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ABSTRACT

Traditionally, the main role of the bank is to offer loans to its customers, to facilitate the intermediary role in the financial market between the investors and feed the need of the big corporations in terms of investment. This study is an attempt to analyze, at the same time, the impact of three factors that are involved in the income of the European banks. The first two are endogenous to the bank and the third one is deemed, a priori, to be exogenous to the bank. Our objective is to look at the influence of "Fee & commissions", the "Net Non-interest income" and the interest rate on banks' profitability in a panel data of 34 banks chosen from different European countries. The interest rate of reference is supposed to be under the control of the central bank but subject to movement due to the interactions between the cross-border countries and the competitive framework within the same country. The "Fee & commissions" and the "Net Non-interest income" are more related to the efficiency of the management team and the effectiveness of the processing inside the same bank. Our main finding is that the "Fee & commissions" are not really influencing the profitability of the European banks. However, the "Net Non-interest income" and the interest rate are significantly impacting the profitability of the European banks.

Keywords: Banking System, Regulation, Fee and commissions, Bank Profitability, panel data

JEL Classification: C22, C58, G21, G28

1. Introduction

In a perfect competitive market, all banks should charge the same fees and commissions for similar services. To reach this objective, convergence in cost efficiency of banks is required since large differences in banking costs prevent banking prices from converging. Therefore, the investigation of convergence in cost efficiency of banks involves the degree of banking integration in the EU. However, that requires us to examine the importance of interest rate on the profitability of the banks.

Our aim is on the one hand, to assess the impact of both internal factors of the European banks the "fees and commissions" and "non-interest Income" and, on the other hand, the influence of the interest rate of the country for the European Universal banking sector during the recent years. Both "fees and commissions" and "non-interest Income" are in the hand of the management of the bank and its relation with its own customers, the latter is a consequence of the monetary policy and the financial framework of the country. We estimate those parameters of European banks with the Panel technique approach. We then, analyze the issue of coming back to the equilibrium and the speed of this convergence. One great point of this analysis is the application of whole process of panel tests on banking efficiency measures.

We make use of two major concepts of Panel techniques: Estimating Long-run relationship with Dynamic OLS and the use of Panel VECM Granger causality with GMM, in particular the convergence to the equilibrium will be examined for both ROE and ROA. The short-term and long-term relationship with the dependent variable and the explanatory variables will be analyzed using Wald F-test, panel Granger causality Beta-convergence and Sigma-convergence. Beta-convergence implies that countries with a lower level of banking efficiency have faster growth rates than countries with a higher level of banking efficiency. Convergence is observed if each country's level of banking efficiency is converging to the average level of the group of countries.

The structure of this article is as follows. Section 1 (Background) develops the evolution of the European banking sector over the last decade.

First, we will test the unit root, the long run and short run relationship between ROE (and ROA) where the variables are considered as independent. We provide also, the equations of FE, RE, and the DFE the measure of PMG and MG. Haussman test will be used to make a choice between the three models.

DOLS and Panel VECM Granger causality with GMM will be used in section 2.

Section 3 outlines the methodology used for the cost efficiency measures and the convergence tests. Section 4 describes the data and variables. Section 5 develops the empirical results. Finally, we provide some concluding remarks in Section 6

2. Literature review

In his paper Fung (2006) has made a performing test of convergence on banking efficiency measures for the US bank holding companies. Thus, the objectives were far different from the investigation on the convergence in pure technical efficiency and scale efficiency.

Many works have tried to extend the established literature on banking efficiency in European countries notably (e.g. Lozano-Vivas et al., 2001, 2002). In this latter strand of literature, several papers have investigated banking efficiency in European countries to analyze, specifically, the cross-country differences. Lozano-Vivas et al. (2001) notably estimated a cross-country production frontier on a sample of banks from 10 European countries with the non-parametric DEA approach. Vander Vennet (2002) investigated cost and profit efficiency on a sample of banks from 17 European countries. The main conclusion of these papers is the existence of substantial discrepancies in banking efficiency across European countries. However several studies have underlined the fact that, after controlling for environment, cross-country differences in banking efficiency are substantially reduced (Lozano-Vivas et al., 2002; Carbo Valverde et al., 2007). Furthermore, a few studies have investigated the evolution of banking efficiency in the European countries since the nineties so as to provide evidence on the effects of European integration on banking efficiency.

Most of these works conclude in favor of an increase in efficiency for the European banks (Altunbas et al., 2001; Carbo Valverde et al., 2002; Casu and Molyneux, 2003), even if some papers provide more ambiguous results (Schure et al., 2004; Maudos and Fernandez de Guevara, 2007).

The adoption of the Single European Act in 1986 was a very important moment in integration of European market, stating the completion of the single market through the free circulation of people, goods and services, and capital in 1992. This was the very starting point of banking integration in the European with the adoption of the Directive on Liberalization on Capital Flows in 1988, and more particularly the Second Banking Directive in 1989. This latter text established the single banking license: any bank authorized to provide banking services in a European state was from then

on allowed to provide banking services in another European state. In practice, by reducing legal barriers to entry on foreign banking markets, this directive was expected to favor the cross-border expansion of banking services through either the creation of branches or the supply of cross-border financial services. The creation of subsidiaries was not favored as they were still submitted to the control of the host country authority. The creation of the single currency in 1999 was another step taken towards an integrated European banking market, as it removed the exchange risk for banks in the cross-border acquisitions and in the supply of cross-border services. However the way to the integration of the banking markets was still punctuated with legal obstacles. Therefore, the Financial Services Action Plan (FSAP) was launched in 1999 to be implemented in 2005. This plan had three aims: the creation of a single European wholesale market for financial services and products, the creation of an open and secure financial retail market, and the implementation of state of the art prudential rules and supervision. Therefore, it aimed to implement integrated wholesale banking markets, and to develop the prudential regulation and the openness of the retail banking markets. It was then a set of 42 measured intended to reach these aims.

Consequently, the analysis of the legal efforts to promote banking integration in the European shows major changes. Indeed, great efforts have been performed in particular through the Second Banking Directive and the Liberalization of Capital Flows, reducing the legal barriers to entry. However, some legal obstacles such as the consumer protection rules and the tax rules remain. We turn now to the evolution of the structure of the European banking markets, to analyze notably the outcome of these legal changes.

Yafeh and Yosha (2001) showed that banks can implement barriers to entry by increasing their customership, so that the switching costs for the customers (resulting among others from the best information owned by the bank on its borrower) prevent the potential competitors from enter the market. Therefore, the expectations of new competitors may have incited European banks to increase the number of branches so as to have a larger customership. This behavior may have reached its peak in countries with poor levels of banking efficiency, as banks originating from these countries are the most threatened by foreign competition.

The consequences of these changes on banking competition can then be measured. Several works have then shown the absence of increased competition during the nineties and the first half of the current decade. Fernandez de Guevara et al. (2005) support the absence of increased competition on European banking markets during the 90s. They compute a Lerner index of market power for the banking sectors of the five biggest European countries between 1992 and 1999.

In a related study, Goddard et al. (2004) investigate profitability of European banks in six European countries between 1992 and 1998 and observe a significant persistence of abnormal profit during that period.

The absence of increased competition in the European banking sectors during the 90s may seem surprising, as there is consensual evidence regarding the reduction of margins in these sectors. Maudos and Fernandez de Guevara (2004) however explain how the fall of margins in European banking was compatible with a relaxation of competitive conditions, and notably an increase of market power, during that period. They indeed show that European banks benefited during the 90s from a reduction of interest rate risk, credit risk, and also of operating costs which allow them to reduce their margins without decreasing their market power.

To sum it up, Dermine (2003) stressed that the effects on banking integration from the Second Banking Directive may have been an illusion.

It appears relevant to analyze the impact of "fees and commissions" and the interest rate, to assess the effective effects of banking integration on the behavior of banks. Indeed, even if there was no increase of competition, banking behavior may for instance have been affected by the implementation of the Euro and the expected cross-border mergers. Furthermore, competition policy from European authorities may have shrunk the possibilities of collusion for banks.

3. Data and Methodology

3.1. Data

Data are taken from the Bloomberg and completed in a minor way by "Bankscope" database. Bankscope includes both consolidated and unconsolidated balance sheet data. To make sure that observations are not duplicated for the same bank, the following procedure was applied to include information from only one of the balance sheets. First using the "consolidated code" variable in Bankscope we choose institutions, which will provide one balance sheet for each institution at the higher level of consolidation available. In a second step, we add those banks not included in the first step for which data are available. We use financial data for a sample of banks from 9 European countries (France, Germany, Greece, Italy, Ireland, Portugal, Spain, Sweden, Switzerland). The data needed at the level of the country (macro variables like GDP, inflation, interest rate and stock

market) have been taken from BIS Historical Statistics database, for each year and each country.

The lack of sufficient data in our database concerning the other European countries brought us not to include all European countries. This sample of 9 European countries is however satisfactory for an investigation of the evolution in banking efficiency in European countries, as it includes the major European countries. Our sample includes only some European banks. The period of observation stretches from 2000 up to 2009, since we cannot get the data for some banks for the year 2010. We use only balanced panel, as the choice of a unbalanced sample would create more disparities in the measurement of fees and commissions. Indeed, we could not take into account the banks gone into bankrupt and those being absorbed during this period. Data sets for banks with observations out of the range 2000 – 2009 were dropped. These criteria produce a sample of 340 observations.

3.2. Methodology

The bank collects deposits to transform them, using labor and capital, into loans as opposed to the production approach, which views the bank as using labor and capital to produce deposits and loans. Two outputs are included: loans, and investment assets. The inputs, whose prices are used to estimate the cost frontier, include labor, physical capital and borrowed funds. As data on the number of employees are not available, the price of labor is measured by the ratio of personnel expenses to total assets, following Altunbas et al. (2001) and Maudos et al. (2002) among others. The price of physical capital is defined as the ratio of other non-interest expenses to fixed assets. The price of borrowed funds is measured by the ratio of paid interests to all funding. Total costs are the sum of personnel expenses, other non-interest expenses and paid interest.

Time-series and cross-sectional data (panel data) have been used for this paper. The first estimation in such cases is Dynamic Heterogeneous panel technique. The sample included banks that have different sizes and are widely dispersed in terms of efficiency. This factor has to be considered as the firm-specific effect. The Fixed Effects method solves this problem and allows us to take into consideration the firm-specific effects on regression estimations. However this model does not take into consideration the time effect. It would be robust only under the omission of any relevant time-varying factors. Hence this study will implement the Random Effects Model, which besides incorporating the firm-specifics effects takes into consideration the time effects. The equation of Random Effects Model

3.2.1. Variables

We have included in the regressions as dependent variables the two basic instruments that authorities use to control bank's profitability: ROA and, ROE.

Additionally, we have also included control variables related to the financial development of the country, macro variables and other banks variables. We limit our study to the following additional information about:

- ✓ The level of inflation, and the interest rate
- ✓ Stock market to GDP of each country from BIS Historical Statistics database.

(see the table in the Appendix 1)

List of Variables:

Bank characteristics according to Demirgüc-Kunt and Huizinga (2001) will include:

- ✓ ROE (Return to Equity) related and ROA (Return to Assets)
- ✓ Income or banks' interest margin (P_NII) is the interest income minus interest expense over total assets and it captures the profitability of the intermediation activity of banks,
- ✓ LOANS to Deposit (L2DEP), bank loans bring, in general, the main source of income to the bank and are expected to have a positive impact on bank profitability.
- ✓ Net non-interest earnings (P_NNII) and
- ✓ Banks overhead cost to total assets (P_OPEX) is used to provide information on variation in bank costs. It reflects employment, total amount of salaries and cost of running the facilities offered by the bank. Overhead is expected to have a negative impact on performance because efficient bank should operate at lower costs.
- ✓ The variable "Fee and commissions" (PFC) represents the income of the bank as in intermediary or agent for the customer

We note that, except for L2DEP, the total banks' assets divide all these previous banks' variables in each year.

Since they are macro variables potentially affecting banks' profitability in each country, we include:

- ✓ The interest rate (INT) and,
- ✓ the inflation rate (INF)

For measuring the volume and activity of the banking sector, Beck et al (2001) proposed to control the development of the financial system, those variables. To measure the size of the banking sector we use:

- The size of the stock market is replaced by the ratio of the stock market capitalization divided by GDP (S2GDP), as a proxy.

To measure credit activity of the banking sector, we would use a proxy:

- The credit to the private sector by deposit money banks divided by GDP.

This variable will not be used, since it is not easy to get it.

However, we will not use the national regulatory restrictions such the index of restrictions on banks owning non-financial firms elaborated by Barth et al. (2001b) since the portion of the equity investment still small in regard to the principal activity of giving a loans.

Net income is net interest income plus non-interest earnings minus overhead cost and provides a measure of bank profits before provisions and taxes.

As the capital gains or losses and dividends of firms' shares are included in the net income but not in the net interest income, the relationship between banks' equity investments and banks' net income would depict not only the effect on the banks' lending relationship but also on the direct yields (capital gains or losses, dividends) that banks get from the investment in the firm's equity. We will use the two main variables, as dependant variable one after the other, ROE and ROA.

So the relationship between profitability and these variables can be described by the following equation presented in the next sub-section.

3.2.2. The model

$$IN_{it} = \alpha + \beta B_{it} + \gamma M_{it} + \delta FD_{it} + \mu_i + \eta_{it}$$

where:

- IN_{it} is the dependent variable (either ROE or ROA) for country i in year t,
- B_{it} are banks' variables for country i in year t,
- M_{it} represents the macro variables,
- FD_{it} are the financial development variables,
- μ_i is a Country Specific effect and,
- η_{it} is a white-noise error term.

This section is devoted to the presentation of our results. We first display the main findings. We then provide some robustness checks. We attempt afterwards to provide some explanations.

The table in Appendix 1 is giving the details of the variables used.

4. Results and Discussions based on Multivariate Analysis

4.1. Unit root

The availability of a panel data enables us to analyze country-specific and time-specific effects. Unit root has been tested for ROA as independent variable) using *HADRI test* , see results 1 annex II. A*ccording to HADRI test, the variables:* ROA, banks' interest margin (P_NII), Net non-interest earnings (P_NNII), "Fee and commissions" (PFC), banks overhead cost to total assets (P_OPEX) are non stationary.

However, ROA, banks' interest margin (P_NII), Net non-interest earnings (P_NNII), "Fee and commissions" (PFC), The ratio of the stock market capitalization divided by GDP (S2GDP) Are stationary all together.

Also, Unit root has been tested for ROE (as independent variable) using IPS test (Im. Pesaran and Shin) with three different equation as it is allowed by the system, see results 2 annex II. According to IPS test, the variables presented in the two following equations have at least one endogenous variable. The Inflation seems to be the good candidate for that.

It seems to be difficult to find out the endogenous variable, but we suggest the ROE itself since this one is depending of the others as we can see in the three following equations:

<u>First equation:</u>

ROE is a function of: banks' interest margin (P_NII), Net non-interest earnings (P_NNII), "Fee and commissions" (PFC) and banks overhead cost to total assets (P_OPEX)

$$ROE = f(\ inf, int, s2gdp\ )$$

<u>Second equation:</u>

$$ROE = f(\ nii, nnii, inf, int\ )$$

ROE is a function of: banks' interest margin (P_NII), Net non-interest earnings (P_NNII), , banks overhead cost to total assets (P_OPEX)

<u>Third equation:</u>

ROE = f(nii, nnii, loans2dep, pfc)

ROE is a function of: banks' interest margin (P_NII), Net non-interest earnings (P_NNII), loans offered by banks and (loans2dep) and pfc.

4.2. Co-integration

The cointegration has been tested using Pedroni Residual Cointegration Test and Kao test for ROA and ROE with different equations series within the numbers of parameters accepted by the software system. See table 2 below.

Pedroni is not conclusive given the limited number of datasets (10 years x 34 banks = 340). Since there is a limitation in term of number of variables to be tested under PEDRONI. Therefore, we can conclude that there is cointegration with 7 variables in the two series 5 and 6: (ROE? NII? NNII? L2DEP? PFC? OPEX? S2GDP?) and (ROA? NII? NNII? L2DEP? PFC? OPEX? S2GDP?)
There is cointegration according to PP-Statistic only for both series 4 and 5 (with both ROE and ROA).

According to Kao, there is one cointegration vector between all the independent variables either with ROE or ROA .

Table 1*:* Pedroni test for ROE and ROA with different variables

Pedroni	***Null Hypothesis: No cointegration***		**Statistic**	**Prob**	***Result***
Serie 1	N_ROA? P_NII? P_NNII?	Group rho-Statistic	4.687312	1.0000	No cointegration
		Group PP-Statistic	-5.147085	0.0000	**Cointegration**
		Group ADF-Statistic	0.035927	0.5143	No cointegration
Series 2	N_ROA? P_NII? P_NNII? LOANS2DEP? PFC? P_OPEX? INF?	Group rho-Statistic	10.00988	1.0000	No cointegration
		Group PP-Statistic	-38.83295	0.0000	**Cointegration**
		Group ADF-Statistic	-5.642727	0.0000	**Cointegration**
Series 3	ROA? NII? NNII? L2DEP? PFC? OPEX?	Group rho-Statistic	8.501002	1.0000	No cointegration
		Group PP-Statistic	-14.24239	0.0000	**Cointegration**
		Group ADF-Statistic	0.212188	0.5840	No cointegration
Series 4	ROA? NII? NNII? L2DEP? PFC? OPEX? S2GDP?	Group rho-Statistic	9.601398	1.0000	No cointegration
		Group PP-Statistic	-20.82668	0.0000	**Cointegration**
		Group ADF-Statistic	-0.236005	0.4067	No cointegration
Series 5	ROE? NII? NNII? L2DEP? PFC? OPEX? S2GDP?	Group rho-Statistic	9.364887	1.0000	No cointegration
		Group PP-Statistic	-19.14629	0.0000	**Cointegration**
		Group ADF-Statistic	0.971338	0.8343	No cointegration
Series 6	ROE? NII? NNII? L2DEP? PFC? OPEX? INF?	Group rho-Statistic	9.717539	1.0000	No cointegration
		Group PP-Statistic	-17.76451	0.0000	**Cointegration**
		Group ADF-Statistic	2.253199	0.9879	No cointegration

Table 2: Kao test for ROE and ROA with different variables

KAO Test	H0: No cointegration		**t-Statistic**	**Prob.**
Serie 1	**ROE**? NII? NNII? L2DEP? OPEX?	ADF	-6.386473	0.0000
Serie 2	**ROE**? NII? NNII? L2DEP? OPEX? PFC?	ADF	-7.074024	0.0000

Serie 3	**ROE**? NII? NNII? L2DEP? OPEX? PFC? INF?	ADF	-6.708735	0.0000
Serie 4	**ROE**? NII? NNII? L2DEP? OPEX? PFC? INF? INT?	ADF	-6.593227	0.0000
Serie 5	**ROE**? NII? NNII? L2DEP? OPEX? PFC? INF? INT? S2GDP?	ADF	-8.609403	0.0000
Serie 6	**ROA**? NII? NNII? L2DEP? OPEX? PFC? INF? INT? 2GDP?	ADF	-6.103881	0.0000

However, Johansen Fisher cointegration test is not conclusive given the limited number of datasets (10 years x 34 banks = 340), since there is a limitation in term of number of variables to be tested. This limitation is equal to only two variables (see table below).

Table 3: Johansen Fisher test for ROE and ROA with different variables

Johansen Fisher		Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (max-eigen test)	
ROA? NII?	None	361.8	0	311	0
	At most 1	179.6	0	179.6	0
ROE? NII?	None	407.1	0	362.5	0
	At most 1	194.4	0	194.4	0

4.3. Estimating Long-run relationship with the Dynamic OLS

The result from Kao test has shown, there is cointegration if ROA (ROE) is dependent variable. Therefore, we have proceeded to the estimation of long run relationship for *ROE and ROA as dependent variables.*

So, according to DOLS applied to ROA, The "Net Interest income" (p_nii), "non-interest income" (p_nnii), "Fee & commissions" (pfc), the Inflation (INF) and "Interest rate" (INT) have a significant impact over ROA. *(See Annex IX Table 1)*

However, for ROE, The "non-interest income" (p_nnii), "Fee & commissions" (pfc), the operating expenses (p_opex), the "stock to GDP" (s2gdp) ratio, the Inflation and "Interest rate" (INT) have a significant impact over ROE. (See Annex IX Table 1)

4.4. Panel VECM Granger causality with GMM

According to GMM (granger Causality) applied to ROA, ECT is significant and negative(value = -0.817) bringing the system to the equilibrium quickly in less than 15 months (1/0.817 year = 14.64 months). (See Annex IX Table 3)

In the case of ROE, according to GMM (Granger Causality), ECT is significant and negative(value = -10.06) bringing the system to the equilibrium very quickly in less than 35 days (1/1.06 year) for ROE. (See Annex IX Table 4)

However, the Sagan test (of Overidentifying restrictions) has shown that there is no need for overidentifying restrictions, the equation should stay as it is. (see table below).

H0: overidentifying restrictions are valid

chi2(27) = 28.71994

Prob > chi2 = 0.3746

4.5. Panel VECM with the option Robust

We found that The panel VECM with a robust option applied to ROA shows that the ECT (z = -11.50) is highly significant and can bring the system to the equilibrium very quickly (8.4 months = 1/-1.27 year) since ECT = -1.27. (see Annex IX table 5.1)

However, the panel VECM with a robust option applied to ROE shows that the ECT is not significant (z = -0.92). (see Annex IX table 5.2)

Test of Autocorrelation:This test has shown that there is autocorrelation between the variables in first differenced errors. But zero autocorrelation in second differenced errors (Annex IX, table 5)

*Wald F-test: In other side, a*ccording to Wald F-test, we can conclude that both short-run and lon-run variables are significant affecting dependent variable ROA. (See Annex IX table 5.1 & 5.2)

4.6. Fixed Effects and/or Random Effects

It is clear that the fixed effects model is a particular case of the random effects model when the variable representing the country effects is non-stochastic. However, as pointed out by Hsiao (1986), when the individual effects are correlated with the regressors, the random effects' model produces biased estimations of coefficients.

Table 4: List of used variables

List of Variables	**"Fee and commissions"**	**"Net non-interest income"**	**Inflation**	**Interest rate**	**Net Interest Income**	**S2GDP**
FE / ROA	NS*	Significant	Significant	significant	NS*	NS*
RE / ROA	NS*	NS*	Significant	NS*	NS*	NS*
FE / ROE	NS*	NS*	Significant	Significant	NS*	NS*
RE / ROE	NS*	NS*	NS*	NS*	NS*	Significant
NS*	- Stands for Non- Significant					

For ROA, according to the FE test, the "Fee and commissions" (pfc) has a non-significant impact on ROA (t-ratio=0.45). At the same time the "Net non-interest income" (p_nnii), Inflation and

Interest rate have a significant impact on ROA. Surprisingly, the Net Interest Income (p_nii) seems not to have a significant impact on the return to Assets of the bank, this result suggests, the fact that income is so stable at the point is not making, that much, a big change in the profitability of the bank.

However, the RE, has shown that the pfc still has non-significant impact on ROA (t-ratio=0.09). At the same time Inflation has a significant impact on ROA, but not the Interest rate.

The FE, has shown that the pfc still has non-significant impact on ROE (t-ratio=1.45). At the same time Inflation and Interest rate have a significant impact on ROE. However, the RE has shown that the pfc still has non-significant impact on ROE (t-ratio=-0.42). At the same time Inflation and Interest rate have a significant impact on ROE, surprisingly, the stock to GDP (s2gdp) has a significant negative impact .

In the end, Haussman test – Between FE and RE, has shown that FE is preferred. Since Fixed Effect is chosen, then to overcome heteroscedasticity problem.

In other side, we have estimated the Fixed Effect with the option Robust, We can notice that the pfc still has non-significant impact on ROA (t-ratio=-0.40). At the same time only Interest rate has a significant impact on ROA.

4.7. PMG estimation

We assume that the long-run ROA (and ROE) function is depending on the list of the independent variables:

a- Intrinsic bank variables: p_nii p_nnii loans2dep pfc p_opex
b- Variables of the country: INF INT s2gdp

In this context, the PMG model allows for heterogeneous short-run dynamics and common long-run income and inflation elasticity. Often only the long-run parameters are of interest. The default results of the PMG option include the long-run parameter estimates and the averaged short-run parameter estimates.

Table 5: PMG estimation of ROE against different variables

Group of Variables	**ECT**	**Coef.**	**Std. Err**	**z**	**P>|z|**
ROE against P_NII	P_NII	.299729	.1049388	2.86	0.004
	Short Run	*-.451026*	*.09044 -*	*4.99*	*0.000*
ROE against P_NII and P_NNII	P_NII	1.088761	.2542182	4.28	0.000
	P_NNII	9.631548	1.378819	6.99	0.00
	Short Run	*-.1321011*	*.1207728*	*-1.09*	*0.274*

ROE against P_NII, P_NNII and loans2dep	P_NII	3.718487	.5086523	7.31	0.000
	P_NNII	3.307328	.3283975	10.07	0.000
	loans2dep	-40.14494	6.070718	-6.61	0.000
	Short Run	*-.1314092*	*.0865735*	*-1.52*	*0.129*
ROE against P_NII, P_NNII, loans2dep and pfc	The result is not converging. After a number of Iterations equal to 307: log likelihood = -623.5775 (not concave) Hessian has become unstable or asymmetric – r(504);				
ROA against P_NII, P_NNII, loans2dep and pfc	The result is not converging. After a number of Iterations equal to 49, the system became unstable.				
	Iteration 49: log likelihood = 366.24916 (not concave)				
	Hessian has become unstable or asymmetric – r(504);				

In the output, the estimated long-run Net Interest Income and Net non-interest Income are significantly positive, as expected, but the Loans to deposit is significantly negative and that contradicts what it is expected from the theory. The latter result suggests that we need to do more investigation like adding more parameter. However, the error-correction speed of adjustment parameter, ECT, is not significant in the short-run since it is less that one.

Many tests have been driven to see the impact on the equilibrium, but the estimation was not converging. *Hessian has become unstable or asymmetric for eleven test based on ROE against different variables (See table "Hessian test for ROE" in the Appendix 4.).*

The same tests has been driven with the variable ROA by adding the country parameters, the system still indicate no convergence.

We conclude that, under PMG, the country variables are not driving the estimation to the convergence for both ROE and ROA.

4.8. MG estimation

In this section we will focus only on the case of ROE since the ROA is less pertinent in regards to the results above. Also, we got a certain difficulties to find a convergence of the system, so many tests have been conducted to check this convergence.

Table 6: MG estimation of ROE against different variables

	ECT	**Coef.**	**Std. Err**	**z**	**P>|z|**
1. ROE against P_NII, P_NNII and loans2dep	**P_NII**	**-11.72176**	**6.855997**	**1.71**	**0.087**
	P_NNII	**13.90954**	**13.47139**	**1.03**	**0.302**
	loans2dep	**-36.26257**	**54.56031**	**-0.66**	**0.506**
	Short Run	**.3393738**	**.2541827**	**1.34**	**0.182**
2. ROE against P_NII, P_NNII, loans2dep And pfc	**P_NII**	**13.55682**	**15.18894**	**0.89**	**0.372**
	P_NNII	**37.51473**	**15.73057**	**2.38**	**0.017**
	loans2dep	**-44.30625**	**36.6837**	**-1.21**	**0.227**
	pfc	**-47.75327**	**39.6032**	**-1.21**	**0.228**
	Short Run	***-.9045947***	***.4411846***	***-2.05***	***0.040***
3. ROE against P_NII, P_NNII, loans2dep,	**P_NII**	**2.227262**	**4.173176**	**0.53**	**0.594**

Pfc and p_opex	**P_NNII**	**21.44796**	**7.070477**	**3.03**	**0.002**
	loans2dep	**-1.729145**	**4.323557**	**-0.40**	**0.689**
	pfc	**6.307825**	**7.47958**	**0.84**	**0.399**
	p_opex	**-9.163953**	**8.264326**	**-1.11**	**0.267**
	Short Run	***-.558977***	***.2314505***	***-2.42***	***0.016***
4. ROE against P_NII, P_NNII, loans2dep, pfc,p_opex and s2gdp INF	**P_NII**	**-.028823**	**2.18011**	**-0.0**	**0.98**
	P_NNII	**34.72529**	**23.12636**	**1.50**	**0.133**
	loans2dep	**(omitted)**			
	pfc	**-2.74864**	**2.40032**	**-1.15**	**0.252**
	p_opex	**-63.5301**	**48.71464**	**-1.30**	**0.192**
	s2gdp	**.7064369**	**.4016413**	**1.76**	**0.079**
	Short Run	***-.622536***	***.176414***	***-3.5***	***0.000***
5. ROE against P_NII, P_NNII, loans2dep, pfc,p_opex, s2gdp and INF	**P_NII**	**-9.758587**	**6.630236**	**-1.47**	**0.141**
	P_NNII	**646.6086**	**637.4088**	**1.01**	**0.310**
	loans2dep	**(omitted)**			
	pfc	**-1.357228**	**.7918515**	**-1.71**	**0.087**
	p_opex	**-.9827669**	**4.032312**	**-0.24**	**0.807**
	s2gdp	**-13.67097**	**14.20871**	**-0.96**	**0.336**
	INF	**-2.873012**	**3.354447**	**-0.86**	**0.392**
	Short Run	***-1.017488***	***.21978***	***-4.6***	***0.000***
6. ROE against P_NII, P_NNII, loans2dep, pfc,p_opex, s2gdp, INF and INT	**P_NII**	***-2.93689***	***2.740071***	***-1.07***	***0.284***
	P_NNII	***5.381712***	***3.398399***	***1.58***	***0.113***
	loans2dep	***(omitted)***			
	pfc	***-.6525535***	***.466491***	***-1.40***	***0.162***
	p_opex	***1.159585***	***2.440436***	***0.48***	***0.635***
	s2gdp	***.5569582***	***.4024769***	***1.38***	***0.166***
	INF	***-3.445969***	***2.311637***	***-1.49***	***0.136***
	INT	***-.3576358***	***.6528221***	***-0.55***	***0.584***
	Short Run	***-1.496663***	***.3834661***	***-3.90***	***0.000***

Following the table above, we can say that:

1. For the second and the third equation, the Net non-interest income has a significant impact on the ROE with a positive effect.

2. The results are more likely to be interpreted as non pertinent because the betas coefficients of Net interest income and loans to deposit are negative and non significant for the equation one, while the results are not significant for the equation 4, 5, & 6.

However, the ECT is significant and negative, making the system coming back to the equilibrium. So, the system is sensitive to the variables in the short run (ECT = -1.017488 & -1.496663).

4.9. Dynamic Fixed Effect (DFE)

The following 4 variables have a significant impact over ROE: the "Net non-interest income", "Fee & commissions", the operating expenses and the "stock to GDP" ratio. The ECT = -0.5 has also a significant impact in the short run bringing quickly the system to the equilibrium. (see table below)

Table 7: DFE estimation of ROE and ROA against different variables					
	ECT	**Coef.**	**Std. Err**	**z**	**P>|z|**
1. **ROE** against P_NII, P_NNII, loans2dep, pfc,p_opex, s2gdp, INF and INT	P_NII	.6663306	.3593288	1.85	0.064
	P_NNII	28.40582	3.962096	7.17	0.000
	loans2dep	31.48614	19.77322	1.59	0.111
	pfc	5.63143	2.510795	2.24	0.025
	p_opex,	-26.88961	4.544601	-5.92	0.000
	s2gdp	-.1667506	.0606875	-2.75	0.006
	INF	3.247689	1.787376	1.82	0.069
	INT	1.268269	.7943819	1.60	0.110
	Short Run	*-.4978824*	*.0599469*	*-8.31*	*0.000*
2. **ROA** against P_NII, P_NNII, loans2dep, pfc,p_opex, s2gdp, INF and INT	P_NII	*-2.282186*	*1.393989*	*-1.64*	*0.102*
	P_NNII	*17.44481*	*12.29288*	*1.42*	*0.156*
	loans2dep	*93.39408*	*70.00958*	*1.33*	*0.182*
	pfc	*-2.165978*	*7.641163*	*-0.28*	*0.777*
	p_opex,	*-17.79109*	*14.52365*	*-1.22*	*0.221*
	s2gdp	*.3005146*	*.2307684*	*1.30*	*0.193*
	INF	*-7.12723*	*6.895139*	*-1.03*	*0.301*
	INT	*4.143309*	*2.818964*	*1.47*	*0.142*
	Short Run	*.0056443*	*.0021776*	*2.59*	*0.010*

All variables have no significant impact over ROA. Thus, this equation will not be reported as acceptable equation. However, the ECT = 0.056 has a significant impact bringing the system to the equilibrium after 17.9 years. This seems to be quite high since some bank assets investment would be in very long term period. (see table above).

In the end, we have considered the null hypothesis (H0) as PMG is preferred or MG and PMG are consistent, but MG is inefficient. The Haussman Test between MG and PMG has shown that the calculated Haussman statistic is 0.00 and is distributed CHI Squared. So, we concluded that the PMG estimator, the efficient estimator under the null hypothesis, is preferred.

The same test has been conducted between MG and DFE. The Results indicate that the simultaneous equation bias is minimal for these data and, for our set of data, we concluded that the DFE model is preferred over the MG model.

4.10. Summary results

This paper has analysed the role of both Interest rate and "Fee & Commissions" on the return of the European banks (ROA and ROE) based on Multivariate Analysis.

We started applying the "Unit root" and the "Co-integration" then, we have estimated the long-run relationship with Dynamic OLS (DOLS), which has given the long term equations for ROA and ROE as follows:

ROA = 0.22 NII + 0.17 NNII + 0.16 LOANS2DEP + 0.83 PFC - 0.12 P_OPEX + 0.08 INF - 0.52 INT - 0.001 S2GDP **(1)**
(3.8) (2.6) (0.4) (1.6) (-1.4) (3.3) (-3.6) (-0.9)

ROE = - 0.01 NII + 18.0 NNII - 7.29 LOANS2DEP - 7.71 PFC - 19 P_OPEX + 4.35 INF + 2.01 INT - 0.06 S2GDP **(2)**
(-0.1) (6.7) (-0.5) (-3.8) (-5.5) (4.2) (3.5) (-2.1)

Furthermore, the panel VECM Granger causality (with simple GMM and with "Robust" option), Fixed Effect and Random Effect, PMG estimation, MG estimation have been applied as well.

Then the Dynamic Fixed Effect (DFE) we are presenting in its long term equation form since the latter is preferred under Haussman test:

ROE = 0.66 NII + 28.4 NNII + 31.5 LOANS2DEP + 5.6 PFC - 26.9 P_OPEX + 3.24 INF + 1.26 INT - 0.17 S2GDP **(3)**
(1.85) (7.17) (1.6) (2.2) (-5.9) (1.8) (1.6) (-2.8)

Those results are showing clearly that the banks return is positively correlated with the "non-interest income", "Fee & commissions", the operating expenses and the "stock to GDP".

5. Conclusions

We investigate the evolution of profitability for European banks between 2000 and 2009. The profitability equations are given above. Several conclusions come up to the front.

Our empirical results finish up with two major findings regarding the evolution of profitability in the European banking sector between 2000 and 2009. A note worthy first finding is that the improvement in profitability (see ROA in the equation **(1)**) in the European banks seems to be more related to the "net-interest income" and "non-interest income.

Consequently, countries with high inflation level, will have more advantage in terms of profitability, as the latter will grow faster than those with low inflation level. This can lead to a situation where the first ones overpass the latter ones, meaning the risk of absence of convergence in terms of profitability.

We know that European authorities aimed to promote competition in the markets of goods and services to improve efficiency and this will be accelerated by the higher competitive pressures exerted in the banking sector. Therefore, the observed improvement in profitability could not be in accordance with this expectation, as a consequence of the increase in competition.

The second finding is the convergence in profitability across European countries, in fact, according to GMM (Granger Causality), the ECT for ROE is significant and has a negative sign (value = -10.06) bringing the system to the equilibrium very quickly in less than 35 days (1/1.06 year). At the same time**,** the panel VECM with a robust option applied to ROA shows that the ECT (z = -11.50) is highly significant and can bring the system to the equilibrium very quickly (8.4 months = 1/-1.27 year) since ECT = -1.27.

Besides that, Wald F-test applied to ROA, concludes that the short-run variables and the long-run variables are also significant, affecting the dependent variable ROA.

An intuitive explanation would be to link the changes in profitability with the changes in the size of the country's financial market in regard to GDP. The three equations [(1), (2), (3)] show a negative sign of the beta of Stock to GDP (S2GDP), the bigger the market the bigger impact on the ROA or ROE. This phenomenon appears to be counter intuitive, so other investigations should be done by adding the number of transactions in the stock market, for example.

The results suggest a positive influence of "*non-interest income " and* the interest rate on the banks' profitability, and those two parameters are not outweighed by additional requirements of provisions and capital that supervisory authorities establish to control bank risk.

However the "fee & commissions" do not have a significant impact over the profitability of the European banks. This point should raise the question about the role of the European banks, as agent or intermediary that they are supposed to enhance the efficiency of real economy.

First, the interpretation of the result in terms of the impact of "fee & commissions" is not straight forward. First of all, the equation (3) and (4), for ROE, show an opposite sign of betas for "fee & commissions" (PFC , positive for (3) and negative for (4) with a significant impact for both). That is to say, that the result about the role of the bank as an intermediary did not confirm a clear positive impact on the profitability of the bank measured by the ROE.

The results have shown that DFE is preferred over the MG and MG is preferred to PMG. Besides that, the "non-interest income", "Fee & commissions", the operating expenses and the "stock to GDP" ratio. The ECT = -0.5 has also a significant impact in the short run bringing the system back to equilibrium quickly.

According to DOLS, the results show that the “Fee & commissions” are not significant on ROA but significant on ROE. However, the “Fee & commissions”, the “Net Interest income”, the “non-interest income”, Inflation and interest rate have a significant impact over ROA and ROE. Besides that, the operating expenses, the “stock to GDP” ratio, the “Interest rate” have a significant impact over ROE.

Operational expenses (including Overhead) over total assets, play important role as a main determinant of bank profitability. The results show that this variable is significant in determining bank profitability. Like Guru etc. al (2003) and Molyneux and Thorthon (1992) who found a significant relationship between expenditures and profitability measures, this study also found strong significant relationship between Operational expenses with ROA and ROE for both schemes. The tables show that “Operational expenses” are negatives and significantly related to profitability for both schemes at 5% level of confidence. This finding revealed that efficient expenses management was one of the most significant variables in explaining bank profitability. This relationship indicates that high overhead expenses reduce the profitability of these two banking schemes. The cardinal rule of financial analysis states that the effectiveness and efficiency of bank management is reflected by the amount of expenditure incurred in a particular reporting period. For overhead costs such as, salaries and the cost of running branch office facilities, the more are the expenses incurred by the bank, the less the profit the bank will generate ; an increase in this ratio will decrease the quality of bank management, which will translate into lower bank profitability. This result is in line with Maudos and Guevera (2003), which found negative correlation between management efficiency and profitability measures in the European Union.

This study found that interest and Inflation have a positive relationship with ROA and ROE of the European banking schemes, while negative relationships have been found for the ratio of stock market to GDP on both schemes. But no significant relationships were found between all these macroeconomic variables and the profitability measures for both schemes. Profitability of Islamic banking schemes and interest banking schemes seem to be less affected by the macroeconomic factors.

However, we must mention that our analysis is based on two limitations. The first is that we do not consider the implications of deviations from the random walk (non-stationarity) of the variables, the second is that we have applied the Panel technique based on linear model without knowing if the equation is simply linear or not, then the fact that we did not examine the basic economic reasons that grounds the previously mentioned relation, as well as the alternative econometric techniques, non linear panel cross-section time series, that could improve the final results.

A fruitful path for the future study is to examine the effect of the GDP growth, and the total value of stocks traded divided by GDP, and, in the end, the inclusion of the credit to the private sector by deposit money banks divided by GDP in the estimations to improve the explanatory power of the models.

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Appendix 1

The following table is giving the details of the variables used:

Definition of the Variables	Name	Observation
Bank specific parameters		
1a. Profitability of the Bank to equity investments 1b. Return to Assets	**ROE** **ROA**	Profitability for each year (over Equity & Assets).
2. Net interest income to total	**NETINT**	al banks' assets divide this variable in each year.
3. Banks' net income to total bank assets as measures of banks' profitability Net interest	**NETINC**	al banks' assets divide this variable in each year.
"fee & commissions"	**PFC**	
4. Income or banks' interest margin is the interest income minus interest expense and it captures the profitability of the intermediation activity of banks.	**Income**	al banks' assets divide this variable in each year.
5. LOANS	**LOANS**	
6. Non-interest earnings	**NONINTER**	al banks' assets divide the banks' variable in each year.
7. Banks overhead cost	**OVHEADC**	al banks' assets divide the banks' variable in each year.
Country specific parameters		
8. The inflation rate	**INFLATION**	
9. The ratio of the total domestic assets of deposit money banks divided by GDP.	**DBANKA**	
10. The interest rate	**INTRATE**	The mean of the year
11. The GDP growth	**gGDP**	Annual growth
12. The size of the stock market is proxied by the ratio of the stock market capitalization divided by GDP.	**S2GDP**	
14. The loans given by banks to GDP	**loans2dep**	Total annual loans to GDP

Appendix 2

4. - Unit Root

LLC as a pooled DF or ADF comes as a solution which can be used across different sections in the panel.

Limitation from assumption:

1.LLC assumes that the individual processes are cross-sectionally independent. Therefore, this test might neglect the significant distortions for the test due to correlations between groups.

2.The coefficient of the lagged Yi (autoregressive coefficient) is restricted to be homogenous across all units of the panel.

Hadri

1.Hadri maintains the two assumptions on LLC.

2.Hadri differs from other tests. It has a null of stationary rather than non-stationary. In many cases, the test, with non-stationary as a null, does not result very powerful against relevant alternative hypothesis and fails to reject the null hypothesis for many economic series. Hence, Hadri test addresses this problem.

IPS, Im. Pesaran and Shin

1.The IPS maintains the assumption number 1 on LLC.

2.The IPS relaxes the assumption number 2 on LLC. IPS extends LLC by allowing heterogeneity on the coefficient of the lagged Yi (autoregressive coefficient). It allows different specifications of the parametric values, the residual variance and the lag lengths.

3.The IPS put the restrictive assumption that T should be the same for all cross-sections which requires a balanced panel.

In the following, we will use only IPS and Hadri tests because of the two limitations of LLC.

4.1 – Unit root for ROE

a- **Using IPS**

***H0*: Non Stationary**

Method Im, Pesaran and Shin		Statistic	Prob.**
The equation: roe? inf? int? s2gdp?	W-stat	-7.50905	0.0000
roe? nii? nnii? inf? int?	W-stat	-9.07897	0.0000
roe? nii? nnii? loans2dep? pfc?	W-stat	-5.27101	0.0000

P= 0.000 means we have at least one stationary variable, in our case it should be the Inflation.

b- Using Hadri

The maximum of variables accepted through the system is limited to few. As we can not test all the variables in one batch, so we use different batches of variables as follow.

1. The tested variables are: ***ROE****? NII? NNII? PFC? S2GDP?*

***H0:* Stationarity**

1. Intermediate results on **ROE**? NII? NNII? PFC? S2GDP?

Method	Statistic	Prob.**
Hadri Z-stat	1.10799	0.1339
Heteroscedastic Consistent Z-stat	12.6607	0.0000

P= 0.13, means that we accept the null, then all those variables are stationary.

2. The tested variables are: ***ROE****? NII? NNII? PFC? S2GDP?*

2. Intermediate results on **ROE**? NII? NNII? PFC? OPEX?

Method	Statistic	Prob.**
Hadri Z-stat	18.6766	0.0000
Heteroscedastic Consistent Z-stat	15.9162	0.0000

P= 0.000, we reject the null, means all the variables ROE? NII? NNII? PFC? OPEX? are non stationary.

4.2 – Unit root for ROA

a- Using HADRI:

The tested variables are: **ROA**? NII? NNII? PFC? S2GDP?

H0: Stationarity

Intermediate results on **ROA**? NII? NNII? PFC? S2GDP?

Method	Statistic	Prob.**
Hadri Z-stat	-2.48842	0.9936
Heteroscedastic Consistent Z-stat	12.8714	0.0000

b- Using HADRI

The variables are: **ROA**? NII? NNII? PFC? OPEX?

Intermediate results on **ROA**? NII? NNII? PFC? OPEX?

Method	Statistic	Prob.**
Hadri Z-stat	25.4507	0.0000
Heteroscedastic Consistent Z-stat	16.1270	0.0000

We can conclude from above that according to HADRI test, the variables ROA? NII? NNII? PFC? OPEX? Toghether and ***ROE****? NII? NNII? PFC? OPEX? are non stationary.*

The variables ***ROA****? NII? NNII? PFC? S2GDP? Are stationary all toghether.*

- *Hessian test for ROE*

Hessian has become unstable or asymmetric for eleven test based on ROE against different variables as follows:

ROE against P_NII, P_NNII, loans2dep, pfc and P_OPEX
ROE against P_NII, P_NNII, loans2dep, pfc and P_OPEX, INF
ROE against P_NII, P_NNII, loans2dep, pfc and P_OPEX, INT
ROE against P_NII, P_NNII, loans2dep, pfc and P_OPEX, INF, INT
ROE against P_NII, P_NNII, loans2dep, pfc and P_OPEX, INF, and s2gdp
ROE against P_NII, P_NNII, loans2dep, pfc and P_OPEX, and s2gdp
ROE against P_NII, P_NNII and loans2dep, *INF INT s2gdp*
ROE against P_NII, P_NNII and loans2dep, *INF INT*
ROE against P_NII, P_NNII and loans2dep, *INF*
ROE against P_NII, P_NNII and loans2dep, *INT*
ROE against P_NII, P_NNII and loans2dep, *s2gdp*

Appendix 3

5.1 - Pedroni Residual Cointegration Test

Null Hypothesis: No cointegration

Series:1 N_ROA? P_NII? P_NNII?

	Statistic	Prob.
Group rho-Statistic	4.687312	1.0000
Group PP-Statistic	-5.147085	0.0000
Group ADF-Statistic	0.035927	0.5143

There is cointegration according to PP-Statistic only.

Series2: N_ROA? P_NII? P_NNII? LOANS2DEP? PFC? P_OPEX? INF?

	Statistic	Prob.
Group rho-Statistic	10.00988	1.0000
Group PP-Statistic	-38.83295	0.0000
Group ADF-Statistic	-5.642727	0.0000

There is cointegration according to PP-Statistic and ADF-Statistic.

Series3: ROA? NII? NNII? L2DEP? PFC? OPEX?

	Statistic	Prob.
Group rho-Statistic	8.501002	1.0000
Group PP-Statistic	-14.24239	0.0000
Group ADF-Statistic	0.212188	0.5840

Series4: ROA? NII? NNII? L2DEP? PFC? OPEX? S2GDP?

	Statistic	Prob.
Group rho-Statistic	9.601398	1.0000
Group PP-Statistic	-20.82668	0.0000
Group ADF-Statistic	-0.236005	0.4067

Series:5 ROE? NII? NNII? L2DEP? PFC? OPEX? S2GDP?

	Statistic	Prob.
Group rho-Statistic	9.364887	1.0000
Group PP-Statistic	-19.14629	0.0000
Group ADF-Statistic	0.971338	0.8343

There is cointegration according to PP-Statistic only for both series 4 and 5 (with both ROE and ROA).

Series6: ROE? NII? NNII? L2DEP? PFC? OPEX? INF?

	Statistic	Prob.
Group rho-Statistic	9.717539	1.0000
Group PP-Statistic	-17.76451	0.0000
Group ADF-Statistic	2.253199	0.9879

There is cointegration according to PP-Statistic only.

PEDRONI is not conclusive given the limited number of datasets (10 years x 34 banks = 340). Since there is a limitation in term of number of variables to be tested under PEDRONI. Therefore, we can conclude that there cointegration with 7 variables in the two series 5 and 6: (ROE? NII? NNII? L2DEP? PFC? OPEX? S2GDP?) And (ROA? NII? NNII? L2DEP? PFC? OPEX? S2GDP?)

5.2 - KAO Test

Null Hypothesis: No cointegration

Case of ROE

Series1: ROE? NII? NNII? L2DEP? OPEX?

	t-Statistic	Prob.
ADF	-6.386473	0.0000

Series2: ROE? NII? NNII? L2DEP? OPEX? PFC?

	t-Statistic	Prob.
ADF	-7.074024	0.0000

Series 3: ROE? NII? NNII? L2DEP? OPEX? PFC? INF?

	t-Statistic	Prob.

ADF	-6.708735	0.0000

Series 4: ROE? NII? NNII? L2DEP? OPEX? PFC? INF? INT?

	t-Statistic	Prob.
ADF	-6.593227	0.0000

Series 5: ROE? NII? NNII? L2DEP? OPEX? PFC? INF? INT? S2GDP?

Series: ROE? NII? NNII? L2DEP? OPEX? PFC? INF? INT? S2GDP?

	t-Statistic	Prob.
ADF	-8.609403	0.0000

Case of ROA

Series 6: ROA? NII? NNII? L2DEP? OPEX? PFC? INF? INT? S2GDP?

	t-Statistic	Prob.
ADF	-6.103881	0

According to KAO, there is one cointegration vector between all the independent variables either with ROE or ROA .

5.3 - Test of cointegration based on Johansen Fisher

Johansen Fisher is not conclusive given the limited number of datasets (10 years x 34 banks = 340). Since there is a limitation in term of number of variables to be tested. This limitation is equal to only two variables. See below, some examples.

Series: ROA? NII?

None	361.8	0	311	0
At most 1	179.6	0	179.6	0

Series: **ROE**? NII?

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.	Fisher Stat.* (from max-eigen test)	Prob.
None	407.1	0	362.5	0
At most 1	194.4	0	194.4	0