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Why does the Euro fail? The DCCA approach

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HIGHLIGHTS

- We apply DCCA and its correlation coefficient to study financial integration.
- With DCCA correlation coefficient we can see if covered interest parity is verified.
- Covered interest parity (CIP) is a measure of financial integration.
- When CIP fails, countries could face problems if asymmetric shocks occur.
- Countries with debt problems are those where CIP fails.

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ABSTRACT

The present crisis in the Euro is one of the most serious crises reported in history. The fact that different countries that adopted the Euro have different conditions to support asymmetric shocks in their economies could explain some of the consequences currently affecting the Eurozone. In this paper we apply detrended cross-correlation analysis and its cross correlation coefficient to evaluate the degree of financial integration of the first set of countries to adopt the common currency. Since time series used in these studies are known to be non-stationary, DCCA is suited to study it. It is the first time this methodology has been applied to study financial integration. We conclude that the degree of financial integration is unequal in several countries using the common currency. The fact that countries like Greece, Ireland or Portugal are the ones facing most problems in verification of the parity used in this paper could help to explain the present instability in the Eurozone.

1. Introduction

The decision to adopt a common currency brought many benefits to the countries involved. Among these benefits, we can name better allocation of savings, which will lead to better investment returns, allowing countries to reach better economic performance, increasing levels of consumption. Financial integration leads also to reduced borrowing costs (due to more competition), lower intermediation costs (for the same reason) and the harmonization of product prices and financial services. In fact, with financial integration between countries, we can expect higher market efficiency.

However, financial integration is also an institutional challenge. Firstly, a rapid integration of financial markets (noted by the increase in the volume of capital flow between countries) could increase currencies' exposure to risk, facilitating the

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emergence of crisis on a global scale. In addition, and probably more importantly, when countries decide to adopt a common currency, they lose their monetary authority which could be an important instrument to combat possible asymmetric shocks in their economy. So adopting the euro when financial integration is not complete could result in greater disparities between countries. For more information about the benefits and risks of financial integration see, for example, Ref. [1].

We base our study on covered interest parity (CIP) which is considered, for example by Frankel [2] as a pure criterion of capital mobility. With instruments that cover exchange risks, investors carry out arbitrage operations and eliminate differentials between the returns on similar assets (similar in maturity, political and sovereign risks, among others) except in currency denomination. With capital mobility between countries, arbitrage assures that differentials, which represent riskless profits, are eliminated. Frankel [3] shows that we only need the abolition of capital controls to have reduced profit opportunities.

The Eurozone has now 19 members. In this study we analyze the behavior of 9 of the first set of countries which adopted the European common currency in 1999: Austria, Belgium, Finland, France, Ireland, Italy, the Netherlands, Portugal and Spain. Luxembourg was not included because we have no available data. Germany is the reference market used in the CIP equation. Greece formally adopted the euro in 2001 and is also studied in this paper. We chose just these countries because we want to know if these countries could have some impact on the current crisis. Authors such as Herrmann and Jochem [4], Mansori [5] and Ferreira et al. [6] use other countries. However, this is not our interest and we leave analysis of those countries to further research. The first warning about a possible financial crisis was announced by the European Central Bank on December 8, 2005. On this date, the Eurozone was still made up of the same countries listed above.

The objective of this study is to analyze verification of CIP, in the first set of the countries to adopt the common currency, by using a detrended cross-correlation analysis (DCCA). To our knowledge, this methodology has never been used to study financial integration and this is the novelty of this paper when compared with previous studies.

The main results point to confirmation of CIP in Central European countries, while Southern countries show more evidence of its violation. This is consistent with previous studies and means that countries where CIP is violated could face some problems in the case of asymmetric shocks. It is no surprise that Greece, Ireland and Portugal are included in the group which presents less evidence of CIP, and these are countries where the International Monetary Fund (IMF) was called in previous years, due to their debt crises.

The remainder of the paper is organized as follows: Section 2 explains covered interest parity (CIP). Section 3 shows data and the methodology used in this study. Section 4 reports the empirical analysis and its results, and Section 5 concludes.

2. Covered interest parity

Considering forward contracts as the instruments to cover risks, we can formalize CIP in short maturities (less than one year) 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, defined as units of foreign currency per unit of domestic currency, F the forward exchange rate and the symbol $*$ is used for foreign variables. Taking the logarithm of the previous equation we get:

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

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

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

Defining $c_t^* = i_t^* - (f_{t+1} - s_t)$ as the covered foreign rate and including an error term, we have the equation $i_t = c_t^* + \varepsilon_t$, where ε_t is the error. In order to test CIP empirically, we need to estimate the following equation:

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

CIP holds when $\alpha = 0$ and $\beta = 1$, thus, testing CIP is equivalent to testing these two conditions. Transaction costs, obstacles preventing capital mobility such as government restrictions to capital circulation and political risk are detected in the constant term, with this showing a non-zero value. Political risk is the probability of future government intervention in financial markets. It tells us that if an investor anticipates the government's intention to impose obstacles to capital mobility, he will demand an extra premium for his investment [7]. In addition, the trend detects differentials due to differences in fiscal treatment of returns, financial restrictions imposed by governments or data imperfections.

The CIP condition could be studied in different ways. One of the most common is to analyze CIP differentials, analyzing the stationarity of $\varepsilon_t = i_t - c_t^*$. Almost all studies use information from Central European countries and the results generally point to CIP verification. For example, the work by Holmes and Pentecost [8], Holmes [9] or Ferreira [10], among others, find differentials that are eliminated over time, showing evidence in favor of financial EU integration. Few cases, with these countries, show evidence against CIP. One is the study by Holmes and Wu [11], who find significant covered interest

Table 1
Beginning of samples and number of observations used in the study.

Country	Date of beginning	Number of 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	2130
Portugal	31st December 1996	523
Spain	19th December 1991	1836

[a] For 12-month maturity, the Italian sample only begins on 25th May 1993.

differentials. Exchange rate turbulence and German unification in 1990, an asymmetric shock, are the reasons advanced for these results.

However, when more peripheral countries are included in samples, the results show that financial integration is not complete. For example, the study by Ferreira [10] shows that countries like Greece, Ireland, Italy, Portugal or Spain present some violations of CIP.

As both series used in Eq. (4) are commonly non-stationary, Ordinary Least Squares can only be used if series are cointegrated, in which case CIP is verified in its weak form. However, parameters of Eq. (4) could not be tested since in this case they do not follow any theoretical probability distribution. However, that regression could be indirectly studied by analyzing the stationarity of CIP deviations. We are also aware of the possibility of structural breaks in the data under analysis, but given the partition method used in DCCA, we believe this problem can be partially solved.

However, the development of econometric methodologies allows researchers to use alternative methodologies. General Maximum Entropy is one of them and allows, for co-integrated series, direct analysis of Eq. (4). Ferreira et al. [6] used this methodology and found, once again, that Central European countries show more evidence of CIP verification than Southern European ones.

In this paper we propose analysis of the CIP condition using the DCCA method and its correlation coefficient, which can be used even if series are non-stationary. Besides, DCCA has the advantage of being a non-linear approach while cointegration (or indirectly, stationarity of CIP deviations) are linear approaches.

3. Data and methodology

As already mentioned, we propose to analyze financial integration in the first group of Eurozone countries, applying the DCCA method. Because CIP implies the relation between exchange rates in different countries, our dataset only uses information up to 1999.

We test CIP using assets with maturity up to 12 months (1, 3, 6 and 12 months), made with onshore assets: interbank interest rates, in the currency of each country. To study financial integration of the euro EU countries in the period before they adopted a common currency we should use spot and forward exchange rates for each country in relation to the German mark. This is the usual procedure, due to Germany's importance in the European Union. Since exchange rates in relation to the German mark are not available, we recovered those of each country in relation to the American dollar. Then we calculated the corresponding exchange rate with respect to the German mark using triangular parity. Due to the existence of transaction costs, there may be some differences between the real values of the true exchange rates in relation to the German mark and the values calculated by triangular parity. However, the deviations are minimal since the currency used in calculations (the American dollar) is widely used in international markets, so transaction costs are small and do not show a significant effect on the tests. We use daily data from DataStream. Because data is not available in DataStream, we do not analyze CIP for the Netherlands for 12-month maturity. The choice of this database is due to relative homogeneity within the data. Samples were recovered according to data availability. Longer samples start in November 1990 and end in December 1998. Austria, Finland, Spain, Greece, Ireland and Portugal have smaller samples. Information about the samples is given in Table 1.

When we want to compare behavior between series using financial time series, one problem is the possibility of non-stationarity, which prevents using some econometric techniques. Even if series are co-integrated, the results of Ordinary Least Squares cannot be interpreted, namely the hypothesis tests to analyze correlation between series.

In this context, Podobnik and Stanley [12] developed DCCA, a method that can calculate the cross-correlation between two non-stationary series. It is a generalization of Detrended Fluctuation Analysis (DFA), a technique used to analyze temporal dependence in time series with the advantage of being used in the context of non-stationary time series, created by Peng et al. [13]. Originally used to explain behavior in natural sciences phenomena, both techniques could also be applied to economic time series, namely financial data (see, for example, Ref. [14], or Ref. [15], among others). In our study, we use the correlation coefficient from DCCA which also implies calculation of detrended fluctuation analysis (DFA), which analyzes the behavior of individual series. However, we use the exponent from DFA only indirectly and so do not explain

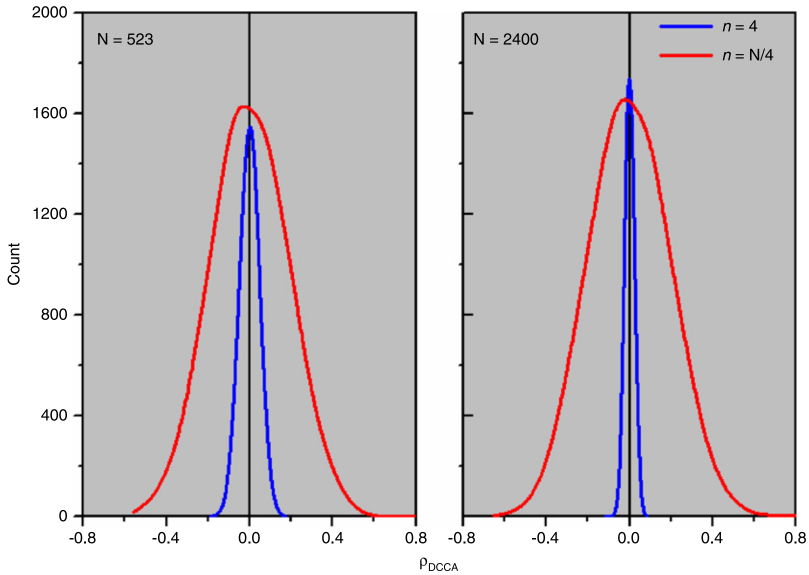

Fig. 1. Behavior at 95% confidence levels, for different numbers of observations.

this methodology in detail. For more information, see the original work on DFA, by Peng et al. [13]. For a brief literature review, see the work of Ferreira and Dionísio [16].

Considering the data given by x_k and y_k with $k = 1, \ldots, t$ equidistant observations. The first step of DCCA is obtained integrating both series and calculating the values: $x(t) = \sum_{k=1}^{t} x_k$ and $y(t) = \sum_{k=1}^{t} y_k$. Afterwards, we divide them into $N - n$ overlapping boxes, defining for each box the local trend ($\tilde{x}_k$ and $\tilde{y}_k$), using ordinary least squares. After this, the detrended series is calculated: the difference between the original values and its trend. Then, we calculate the covariance of the residuals in each box given by $f_{DCCA}^2 = \frac{1}{n-1}\sum_{k=i}^{i+n}\left(x_k - \tilde{x}_k\right)\left(y_k - \tilde{y}_k\right)$. Finally, the detrended covariance is calculated summing all $N - n$ boxes of size n, given by $F_{DCCA}^2(n) = \frac{1}{(N-n)}\sum_{i=1}^{N-n} f_{DCCA}^2$. This process should be repeated for different length boxes in order to find the relationship between DCCA fluctuation function and n size, which allows us to find the long-range cross correlation $F_{DCCA}(n)$ given by the power law $F_{DCCA}(n) \sim n^{\lambda}$. Interpretation of λ is quite similar to interpretation of DFA: if λ is equal to 0.5 series have no long range cross-correlation; a λ greater than 0.5 means persistent long-range cross-correlations while values lower than 0.5 mean anti-persistent cross-correlation (a large value in one variable is likely to be followed by a small value in another variable, and vice versa).

DCCA gives us information about cross correlation between series but does not quantify that value. In order to make that quantification, from the results of DCCA between x and y and DFA for each series, Zebende [17] created the correlation coefficient given by $\rho_{DCCA} = \frac{F_{DCCA}^2}{F_{DFA\{xi\}}F_{DFA\{yi\}}}$. This coefficient has the general properties of one correlation coefficient, namely $-1 \leq \rho_{DCCA} \leq 1$. A value of $\rho_{DCCA} = 0$ means that there is no cross-correlation between series, while a positive or negative value means, respectively, cross-correlation or anti cross-correlation between series.

According to Podobnik et al. [18] we can test the significance of this correlation coefficient. The authors estimate the critical points for this test and we use them to test our coefficients (see Fig. 1 and dotted line in the other figures).

4. Results of application of DCCA to CIP

The main objective of this paper is to apply DCCA to both variables present in Eq. (4). As referred to previously, DCCA has the advantage of being applied also in the presence of non-stationary time series, such as those applied in CIP. In the context of CIP, we interpret the existence of significant cross-correlation as evidence of CIP in its weak form, meaning there is evidence of financial integration. When correlation is not significant, it means there is some violation of CIP.

In Table 2 we show the results of the DCCA exponent for each country and each maturity used in this paper. Our first conclusion concerns the value of the DCCA exponent: as it is always greater than 0.5 we conclude that for all countries and maturities, the variables we study show evidence of persistent long-range cross-correlation. However, the degree of persistence is different among countries and maturities. First, we can see that for shorter maturities the exponent is lower for those countries experiencing a debt crisis and some kind of intervention by the IMF: Portugal, Greece and Ireland. Italy also has an exponent that is slightly lower than other countries. In longer maturities, differences are smaller. For 1-month maturity, $F_{DCCA}^2(n)$ does not have a clear long-range cross-correlation for: Finland (Fig. 4(c)), France (Fig. 5(c)), and Portugal (Fig. 10(c)) (so, results are not presented in Table 2). We can see, by ρ_{DCCA}, what the time scale is where these power-laws

Table 2
λ DCCA exponent for different maturities.

Country	1 month	3 months	6 months	12 months
Austria	1.74	1.72	1.71	1.69
Belgium	1.50	1.47	1.45	1.46
Finland	–	1.58	1.60	1.63
France	–	1.54	1.50	1.53
Greece	1.35	1.47	1.46	1.43
Ireland	1.31	1.50	1.85	1.60
Italy	1.41	1.40	1.44	1.47
Netherlands	1.63	1.65	1.64	–
Portugal	–	1.23	1.46	1.52
Spain	1.67	1.57	1.57	1.60

Table 3
DCCA cross-correlation coefficient mean for different maturities.

Country	1 month	3 months	6 months	12 months
Austria	0.57	0.62	0.65	0.65
Belgium	0.41	0.59	0.73	0.81
Finland	0.13	0.33	0.42	0.50
France	0.35	0.58	0.72	0.79
Greece	0.11	0.68	0.72	0.81
Ireland	0.12	0.35	0.51	0.59
Italy	0.23	0.47	0.70	0.83
Netherlands	0.70	0.72	0.76	–
Portugal	0.04	0.20	0.40	0.60
Spain	0.38	0.61	0.75	0.83

are broken (Figs. 4(d), 5(d) and 10(d)), e.g., approximately $\rho_{DCCA} \neq 0$. The DCCA cross-correlation coefficient ρ_{DCCA} was calculated, and Table 3 presents the average of this for each country and maturity.

Besides DCCA, we also calculated the long-range correlation coefficient for our data. The methodology we propose calculates, for each country and maturity, one correlation coefficient for each length box we use in the DFA and DCCA analysis. Table 3 presents the average correlation coefficient for each country and maturity. Since presentation of all results is not practical due to space constraints, we do not show them here. However, the results are available on request.

For 1-month maturity, Portugal, Greece and Ireland have lower correlation coefficients, closely followed by Finland. Italy also has a correlation coefficient lower than other countries. As long as we have higher maturities, differences between the values of the coefficients are smaller. However, even considering 12-month maturity, Portuguese, Irish and Finnish coefficients remain lower than other countries. The results for Greece are somewhat surprising. While for 1-month maturity the value is very weak (meaning low levels of correlation), for longer maturities values are greater than for other countries. One possible explanation is the fact that the Greek sample is smaller, which could mean the correlation coefficient is less robust than for other countries (such as Austria, Belgium or France).

The average correlation coefficient could give us some information about which countries have less or greater correlation between the variables considered in Eq. (4). However, it does not give us any information about the significance of that cross-correlation. We proceeded to test the respective hypothesis, and this is based on the null hypothesis of $\rho_{DCCA} = 0$. The alternative hypothesis rejects this assumption and implies the existence of significant cross-correlation between variables (see the procedure of Podobnik et al. [18]). In our case, this could be interpreted as verification of CIP at least in its weak form.

With our data, and according to each country's number of observations, we simulated the critical values at 90%, 95% and 99% for the above test, according to the procedure of Podobnik et al. [18]. We can see the behavior of our simulations in Fig. 1, for series with 523 and 2400 observations, for the minimum length box ($n = 4$) to the maximum one ($n = N/4$). We have the same figures for another number of observations (supplied on request).

We compiled all the information of correlation coefficients for each country, maturity and length boxes, with critical values at 95% level, as seen in Figs. 2–11. At the top of these figures we can see the $F_{DFA}(n) \times n$ for each series used in the test (i_t and c_t^*) and at the bottom we present the absolute values of $F_{DCCA}^2(n) \times n$ (left) and $\rho_{DCCA}(n)$ (right). The dashed line identifies the 95% confidence level, while the other lines represent the correlation coefficient for each maturity, depending on the length boxes. If the cross-correlation coefficient is found inside the dashed lines, the correlation coefficient is not significant, showing evidence against CIP. The horizontal axis (Figs. 2–11) indicates the time dimension (in days).

The results show that Belgium and the Netherlands always have correlation coefficients different from zero. In the case of Austria, just one of the coefficients is significantly equal to zero (for 1 month maturity, with length boxes up to 5). Observing the figures for these countries (Figs. 2, 3 and 9), we can note than both variables used in Eq. (4) have stable behavior, which also happens with DCCA. For these countries, the ρ function is also stable, except for the Belgian case. However, it is not enough to violate the parity condition. So for these countries we have strong evidence of CIP verification. These results are consistent with other studies such as those by Holmes and Pentecost [8], or Ferreira et al. [6], among others.

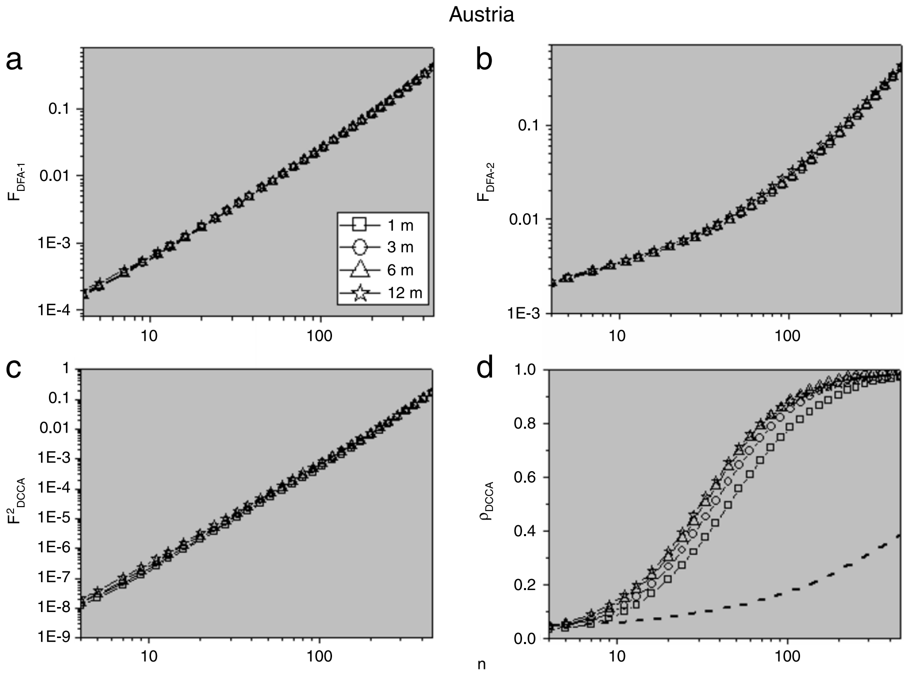

Fig. 2. DCCA cross-correlation coefficient for Austria as a function of n (days).

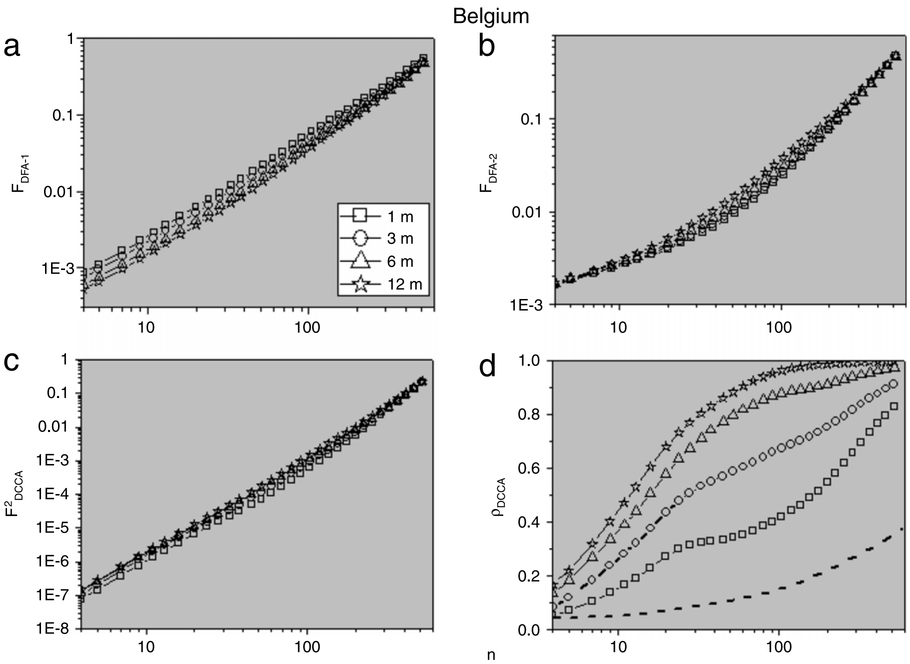

Fig. 3. DCCA cross-correlation coefficient for Belgium as a function of n (days).

However, Southern European countries have more situations where CIP is not confirmed, according to ρ_{DCCA} criteria. Looking at Figs. 6, 7 and 10, we can see some irregularity in the Greek, Irish and Portuguese results, for example, the irregularity of DCCA functions for all these countries in 1 month maturity, which presents the worst results in terms of CIP verification. In fact, Greece, Ireland and Portugal have evidence of no cross-correlation between variables included in CIP in all shorter maturities. In 1 month maturity the great majority of coefficients stay in the area of uncorrelated variables in these three countries. In Portugal, the same is found in 3-month maturity. Then, Greece and Portugal do not support CIP verification in 3 and 6-month maturities in shorter length boxes while in Ireland this also happens in the case of 12-month maturity.

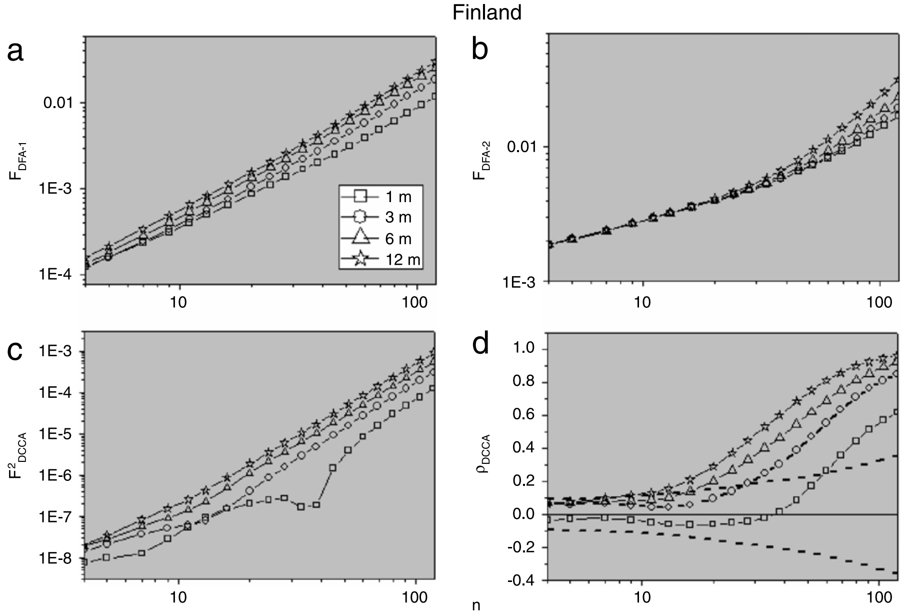

Fig. 4. DCCA cross-correlation coefficient for Finland as a function of *n* (days).

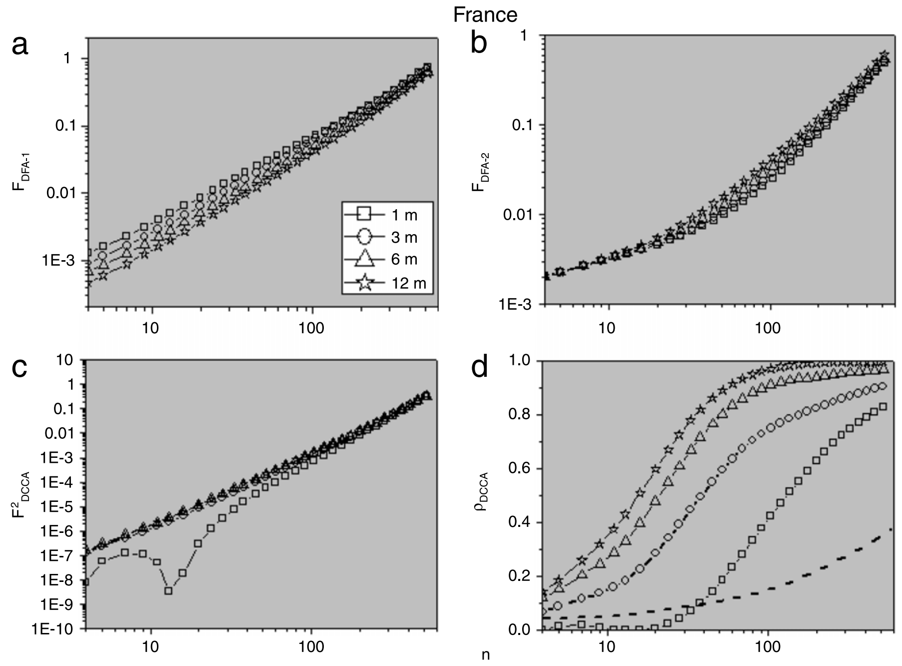

Fig. 5. DCCA cross-correlation coefficient for France as a function of *n* (days).

The fact that CIP is not fully confirmed in these countries indicates they could have problems following any asymmetric shock. Currently, these countries face greater problems with their sovereign debts, showing that Eurozone authorities should have paid more attention to this situation.

Italy has also some similarities with these countries. In 1-month maturity, CIP is not found mainly in the longer time scale (see Fig. 8). This could be due to some speculative EMS attacks in the country and problems such as high public debt and budget deficits. Furthermore, Italy faced some political instability between 1992 and 1997, and this instability could also result in weak CIP confirmation (see, for example, Ref. [6], or Ref. [10]).

Besides these countries, Spain and France also fail CIP verification in some aspects. While in the long time scale, CIP is fully verified, in the short scale it fails in 1-month maturity. These differences can be seen comparing Figs. 5 and 11, showing that the behavior of French DCCA, in 1-month maturity, is very instable, implying the same behavior in its correlation coefficient,

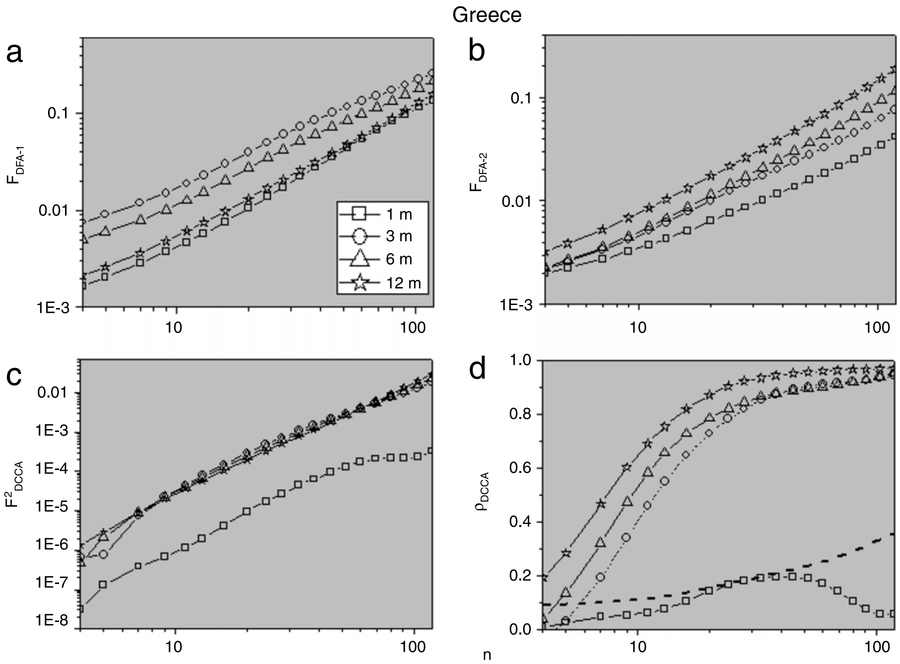

Fig. 6. DCCA cross-correlation coefficient for Greece as a function of *n* (days).

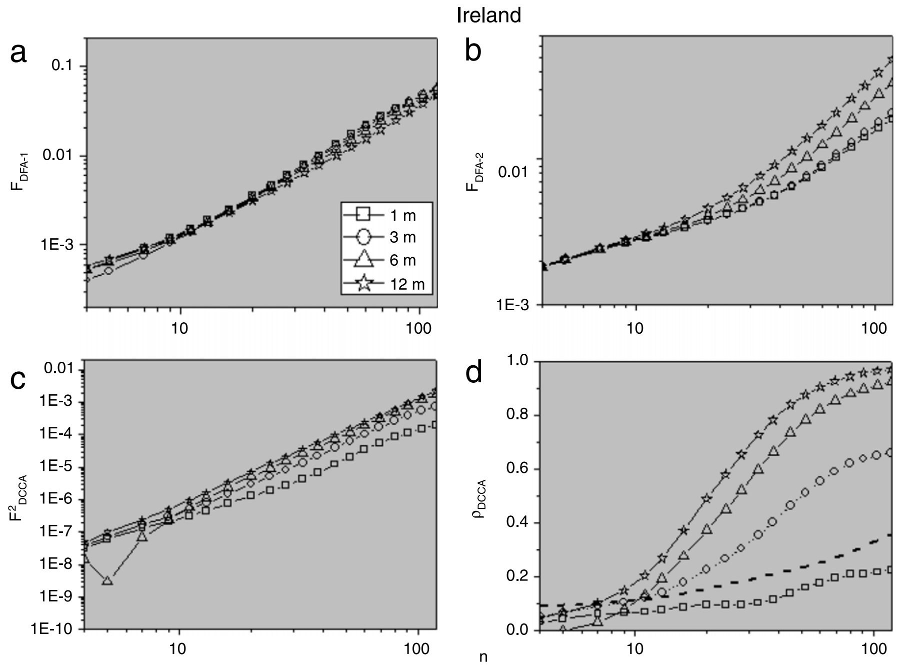

Fig. 7. DCCA cross-correlation coefficient for Ireland as a function of *n* (days).

while in the Spanish case figures show more stability. In France, non-verification of CIP in 1-month maturity is greater and could be caused by some problems occurring in the country at the beginning of the period under analysis, such as speculative exchange rate attacks, as referred to, for example, by Ferreira et al. [6]. In Spain, CIP failure is only residual. Currently Spain also has some economic and financial troubles but more limited to bank activity, when compared with its Southern European partners.

Finally, Finland also fails to present verification in favor of CIP, meaning that the Finnish economy is not fully financially integrated. (See, in Fig. 4, 1-month maturity of CIP, for $n < 50$, in 3-month maturity, for $n < 30$, and for $n < 20$ for 6-month

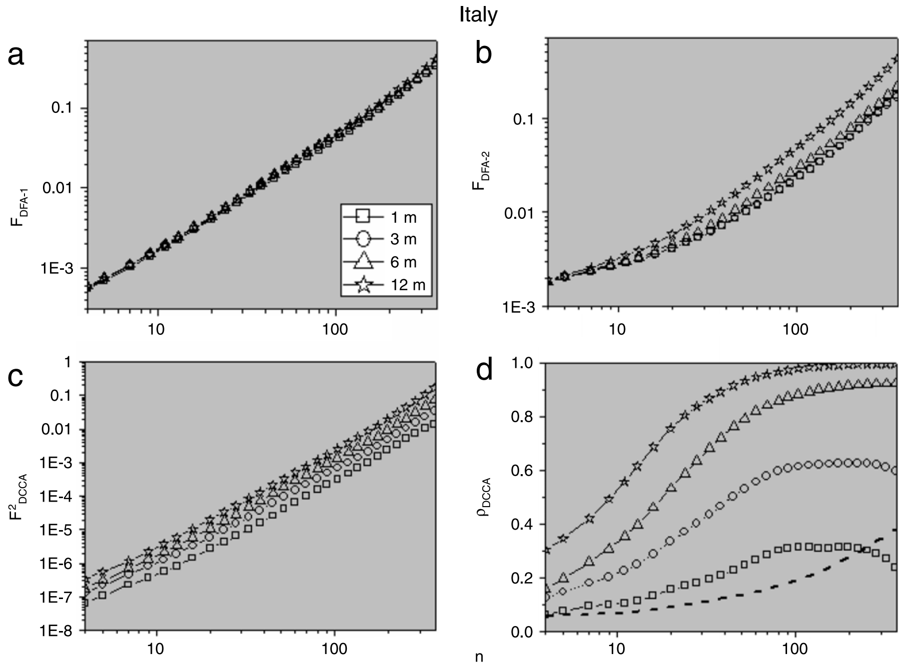

Fig. 8. DCCA cross-correlation coefficient for Italy as a function of *n* (days).

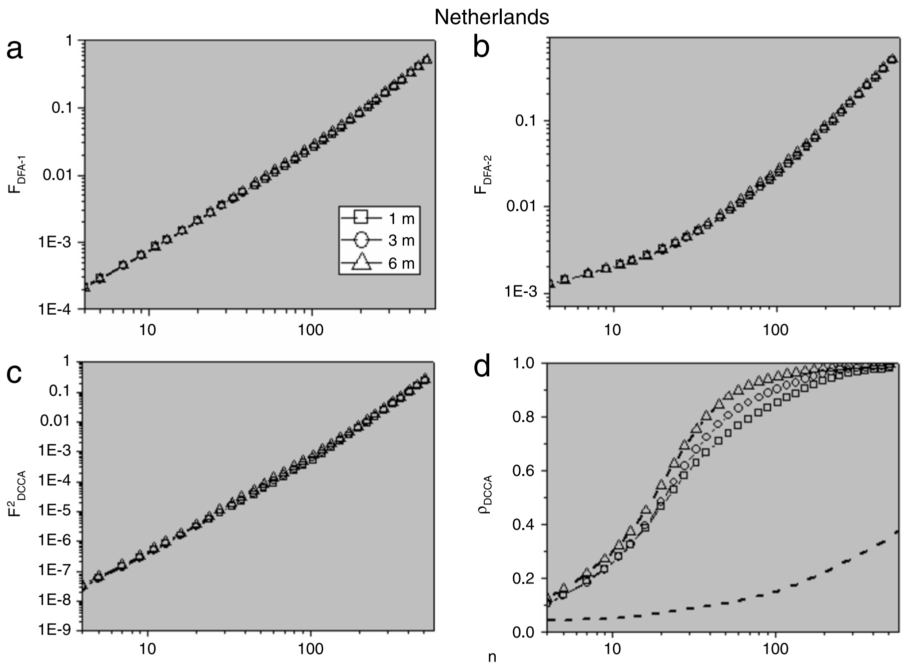

Fig. 9. DCCA cross-correlation coefficient for the Netherlands as a function of *n* (days).

maturity.) However, as this is a more disciplined country in terms of public accounts, it did not suffer the same asymmetric shock as other Southern European countries, when the sovereign debt crisis started in Europe.

5. Conclusions

Financial integration is an important issue. Therefore, applying a new methodology can be important to show financial integration more clearly. Here, we apply the DCCA method in time series of covered interest parity (in the Eurozone), and

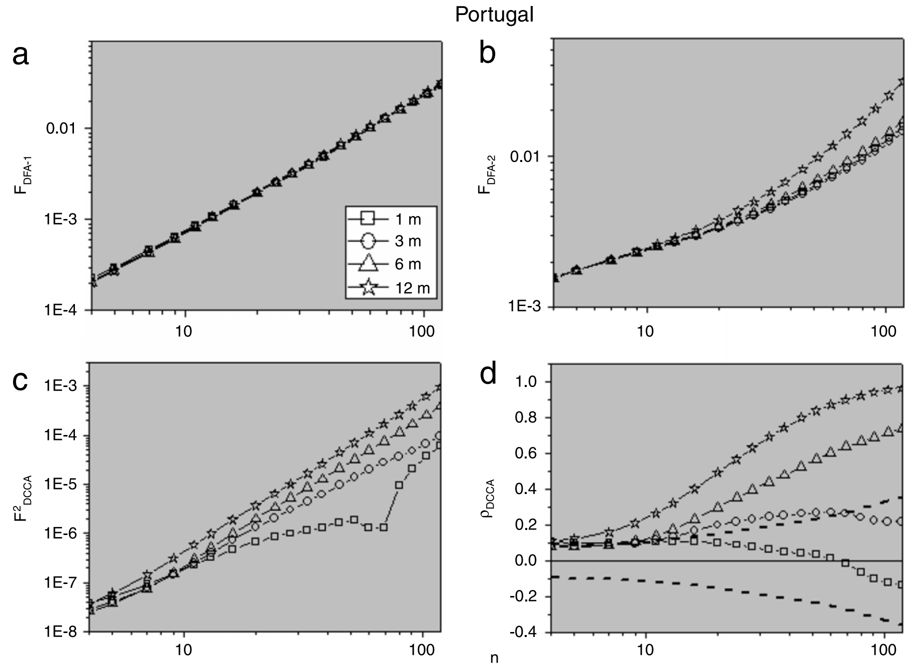

Fig. 10. DCCA cross-correlation coefficient for Portugal as a function of n (days).

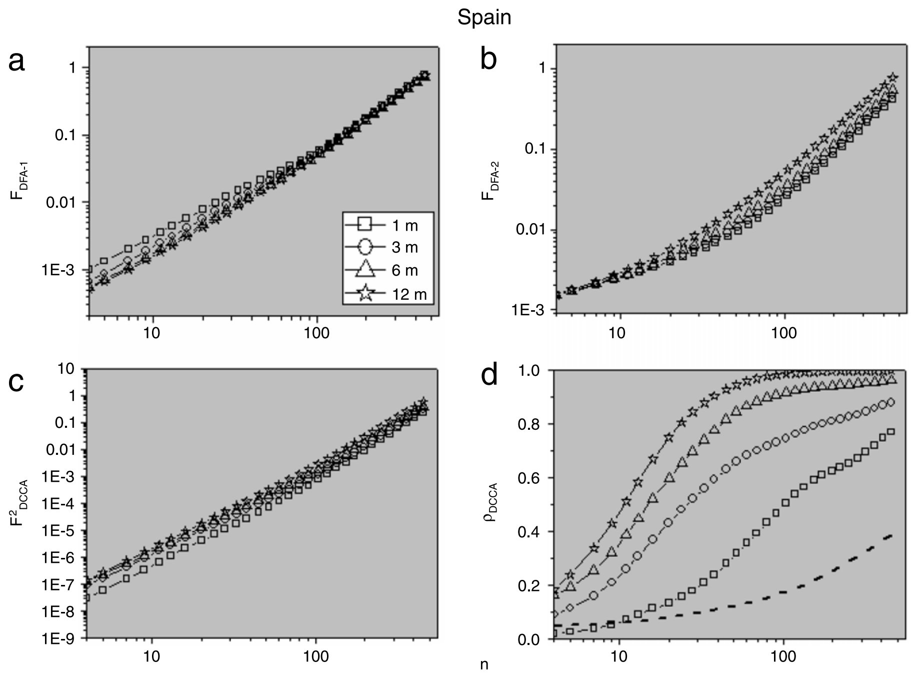

Fig. 11. DCCA cross-correlation coefficient for Spain as a function of n (days).

conclude that the degree of financial integration is unequal in some countries using the common currency. The results are similar to those of other studies.

Thus, concerning our first conclusion, about the value of the λ exponent, this is always greater than 0.5 for all countries and maturities, showing the presence of long-range cross-correlation between the time series. However, the degree of persistence is different among countries and maturities. Countries like Greece, Ireland and Portugal are those with most problems in verification of parity, because the detrended cross-correlation coefficient is more irregular, mainly for 1-month of integration. In these cases, the assumption of cross-correlation is null. But, countries like Austria and the Netherlands always had ρ_{DCCA} statistically different from zero, for any maturity. In the case of Belgium and Spain, the cross-correlation coefficient is positive, but the value of ρ_{DCCA} depends on the maturity, less maturity having a lower cross-correlation coefficient (see Fig. 3). Italy has also some similarities with these countries, but in 1-month maturity CIP is not found in the long time scale. France fails CIP verification in the short time scale for 1-month maturity, ρ_{DCCA} in 1-month maturity being very instable for $n < 30$ days. Finally, Finland also fails to present verification in favor of CIP in some maturities. In 1-month maturity for $n < 50$, in 3-month maturity, for $n < 30$, and for $n < 20$ for 6-month maturity.

But if capital controls were progressively abolished in European Union countries, with the objective of introducing the common currency, why is there still evidence against financial integration at the moment of introducing the Euro?

Firstly, some remaining factors could prevent complete financial integration. The political risk, defined by Aliber [7], and related with the possibility of reinserting controls, is one of these factors. The existence of asymmetric information, transaction costs or different fiscal treatment of returns in the different countries are other factors that can explain our conclusions. These are not legal barriers but they can also affect capital mobility, implying that countries do not fully explore the potential benefits of financial integration.

Another possible explanation of CIP deviations is data imperfections (see, for example, Ref. [19]). The fact that we use different samples for different countries or our choice of interbank rates rather than, for example, Treasury bill rates, could be seen as a caveat of our study. However, we were limited by data availability. Furthermore, we tried to use longer samples for some countries in order to have more robust results.

With the absence of transaction costs, when assets are really similar, CIP differentials are expected to be null. If they exist, they are expected to decrease till all profitable opportunities are eliminated and evidence in favor of CIP is found. However, it is also possible that agents do not consider some countries' assets as similar to German ones. In this case, CIP could also fail.

It is also important to understand that CIP violation could be caused by some frictions that provoke differentials but do not mean riskless profit opportunities.

Firstly, in the presence of transaction costs, CIP differentials do not necessarily mean the existence of profit opportunities. If the differentials are smaller than the transaction costs, they do not generate profit opportunities. Based on this assumption, Frenkel and Levich [20,21] elaborate a neutral band for parity, within which differentials are not synonymous with riskless profit opportunities. Outside this band, differentials could mean different tax treatment, sovereign risk, government controls, non-infinite demand and supply elasticities, transaction costs, information costs, capital controls, imperfect asset substitutability or even measurement errors. The absence of long-range correlation between markets should be interpreted as differentials outside the neutral band. Alternatively, rejection of CIP could also be a sign of monetary autonomy.

But the most important conclusion, in our view, is that our results show that some countries did not gain the advantages expected from full financial integration. Furthermore, rejection of CIP implies those countries did not have the capacity to face asymmetric shocks. The sovereign debt crisis faced by more peripheral EU countries is surely one example of asymmetric shock. Unsurprisingly, we can conclude that the countries with most problems were those where DCCA showed no support for financial integration.

This suggests European authorities should be more cautious when deciding that new countries can join the Eurozone, because if countries are not financially integrated, they do not gain all the advantages of adopting a common currency. But at the same time, future asymmetric shocks could also cause more problems for the Eurozone as a whole. It is also important that European authorities review their role, not only in order to make a better assessment of countries potentially adopting the Euro but also to analyze the behavior of countries already in the Eurozone, for instance, regarding budget policy. It is probably also important to check the mechanisms that can be made available to those countries as a way to minimize possible future asymmetric shocks.

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