

# The Co-integration of European Stock Markets after the Launch of the Euro

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**Summary:** This article studies the international integration of the national stock markets of sixteen European countries. The international financial market is represented by two indices: a European index and a World index. The methodology of co-integration, used in this article, is the proper econometrical solution for the treatment of non-stationary series as those used in the present research. Complementarily, co-integration offers the possibility of distinguishing the long-term and the short-term interdependence, which very important when the variables are financial market indices. The empirical tests in this research have shown that both European and non European international factors are necessary to explain the international integration of the national stock markets under analysis.

**Key words:** Co-integration, Stock markets, Euro

**JEL:** F36, F37, G15

## Introduction

In this article, the Engle and Granger co-integration methodology is applied to evaluate the international integration of sixteen European stock markets, twelve members of the European Monetary Union and four non members, during five years, between the beginning of 2001 and the end of 2005. By centring this research on the period after the launch of the euro, we can verify if the popular assumption that the European financial markets became more integrated after the settlement of the single currency if confirmed by data, or not. If the first hypothesis is true, our results would be different between the countries belonging to the Euro area and those not belonging to it. The countries under analysis are Austria, Belgium, Denmark, Finland, France, Germany, Greece, Holland, Ireland, Italy, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom. Each national stock market is represented by its national stock index. The integration of each of these individual stock markets is evaluated both at the European level, through their co-integration with the European stock index, and at the world level, through their co-integration with the World stock index. Complementarily, the same methodology is applied including simultaneously in

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the tests, both the European index and a variable representing the difference of performance between the World and the European indices. This approach made possible the clarification of the European and non European influence on the international integration of each of these national stock markets.

### **1. Co-integration as a method to evaluate the integration of financial markets**

The research on financial markets integration has been dominated, during the previous decade, by asset pricing models. Since the seminal article of Solnik (1974), in which an international asset pricing model is proposed, most of the research on this subject, such as the one of Harvey (1991) and Bekaert and Harvey (1995), among others, has been concerned with the problem of determining if the risk premium in domestic stock markets depends exclusively on the domestic market portfolio (perfect segmentation), on the world market portfolio (perfect integration), or on both (intermediary situation).

The approach based on co-integration, as is proposed in this piece of research, offers several empirical advantages to the study of financial markets integration. First of all, co-integration does not require the condition of financial markets efficiency, and does not have the estimation of risk premium as a target, as it is the case in asset pricing models. Secondly, it makes possible to distinguish the long and short-term interdependence between different financial markets. Co-integration has been used as a method to evaluate financial market integration, in several studies. Kasa (1992) used the co-integration to estimate the number of common stochastic trends in five stock markets: Canada, Germany, Japan, United Kingdom and USA. The study of Kasa presented evidence that a single common stochastic trend governed the long-run co-movement between those stock markets, during the period from January 1974 through August 1990, which indicates that a high degree of integration existed at that time between those markets. Arshanapalli and Doukas (1993) used co-integration to estimate the dependence of the stock indices of France, Germany, Japan and United Kingdom, relative to a USA stock index, before and after the 1987 crash. These authors concluded that the Japanese stock market was integrated with the US stock market before and after the 1987 crash. By the contrary, they concluded that the stock markets of France, Germany and UK were not integrated with the US stock market before the 1987 crash. The same study also concluded that, after the crash, these three European stock markets became strongly integrated with the US stock market. This result is not consistent with previous studies, using other types of methodology, which concluded that a strong interdependence among these stock markets existed even before the 1987 crash. Richards (1995) estimated the co-integration of 16 national stock indexes, relative to a

world stock index, using quarterly data from end-December 1969 to end-December 1994. The 16 stock markets were those of Australia, Austria, Canada, Denmark, France, Germany, Hong Kong, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and United States. One of the aims of the study conducted by Richards was to explain the apparently anomalous results reported by Kasa (1992), when this author identifies a single common stochastic trend between the stock indexes included in his tests. According with Richards, this could be the consequence of an exaggerated number of lags in the estimations. Richards' explanation for Kasa's anomalous result was put on evidence by that author, using some Monte Carlo simulations. His results conducted him to confirm that the stock returns indices of this group of countries are explained together by a common "world" return, whose existence is suggested by the significant short-rate correlations between returns in different national indexes. He also concluded, however, that these national return indexes are not co-integrated around the common component.

Co-integration has also been used in research on the integration of the European stock market. Rangvid (2001) applied co-integration methods to evaluate the integration between the stock indices of France, Germany and the United Kingdom before the introduction of the Euro. Miloudi (2003) also used this methodology to analyse the integration between sixteen European stock indexes, before and after the launch of the euro, conducting separated tests for the members and non-members of the EMU. In his tests Miloudi observed that the number of long-term relations between the stock indexes of EMU countries was augmented when the indexes of Austria, Finland and Greece were withdrawn from the tests. This result is interpreted by Miloudi as meaning that a strong degree of integration exists between the stock markets of the countries which founded the European Union.

## **2. Empirical tests of the present research**

The period under analysis in this article is of five years, going from 2 January 2001 to 31 December 2005. The database is composed by weekly data and comprises 261 observations of each index. The period chosen for this study is clearly free from the transition effects that occurred during the first years after the launch of the single currency. On the other hand, the integration of the European stock markets before the III stage of the single currency, using co-integration methods has already been the object of other pieces of research, namely those, mentioned before, of Rangvid (2001), and Pascual (2003), the second one covering also the transition period.

The national indices, the Europe index and the World index, which are used in our tests, were obtained from MSCI<sup>1</sup>. Prior to the tests the series value in euros were transformed in logs in order to have the base 100 at the 2 January 2001 for all the variables. Taking logs allowed giving an economic meaning to a supplementary variable that will be used in the tests, which is the difference between the logs of the World and the Europe indices. This procedure made possible to verify if the international integration of the European stock markets, during the period under study, is mainly a European regional or a World global phenomenon, or the result of both types of factors.

The Engle and Granger (1987) and the Gregory and Hansen (1996) approaches to co-integration were used in the tests. The first methodology was chosen, because it easily allows putting in evidence, separately, the long term and the short term interdependence between the variables. Our empirical tests have shown that a clear distinction between these two types of interdependence is very important in this research. The second methodology was used to verify if regime shifts in the data that occurred during the period under study could have exerted any influence on the long term relation between the variables.

### ***2.1. The unit root tests***

Co-integration only can exist between non-stationary variables. Prior to the co-integration estimations, it must be verified if the variables involved are integrated of order 1, I(1), which means that the indexes are not stationary but, on the contrary, stationarity is observed in their first differences. The values calculated for the Dickey-Fuller  $\tau$ -statistic, presented in Table I, for all the national indices, for the Europe and the World indices, and for the non European International Variable, confirm that all these variables are non stationary, and that their first differences are stationary, by comparison with the statistics value at the critical level of 5%, presented at the bottom of the table. Thus, all these indices can be the object of analysis using co-integration methods. According with Akaike information criteria and Schwarz Bayesian criteria only one lag was included in these tests.

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<sup>1</sup> Morgan Stanley Capital International

**Table I-** Dickey-Fuller Tests on the stationarity of the stock indices and their first differences  
(Dickey-Fuller  $\tau$  statistic)

Country	Index	First Diff. of the index
Austria	-1.616	-14.950
Belgium	-0.843	-16.226
Denmark	-0.209	-15.907
Europe Index	-1.760	-16.786
Finland	-2.572	-16.387
France	-1.739	-17.839
Germany	-1.803	-16.072
Greece	-0.936	-13.980
Holland	-2.019	-16.074
Ireland	-1.369	-15.146
Italy	-1.710	-15.281
Norway	-0.309	-15.221
Portugal	-1.819	-15.598
Spain	-1.115	-17.176
N. Eur. I.V	-1.940	-18.683
Sweden	-1.456	-15.647
Switzerland	-1.666	-16.826
Un. Kingdom	-1.718	-17.686
World Index	-0.030	-20.437
Statistic value at the critical level of 5%	-2.873	-2.873

### 2.2. Co-integration between the national indices and the Europe index

The co-integration between each national index and the Europe index was estimated in the first group of tests. The first step of the Engle and Granger model is the estimation of the long-term relation between the national index of each country  $i$ ,  $P_i$  and the Europe index,  $P_E$ , represented by the following regression:

$$P_{i,t} = \alpha + \beta P_{E,t} + e_t \quad (1)$$

This regression is followed by the on the MacKinnon(1991)  $\tau$  statistics related to the Engle-Granger test. With these statistics we test the stationarity of the error terms series,  $e_t$ . The results of these statistics are presented in Table II.

**Table II:** Mckinnon statistics of the error terms of the long-term relation between each national index and the European index using the Engle-Granger standard model

Country	Mckinnon Stat.
Austria	-0.785
Belgium	-1.362
Denmark	-0.633
Finland	-3.178
France	-3.780
Germany	-3.455
Greece	-1.365
Holland	-0.605
Ireland	-2.980
Italy	-1.668
Norway	-0.423
Portugal	-2.362
Spain	-1.087
Sweden	-1.360
Switzerland	-1.896
U. Kingdom	-3.041
Statistic value at the critical level of 5%	-3.360

In the case of almost every country, with the exceptions of France and Germany, the values of these statistics, compared with the statistics value at the critical level of 5% (presented at the bottom of the table) lead to the rejection of the co-integration hypothesis.

During the period under study, two different trends were observed in the stock market. The first period, from January 2001 to March 2003, was dominated by a decreasing trend in stock prices, while the reverse tendency was observed after that period. This modification in the stochastic process followed by stock prices could be one of the reasons why the previous model failed to explain the internationalisation of these European stock markets. To take account of the possibility that this change in the trend of the variables could have some influence on the results, we used the Gregory and Hansen (1996) approach to co-integration. This method tests if the non-stationarity of long-term relation, observed in the previous tests, could be the consequence of a level break, of a level break and trend, or the result a regime shift (which consists of a level and a slope break). The possibility of a *level break* is represented by the following long-term relation:

$$P_{i,t} = \alpha_0 + \alpha_1 \varphi_{i\tau} + \beta_1 P_{E,t} + e_t \quad (2)$$

The difference between this model and the standard model of Engle and Granger consists in the inclusion of a dummy variable  $\varphi_{i\tau}$ , representing the level break which occurred at time  $\tau$ . The possibility of a *level break and a trend* in long-term relation has the following representation:

$$P_{i,t} = \alpha_0 + \alpha_1 \varphi_{i\tau} + \beta P_{E,t} + \mu t + e_t \quad (3)$$

Finally, the hypothesis of a full break, both in the level and in the slope, takes the following representation:

$$P_{i,t} = \alpha_0 + \alpha_1 \varphi_{i\tau} + \beta_1 P_{E,t} + \beta_2 \varphi_{i\tau} P_{E,t} + e_t \quad (4)$$

The estimation of these three models is followed by the tests on the stationarity of the error terms, using the statistics adapted by Gregory and Hansen from the Engle-Granger original ones.

According with the calculated values of the Gregory and Hansen statistics, presented in Table III, compared with the statistics value at the critical level of 5% (presented at the bottom of the Table), these models only suggest the possibility of co-integration, between the national indices and the European index, in a small number of cases. In fact, it is only in the cases of France, Spain, Norway and United Kingdom that all the three hypothesis of break seem to be capable of explaining the lack of stationarity of the long-term relation with the Europe index. When we took into consideration only the level break hypothesis, a stationary long term relation with the Europe index was observed in the cases of Finland, Greece, and Sweden. By the contrary, in the cases of Austria, Belgium, Denmark, Holland, Ireland, Italy, Portugal and Switzerland, none of the Gregory and Hansen hypothesis has produced a long-term stationary relation with the Europe index.

**Table III:** Gregory & Hansen statistics of the error terms of the long term relation between each national index and the Europe index

Country	Level Break		Level Break & Trend		Level and Slope Breaks	
	GH Stat	Break date	GH Stat	Break date	GH Stat	Break date
Austria	-4.261	*	-3.939	*	-4.089	*
Belgium	-3.767	*	-4.037	*	-4.035	*
Denmark	-4.287	*	-4.898	*	-4.733	*
Finland	-4.668	2004:03:13	-4.622	*	-4.707	*
France	-5.257	2002:11:30	-6.000	2003:01:25	-5.234	2002:11:30
Germany	-3.490	*	-4.545	*	-4.565	*
Greece	-4.661	2002:07:20	-4.632	*	-4.404	*
Holland	-3.755	*	-3.934	*	-3.934	*
Ireland	-3.417	*	-3.588	*	-3.647	*
Italy	-3.795	*	-3.701	*	-3.961	*
Norway	-4.616	2002:07:13	-5.163	2003:03:22	-4.979	2003:03:22
Portugal	-2.986	*	-3.884	*	-3.975	*
Spain	-5.443	2003:01:04	-5.598	2003:01:04	-5.750	2003:01:04
Sweden	-4.791	2002:11:30	-4.726	*	-4.811	*
Switz.	-2.183	*	-2.870	*	-3.154	*
Unit.King	-5.039	2003:03:08	-5.069	2002:12:14	-5.025	2003:03:08
Stat value at the critical level of 5%	-4.61		-4.99		-4.95	

### *2.3. Co-integration between the national indices and the World index*

Since in the previous tests, where the Europe index was used to represent the international financial market, the co-integration has been suggested only for a small number of the European stock markets under analysis, the same tests were applied replacing the Europe index by the World index. The aim of this procedure is to verify if the international integration of the European stock markets can alternatively be explained by the non European international integration process. The same steps of the previous tests were used with the World index. The Engle-Granger model was the first one that we estimated, and Mckinnon statistics on the stationarity of the error terms of the long-term relations, obtained with this model are presented in Table IV.

**Table IV:** Mckinnon statistics of the error terms of the long-term relation between each national index and the World index using the Engle-Granger standard model

<b>Country</b>	<b>Mckinnon Stat.</b>
Austria	-2.563
Belgium	-1.557
Denmark	-1.697
Finland	-3.105
France	-1.858
Germany	-1.772
Greece	-2.127
Holland	-1.713
Ireland	-1.716
Italy	-2.303
Norway	-1.612
Portugal	-2.129
Spain	-2.089
Sweden	-2.593
Switz.	-1.956
U. King.	-1.622
Stat.value at the critical level of 5%	-3.360

In all the cases the values of these statistics, compared with the statistics value at the critical level of 5% (presented at the bottom of the table) lead to the rejection of the co-integration hypothesis.

The long-term relation of each national stock index with the World index was also subjected to estimation using Gregory and Hansen models, the results being presented in Table V. The Gregory-Hansen statistics show that taking in consideration a level break helped to obtain long-term stationary long-term relations in the cases of France, Germany, Holland, Spain, Sweden, Switzerland and United Kingdom. No stationary long-term relation is observed when the hypothesis of a level break and trend is considered. In the cases of France, Germany, Switzerland and United Kingdom, a stationary long-term relation was also obtained, when both a level and a slope break were considered.

We can conclude that these results do not show that the World index has a better capability to explain the international integration of these national stock markets, comparatively with the Europe index.

**Table V:** Gregory & Hansen statistics of the error terms of the long term relation between each national index and the **World** index

	<i>Level Break</i>		<i>Level Break &amp; Trend</i>		<i>Level and Slope Breaks</i>	
	<b>GH Stat</b>	<b>Break date</b>	<b>GH Stat</b>	<b>Break date</b>	<b>GH Stat</b>	<b>Break date</b>
Austria	-3.321	*	-4.051	*	-3.438	*
Belgium	-3.714	*	-3.878	*	-3.660	*
Denmark	-4.526	*	-4.291	*	-4.488	*
Finland	-4.547	*	-4.617	*	-4.619	*
France	-4.992	2002:08:10	-4.851	*	-5.067	2002:08:10
Germany	-4.916	2002:08:10	-4.849	*	-5.042	2002:08:10
Greece	-4.200	*	-4.363	*	-4.222	*
Holland	-4.681	2002:08:10	-4.161	*	-4.759	*
Ireland	-3.777	*	-3.977	*	-3.801	*
Italy	-4.222	*	-4.239	*	-4.305	*
Norway	-3.322	*	-3.558	*	-3.085	*
Portugal	-3.850	*	-3.690	*	-3.846	*
Spain	-4.843	2002:07:13	-4.069	*	-4.714	*
Sweden	-4.837	2002:07:13	-4.712	*	-4.792	*
Switzer.	-5.193	2002:08:10	-4.514	*	-5.166	2002:08:10
U. King.	-4.831	2002:07:13	-4.144	*	-4.980	2002:07:13
Statistic value at the critical level of 5%	-4.61		-4.99		-4.95	

#### ***2.4. Co-integration of the national index with the Europe index and a non European factor***

The major conclusion of the previous tests is that neither the Europe index nor the World indexes, when they are introduced separately in the tests, present a clear capability to explain the international integration of the major part of the European national stock markets under study. Furthermore, the previous results also shown that there is not a difference of pattern between countries belonging and not belonging to the European Monetary Union.

The next step, in our search for a model being capable of explaining the internationalisation process for a large number of the European stock markets, consisted in including in the test two international variables, one of which is the index Europe, and the other represents the rest of the world. This second variable, a “pure” non European factor, is measured by the difference between the logs of the World and the Europe indices. Since both the indices have, after our data transformation, the value of log (100) at 2 January 2001(the first date of the series), the difference between them, at any date afterwards, measures the difference between the rates of growth of the World and the Europe indices, since 2

January 2001. This decomposition makes possible to obtain more clear results regarding the influence of European and non European elements, over each of the national indices. The long-term relation, in the case of the Engle-Granger model, has the following representation in these tests:

$$P_{i,t} = \alpha + \beta_1 P_{E,t} + \beta_2 P_{NE,t} + e_t \quad (5)$$

where  $P_{i,t}$  is the national index of country  $i$ ,  $P_{E,t}$  is the European index, and  $P_{NE,t}$  is the non European international factor, calculated as we explained in the previous paragraph.

This model has been subject to the same tests as other models that we have presented. We began by estimating the standard Engle-Granger model, whose the Dickey-Fuller statistics associated to error term are presented in the Table VI.

**Table VI:** Mckinnon statistics of the error terms of the long-term relation between each national index and the Europe index plus a non European international factor, using the Engle-Granger standard model

Country	Mckinnon Stat.
Austria	-3.898
Belgium	-3.815
Denmark	-5.057
Finland	-3.800
France	-5.094
Germany	-4.177
Greece	-3.963
Holland	-4.201
Ireland	-4.262
Italy	-3.859
Norway	-4.358
Portugal	-3.918
Spain	-4.530
Sweden	-4.583
Switzer.	-4.145
U. King.	-4.665
Statistic value at the critical level of 5%	-3.780

According with the results presented at the Table VI, and by comparison of the calculated Dickey Fuller statistics with the statistics value at the critical level of 5% (presented at the bottom of the table) we can conclude that the inclusion of

two international variables in the Engel-Granger model provides a long-term stationary relation for all the European national stock indices under study. These results suggest that the inclusion of two international variables gives to our model a generalized capability of explaining the international integration of the European stock markets. Notwithstanding that, we repeated the sequence of tests used previously, and the hypothesis of breaks according the Gregory and Hansen break models was also taken in consideration. The results of these tests are presented in Table VII. The comparison of the G&H statistics presented in this table with the statistics value at 5% level of significance shows, clearly that, only in few cases, the hypothesis of breaks is important to obtain long term stationary relations. In fact, only in the cases of Denmark and France a long term stationary relation can be accepted whatever the type of break under consideration. The other cases where such a stationary relation can be accepted are the United Kingdom, under the hypothesis of a level break, and Spain, under the hypothesis of a level break and trend.

**Table VII:** Gregory & Hansen statistics of the error term of the long term relation between each national index and the Europe index plus a non European international factor

	<i>Level Break</i>		<i>Level Break &amp; Trend</i>		<i>Level and Slope Breaks</i>	
	<b>GH Stat.</b>	<b>Break date</b>	<b>GH Stat.</b>	<b>Break date</b>	<b>GH Stat.</b>	<b>Break date</b>
Austria	-4.477	*	-4.245	*	-5.159	*
Belgium	-4.245	*	-4.284	*	-4.744	*
Denmark	-6.130	2004:06:19	-6.387	2004:07:03	-6.081	2004:07:03
Finland	-4.664	*	-4.652	*	-4.726	*
France	-7.076	2003:01:04	-7.065	2003:01:04	-7.220	2003:01:04
Germany	-4.665	*	-4.618	*	-5.196	*
Greece	-4.236	*	-4.395	*	-4.507	*
Holland	-4.074	*	-4.053	*	-5.231	*
Ireland	-3.505	*	-3.933	*	-3.807	*
Italy	-3.782	*	-4.130	*	-4.756	*
Norway	-3.716	*	-5.144	*	-5.064	*
Portugal	-3.639	*	-3.911	*	-4.009	*
Spain	-4.327	*	-6.236	2003:01:11	-4.657	*
Sweden	-4.712	*	-4.776	*	-5.062	*
Switzer.	-3.712	*	-3.648	*	-4.543	*
U. King.	-5.042	2003:03:08	-5.162	*	-4.878	*
Stat.value at the critical level of 5%	-4.92		-5.29		-5.50	

These results confirm that the inclusion of two international variables, the Europe index and the non European international factor, when the Engle-Granger model is used, presents the best capability to explain the international integration of the major part of the sixteen European stock markets under analy-

sis in the present study. According to these results, we chose this model to be subjected to the second part of the co-integration tests, which consists in verifying if the long term relation with the international variables has, or not, influence over the current changes of each national index. Only if that type of influence is observed, the co-integration can be confirmed. This second part of the tests is represented by the following *error-correction* model:

$$\Delta P_{i,t} = a_1 + a_{i,e} e_{t-1} + \sum_{j=1}^L a_{ii}(j) \Delta P_{i,t-j} + \sum_{j=1}^L a_{iE}(j) \Delta P_{E,t-j} + \sum_{j=1}^L a_{iNE}(j) \Delta P_{NE,t-j} + \varepsilon_{i,t} \quad (6)$$

where the current change of the national index,  $\Delta P_{i,t}$ , is explained by the lagged error term of the long-term relation,  $e_{t-1}$ , by the lagged changes of the national index, itself,  $\Delta P_{i,t-j}$  ( $j=1, \dots, L$ ), by the lagged changes of the European index,  $\Delta P_{E,t-j}$  ( $j=1, \dots, L$ ), and by the lagged changes of the non European international variable,  $\Delta P_{NE,t-j}$  ( $j=1, \dots, L$ ). The optimal number of lags,  $L$ , was calculated using Akaike Information criteria and Schwarz Bayesian criteria, according with which a single lag for each variable was included in the model, which means  $L=1$  in all estimations. The value of the estimator of  $a_{i,e}$ , and its level of significance are the most important results of the estimations of the error correction model. In fact, that estimator is the measure of *elasticity of reversion* of the value of the national stock index to its long term relation with the international variables. Thus, the value of that estimator is an indicator of the dependence of the current changes of each national index relatively to its long term relation with the European Index and the non European international variable. The values of these estimators and their levels of significance are presented in Table VIII.

**Table VIII:** Estimators, Student T and Level of significance of the elasticity of reversion of the national indices to their long-term relations with the international variables

Country	$a_{ie}$	Student T	Level of Sig.
Austria	-0.024	-1.982	0.045
Belgium	-0.078	-2.034	0.042
Denmark	-0.108	-2.569	0.010
Finland	-0.037	-2.150	0.033
France	-0.133	-2.320	0.021
Germany	-0.146	-2.410	0.016
Greece	-0.046	-1.988	0.048
Holland	-0.050	-2.075	0.039
Ireland	-0.069	-2.353	0.019
Italy	-0.061	-1.987	0.048
Norway	-0.071	-3.078	0.002
Portugal	-0.036	-2.014	0.045
Spain	-0.027	-2.010	0.045
Sweden	-0.068	-1.993	0.047
Switzer.	-0.173	-3.233	0.001
U. King.	-0.116	-2.328	0.020

The results presented at Table VIII show that, in all the cases of European national countries under analysis, the estimators of the elasticity of reversion of the national indices to their long-term relations with the international variables are significantly different from zero. These results confirm the importance of the inclusion of two international variables, one representing the European financial markets and the other representing the rest of the World, to explain the international integration of the European national financial markets.

## Conclusions

In the present study we used the co-integration methodology to study the international integration of sixteen European stock markets, which are the twelve members of the European Monetary Union (Austria, Belgium, Finland, France, Germany, Greece, Holland, Ireland, Italy, Portugal, Spain and Sweden), Denmark and United Kingdom (members of EU but not of EMU), Norway and Switzerland (non members of EU). The methodology used consisted in applying alternatively the Engle-Granger and the Gregory & Hansen models to test the stationarity of the long-term relations between each one of the national indices and the international variables. Each of these models was applied in tests where

the international variables were, alternatively, the Europe index (first group of tests), the World index (second group of tests) and the Europe index plus an non European International variable, whose calculation was based on the difference between the rates of growth of the World and the Europe indices (third group of tests). The only group of tests in which the stationarity of the long-term relations with the international variables was observed for all countries was, in the third group of tests, the sub-group in which the Engle-Granger model was applied. By consequence, it was only in this sub-group that estimation of the long-term relations between the variables was followed by the estimation of the *error-correction model*, which confirmed that there is co-integration between each one of the national indices and the international variables represented by Europe index and the non European International variable.

The main comments that these results suggest are, first of all, the fact that regime shifts or breaks in the stochastic processes followed by these variables are not important to in the analysis. This can be explained by the fact that, in general, when regime shifts occur, they affect a significant number of markets, leaving unchanged the nature of the long-term relations between them. Another comment concerns the fact that neither the Europe index nor the World index, when taken separately, could give a generalized explanation for the process of international integration of these national stock markets. This result puts clearly in evidence that this process of international integration is a mixture result of European and non European influences.

Finally, we must underline the fact that the results of these tests didn't show any difference of patterns between EMU and non EMU members. According with this evidence, we can conclude that the role of European Monetary Union in the integration of the stock markets of the member countries is not as important as the common sense often suggests. It must not be forgotten that other causes have contributed significantly to the international integration of financial markets, during the last two decades. One of these important causes is the technological innovation in the systems of negotiation. Two other causes of this phenomenon are the liberalization of international capital movements and the development of the emergent markets. This does not mean that the monetary unification is not important in the integration of stock markets of the member countries. However, its contribution to that integration has not been as important as it should have been, if other important causes of internationalisation of the financial markets were not acting at the same time.

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