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What is new about covered interest parity condition in the European Union? Evidence from fractal cross-correlation regressions

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HIGHLIGHTS

- We analyse financial integration in the EU using two novel regression frameworks.
- We study the covered interest parity before and after the Eurodebt crisis.
- Results point to the parity verification mainly in the Central Europe.
- In the remaining countries, the verification of the parity is only residual.
- Results do not show difference between either period under analysis.

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ABSTRACT

We analyse the covered interest parity (CIP) using two novel regression frameworks based on cross-correlation analysis (detrended cross-correlation analysis and detrending moving-average cross-correlation analysis), which allow for studying the relationships at different scales and work well under non-stationarity and heavy tails. CIP is a measure of capital mobility commonly used to analyse financial integration, which remains an interesting feature of study in the context of the European Union. The importance of this features is related to the fact that the adoption of a common currency is associated with some benefits for countries, but also involves some risks such as the loss of economic instruments to face possible asymmetric shocks. While studying the Eurozone members could explain some problems in the common currency, studying the non-Euro countries is important to analyse if they are fit to take the possible benefits. Our results point to the CIP verification mainly in the Central European countries while in the remaining countries, the verification of the parity is only residual.

1. Introduction

When a country decides to adopt a common currency, as happens with countries entering or interested in entering the Eurozone, they expect to gain some benefits. The main benefits are decreasing the costs for agents because the exchange rates disappear and markets become more competitive (for example, with a decrease of intermediation costs), a harmonization of

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financial and services prices and a better allocation of savings. These benefits will allow agents to increase their consumption levels, to have better investment returns and, consequently, to reach better economic performances, due to a higher market efficiency. However, the adoption of a common currency is also a challenge: the possibility of an increased exposure to risk and the possibility of emergence of global crisis are factors to consider. Besides these, and probably more importantly, that decision will make the countries lose their monetary authority. In fact, monetary policies could be very important to fight a crisis and to combat possible asymmetric shocks that occur in economies.

The benefits and risks of adopting a common currency are well documented in the literature, but it is also known that to attain all the benefits and mitigate the possible risks, countries should be financially integrated (see, for example, [1]). If countries are not so integrated, they shall not enjoy all the benefits and they shall increase those risks. Furthermore, economic disparities could also increase between countries.

It is possible to find several different approaches and methodologies towards analysing financial integration. The use of interest parities, data from banks and information of stock markets are the main price approaches. Tests of correlation between national investment and saving, correlations of consumption between countries and studies of the behaviour of flows are the main quantity approaches.

In this paper, we use the covered interest parity (CIP), which is considered as a pure criterion of economic mobility [2]. Since investors have financial instruments to cover exchange rate risks, they will carry out arbitrage operations and eliminate the existent differentials between return rates of assets that are similar in all (for example, maturity or political and sovereign risks, among others) except in currency denomination. The existence of capital mobility, as occurred in the European Union (EU) since 1992, should ensure the elimination of the referred differentials.

Formed by 11 countries in 1999, the Eurozone has now 19 members. Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal and Spain adopted the Euro in 1999, while Greece entered the common currency area two years later. After that, other seven countries adopted that currency: Slovenia (in 2007), Cyprus and Malta (both in 2008), Slovakia (2009), Estonia (2011), Latvia (2014) and Lithuania (2015). Although without announced dates, some of the remaining EU countries could decide to adopt the Eurozone in the future.

Regarding the benefits and possible costs of the adoption of the common currency, the study of financial integration is still an actual issue, mainly by two factors. Firstly, regarding the countries that had already adopted the Euro, it is interesting to analyse if they were able to enjoy all the benefits. And secondly, for those countries which are not in the Eurozone, it could be useful to analyse if they meet the conditions to adopt that currency.

In this study, we analyse CIP for all Eurozone countries with available data. Relevant data are not available for Luxembourg, Cyprus and Malta. Besides this, Germany is used as reference for some countries, as explained in the next section. We thus analyse 15 Eurozone members. For the remaining EU but non-Euro countries, the data are available. Apart from a wide dataset studied here, an important contribution of our analysis lays in utilizing two novel regression methods based on detrended cross-correlation analysis and detrended moving-average cross-correlation analysis recently proposed by Kristoufek [3,4].

Our main results point to the verification of CIP just in some Central European countries, like Austria, Belgium, the Netherlands and in France (although in a minor extension). As in other works, the Southern European countries show little evidence of CIP verification, as well as other new Eurozone countries.

Aware of the fact that turmoil periods could have influence towards the CIP verification (see, for example, [5] or [6]), we split our whole sample into two different subsamples: before and after the Eurodebt crisis. Following [7], we chose the 20th of October 2009 to split our sample. With this break, we cannot analyse the effect of the turmoil for the first group of Euro adopters, because their samples end before of that date. Furthermore, Slovenia and Slovakia also adopted the common currency before the referred episode. Estonia adopted the Euro in 2011, but the split of the sample would lead to a very small sample in the second subperiod (around 300 observations). So, we excluded it from our analysis. From the Eurozone countries, we can analyse both subperiods only for Latvia and Lithuania. For the non-Eurozone countries, we can analyse CIP both before and after the beginning of the crisis. It will allow us to analyse if the crisis had any impact on an eventual future decision of joining the Eurozone, regarding to the possible advantages.

Regarding the split of the sample, the results are not significantly different, both considering the Eurozone countries (in this case, just Latvia and Lithuania) or the non-Eurozone countries. Results are similar, both before and after the crisis, so CIP has low evidence of verification, without any evidence for a change in that behaviour.

The remainder of the paper is organized as follows: Section 2 explains the covered interest parity (CIP) and presents a brief literature review on it, considering the countries studied in this paper. Section 3 presents the data and methodology used. Section 4 shows our results and Section 5 concludes.

2. Covered interest parity condition and a literature review

Assuming investors have available forward contracts as instruments to make risk coverage, the covered interest parity (CIP) for short maturities (less than one year) is formalized as follows:

$$\frac{F_{t+1}}{S_t} = \frac{1 + i_t^*}{1 + i_t} \tag{1}$$

where i is the nominal interest rate, S the spot exchange rate,[1] and F the forward exchange rate. The symbol * is used for variables of the foreign country. It means that, prior to the adoption of the Euro, it was necessary to find a country which

[1] Units of foreign currency per unit of domestic currency.

serves as reference. We stick to the usual concept of using Germany as a reference country, which, however, implies that Germany as such cannot be analysed. For the other countries, the foreign variable is the Euro. Taking the logarithm of the previous equation, we get[2] :

$$f_{t+1} - s_t = i_t^* - i_t. \tag{2}$$

Rearranging the previous equation and isolating the national rate, we have

$$i_t = i_t^* - (f_{t+1} - s_t). \tag{3}$$

If we define $ic_t^* = i_t^* - (f_{t+1} - s_t)$ as the covered foreign rate and include an error term, it is possible to write the equation $i_t = ic_t^*$. In order to test CIP empirically, it is possible to estimate the following equation:

$$i_t = \alpha + \beta ic_t^* + \varepsilon_t. \tag{4}$$

CIP holds if $\alpha = 0$ and $\beta = 1$. Testing CIP is thus equivalent to testing these two conditions jointly. Transaction costs, obstacles preventing capital mobility such as government restrictions to capital circulation and political risk[3] are detected in the constant term (which will be different from zero). On the other hand, the β parameter different from the unity could be explained by differences in fiscal treatment of returns, financial restrictions imposed by governments or data imperfections.

The CIP condition could be studied using different methodologies. Some of the former studies applied the ordinary least squares (OLS) to estimate Eq. (4). However, as both variables of interest are commonly non-stationary, such estimates are not reliable. A straightforward way of testing such relationship is utilizing the cointegration procedures, which allow for analysing CIP in its weak form [9,10]. Alternatively, CIP can be tested on differentials of Eq. (4), see e.g. [9–12].

However, with the development of econometric methodologies, it is possible to use other methodologies. Ferreira et al. [13] use the general maximum entropy (GME) to analyse Eq. (4) directly. Although, this analysis could be performed just for cointegrated series (GME estimations are not feasible if cointegration is not verified). In fact, and as we can notice, this is the unique work which analyses CIP with the referred equation. More recently, Ferreira et al. [14] and Ferreira and Dionísio [15] use the detrended cross-correlation analysis (DCCA) and the respective correlation coefficient to analyse CIP. The first work analyses the first group of countries to adopt the common currency, while the second one extends the analysis to the other countries (those which adopted the Euro later and those which did not adopt it).

Besides different methodologies, we can also find CIP studies using different countries and samples. Due to data availability, the first studies just use countries from Central Europe. Generally, the referred works find evidence in favour of financial integration (see, for example, [10,16], or [11]). For these countries, evidence against CIP is rare, but it is found by Holmes and Wu [12], which refer that exchange rate turbulence and the German unification could explain the differentials found in CIP.

Regarding the first group of countries that adopted the Euro, it is also possible to find some studies using other countries, namely the peripheral economies of the EU. For example, the studies of Ferreira et al. [13], Ferreira [9], Ferreira and Dionísio [15], and Ferreira et al. [14] show that countries like Greece, Ireland, Italy, Portugal or Spain present some violations of CIP.

Majority of the referred works analyse rather old samples. This happens because the analysis of CIP using the former countries to adopt the Euro could be run just until 1999 because after that date, it is not possible to have data on exchange rates (which do not exist). But the fact that some countries have not adopted the Euro and other enlarged the EU makes the analysis of CIP still actual.

In fact, it is possible to find some studies using other countries, namely for the newer EU countries. For example, Mansori [17] studies Hungary, Poland and the Czech Republic, and analyses the CIP differentials. The author finds that these countries showed similar conditions to those verified by the EU countries in the pre-Euro era. The same countries are studied by Ferreira [9], who finds contrary evidence, rejecting CIP. Herrmann and Jochem [18] add Slovakia to their sample and find the same conclusions. Filipozzi and Staehr [19] do not use Slovakia but extend the analysis with Romania. All the countries show evidence against CIP. Ferreira and Dionísio [15] use data for Bulgaria, the Czech Republic, Hungary, Estonia, Latvia, Lithuania, Poland, Romania and Slovakia and the results show that Bulgaria and the Czech Republic have some evidence in favour of the CIP verification (although higher in the latter).

Regarding the three countries that decided not to adopt the Euro at the moment of its creation (Denmark, Sweden and the UK), studies usually find that Denmark and Sweden show some evidence of the CIP verification, while the UK has worse results. Studies like the ones of Lemmen [1], Holmes and Pentecost [10,16], Ferreira [9] and Ferreira and Dionísio [15] corroborate such results.

There are studies that study CIP outside the EU, specifically in the Asian markets (see, for example, [20]), the BRIC countries (see, for example, [21]), between specific pairs of currencies (like, for example, [22]) or even for big markets (see,

[2] It is assumed that $\ln(1+z) = z$, a standardly used approximation when z close to 0.

[3] Political risk is the probability of future government intervention in financial markets [8], which means that investors anticipate the government's intention to impose obstacles to capital mobility and demand an extra premium for his investment.

for example, [6]). Although, these and other studies are beyond the main focus of this paper, which is the analysis of CIP condition for the European Union.[4]

As previously referred, the use of DCCA and DMCA regression frameworks are new approaches to the study of CIP. In addition, they allow for a more detailed analysis as individual parameters of Eq. (4) can be studied both separately and jointly, while other methodologies do not allow it.

3. Methodology and data

In financial and economic applications, the detrended fluctuation analysis (DFA) and the detrending moving average (DMA) procedure are usually used to study long-range serial correlations [28–30]. However, they have convenient properties which make them useful for more general applications. Among others, DFA and DMA turn out to be robust to long-range dependence, short-range dependence and partly also to heavy tails [31–33]. One of the possible avenues has been uncovered by Zebende [34] who introduces the correlation coefficient based on DFA and its bivariate generalization—the detrended cross-correlation analysis (DCCA) [35,36]. This correlation coefficient attracted much attention both theoretically and empirically [37–40]. Kristoufek [41] uses the same idea and introduces the correlation coefficient based on DMA and its bivariate generalization – the detrending moving-average cross-correlation analysis (DMCA) [42,43] – which turns out to be more robust to long-range dependence than the method of Zebende [44].

Kristoufek [3,4] introduces regression procedures which are built on the similar idea as the DFA/DCCA and DMA/DMCA based correlation coefficients, i.e. estimating a relationship between variables for different scales as well as getting more precise estimates in the case of long-range dependent and/or non-stationary time series. The essential idea of both procedures is the connection between the least squares estimator and fluctuation functions of DFA/DCCA and DMA/DMCA. As the least squares estimator is in fact a fraction between covariance and variance, the same can be applied for scale-specific covariance and variance based on DFA/DCCA and DMA/DMCA. The estimators of regression parameters can be then simply written as

$$\hat{\beta}^{DFA}(s) = \frac{F^2_{XY,DFA}(s)}{F^2_{X,DFA}(s)}$$
$$\hat{\beta}^{DMA}(\lambda) = \frac{F^2_{XY,DMA}(\lambda)}{F^2_{X,DMA}(\lambda)}$$

where $F^2_{X,DFA}(s)$, $F^2_{XY,DFA}(s)$, $F^2_{X,DMA}(\lambda)$, $F^2_{XY,DMA}(\lambda)$ are fluctuation functions parallel to scale-specific (scales are labelled as s and λ) covariance and variance functions for DFA/DCCA and DMA/DMCA procedures, respectively. This way, we can obtain the relationship between two variables with respect to a specific scale. The procedures can be also used to estimate a global parameter β simply by estimating the scale-specific parameters and averaging over the scales. Such procedure yields very promising results as reported by Kristoufek [3].

As we are interested in testing whether $\alpha = 0$ and $\beta = 1$ both separately and jointly, we need appropriate t-statistics and F-statistics for these respective cases. For the former, we need standard errors of the estimates. Specifically, we stick to the logic of the least squares standard errors and we thus have

$$SE\left(\hat{\alpha}^{DFA}(s)\right) = \frac{1}{\lfloor T/s \rfloor} \frac{\sum_{i=1}^{T} x_i^2}{T} \frac{F_{\hat{u},DFA}}{F_{X,DFA}}$$
$$SE\left(\hat{\alpha}^{DMA}(\lambda)\right) = \frac{1}{\lambda - 1} \frac{\sum_{i=1}^{T} x_i^2}{T - \left\lfloor \frac{\lambda}{2} \right\rfloor - \lambda + 1} \frac{F_{\hat{u},DMA}}{F_{X,DMA}}$$
$$SE\left(\hat{\beta}^{DFA}(s)\right) = \frac{1}{\lfloor T/s \rfloor} \frac{F_{\hat{u},DFA}}{F_{X,DFA}}$$
$$SE\left(\hat{\beta}^{DMA}(\lambda)\right) = \frac{1}{\lambda - 1} \frac{F_{\hat{u},DMA}}{F_{X,DMA}}.$$

These allow us to construct the t-statistics for separate null hypothesis. Note that we keep the assumptions of the least squares procedure here as well. The biggest difference between the DFA and DMA based procedures is that we are losing more degrees of freedom for the former as we estimate a constant and a linear trend in each window of size s. Therefore, the standard errors for the DFA estimator are usually wider and thus the estimates of DFA are usually less precise than the ones of DMA. Nevertheless, utilizing both procedures provide a more solid ground for our results.

In our study, we analyse CIP using interbank interest rates with maturity of 1, 3, 6 and 12 months, denominated in the currency of each country. It is necessary to use the spot and forward exchange rates to analyse CIP. For countries that adopted

[4] The analysis of CIP could be included in a broader research field of analysis: the efficiency of foreign exchange markets [23]. Since the seminal works of Hakkio [24], Hansen and Hodrick [25,26] or Fama [27] that many studies analyse the behaviour of exchange markets, with several methodologies. Once again, it is important to identify that our main objective is to analyse CIP in the European Union, so that we do not provide an extended literature review about exchange markets efficiency.

Table 1
Beginning of samples and number of observations. The first group is composed of countries that adopted the Euro in 1999. The second group is formed by countries which adopted the Euro later. The las group is formed by non-Euro countries.

Country	Date of beginning	Number observations
Austria	10th June 1991	1975
Belgium	2nd November 1990	2130
Finland	31st December 1996	523
France	2nd November 1990	2130
Greece	31st December 1996	523
Ireland	31st December 1996	523
Italy	1st April 1993[a]	1501
Netherlands	2nd November 1990[b]	2130
Portugal	31st December 1996	523
Spain	19th December 1991	1836
Estonia	29th March 2004	1765
Latvia	29th March 2004	2547
Lithuania	29th March 2004	2808
Slovenia	29th March 2004[c]	715
Slovakia	11th February 2002	1798
Bulgaria	29th March 2004[d]	3242
Croatia	29th March 2004[e]	3242
Czech Republic	1st January 1999	4608
Denmark	1st January 1999	4608
Hungary	1st January 1999[f]	4608
Poland	11th February 2002	3797
Romania	29th March 2004	3242
Sweden	1st January 1999[g]	4608
UK	1st January 1999	4608

[a] For the 12-month maturity, Italian sample only begins on 25th May, 1993.
[b] The Netherlands have no available data for the 12-month maturity.
[c] For 3-month maturity, there is no data available.
[d] For the 6 and 12-month maturities, sample only begins on 5th October 2007, with $n = 2323$.
[e] For the 12-month maturity, sample only begins on 20th March 2006, with $n = 2727$.
[f] For the 12-month maturity, sample only begins on 2nd January 2003, with $n = 3564$.
[g] For the 12-month maturity, there is no data available.

the Euro in the first group, it is necessary to use the exchange rate relative to a reference country, and we use the German mark.[5] For the remaining countries, exchange rates relative to the Euro have been retrieved. Daily data from DataStream are used as they provide enough homogeneity.

Table 1 shows information for the beginning of samples and the number of observations for each country used in our study. The table is divided into three groups: the first one, composed by countries which entered in the first group of the Euro[6] ; the second one, formed by the countries which joined the Eurozone later; and the third group, composed by the EU countries which have an autonomous currency. All samples were recovered with respect to the data availability. CIP could be analysed only in countries which have different currencies, so, for the first two groups, the samples end before the entrance of the referred countries into the Euro area. This is the reason for the reduced number of observations of some countries. Regarding the last group, the samples end on the 30th August 2016. As previously referred, and as we can notice, although the use of a different methodology to analyse CIP, this is also the larger database to study the condition in the European Union compared to other topical studies.

As previously referred, in order to study if the turmoil caused by the Eurodebt crisis caused changes in the CIP verification, we split our sample into two—before and after the beginning of that crisis. As explained above, it allows us to study only some specific countries. The first subperiod goes from the beginning of the sample of each country to the 20th October 2009, while the second subperiod goes from that day until the end of the sample. Note that the end of the sample for Latvia and Lithuania is different from the other non-Eurozone countries and that is due to their adoption of the euro. The information about the sample dimensions is presented in Table 2.

5 Exchange rates in relation to German mark are not available, so we retrieved information from each currency exchange rate relatively to the American dollar and, with triangular parity, we calculated the corresponding exchange rate with respect to the German mark. Because transaction costs exist, it is possible there are some differences between the real values and the calculated ones. However, since the dollar is largely used in international markets, those transaction costs are small and the deviations are minimal, which should not have great effect on the tests.

6 As in other studies, we also evaluated the behaviour of Greece until the beginning of 1999.

Table 2
Sample dimensions after splitting the sample.

Country	Observations before crisis	Observations after crisis
Latvia	1451	1096
Lithuania	1451	1357
Bulgaria	1451[a]	1791
Croatia	1451[b]	1791
Czech Republic	2817	1791
Denmark	2817	1791
Hungary	2817[c]	1791
Poland	2006	1791
Romania	1451	1791
Sweden	2817[d]	1791[d]
UK	2817	1791

[a] For the 6 and 12-month maturity, $n = 523$.

[b] For the 12-month maturity, $n = 936$.

[c] For the 12-month maturity, $n = 1773$.

[d] For the 12-month maturity, there is no data available.

4. Results

In our analysis, we estimate the CIP relationship utilizing the regression frameworks based on DCCA and DMCA for the three specified groups of countries. The parameters have been estimated for scales between 10 and 250 for DCCA and between 11 and 251 for DMCA. For some countries, which have smaller samples, the highest scales have been set to 100 and 101, respectively.

We start the analysis with the countries which founded the Eurozone. Table 3 shows the results of DCCA and Table 4 shows the results of DMCA. We present only the lowest and the highest estimated scales,[7] which can be interpreted as short-term and long-term effects, respectively.

In the short run, the hypothesis of CIP is rejected for all countries except for Greece (in the 3 and 6 months maturities). These are curious results, because Greece is one of the main countries which face rejections of CIP in other studies. Although, the fact that the sample is smaller could affect these results as well as rather high uncertainty of this specific estimate (with high standard errors compared to the other countries). For all other countries and maturities, both parameters are significantly different from the hypothesized ones in the short-run.

The analysis of the behaviour of the CIP equation in the long run allows us to have different conclusions and in line with other studies. Firstly, Central European countries show evidence in favour of the CIP verification. It is observed for Austria (except for the 12-month maturity), Belgium and the Netherlands (although in these two countries, with DMCA, some maturities have contrary evidence). Other Central European countries and France have some evidence against the CIP verification: some parameters from DCCA are not the expected, as well as almost all the parameters of DMCA. The speculative attacks in the European Monetary System in 1992 could be the reason for the non-verification of CIP in France, and is also referred to in [13].

In the case of the Southern European countries, results are similar to the ones in other studies, with some evidence of the CIP failure. Excepting the previous referred case, these countries show evidence against the CIP verification: Greece (for most of the maturities, considering the long run), Ireland and Spain (mainly considering DMCA), and Portugal in some shorter maturities. The remaining country, Finland, shows evidence against the CIP verification as well (also common with other studies).

The second group of countries considered in this study includes other countries which adopted the Euro as a currency later—Estonia, Latvia, Lithuania, Slovakia and Slovenia. Results are presented in Tables 5 and 6. Except for the 1-month maturity, where we can observe that DCCA and DMCA found some parameters in hand with the theory, in the remaining cases, all the results are against he CIP verification.

Finally, the last group of countries is composed of the other EU countries which keep their own currencies, with the results presented in Tables 7 and 8. For these countries, the evidence about the CIP verification is very low and we can divide the results into the older EU members (Denmark, Sweden and UK) and the new EU members (Bulgaria, Croatia, the Czech Republic, Hungary, Poland and Romania). In fact, the older EU members show some evidence in favour of the CIP verification: Denmark and Sweden in the long-term, with DCCA and in the short-term and shorter maturities with DMCA; the UK, mainly in the β parameter, using DCCA, and some short-term evidence in shorter maturities, with DMCA. Regarding the new members, almost all the results point to the non-verification of CIP, excepting some cases: Bulgaria, in 1 month maturity, and in the β parameter in the 3 month maturity, with DCCA; Croatia (1 month maturity, with DCCA); Poland, in the β parameter of 1 month maturity with DCCA; Hungary, in the β parameter of 1 month maturity with DMCA; and Romania in the β parameter of 1 month maturity and in the α parameter of 3 month maturity, both with DMCA. Although, in almost all the other cases, results point to the non-verification of CIP.

[7] This is done simply for brevity. The complete results are available upon request.

Table 3
DCCA regression based results for α and β, for the Eurozone founders.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
AUT	10	0.0514**	0.0170**	0.0526**	0.0223**	0.0526**	0.0246**	0.0521**	0.0299**
	250	−0.0015	1.0011	0.0014	0.9771	0.0024	0.9627	0.0092**	0.8264**
BEL	10	0.0499**	0.1607**	0.0479**	0.1957**	0.0480**	0.1880**	0.0469**	0.2071**
	250	−0.0032	1.1042	−0.0039	1.1092	−0.0022	1.0710	0.0029	0.9636
FIN	10	0.0319**	0.0029**	0.0330**	0.0037**	0.0343**	0.0022**	0.0360**	0.0081**
	100	0.0251**	0.2073**	0.0150	0.5390	0.0048	0.8616	0.0028	0.9260
FRA	10	0.0583**	0.0873**	0.0549**	0.1447**	0.0523**	0.1744**	0.0532**	0.1462**
	250	−0.0279	1.6075	−0.0347*	1.6887*	−0.0223**	1.4305**	0.0002	1.0016
GRE	10	0.1163**	0.0038**	0.0346	1.5615	0.0196	1.3103	0.0520**	0.5514**
	100	0.2359**	−2.9096	−0.0895	3.7841*	0.0097	1.4411	−0.0025	1.0439
IRE	10	0.0550**	0.0644**	0.0537**	0.0543**	0.0512**	0.0568**	0.0475**	0.0653**
	100	0.0007	1.5779	−0.0745*	3.2552**	−0.0271**	1.7993**	−0.0004	0.9944
ITA	10	0.0748**	0.0852**	0.0713**	0.1417**	0.0654**	0.2141**	0.0553**	0.2915**
	250	0.0235	1.1955	0.0060	1.3944	−0.0073	1.4106*	0.0005	1.0084
NET	10	0.0510**	0.0678**	0.0510**	0.0690**	0.0502**	0.0853**	–	–
	250	−0.0033	1.0352	−0.0032	1.0373	−0.0026	1.0348	–	–
POR	10	0.0490**	0.0295**	0.0481**	0.0176**	0.0470**	0.0080**	0.0452**	0.0270**
	100	0.0693	−0.5554	0.0252	0.6310	−0.0068	1.3371	−0.0007	1.0352
SPA	10	0.0730**	0.1640**	0.0657**	0.2632**	0.0618**	0.2858**	0.0587**	0.2735**
	250	−0.0131	1.7531	−0.0189	1.6901*	−0.0148	1.4329**	0.0026	0.9590

* Denotes rejection at a significance level of 5%.
** Denotes rejection at a significance level of 1%.

Table 4
DMCA regression based results for α and β, for the Eurozone founders.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
AUT	10	0.0514**	0.0156**	0.0528**	0.0182**	0.0528**	0.0227**	0.0523**	0.0263**
	250	0.0007	0.9601	0.0000	1.0036	0.0002	1.0042	0.0060**	0.8857**
BEL	10	0.0500**	0.1583**	0.0464**	0.2219**	0.0456**	0.2309**	0.0454**	0.2322**
	250	0.0027	0.9994	−0.0042	1.1148*	−0.0037*	1.0963**	0.0003	1.0089
FIN	10	0.0322**	−0.0041**	0.0329**	0.0083**	0.0338**	0.0156**	0.0353**	0.0270**
	100	0.0198**	0.3680**	0.0085**	0.7320**	0.0024	0.9325	0.0046**	0.8748**
FRA	10	0.0626**	0.0122**	0.0559**	0.1266**	0.0526**	0.1694**	0.0529**	0.1515**
	250	−0.0139*	1.3606**	−0.0221**	1.4715**	−0.0141**	1.2924**	−0.0006	1.0140**
GRE	10	0.1132**	0.0791*	0.0391	1.4805	0.0258	1.2278	0.0615**	0.4655**
	100	0.1076**	0.2159*	−0.0672**	3.3845**	−0.0189**	1.8191**	0.0218**	0.8247**
IRE	10	0.0560**	0.0368**	0.0538**	0.0519**	0.0517**	0.0448**	0.0469**	0.0770**
	100	0.0367**	0.5736	−0.0139**	1.7427**	−0.0148**	1.5266**	0.0035*	0.9201**
ITA	10	0.0757**	0.0654**	0.0714**	0.1401**	0.0658**	0.2074**	0.0557**	0.2861**
	250	0.0529**	0.5601**	0.0135*	1.2507*	−0.0158**	1.5508**	0.0018**	0.9910
NET	10	0.0492**	0.1000**	0.0495**	0.0960**	0.0486**	0.1133**	–	–
	250	−0.0009	0.9917	−0.0021	1.0183	−0.0020**	1.0236*	–	–
POR	10	0.0489**	0.0330**	0.0476**	0.0328**	0.0459**	0.0356**	0.0432**	0.0704**
	100	0.0572**	−0.2061**	0.0328**	0.4280**	−0.0015	1.2064	0.0023	0.9694
SPA	10	0.0779**	0.0729*	0.0692**	0.2043**	0.0652**	0.2348**	0.0598**	0.2599**
	250	0.0087	1.3516**	−0.0050**	1.4561**	−0.0089**	1.3445**	0.0018**	0.9692**

* Denotes rejection at a significance level of 5%.
** Denotes rejection at a significance level of 1%.

The previous analysis has been conducted considering the whole sample. In order to evaluate if the Eurodebt crisis has had an effect on the CIP verification, we split the sample to tow subperiods—before and after the start of the referred crisis. As previously mentioned, regarding the Eurozone countries, it is possible to analyse that evidence only for Latvia and Lithuania, with results presented in Table 9.

Regarding the non-Eurozone countries, the results before the crisis are presented in Tables 10 and 11 (DCCA and DMCA, respectively), while for the period after the crisis, results are shown in Tables 12 and 13. The analysis of CIP considering the

Table 5
DCCA regression based results for α and β, for new Eurozone countries.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
EST	10	0.0281**	0.2073**	0.0366**	−0.0550**	0.0398**	−0.1219	0.0406**	0.0195**
	250	0.0137	0.8261	0.0289**	0.2734	0.0428**	−0.2678	0.0441**	0.1477**
LAT	10	0.0833**	−3.0670**	0.0635**	−1.6358**	0.0531**	−0.9792**	0.0468**	−0.5209**
	250	0.0484	−1.0432	0.0536**	−0.9868**	0.0549**	−1.140**	0.0465**	−0.7840**
LIT	10	0.0172**	0.3160**	0.0339**	−0.3376**	0.0339**	−0.1568	0.0361**	−0.0968
	250	0.0211	0.0713	0.0318**	−0.2094*	0.0396**	−0.5311	0.0412**	−0.5812
SLK	10	0.0472**	−0.0418**	0.0591**	−0.4358**	0.0554**	−0.3909	0.0515**	−0.2929
	250	0.0292	0.5946	0.0491**	−0.0635	0.0543**	−0.3457	0.0539**	−0.4168
SLO	10	0.0398**	−0.2240**	–	–	0.0440**	−0.4521	0.0344**	−0.0117
	100	0.0423**	−0.3360**	–	–	0.0433**	−0.4172	0.0408**	−0.3737

* Denotes rejection at a significance level of 5%.
** Denotes rejection at a significance level of 1%.

Table 6
DMCA regression based results for α and β, for new Eurozone countries.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
EST	11	0.0269*	0.2582	0.0368**	−0.0646**	0.0400**	−0.1354**	0.0405**	−0.0691**
	251	0.0287**	0.1813**	0.0372**	−0.0832**	0.0432**	−0.2853**	0.0438**	−0.2870**
LAT	11	0.0646	−1.9844	0.0616**	−1.5115*	0.0525**	−0.9162**	0.0468**	−0.4974**
	251	0.0456**	−0.8845**	0.0593**	−1.3600**	0.0548**	−1.1950**	0.0466**	−0.7280**
LIT	11	0.0195	0.1739	0.0344**	−0.3666**	0.0355**	−0.2607**	0.0365**	−0.1287**
	251	0.0139**	0.5140**	0.0348**	−0.3897**	0.0402**	−0.5705**	0.0394**	−0.4058**
SLK	11	0.0460*	0.0002	0.0623**	−0.5539**	0.0605**	−0.6051**	0.0538**	−0.4112**
	251	0.0329**	0.4617**	0.0519**	−0.1682**	0.0585**	−0.5225**	0.0570**	−0.5832**
SLO	11	0.0374	−0.1206	–	–	0.0363**	−0.0640**	0.0347**	−0.0292*
	101	0.0428**	−0.3594**	–	–	0.0409**	−0.2953*	0.0380**	−0.2148**

* Denotes rejection at a significance level of 5%.
** Denotes rejection at a significance level of 1%.

Table 7
DCCA regression based results for α and β, for non-Euro countries.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
BUL	10	0.0190**	0.1562**	0.0266**	0.0441**	0.0318**	−0.0225**	0.0442**	−0.0329**
	250	0.0089	0.8951	0.0195**	0.5801	0.0302**	0.3091**	0.0435**	−0.0944**
CRO	10	0.0827**	−3.9035**	0.0487**	−1.0495**	0.0431**	−0.3673**	0.0393**	−0.1399**
	250	0.0308	0.2299	0.0430**	−0.5049*	0.0445**	−0.5972**	0.0385**	−0.4477**
CZE	10	0.0205**	0.1013**	0.0233**	0.0075**	0.0265**	−0.0971**	0.0287**	−0.1237**
	250	0.0145**	0.4054**	0.0177**	0.2784**	0.0211**	0.1606**	0.0250**	0.0438**
DEN	10	0.0104**	0.6023**	0.0160**	0.3682**	0.0184**	0.3002**	0.0210**	0.2448**
	250	0.0040*	0.9235	0.0047*	0.9086	0.0059*	0.8806	0.0072**	0.8530
HUN	10	0.0783**	−0.3774**	0.0755**	−0.3840**	0.0714**	−0.3237**	0.0514**	−0.5243**
	250	0.0764**	−0.2500**	0.0748**	−0.3036**	0.0713**	−0.3609**	0.0539**	−0.3916**
POL	10	0.0407**	0.1304**	0.0441**	−0.0501**	0.0451**	−0.1718**	0.0442**	−0.1618**
	250	0.0341**	0.6031	0.0418**	0.1617*	0.0448**	−0.1138**	0.0441**	−0.1832**
ROM	10	0.0908**	−2.7036**	0.0700**	−1.3499**	0.0607**	−0.7822**	0.0565**	−0.3356**
	250	0.0787**	−1.4764*	0.0713**	−1.8225**	0.0548**	−1.4848**	0.0405**	−0.8551**
SWE	10	0.0146**	0.3956**	0.0168**	0.3234**	0.0232**	0.0627**	–	–
	250	0.0038	0.9461	0.0050	0.9018	0.0082	0.7822	–	–
UK	10	0.0184**	0.5836**	0.0234**	0.3885**	0.0280**	0.1506**	0.0341**	−0.0039**
	250	0.0113**	0.9559	0.0148**	0.8560	0.0179**	0.7520	0.0277**	0.4863**

* Denotes rejection at a significance level of 5%.
** Denotes rejection at a significance level of 1%.

Table 8
DMCA regression based results for α and β, for non-Euro countries.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
BUL	11	0.0196*	0.1063*	0.0277**	−0.0375**	0.0317**	−0.0178**	0.0443**	−0.0183**
	251	0.0129**	0.6064**	0.0221**	0.3853**	0.0312**	0.1042**	0.0429**	−0.1519**
CRO	11	0.0796*	−3.6556**	0.0499**	−1.1693**	0.0435**	−0.4434**	0.0392**	−0.1480**
	251	0.0481**	−1.1476**	0.0479**	−0.9757**	0.0452**	−0.7172**	0.0386**	−0.4203**
CZE	11	0.0196**	0.1441**	0.0225**	0.0425**	0.0265**	−0.0983**	0.0290**	−0.1394**
	251	0.0157**	0.3460**	0.0183**	0.2486**	0.0215**	0.1400**	0.0256**	0.0201**
DEN	11	0.0107	0.5840	0.0153	0.4009	0.0183*	0.3063*	0.0215**	0.2254**
	251	0.0049**	0.8787**	0.0060**	0.8450**	0.0072**	0.8196**	0.0089**	0.7793**
HUN	11	0.0803**	−0.5078	0.0785**	−0.7308**	0.0708**	−0.5917**	0.0542**	−0.3714**
	251	0.0778**	−0.3398**	0.0771**	−0.5661**	0.0707**	−0.6544**	0.0519**	−0.4976**
POL	11	0.0408**	0.1172	0.0446**	−0.1003*	0.0453**	−0.1927**	0.0441**	−0.1929**
	251	0.0343**	0.5941**	0.0395**	0.3670**	0.0431**	0.1525**	0.0445**	−0.0767**
ROM	11	0.0891*	−2.5357	0.0698**	−1.2505*	0.0617**	−0.6690*	0.0573**	−0.3096**
	251	0.0699**	−0.5757**	0.0694	−1.1075**	0.0593**	−0.9516**	0.0466**	−0.6566**
SWE	11	0.0140	0.4261	0.0172**	0.3044	0.0235*	0.0476**	–	–
	251	0.0044**	0.9179*	0.0056**	0.8737**	0.0085**	0.7684**	–	–
UK	11	0.0178	0.6109	0.0232*	0.4019	0.0280**	0.1523*	0.0340**	−0.0025**
	251	0.0120**	0.9181*	0.0151**	0.8375**	0.0186**	0.7096**	0.0284**	0.4363**

* Denotes rejection at a significance level of 5%.

** Denotes rejection at a significance level of 1%.

Table 9
DCCA (upper panel) and DMCA (lower panel) regression based results for α and β, for Latvia and Lithuania.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
DCCA									
LAT	10	0.1354**	−3.2927**	0.0977**	−1.7152**	0.0784**	−1.0439**	0.0656**	−0.5508**
	250	0.0961*	−2.2893**	0.0913**	−1.4330*	0.0830**	−1.3465**	0.0655**	−0.8214**
LIT	10	0.0274**	0.3162*	0.0531**	−0.3602**	0.0496**	−0.1349**	0.0502**	−0.0540**
	250	0.0337	0.9226	0.0560*	−0.4716**	0.0647**	−0.7670**	0.0590**	−0.6083
DMCA									
LAT	11	0.1037	−2.0866**	0.0924**	−1.4781*	0.0770**	−0.9471**	0.0656**	−0.5197**
	251	0.0698**	−0.7984**	0.0807**	−1.2735**	0.0741**	−0.7553**	0.0656**	−0.4876**
LIT	11	0.0318	0.1548	0.0539**	−0.3925*	0.0521**	−0.2405**	0.0510**	−0.1019**
	251	0.0199**	0.5882**	0.0485**	−0.1904**	0.0534**	−0.2954**	0.0528**	−0.2182**

* Denotes rejection at a significance level of 5%.

** Denotes rejection at a significance level of 1%.

split of the sample could be seen differently if we make the analysis for the countries which adopted the Euro after the split or for the non-Eurozone countries. Regarding the Euro countries, it will confirm if countries, when adopting the Euro, have the conditions to take advantage of all possible benefits of a common currency. For the non-Eurozone countries, it could be important to analyse if a possible adoption of the common currency could benefit them.

Splitting the sample does not change the previous analysis significantly, both for Eurozone and the non-Eurozone countries.

Regarding to the first group, the results show that there is no significant difference in the CIP verification, both before and after the crisis. Just Lithuania shows some evidence of the CIP verification but just in the 1-month maturity: before the crisis, measured by DCCA in longer scales, and after the crisis measured by DMCA for smaller scales. Although, this is not significant for a broader conclusion about the CIP verification. So, it could be interpreted that, because CIP is not verified, these countries could not take all possible advantages of adopting the common currency.

Regarding the non-Eurozone countries, and as in the case of the whole sample, the evidence for CIP is low, and mainly for some parameters for the oldest EU countries (Denmark, Sweden and UK). Although, it seems that the evidence was higher before the crisis, once all three countries showed some CIP adherence, while after the crisis it happened just with Denmark, and not for all maturities. Regarding to newer countries, before the crisis, Bulgaria and Poland show some evidence in favour of β, for shorter maturities. After the beginning of the crisis, Bulgaria shows some evidence for β (3 and 6 months maturities), and Croatia shows some evidence as well, for the 1-month maturity. But generally, the evidence in favour of CIP is very weak, which implies that an eventual adoption of the common currency for these countries might be considered risky. The fact

Table 10
DCCA regression based results for α and β, for non-Euro countries, before the starting of Eurodebt crisis.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
BUL	10	0.0332**	0.1665**	0.0418**	0.0394**	0.0642**	0.0486**	0.0740**	−0.0298**
	250[a]	0.0223	0.5675	0.0366*	0.2360	0.0613**	0.1089**	0.0739**	−0.0872**
CRO	10	0.1589**	−3.8578**	0.0850**	−1.0405**	0.0678**	−0.3454**	0.0620**	−0.1247**
	250	0.0882*	−1.0703	0.0772**	−0.6881*	0.0713**	−0.5638**	0.0642**	−0.3046**
CZE	10	0.0305**	0.1115**	0.0341**	0.0138**	0.0389**	−0.1205**	0.0410**	−0.1468**
	250	0.0208**	0.4349	0.0255**	0.2978**	0.0300**	0.1732**	0.0351**	0.0552**
DEN	10	0.0151**	0.6220**	0.0233**	0.4139**	0.0236**	0.3927**	0.0241**	0.4122**
	250	0.0056*	0.9377	0.0065**	0.9253	0.0077**	0.9093	0.0089**	0.9068
HUN	10	0.1023**	−0.3942**	0.0984**	−0.4104**	0.0922**	−0.3517**	0.0701**	−0.5875**
	250	0.0971**	−0.1852**	0.0956**	−0.2288**	0.0920**	−0.2733**	0.0742**	−0.3545**
POL	10	0.0499**	0.1401**	0.0543**	0.0016**	0.0572**	−0.1431**	0.0564**	−0.1487**
	250	0.0344*	0.7505	0.0473*	0.3099	0.0549*	−0.0123*	0.0564**	−0.1436**
ROM	10	0.1544**	−2.5073**	0.1171**	−1.4868**	0.0944**	−0.9862**	0.0811**	−0.4567**
	250	0.1563*	−2.5935*	0.1218*	−1.9306**	0.0922**	−1.4059**	0.0688**	−0.7968**
SWE	10	0.0184**	0.4197**	0.0203**	0.3723**	0.0296**	0.1107**	–	–
	250	0.0018	0.9674	0.0031	0.9197	0.0071	0.8153	–	–
UK	10	0.0265**	0.6218**	0.0340**	0.4258**	0.0416**	0.1730**	0.0479**	0.0011**
	250	0.0146**	1.0297	0.0203**	0.9170	0.0255**	0.8191	0.0372**	0.5684*

* Denotes rejection at a significance level of 5%.

** Denotes rejection at a significance level of 1%.

[a] Bulgaria, for 6-months and 12-months maturity, the higher scale is equal to 100 instead of 250.

Table 11
DMCA regression based results for α and β, for non-Euro countries, before the starting of Eurodebt crisis.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
BUL	11	0.0350**	0.1012*	0.0452**	−0.0881**	0.0640**	−0.0302**	0.0741**	−0.0113**
	251[a]	0.0220**	0.5820**	0.0340**	0.3350**	0.0620**	0.0725**	0.0740**	−0.0547**
CRO	11	0.1493**	−3.4822**	0.0866**	−1.1118**	0.0695**	−0.4477**	0.0620**	−0.1291**
	251	0.0891**	−1.1071**	0.0763**	−0.6464**	0.0692**	−0.4333**	0.0629**	−0.1956**
CZE	11	0.0290**	0.1606**	0.0330**	0.0529**	0.0390**	−0.1212**	0.0415**	−0.1650**
	251	0.0231**	0.3584**	0.0268**	0.2536**	0.0311**	0.1370**	0.0362**	0.0161**
DEN	11	0.0157	0.6044	0.0210	0.4561	0.0231**	0.3149*	0.0262**	0.3452*
	251	0.0077**	0.8697**	0.0091**	0.8400**	0.0101**	0.8288**	0.0118**	0.8134**
HUN	11	0.1061**	−0.5466	0.1045**	−0.7875**	0.0928**	−0.6569**	0.0729**	−0.4263**
	251	0.1016**	−0.3630**	0.1010**	−0.5676**	0.0928**	−0.6267**	0.0730**	−0.4244**
POL	11	0.0501**	0.1324*	0.0555**	−0.0535**	0.0575**	−0.1615**	0.0567**	−0.1885**
	251	0.0366**	0.6633	0.0438**	0.4655**	0.0504**	0.2481**	0.0555**	−0.0348**
ROM	11	0.1513*	−2.3631	0.1153**	−1.3273*	0.0952**	−0.8493*	0.0835**	−0.3908**
	251	0.1129**	−0.5802	0.1120**	−1.0203**	0.0950**	−0.8791**	0.0755**	−0.6120**
SWE	11	0.0172*	0.4617	0.0210	0.3496	0.0303*	0.3615*	–	–
	251	0.0033**	0.9187*	0.0042**	0.8860**	0.0072	0.8091**	–	–
UK	11	0.0256*	0.6527	0.0338**	0.4327	0.0416**	0.1724	0.0478**	0.0016**
	251	0.0153**	1.0061	0.0210**	0.8924**	0.0268**	0.7654**	0.0384**	0.5075**

* Denotes rejection at a significance level of 5%.

** Denotes rejection at a significance level of 1%.

[a] Bulgaria, for 6-months and 12-months maturity, the higher scale is equal to 101 instead of 251.

that none of them shows a clear evolution in favour of CIP could also be related with the lack of interest of those countries in adopting the Euro and the fact that they keep some monetary autonomy (which cannot be verified if they adopt that currency).

5. Conclusions

The adoption of the Euro as the common currency of several EU countries is the continuation of the European integration. Several discussions on this topic called the attention for possible emergency situations and difficulties in countries that want

Table 12
DCCA regression based results for α and β, for non-Euro countries, after the starting of Eurodebt crisis.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
BUL	10	0.0074**	0.1008**	0.0143**	0.0647**	0.0222**	0.0032*	0.0355**	−0.0157**
	250	0.0065**	0.4281*	0.0130**	0.6043	0.0221**	0.3277	0.0291**	−0.4987**
CRO	10	0.0196**	−3.7451**	0.0190**	−0.9889	0.0227**	−0.4073**	0.0273**	−0.1442**
	250	0.0094	0.9871	0.0191**	−1.1275*	0.0210**	−1.1592**	0.0213**	−0.7361**
CZE	10	0.0045**	0.0135**	0.0059**	−0.0005**	0.0073**	0.0267**	0.0091**	0.0035**
	250	0.0046**	−0.0038**	0.0062**	−0.0700**	0.0076**	−0.0320**	0.0095**	−0.0365**
DEN	10	0.0029**	0.3100**	0.0067**	−0.1884**	0.0101**	−0.3044**	0.0124**	−0.1967**
	250	0.0019	0.5983	0.0035	0.4399	0.0055*	0.3359*	0.0078**	0.2662**
HUN	10	0.0412**	−0.2272**	0.0402**	−0.3448**	0.0397**	−0.2084**	0.0403**	−0.0751**
	250	0.0412**	−0.4744*	0.0398**	−0.4582**	0.0380**	−0.4138**	0.0356**	−0.3258**
POL	10	0.0302**	−0.0617**	0.0309**	−0.2932**	0.0306**	−0.2563**	0.0304**	−0.1621**
	250	0.0301**	0.0424	0.0308**	−0.3560**	0.0296**	−0.4060**	0.0288**	−0.2674**
ROM	10	0.0361**	−3.3871**	0.0346**	−0.9684**	0.0383**	−0.2464**	0.0395**	−0.0878**
	250	0.0350**	−0.2982**	0.0323**	−1.5667**	0.0259**	−1.4011**	0.0173**	−0.9325**
SWE	10	0.0088**	−0.1306**	0.0106**	−0.2369**	0.0119**	−0.2652	–	–
	250	0.0064**	0.7939**	0.0078**	0.6858	0.0099**	0.3413	–	–
UK	10	0.0053**	0.0174**	0.0063**	0.0575**	0.0065**	0.0106**	0.0123**	−0.0243
	250	0.0050**	0.1351**	0.0059**	0.1619**	0.0059**	0.1424**	0.0119**	0.0814**

* Denotes rejection at a significance level of 5%.

** Denotes rejection at a significance level of 1%.

Table 13
DMCA regression based results for α and β, for non-Euro countries, after the starting of Eurodebt crisis.

Country	Scale	1M		3M		6M		12M	
		α	β	α	β	α	β	α	β
BUL	11	0.0072**	0.1467**	0.0143**	0.0841**	0.0222**	−0.0034*	0.0354**	−0.0247**
	251	0.0067**	0.3567**	0.0134**	0.4497**	0.0221**	0.3838	0.0280**	−0.5823**
CRO	11	0.0210*	−4.3574**	0.0192**	−1.2407**	0.0226**	−0.4257**	0.0272**	−0.1515**
	251	0.0128**	−0.6187	0.0194**	−1.4868**	0.0214**	−0.9608**	0.0231**	−0.5559**
CZE	11	0.0046**	−0.0076**	0.0060**	−0.0198**	0.0074**	0.0006**	0.0092**	−0.0056**
	251	0.0044**	0.0529**	0.0057**	0.0440**	0.0069**	0.0864**	0.0089**	0.0309**
DEN	11	0.0030	0.2857	0.0066*	−0.1698**	0.0100**	−0.2877	0.0125**	−0.2055**
	251	0.0018**	0.6467**	0.0031**	0.5134**	0.0050**	0.4164**	0.0073**	0.3211**
HUN	11	0.0411**	−0.1200	0.0407**	−0.1905**	0.0404**	−0.1244**	0.0405**	−0.0675**
	251	0.4130**	−0.5243**	0.0394**	−0.6033**	0.0359**	−0.6645**	0.0311**	−0.5673**
POL	11	0.0301**	−0.0120	0.0307**	−0.4232	0.0301**	−0.3394*	0.0297**	−0.2088**
	251	0.0301**	0.0284**	0.0309**	−0.2814	0.0299**	−0.3629	0.0287**	−0.2796
ROM	11	0.0360**	−3.2463**	0.0346**	−0.9743**	0.0386**	−0.2184**	0.0395**	−0.0878**
	251	0.0351**	−0.6193**	0.0345**	−1.0038	0.0321**	−0.8186**	0.0173**	−0.9325**
SWE	11	0.0087**	−0.0918*	0.0105**	−0.2192**	0.0119**	−0.2465**	–	–
	251	0.0061**	0.8924	0.0075**	0.7572*	0.0101**	0.2956**	–	–
UK	11	0.0053**	0.0145**	0.0063**	0.0506**	0.0065**	0.0108**	0.0122**	−0.0193**
	251	0.0051**	0.0921**	0.0059**	0.1853**	0.0060**	0.1294**	0.0121**	0.0196**

* Denotes rejection at a significance level of 5%.

** Denotes rejection at a significance level of 1%.

to adopt this currency if they do not have necessary structural conditions, namely if they are not financially integrated. This financial integration would benefit the countries but also open them towards some new risk factors.

In this paper, we use two new methodologies to analyse covered interest parity condition, which is considered an important measure of financial integration. Our approach is innovative because these methodologies were not used previously in this field but also because we use an extended sample of countries.

As in previous studies, Austria, Belgium and the Netherlands are the countries which show the most evidence of the CIP verification, while France also shows some evidence. For the remaining countries, the CIP verification is an exception, results that are contrary to the expected, with the advance of the integration process of the EU. This is true even when the studied sample is separated by the Eurodebt crisis.

Possibly, the main rejection factor is the fact that investors do not consider assets of different countries as substitutes. For example, if the EU is not credible, investors consider government bonds of the South European countries as having

the same risk as other countries' bonds, such as the German ones (just to name the most obvious one). Another factor could be the possibility of reinserting controls, defined by Aliber [8], as political risk. Other problems like asymmetric information, transaction costs, different fiscal treatment of returns, incomplete integration of monetary markets, premium risk, transaction costs, capital controls, inefficiency and underdevelopment of financial systems and lack of liquidity of markets could also contribute towards the CIP violation (see, for example, [9] or [15]).

Independently of the factors that may prevent the verification of financial integration, the study of this topic is important due to two different motives. Firstly, it shows that countries probably do not take advantage of all the possible benefits of financial integration. Secondly, and probably more importantly, most of the countries which adopted the Euro had not been prepared for it, once they faced a loss of economic policy instruments, which is one of the major costs associated with the adoption of a common currency, mainly due to the existence of potential asymmetric shocks. Therefore, the adoption of a common currency should be a prudent choice to prevent the increase of economic disparities between countries. Moreover, in the context of financial integration, these countries are more exposed to risk, to exchange rate volatility or to the contagion effect. And, unfortunately, the recent history of the Eurozone has showed that the authorities should have paid more attention to this particular issue.

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