criteria, depending on whether the EZc and the n-EZc, entail a different degree of investor confidence towards these countries in their long-term bond yields, which has had consequences in the evolution of other key indicators of the economy.

The Treaty of Lisbon is not the instrument the EU needs to face important shocks since the Commission does not have the powers to manage a sustainable governance of the Union as a whole (Darvas et al. 2010). Further, the EU includes several potential conflicts in many of their objectives and policies, including ad-hoc policies instead of carefully coordinated reforms (Ferreiro et al., 2014).

EU authorities and Member States did not react quickly and decisively to the negative effects of the crisis, relying primarily on restrictive policies, improvised measures and reactions which ultimately failed to address the fundamental problems of the Monetary Union.

So, the EZ needs to consider elements of fiscal federalism to deal with its biggest weaknesses. Even without a big budget, the conclusion is that in the

future the EU will be built around macroeconomic bases that could overcome some limits of sovereignty, a change in the rules to construct a common future.

Possibly, the solution to address the problems of the European monetary union needs to be inspired by the measures implemented by Alexander Hamilton in the United States, meaning that progress in the fiscal union could be reached by establishing a clear separation between the Union's commitments and those of the Member States for which maximum public deficit limits can be imposed. Moreover, a federal budget can be established, enabling the states undergoing a crisis or emergency situations to be protected.

On the other hand, until now, the debt problem has been tackled with temporary measures, with the help of the rescue fund and the European Central Bank direct interventions in the form of sovereign debt purchases. However, in order to transmit confidence about the effectiveness of the EU system, the necessity to develop and put in place a comprehensive and appropriate mechanism has become more urgent than ever. Firstly, it may not be a mechanism involving recurring and permanent transfers and, secondly, it must envisage instability situations under which it will be triggered.

We propose, therefore, the creation of a fiscal stabilisation instrument (measure), which would be accessible to crisis-affected countries when their national resources proved insufficient.

This would be a measure aimed primarily as a solution for protecting public investments and would be addressed only to eligible countries facing an economic crisis, through a possible European Monetary Fund.

In order to be entitled to the aid, the applicant State would have to demonstrate compliance with the budgetary discipline criterion, having regard to the provision that fulfilment of this condition does not involve the aforesaid system of recurring and permanent transfers.

The common budget would also be useful to support countries that are implementing reforms (at a national level) and when they could not afford further spending because of the deficit limits. This mechanism could focus on employment.

It is also important to analyse the employment, taking into account country-specific circumstances. The high level of unemployment is triggering public spending policies which ultimately affect debt and the stability of the entire monetary union. Employment policies and mechanisms must, therefore, be strengthened in order to reduce disparities, especially in the long run, and to achieve the convergence between all the EU countries and not only in the sub-groups of countries. Against this backdrop, the establishment of the Euro budget could be conducive to aligning current employment levels across different economies, thereby bridging the gaps in countries (financial) market assessments (evidenced in their long-term bond valuations).

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