

**CENTRE FOR EMEA BANKING, FINANCE & ECONOMICS**

**Integration in European Retail Banking: Evidence  
from Savings and Lending Rates to Non-Financial  
Corporations**

**Aarti Rughoo and Nicholas Sarantis**

Working Paper Series

No 23/11

# **Integration in European Retail Banking: Evidence from Savings and Lending Rates to Non-Financial Corporations**

Aarti Rughoo

London Metropolitan Business School, London Metropolitan University, UK

Nicholas Sarantis

Cass Business School, City University, London, UK

## **Abstract**

The aim of this paper is to investigate the integration process in the European Union retail banking sector during the period 1995-2008, by analysing deposit and lending rates to non-financial corporations which represent one of the main constituents of retail banking. An important contribution of the paper is the application of the recently developed Phillips and Sul (2007a) panel convergence methodology which has not hitherto been employed in this area. This method analyses the degree as well as the speed of convergence, identifies the presence of club formation, and measures the behaviour of each country's transition path relative to the panel average. The results obtained point to the presence of close convergence in all deposit rates and in the short-term lending rates to non-financial corporations. However, we also detect the presence of heterogeneity in the European retail banking sector with notably some diverse convergence patterns observed for the transition paths for the deposit and lending rates with longer maturities.

*Keywords:* Integration; European retail banking; savings; lending rates; non-financial corporations; Phillip and Sul convergence method

---

*Corresponding author:* Aarti Rughoo, London Metropolitan Business School, London Metropolitan University, 277-281 Holloway Road, London N7 8HN, UK

*Email:* a.rughoo@londonmet.ac.uk

## **1. Introduction**

Prior to the Single European Programme (SEP), the banking sector in many European Union (EU) countries was often anti-competitive with entry restrictions against foreign banks and highly segmented with the functional separation of institutions. The SEP had the important objective of shifting the strategic mindset of the EU banks from a collusive and protective environment to a more liberalised market. These goals were channelled through the adoption of banking Directives, like the Second Banking Coordination Directive in 1993 which establishes the principle of a single licence for banks. Over the years, in order to enable banks to compete on equal terms within a sound regulatory framework, several other measures such as the Financial Services Action Plan, supplemented the Second Banking Directive and on many occasions, these have been revised and recast. The wholesale European banking sector has been widely investigated in the literature while the retail sector to a much lesser extent.

The aim of this paper is to investigate whether the Single Market initiatives have been successful in creating an integrated European retail banking sector. For this purpose, convergence methodologies are applied to monthly deposit and lending rates with varying maturities to non-financial corporations (NFCs) for the period 1995 to 2008. The non-financial corporations sector which consists of small-medium enterprises (SMEs) is specifically chosen because of the importance of this sector. Notably, within the euro-area, the biggest share of GDP (around 60%) originates from NFCs while the share of gross savings from this sector accounts for around 42%. The share of gross fixed capital formation for the non-financial corporations takes the lead at around 54% (Eurostat, 2009). The same trends are observable for the whole group of EU states. Based on 2006 value added figures, within the EU, the United Kingdom has the largest non-financial services sector followed by Germany, France and Italy (Stawinska, 2009).

Hence, given the substantial share of the EU's non-financial services sector's savings and borrowing activities, the retail banking rates to this sector serve as an ideal platform to analyse the integration process.

The existing studies on the process of European retail banking integration range from bivariate cointegration analysis on interest rate spreads for different non financial corporations lending and deposit rates (see Kleimeier and Sander (2000, 2003); Schuler and Heinemann (2002)) to beta and sigma panel convergence tests on similar variables (see Murinde et al, 2000, Adam et al, 2002 and Vajanne, 2007). The remaining studies (Affinito and Farabullini, 2006, Sorensen and Guiterrez, 2006) apply some different techniques such as the tests of coefficient equality and hierarchical cluster analysis to euro area retail banking sector. The findings from all these studies generally point to a fragmented retail banking sector in the 1990s but, in contrast, some progress is noted in the retail integration process for the more recent period. However, in most of the recent studies, the persistence of cross-country heterogeneity is also clearly evident. Limited institutional convergence in European banking and the importance of national characteristics, among other factors, are considered to be responsible for these results.

A number of limitations have been noted in several of the existing studies on the retail banking integration in Europe. Firstly, the time series cointegration analysis by Schuler and Heinemann (2002) and Sander and Kleimeier (2003), and the unit root tests and tests of equality by Affinito and Farabullini (2006) are applied to small samples. As argued in the literature, this results in a loss of power of the test. Secondly, the period investigated in the literature is mostly up to the early 2000s, except for Vajanne (2007). Thirdly, the only convergence methodology that is used in the retail banking literature is the beta and sigma

convergence tests drawn from the growth literature<sup>1</sup>. However, short-comings have been identified in the application of these tests outside of the growth context (see Islam (2003)). Furthermore, as argued by Quah (1996), beta and sigma convergence tests are uninformative on the behaviour of the individual countries within the entire cross-section.

This paper makes a major contribution to the literature on EU retail banking integration with the application of the recently developed powerful panel convergence methodology by Phillips and Sul (2007a)<sup>2</sup>, which has not been previously employed in this area. This test of convergence, termed as the *logt test*, is chosen for the following reasons. Firstly, this methodology provides an empirical modelling of long run equilibria within a heterogeneous panel, outside of the co-integration setup. Secondly, this methodology gives an estimate of the speed of convergence and clusters panels into club convergence groups. Hence, in addition to detecting panel convergence, if present, the Phillips and Sul clustering algorithm test reveals whether club formation is also present. Thirdly, this test does not necessitate any specific assumptions regarding the stationarity of the variables and allows for cases where individual series may be transitionally divergent. Fourthly, the Phillips and Sul methodology allows for the calculation of each country's relative transition parameter. This illustrates each individual country's transition path, i.e. the country's behaviour relative to the panel cross-section average over time. Overall, the Phillips and Sul methodology is not only powerful but also much more informative on the behaviour of the whole panel and within.

The paper is organised as follows: section 2 outlines the Phillips and Sul (2007a) convergence methodology. Section 3 describes the datasets used. Section 4 presents the empirical results. Section 5 discusses the conclusions.

---

<sup>1</sup> Developed by Barro (1991) and Barro and Sala-i-Martin (1992) in the growth literature.  $\beta$  convergence measures the speed of convergence while  $\sigma$  convergence measures the degree of convergence. These convergence tests have been used by Adam *et al* (2002) and Vajanne (2007).

<sup>2</sup> See an application in Phillips and Sul (2007b, 2009)

## 2. Empirical methodology

In this paper we take the view that integration in retail banking is a process whereby segmented markets become unified and open and where there is a tendency for prices of financial assets to converge over time. The Phillips and Sul (2007a) convergence panel methodology has not been previously used in the context of the EU retail banking sector and its application brings a new dimension to the study of European banking integration<sup>3</sup>. The Phillips and Sul (P&S) model is based on a time varying factor representation. These are key aspects of the Phillips and Sul (2007a) model as it does away with the restrictions faced with standard unit root and cointegration tests whereby the presence of long-run equilibrium can be rejected because of shorter data panels due to data limitations. For instance, cointegration will not be detected in cases whereby the variables of interest may be converging over time but the speed of convergence is not fast enough to reflect cointegrated behaviour. The Phillips and Sul model will, however, be able to detect the presence of co-movement and convergence. This methodology can thus be described as an asymptotic cointegration test that models long run equilibrium while allowing for individual heterogeneity which can evolve over time. In particular, this feature of the Phillips and Sul methodology makes it superior to the beta and sigma convergence test as the P&S test allows for both common and individual heterogeneity. Furthermore, the Phillips and Sul methodology is better suited for this analysis as the time varying component of this test not only reveals the speed at which retail integration is taking place, if present, (which is also indicated by the beta and sigma convergence tests) but also highlights the different extent and speed of the integration level in the group of countries through the process of club formation.

---

<sup>3</sup>A few recent studies have used the Phillips and Sul (2007a) model within the context of the European financial market namely, Caporale et al (2009) who investigate convergence in stock returns for 5 EU countries; Antzoulatos *et al* (2008) who analyse the convergence of non-interest income in the EU countries; Higson *et al* (2009) who explore the convergence in the European equity markets; and Fischer (2009) who measures price convergence in the European Monetary Union.

## 2.1 Relative transition paths

Panel data for a variable  $X_{it}$  can normally be decomposed into two components comprising systematic components,  $g_{it}$ , and transitory components,  $a_{it}$ , as follows:

$$X_{it} = g_{it} + a_{it} \quad (1)$$

The main procedure in the Phillips and Sul convergence test is to calculate the time-varying loadings,  $g_{it}$  and to do so, Phillips and Sul (2007a) reformulates equation (1) such that common and idiosyncratic components are separated as follows:

$$X_{it} = \left( \frac{g_{it} + a_{it}}{\mu_t} \right) \mu_t = \delta_{it} \mu_t \quad \text{for all } i \text{ and } t, \quad (2)$$

Where  $\mu_t$  is a single common component and  $\delta_{it}$  is a time varying idiosyncratic element. Hence,  $\delta_{it}$  measures the economic distance between the common trend component  $\mu_t$  and  $X_{it}$ . To test whether the components of  $\delta_{it}$  are converging, Phillips and Sul (2007a) define the transition coefficient as  $h_{it}$  and information about the time varying factor loadings  $\delta_{it}$  can be extracted as follows:

$$h_{it} = \frac{X_{it}}{\frac{1}{N} \sum_{i=1}^N X_{it}} = \frac{\delta_{it} \mu_{it}}{\frac{1}{N} \sum_{i=1}^N \delta_{it} \mu_{it}} = \frac{\delta_{it}}{\frac{1}{N} \sum_{i=1}^N \delta_{it}} \quad (3)$$

The so-called *relative transition parameter*  $h_{it}$  measures  $\delta_{it}$  in relation to the panel average at time  $t$  and therefore describes the transition path for country  $i$  relative to the panel average. Moreover, the convergence process can be graphically illustrated by plotting the transition parameter for each country over time.

However, macroeconomic variables often contain business cycle components which render the representation in (3) inappropriate. Hence, following Phillips and Sul (2007a) recommendation, the Hodrick-Prescott (1997) filter is used to filter out the cycle component

in the interest rate data series and then work out the filtered transition coefficients  $\hat{h}_{it}$ . Hodrick and Prescott (1997) demonstrate that higher frequency data require a higher value for the smoothing parameter. In this paper the value of lamda is set to 14400, as suggested in the literature<sup>4</sup> for monthly data.

## 2.2. The Log t regression

The log t regression test of convergence tests for the null hypothesis of convergence:

$$H_0 : \delta_i = \delta \text{ and } \alpha \geq 0$$

Against the alternative

$$H_1 : \delta_i \neq \delta \text{ for all } i \text{ or } \alpha < 0$$

Phillips and Sul's (2007) procedure involves three steps, as listed below.

Step 1: The cross sectional variance ratio  $\frac{H_1}{H_t}$  is calculated as follows:

$$H_t = \frac{1}{N} \sum_{i=1}^N (\hat{h}_{it} - 1)^2 \quad (4)$$

Step 2: The following OLS regression is performed:

$$\text{Log} \left( \frac{H_1}{H_t} \right) - 2 \log L(t) = \hat{a} + \hat{b} \log t + \hat{u}_t \quad (5)$$

Where  $L(t) = \log(t+1)$  and the fitted coefficient of  $\log t$  is  $\hat{b} = 2\hat{\alpha}$ , where  $\hat{\alpha}$  is the estimate of  $\alpha$  in  $H_0$ . The data for this regression starts at  $t = [rT]$  with some  $r > 0$ . Based on the results of their Monte-Carlo simulations, Phillips and Sul (2007a) recommend  $r = 0.3$ .

Step 3: A one-sided t test of null  $\alpha \geq 0$  using  $\hat{b}$  and a standard error estimated using a heteroskedasticity and autocorrelation consistent (HAC) estimator. The test statistic  $t_{\hat{b}}$  is

---

<sup>4</sup> For instance, in Eviews, the default value for lamda is 14400 for monthly data.



normally distributed and hence at the 5% level, the null hypothesis of convergence is rejected if  $t_{\hat{\beta}} < -1.65$ .

### 2.3. *Club convergence algorithm*

Following Phillips and Sul (2007a) argument that a strict rejection of the null of convergence may not necessarily rule out the existence of sub-group convergence within the panel, the authors have developed a club convergence algorithm to detect such units of clusters. In the scope of this paper, this methodology will bring new insight into the convergence process within the EU15 retail banking sector by revealing whether clusters of convergence are present. If present, then the relationship within the clusters based on economic or structural characteristics can be further explored.

Phillips and Sul (2007a) clustering algorithm is based on repeated log  $t$  regressions and contains four main steps which are described below.

Step 1: The  $X_{it}$  series in the panel are ordered according to the last observation,  $X_{iT}$ .

Step 2: A core group is formed by selecting the first  $k$  highest panel members to form the subgroup  $G_k$  for some  $N > k \geq 2$  and the convergence test statistic  $t_{\hat{\beta}}(k)$  is calculated for each  $k$ . The core group size  $k^*$  is chosen by maximising  $t_{\hat{\beta}}(k)$  under the condition that  $\min\{t_{\hat{\beta}}(k)\} > -1.65$ .

Step 3: Once the core group is formed, each remaining country is then added separately to the core group and the log  $t$  test is run. If the corresponding test statistic,  $t_{\hat{\beta}}$  is greater than a chosen critical value,  $c^5$ , then the country is included in the current subgroup to form a new

---

<sup>5</sup> Phillips and Sul (2009) suggest setting  $c$  to zero when  $T$  is small to ensure that it is highly conservative. However, for large  $T$ ,  $c$  can be set at the asymptotic 5% critical value of  $-1.65$ . Given that the number of observations in this paper ranges from 72 to 93,  $c$  is set at 0.

group. The log  $t$  test is run for this subgroup and if  $t_{\hat{b}}$  is  $> -1.65$ , the formation of this subgroup is completed. Otherwise, the critical value  $c$  is raised and the procedure is repeated. Step 4: The log  $t$  test is run on the group of countries not selected in step 3 and if convergence is detected within this new cluster, a second club is formed. Otherwise, in the case of rejection, steps 1, 2 and 3 are repeated on the remaining countries. If no other subgroups can be detected, it can be concluded that the remaining countries diverge.

### **3. Data sets and variable definitions**

Eight monthly deposit and lending interest rate data sets for the non-financial corporations sector have been compiled for up to 15 EU countries<sup>6</sup> for the purpose of this paper. Due to limited availability of data for the other EU countries, the empirical analysis conducted in this paper focuses on the group of 15 EU member states only. The data sets have been compiled into two sub-periods. The first period starts in April 1995 and ends in December 2002 and covers short-term lending rates. The majority of the interest rate data for this dataset has been sourced from the European Central Bank's (ECB) database entitled "National Retail Interest Rates" and some missing data has been supplemented by data from the IMF, the Central banks and Datastream. The ECB discontinued this database in 2002 and replaced it by a more harmonised database entitled "MFI Interest rates" which starts in 2003 and runs to-date. The second sub-period starts in January 2003 and ends in December 2008 and all the remaining data sets belong to this sub-group. The bulk of the data series for the more recent period have been sourced from the ECB's new harmonised database and the remaining data supplemented by data obtained from central banks.

---

<sup>6</sup> Austria (AT), Belgium (BE), Denmark (DK), Germany (DE), France (FR), Finland (FR), Italy (IT), Ireland (IE), Greece (GR), Luxembourg (LUX), Netherlands (NL), Portugal (PT), Spain (ES), Sweden (SE) and the United Kingdom (UK).

The following datasets have been compiled for the non-financial corporations sector

- Short-term lending rates (1995-2002)
- Bank overdrafts (2003-2008)
- Lending rates with up to 1 year; 1-5 years; and over 5 years maturities, respectively (2003-2008)
- Deposit rates with up to 1 year; 1-2 years; and over 2 years maturities, respectively, (2003-2008)

#### **4. Empirical results**

##### *4.1. Phillips and Sul (2007a) log t-test<sup>7</sup>*

Following Phillips and Sul's (2007a) recommendation, the convergence analysis is conducted on filtered data series whereby the cycle component of each series is removed by applying the Hodrick-Prescott (1997) filter. The t-statistics obtained for the convergence test for the 3 categories of deposit rates and the 5 categories of lending rates are tabulated in Table 1. It should also be noted that the magnitude of the convergence coefficient,  $\hat{b}$  illustrate the speed of convergence with typically a higher value of  $\hat{b}$  indicating a faster rate of convergence.

The Phillips and Sul (2007) log *t*-test results provide strong support to the hypothesis of retail banking integration for the SME market in the EU as the null hypothesis of convergence cannot be rejected for all the deposit datasets and for 3 out of 5 of the lending panel data set tested. More specifically, it can be advocated that the deposit rates to non-financial corporations with 1 year, 1-2 years' and over 2 years' maturities respectively have

---

<sup>7</sup>The Gauss codes for the computation of the logt test and convergence clubs are available from Sul's website, <http://homes.eco.auckland.ac.nz/dsul013/>.

all been converging over the period 2003-2008. Looking at the value of  $\hat{b}$  for each of the panel data set also gives us an approximate of the pace of convergence, whereby a higher value of  $\hat{b}$  indicates a faster rate of convergence. For the deposit rates with varying maturities, faster convergence can be detected for short-term deposit rates ( $\hat{b}=2.271$ ) and medium-term maturities ( $\hat{b}=3.090$ ) than for long-term deposit rates ( $\hat{b}=0.480$ ).

As for the lending rates with short term maturities, convergence is detected in both periods tested; i.e. 1995-2002 and 2003-2008. However, the null of convergence is rejected for the overdraft rates and lending rates with 1-5 years' maturities for the period 2003-2008. On the other hand, for the lending rates with over 5 years' maturities for the period 2003-2008, the null of convergence cannot be rejected. Based on these log t-results, it can be seen that convergence is stronger and more consistent in the deposit market as opposed to the credit market.

Furthermore, when the different panels where convergence is detected are compared, it can be seen that the fastest rate of convergence is detected for the short-term lending rates for the 1990s ( $\hat{b}=1.060$ ), followed by the short term lending rates ( $\hat{b}=0.716$ ) for the 2003-2008 period while a very slow rate of convergence is observed for the long-term lending rates ( $\hat{b}=0.051$ ). These results match those of Bondt (2002) who indicate that lending rates to enterprises with short-term maturities for the period 1996 to 2001 have higher pass-through rates than longer-term lending rates. Similar results were obtained by Baele et al (2004) who find higher variability in the medium and long term loans to non-financial corporations for the period 2003 to 2004.

The disparity in the convergence process based on maturity duration could be due to a number of factors. Firstly, the degree of competition is likely to be higher for short-term

loans to enterprises due to the availability of other sources of short-term borrowing such as trade credit which would imply an elastic loan demand curve (Bondt, 2002). Secondly, the log *t*-test results for the lending rates can be explained through economic theories on term structure of interest rates, such as the expectations theory and the liquidity preference theory. According to the expectations theory, long-term interest rates are determined by market expectations about the trajectory of future short-term interest rates. However, the study by Bondt et al (2005) question this rationale and using an error correction model on long term interest rates to enterprises (1994-2002), they find that European retail rates depend on long term interest rate, as evidenced by the sluggishness in their response to money market rates. If this is the case, then the interpretation from this analysis is that if the pricing of long term retail banking products depends on long term market rates which incorporate sovereign risk, then diversity among the lending rates of individual member states will exist. Also, banks are likely to price their long term retail products based on individual bank's perception and management of interest rate risk and therefore, the more diverse the pricing behaviour of banks, the less integrated the retail market is bound to be.

The second theoretical explanation for the limited convergence in medium-term and long-term lending rates is the liquidity preference theory whereby longer term interest rates not only reflect market expectations but also include a risk or liquidity premium to factor in the higher level of risk for the lender. A study by the ECB (2006) attempts to measure the impact of maturity fixation period on lending rates to non-financial corporations by working out the differences between these rates and the euro area yield curve. The findings show that the period of maturity does indeed have an impact on the lending rates with 1-5 years and over 5 years durations. Hence the underlying implication is that the duration of interest rate maturity may very well influence the lending rate by reflecting credit risk. This would, in turn, explain cross-country differentials and the weaker convergence rates for longer term instruments.

#### 4.2. Club clustering test and transition paths

Having established that convergence is present within all the 3 panels of deposit rates and in 3 out of 5 of the lending rates panels, the next step of the analysis is the application of the Phillips and Sul (2007a) clustering algorithm which would indicate whether any sub-group convergence is taking place within the 15 group of EU countries. The test statistics are reported in Table 2, and discussed below together with the third component of the test which is the calculation of each country's filtered relation transition coefficient,  $\hat{h}_{it}$ . This transition coefficient  $\hat{h}_{it}$  summarises the country's behaviour vis-à-vis the panel average over time. This procedure is very insightful as it provides a visual illustration of the convergence process underway and also allows inferences to be drawn with regards to each individual country's transition path.

##### 4.2.1 Short-term deposit rates: 2003-2008

With regards to the 2003-2008 deposit rates with 1 year maturity, only one cluster is identified regrouping all the 15 EU countries. A relatively high rate of convergence is also observed ( $\hat{b}=2.036$ ). It is therefore obvious that with regards to the deposit rates with 1 year maturity, the majority of the 15 EU countries are closely converging. This fact is actually highlighted in the transition paths (see Figure 1) where it can be observed that all the countries in the panel, except for UK and Sweden are strongly convergent over the whole period, as their transition curves are moving asymptotically towards one.

The UK's transition curve diverges away from one between the period 2003 to 2005 and then changes course and gradually moves in tandem with the other countries. The same can be observed for Sweden except that its transition curve has a negative slope until 2005 where after it converges towards one. The unique characteristics of the UK retail banking market

such as a generally higher concentration and profitability ratios; a significantly lower savings ratio (linked to developments in the housing market) compared to the EU average and the fact that it is outside of the Euro-zone could well explain the divergent path observed at the start of the period. However, around the years 2004/5, the UK embraced several EU centred regulatory and legislative measures such as Directives on consumer credit, capital adequacy and changes to money laundering rules and regulations. This could explain the convergent path from then onwards. As for Sweden, the divergence seen at the start at the period coincides with the major reforms being undertaken in Sweden following its banking crisis in the 1990s. These reforms took the form of significant structural change which saw the breakdown of the separation between savings and cooperatives banks. For example, in 1997, Swedbank (formed by the merger of several regional savings banks and privatised in 1995), merged with the cooperative sector to become a leading player, alongside the other three big banks. Further reforms were pursued between 1998 to 2003. Eventually, the Swedish banking sector was transformed from a fragmented banking market to a more competitive one. Hence, these changes could explain the convergence in the time path of the Swedish rates beyond the year 2005.

#### 4.2.2 *Deposit rates (1-2 years' maturity): 2003-2008*

The sub-club convergence tests reveal the presence of only one cluster regrouping all the 15 EU countries for the deposit rates with medium-term maturity for the 2003-2008 period. A relatively high rate of convergence is also noted ( $\hat{b}=2.789$ ). These results lend support to the hypothesis that the European savings market for small and medium enterprises are integrated. Furthermore, as illustrated by the individual countries' transition paths in Figure 2, the clustering of countries for the deposit rates with the 1-2 years maturities seem to be as

pronounced as with the previous data set with 1 year maturity (see Figure 1). In fact, Figure 2 shows that all the countries in the sample have parallel convergence paths, except for the UK and Sweden. The transition curve for these two countries start far above the cross-section average and in the case of the UK, its transition coefficient actually moves away from one between 2003 and 2005 but after that, there is marked convergence towards the rest of the group of countries for both Sweden and UK. The reasons for such behaviour for these two countries have been discussed above in Section 4.2.1.

#### 4.2.3 *Deposit rates (>2years' maturity): 2003-2008*

Once more, the Phillips and Sul (2007a) club clustering test reveals just one cluster comprising all 13 EU countries in the panel. Thus, the presence of just one cluster shows that convergence is also evident for the deposit rates with longer term maturities. However, the speed of convergence is much slower for this panel ( $\hat{b}=0.348$ ) compared to the other two deposit panels. Furthermore, when the transition path of each country is plotted (see Figure 3), greater insight into the convergence of deposit rates with longer maturities is revealed. Indeed, a visual display of the transition paths for each country's deposit rates with over 2 years' maturity shows that heterogeneity in the behaviour of all the 13 countries is evident. All of the countries start at a different point in relation to the panel cross-section average but then slowly converge towards one. Greece is the only country that does not deviate much from its starting point of 0.2 for most of the period until 2005/6, after which a more convergent path is observed. Interestingly, in their study on EU bank competition and concentration for the period 1997-2003, Casu and Girardone (2006) rate the structure of the Greek banking market as a monopolist while the rest of the EU countries banking systems are categorised as monopolistic competition. The lack of competitive pressures in the Greek



banking sector could explain the deviation of the country's transition coefficients from the panel average at the start of the period. However, the Greek banking sector has undergone several changes, most notably moving away from close ownership and management by the government in the late 1990s together with the implementation of several EU directives (Maniatis, 2006). The wave of consolidation and introduction of competition may well explain the subsequent movement of the country's time path towards the panel average.

On the whole, although, group convergence is present in this sample, albeit at a much slower pace than the other deposit panels, it can be observed that the duration of the maturity structure seems to have an impact on the convergence process for these deposit rates.

#### *4.2.4 Short-term lending rates: 1995-2002*

With regards to the short-term lending rates for the period 1995 to 2002, two sub-clubs have been identified by the Phillips and Sul (2007a) club clustering test, each with 3 and 11 countries respectively. The first cluster consists of Germany, Greece and Ireland while the second cluster groups the majority of the countries, namely Austria, Belgium, Spain, Finland, France, Italy, Netherlands, Portugal, Sweden, Denmark and UK. It is also observed that the speed of convergence within these two clusters varies significantly with a faster rate noted for the first cluster ( $\hat{b}=3.725$ ) compared to the second cluster ( $\hat{b}=0.756$ ). On the whole, the positive convergence results and the revelation that the majority of the EU countries in the sample belong to just one cluster provide strong support to the hypothesis that the convergence in the European retail banking was underway in the 1990s. Another noteworthy observation is that the non-euro area countries, i.e. Denmark, Sweden and UK belong to the same cluster. The same observation can be made for two members of the BENELUX group,

namely Belgium, and the Netherlands (Luxembourg is not part of this sample due to a lack of data).

A visual inspection of the relative transition paths for each country, illustrated in Figure 4 shows that all of the countries seem to follow a parallel path, except for Greece which starts way above the panel cross-section but then steadily moves towards the centre around late 1990s. This actually coincides with the start of the major deregulation in the Greek banking sector that was undertaken at the time. Moreover, the countries transition curves also seem to illustrate how the clusters have been formed. For instance, the paths for Germany and Ireland (both in the first cluster) certainly seem to have the same slope, i.e. the same growth rate of the transition coefficient relative to the cross-section average. In general, the clustering of the transition paths for the majority of the countries around the cross section average is more pronounced after the years 1998/99, which coincide with major events such as the Financial Services Action Plan and the launch of the Euro.

#### 4.2.5 *Lending rates (1 year maturity):2003-2008*

Only one cluster grouping all the 15 EU countries in the panel is identified for the short-term lending rates for period 2003-2008 ( $\hat{b}=0.827$ ). These strong convergence results build on similar results obtained for the same lending rates for the earlier period and hence it can be said that the short-term lending rates to non-financial corporations in the EU have been converging since 1990s until 2008. Figure 5 shows the transition paths for the 15 countries and the clustering around one is clearly visible. Two countries, namely Greece and UK show a divergent behaviour at the start but around 2005, their paths change course and move towards the cross-section average. The other noticeably divergent country is Sweden which starts with a negative slope which becomes positive and parallel to the rest of the group

around mid 2005. The reasons explaining the behaviour of the curves for these countries have already been presented in earlier Sections.

#### *4.2.6 Overdraft rates: 2003-2008*

For the overdraft rates, as a whole group, the 14 countries in the panel do not converge, as discussed in Section 4.1 above. However, the club clustering tests show sub-club convergence is present for this panel. One cluster is identified grouping Austria, Belgium, Germany, Denmark, Finland, France, Greece, Italy, Netherlands, Portugal, Sweden and the UK ( $\hat{b} = 1.128$ ). However, two divergent countries (Ireland and Spain) are also identified ( $\hat{b} = -0.446$ ). As shown in Figure 6 the time paths seem to indicate that most of the countries are following parallel paths although a clear divide can be seen between the countries. Several countries such as Austria, Belgium, Germany and Greece all start above 1, at around 1.2 while other countries such as France, Sweden, Portugal and Netherlands have a consistent slope below 1 at around 0.8. The dispersion observed for the overdraft rates is not entirely surprising given that, as argued by Howells and Bain (2008), bank overdraft rates tend to vary from one country to another because very often, the conditions attached to these rates are different. Hence, national characteristics may very well prevail in the market for such products.

Another notable observation from Figure 6 is that Spain is the only country to have a totally different path, which is confined to between 2.5 and 2.7. The reasons for Spain's transition path's behaviour can be explained as follows. Firstly, compared to the other 14 EU countries, the provision of overdraft facilities to enterprises constitutes a major source of retail banking business. For instance, the inquiry conducted by the European Commission (2006) on retail

banking showed that based on 2004 figures, Spanish banks derives almost 32% of its gross income from SME credit lines. In comparison, other EU Member States such as Austria (8.33%), Finland (7%), France (8.82%) and Germany (8.12%) derive much less income from SME credit lines. For these countries and most of the rest of the EU countries in the sample, the core product is current account. In contrast, Spain only derives around 9%<sup>8</sup> of its SME income from current accounts. Moreover as discussed by Martin-Oliver et al (2007), the retail market in Spain is local for most products and services and given the prevalence of regional savings and cooperatives, diversity within the Spanish retail banking market is bound to be rife. As revealed by Martin-Oliver et al (2007), since 1993, dispersion across banks in credit lines increased over time. The interest rate dispersion can be a result of credit risks and product heterogeneity and the degree of competition faced by individual regional banks, which may not necessarily match those of the other EU countries.

#### 4.2.7 *Lending rates (1-5 years' maturity): 2003-2008*

As discussed in Section 4.1, the null of convergence for the whole panel for lending rates with 1-5 years maturity is rejected by the log t-test. As for the club clustering test results, they reveal a very heterogeneous market for such credit instruments. Two clusters are identified with 5 and 8 countries in each cluster respectively. The first group consists of Greece, Ireland, Spain, Portugal and UK ( $\hat{b} = 1.443$ ) while the second cluster comprises Austria, Belgium, Germany, Denmark, Finland, France, Netherlands and Sweden ( $\hat{b} = 0.234$ ). As observed by the magnitude of  $\hat{b}$ , this second cluster has a slow rate of convergence. The club clustering algorithm also identifies two divergent countries, namely, Italy and Luxembourg ( $\hat{b} = -0.947$ ). The transition curves charted in Figure 7 also picture a high degree of

---

<sup>8</sup> Based on 2004 figures (see European commission, (2006))

heterogeneity among the countries' paths for these lending rates. Notably, it can be observed that the paths for Austria, France, Greece, Ireland, Sweden, and Germany all start with negative slopes which turn positive around 2006. UK's path on the other hand, starts by moving away from the cross-section average and then slowly converges to 1. Overall the results for this panel data set underpin the earlier observation that there seems to be more heterogeneous convergence for the lending rates with medium-term maturities. The possible explanations for these findings have been discussed at length in Section 4.2.

#### 4.2.8 *Lending rates (> 5 years maturity):2003-2008*

With regards to the lending rates with longer maturities, only one sub-club, regrouping all 15 EU countries has been detected. However, the rate of convergence is very slow as indicated by the magnitude of  $\hat{b}$  which stands at 0.028. Unsurprisingly, the transition paths for the countries in this sample (see Figure 8) show very diverse convergence patterns. Indeed, the time paths reveal a tendency for most of the countries to have either a large negative slope or a positive one above the cross-section average of one. The heterogeneous behaviour of the countries' transition paths for the panel of lending rates with over 5 years' maturities emphasises the earlier log  $t$ -test results which point to a less integrated retail banking market for instruments with longer term maturities. As discussed in Section 4.2, there are both theoretical and anecdotal evidence that can explain such results.

## 5. Conclusions

The aim of this paper has been to investigate the integration process in the EU retail banking sector by analysing monthly deposit and lending rates to non-financial corporations for the period ranging from 1995 to 2008. An important contribution in this paper is the application

of methodologies that have not, so far, been employed in the literature on European banking integration. Namely, the recently developed Phillips and Sul (2007a) panel convergence test which is both powerful and flexible is applied to the deposit and lending data sets. This convergence methodology has never been applied in this area before and is superior to the commonly used time series cointegration approach and other convergence methods such as the beta and sigma convergence tests as it models long run equilibrium while allowing for individual heterogeneity over time. In addition, the benefit of using this methodology is that it provides evidence on both the degree and speed of convergence and also identifies sub-group convergence. Furthermore, this convergence test advocates the use of filtered data which is rendered free from any cycle components and is thus applied to filtered level deposit and lending data.

The Phillips and Sul (2007a) log  $t$ -test results suggest that retail banking for non-financial corporations in the EU is integrated for the overwhelming majority of products, as the null hypothesis of convergence cannot be rejected for all the deposit panel datasets and for 3 out of the 5 lending panel datasets. These results also indicate faster convergence for short-term and medium-term deposit and lending rates than for rates with long-term maturity.

The club clustering test reveals that convergence is indeed present in all the 8 panels but paints a more heterogeneous picture of retail banking integration for certain products. On the whole, it can be observed that close convergence is evident in the short-term deposit and lending market and that the integration process started well in the 1990s for the short term loans to non-financial corporations. As for the remaining data sets, the club clusters are less concentrated and some divergent units have also been identified. This is particularly apparent with the deposit and lending rates with the medium to long term maturities. This fact is also highlighted in the visual depiction of each country's transition curve for these panel sets. Therefore, it can be stated that heterogeneity is still present within the European retail

banking market for instruments with longer term maturities. These results could well reflect market expectations with regards to inflation, country-risks, growth prospects, fiscal policies, public debt, the government's credibility in managing public finances and other factors which are embedded in the expectations and liquidity preference theories. Further harmonisation efforts by the European Commission on the EU's fiscal and other economic policies may well increase the degree of competition and contestability in the non-financial corporations deposit and credit markets in the future. However, as highlighted by the recent financial turmoil, the importance of liquidity and credit risks cannot, at the same time, be undermined.

## References

- Adam K., Jappelli T., Menichini A., Padula M., Pagano M. (2002), “Analyse, compare and apply alternative indicators and monitoring methodologies to measure the evolution of capital market integration in the European Union”, *Centre for Studies in Economics and Finance, University of Salerno*, January.
- Affinito M. and Farabullini F. (2006), “Does the law of one price hold in retail banking? An analysis of national interest rate differentials in the euro area”, *Bank of Italy, Economic Research Department*, August.
- Antzoulatos A., Panopoulou E., Tsoumas C. (2008), “The enigma of non-interest income convergence, Department of Banking and Finance”, *University of Piraeus*.
- Baele L., Fernando A., Hordahl P., Krylova E., and Monnet C. (2004), “Measuring financial integration in the Euro area”, *ECB Occasional Paper Series*, No. 14, April.
- Barro, R.J. & Sala-i-Martin, X.,( 1991), “Convergence Across States and Regions”, *Yale - Economic Growth Center*, paper No. 629.
- Barro R. J., Sala-i-M. (1992), “Convergence” *Journal of Political Economy*, Vol. 100, No. 2, pp. 223-251.
- Bondt G. (2002), “Retail bank interest rate pass-through: new evidence at the euro area level”, *ECB working paper series* No. 136.
- Bondt G., Mojon B., and Valla N. (2005), “Term structure and the sluggishness of retail bank interest rates in Euro area countries”, *ECB Working paper series* No.518.
- Caporale G. M.; Erdogan B.; and Kuzin V. (2009), Testing for Convergence in Stock Markets: A Non-Linear Factor Approach, CESifo Working Paper Series, No. 2845, Munich.
- Casu, B, Girardone, C., (2006), “Bank competition, concentration and efficiency in the single European market”, *The Manchester School* 74 (4), 441–468, Special Issue, 1463–6786.
- Doornik, J.A. (2005), *Object-Oriented Matrix Programming Using Ox*, 3rd ed. London: Timberlake Consultants Press and Oxford, Available from : [www.doornik.com](http://www.doornik.com).
- European Commission (2006), *Interim Report II: Current accounts and related services - Sector Inquiry under Article 17 Regulation 1/2003 on retail banking*.
- ECB (2006), *Differences in MFI interest rates across Euro Area countries*, September.
- Eurostat (2009), *Overview of the relative economic importance of the institutional sectors* May.



- Fischer C. (2009), "Price convergence in the EMU? Evidence from micro data", *Deutsche Bundesbank, Research Centre, Discussion Paper Series 1: Economic Studies*, No. 06/2009.
- Higson C., Holly S. And Petralla I. (2009), "The financial integration of the European Union: common and idiosyncratic drivers", Working paper D.1.1d, *European Commission, 7<sup>th</sup> Framework Programme*.
- Hodrick R. and Prescott E. (1997), "Postwar U.S. business cycles: An empirical investigation", *Journal of Money, Credit and Banking*, 29(1), 1-16.
- Howells P. and Bain K. (2008), *The Economics of money, banking and finance*, 4th Ed. Prentice Hall.
- Islam N. (2003), "What have we learnt from the convergence debate?" *Journal of Economic Surveys*, Blackwell Publishing, vol. 17(3), pages 309-362, 07.
- Kleimeier S. and Sander H. (2000), "Regionalisation versus globalisation in European financial market integration: Evidence from co-integration analysis", *Journal of Banking and Finance*, 24, 1005-1043.
- Kleimeier S. and Sander H. (2003), "European financial market integration: Evidence on the emergence of a single eurozone retail banking market". *Research in Banking and Finance*, 3, 13-91.
- Maniatis P. (2006), "Market concentration and industry profitability: the case of Greek banking (1997-2004)". *International Business & Economics Research Journal*, Vol. 5, No. 10.
- Martin-Oliver A., Salas-Fumas V. and Saurina J. (2007), "A test of the law of one price in retail banking" *Journal of Money, Credit and Banking*, Vol. 39, Issue 8.
- Murinde V., Agung J. and Mullineux A. (2000), "Banking system convergence in Europe", *University of Birmingham*, September.
- Phillips P. C. B. and Sul D. (2007a), "Transition modelling and econometric convergence tests", *Econometrica* 75(6), 1771-1855.
- Phillips P. C. B. and Sul D. (2007b), "Some empirics on economic growth under heterogeneous technology", *Journal of Macroeconomics* (29) 455-469.
- Phillips P. C. B. and Sul D. (2009), "Economic Transition and Growth", *Journal of Applied Econometrics*, Vol. 24, Issue 7, pp 1153-1185.
- Quah D. (1996), "Empirics for economic growth and convergence", *European Economic Review*, Vol. 40, pp1353-1376.
- Schuler and Heinemann (2002), "How integrated are European Retail financial markets? A cointegration analysis", *ZEW papers*, Germany.

Sørensen C. K. and Gutiérrez J., (2006), “Euro area banking sector integration – using hierarchical cluster analysis techniques”, *Working Paper Series 627*, European Central Bank.

Sul D. (2007), *Gauss codes for the computation of the panel convergence logt test and convergence clubs*, proposed in Phillips and Sul (2007a).

Stawinska A. (2009), “Specialisations within the EU’s non-financial services sector” *Statistics in Focus*, issue No. 61, Eurostat, 2009.

Vajanne L. (2007), “Integration in euro-area retail banking markets –convergence of credit interest rates”, *Bank of Finland Research Discussion paper No. 27*.

**Table 1: Phillips and Sul (2007) Log  $t$  test**

$$\text{Log}\left(\frac{H_1}{H_t}\right) - 2\log L(t) = \hat{a} + \hat{b}\log t + \hat{u}_t$$

<b>Data series</b>	$\hat{b}$	$t$ -statistics
<b>Deposit rates</b>		
• 2003-2008 (1yr mat.) panel set	2.271	9.128
• 2003-2008 (1-2yrs mat.) panel set	3.090	11.181
• 2003-2008 (>2yrs mat.) panel set	0.480	8.030
<b>Lending rates</b>		
• 1995-2002 (short-term)panel set	1.060	12.099
• 2003-2008 (1 yr mat.) panel set	0.716	6.754
• 2003-2008 overdrafts panel set	-0.193	-7.542*
• 2003-2008 (1-5 yrs mat.) panel set	-0.179	-3.593*
• 2003-2008 (>5 yrs mat.) panel set	0.051	0.820

*Note:*

-The Phillips and Sul (2007) log  $t$ -test were run in OxEdit (see Doornik, 2005) using the Gauss code programmed by Sul (2007)

\* Indicates rejection of the null hypothesis of convergence at the 5% significance level.

**Table:2. Phillips and Sul (2007) Club Convergence Test**

$$\text{Log} \left( \frac{H_1}{H_t} \right) - 2 \log L(t) = \hat{a} + \hat{b} \log t + \hat{u}_t$$

Data series	$\hat{b}$	t-statistics
<p><b>2003-2008 (1yr mat.) deposit panel data set</b></p> <p><b>Club 1:</b> Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, Sweden, Luxembourg, UK</p>	2.036	11.994
<p><b>2003-2008 (1-2yrs mat.) deposit panel data set</b></p> <p><b>Club 1:</b> Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, Sweden, Luxembourg, UK</p>	2.789	12.183
<p><b>2003-2008 (&gt;2yrs mat.) deposit panel data set</b></p> <p><b>Club 1:</b> Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, UK</p>	0.348	7.649
<p><b>1995-2002 (short-term) lending panel data set</b></p> <p><b>Club 1:</b> Germany, Greece, Ireland</p> <p><b>Club 2:</b> Austria, Belgium, Spain, Finland, France, Italy, Netherlands, Portugal, Sweden, Denmark, UK</p>	3.725 0.756	15.954 34.042
<p><b>2003-2008 (1 yr mat.) lending panel data set</b></p> <p><b>Club 1:</b> Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, Sweden, Luxembourg, UK</p>	0.827	11.719
<p><b>2003-2008 overdrafts lending panel data set</b></p> <p><b>Club 1:</b> Austria, Belgium, Germany, Denmark, Finland, France, Greece, Italy, Netherlands, Portugal, Sweden, UK</p> <p><b>Divergent countries:</b> Ireland, Spain</p>	1.128 -0.446	15.306 -30.031*

**Table:2 cont'd. Phillips and Sul (2007) Club Convergence Test**

$$\text{Log}\left(\frac{H_1}{H_t}\right) - 2\log L(t) = \hat{a} + \hat{b}\log t + \hat{u}_t$$

<b>2003-2008 (1-5 yrs mat.) lending panel data set</b>		
<b><u>Club 1</u></b> : Greece, Ireland, Spain, Portugal, UK	1.443	11.351
<b><u>Club 2</u></b> : Austria, Belgium, Germany, Denmark, Finland, France, Netherlands, Sweden	0.234	2.082
<b><u>Divergent countries</u></b> : Italy, Luxembourg	-0.947	-528.882*
<b>2003-2008 (&gt;5 yrs mat.) lending panel data set</b>		
<b><u>Club 1</u></b> : Austria, Belgium, Germany, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, Sweden, Luxembourg, UK	0.028	0.910

*Note:*

-The Phillips and Sul (2007) club clustering log t-test were run in OxEdit using the Gauss code programmed by Sul (2007)

\* Indicates rejection of the null hypothesis of convergence at the 5% significance level.

Figure 1 Transition paths for each country's 1yr deposit rates (2003-2008)    Figure 2 Transition paths for each country's 1-2yrs deposit rates (2003-2008)

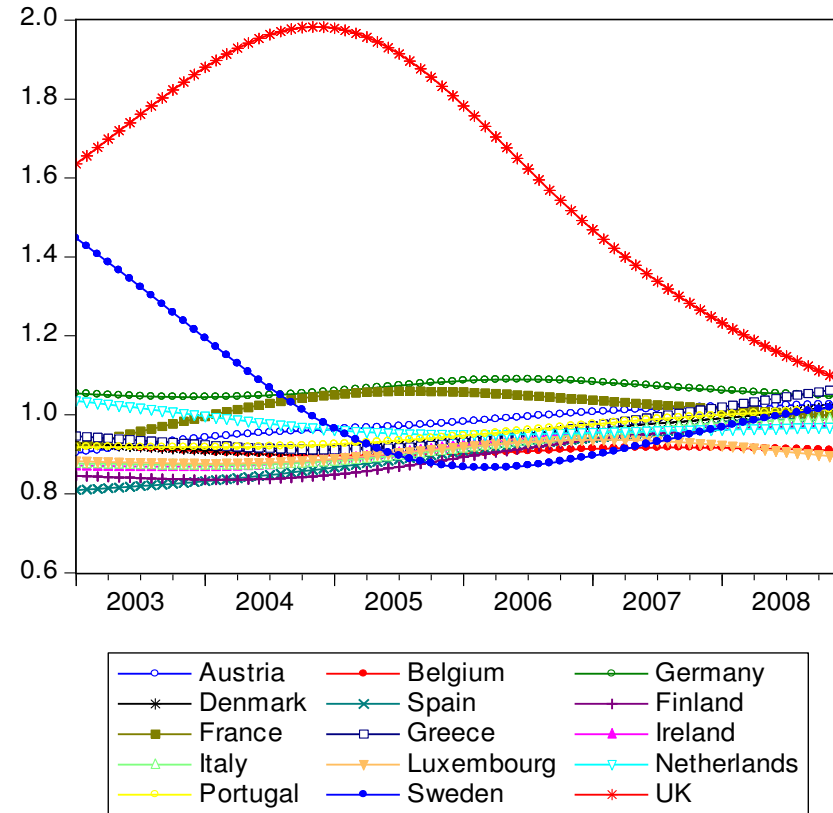
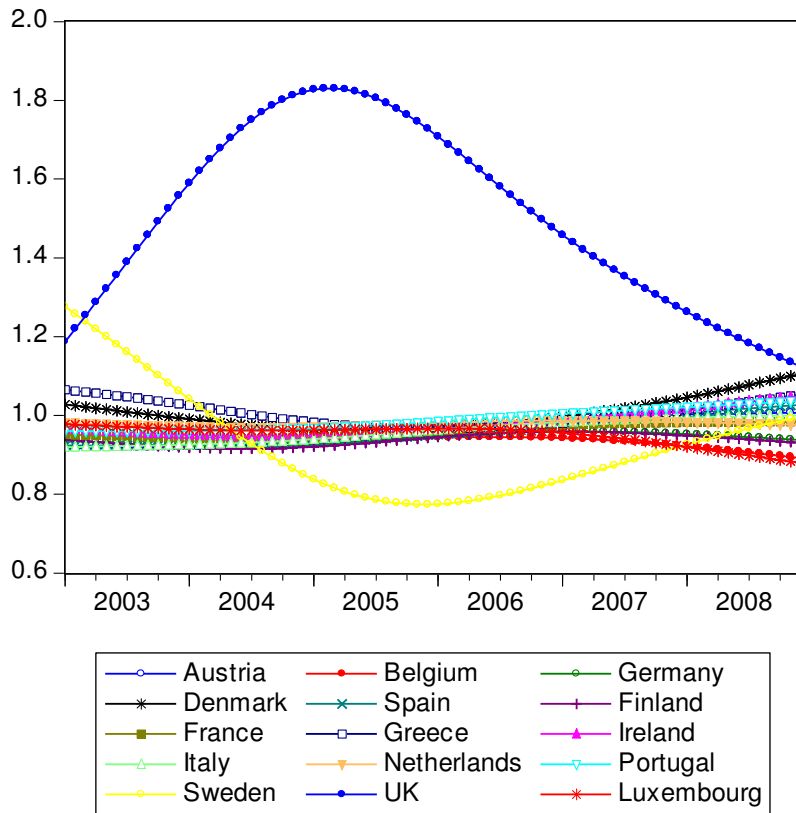


Figure 3 Transition paths for each country's >2yrs deposit rates (2003-2008)

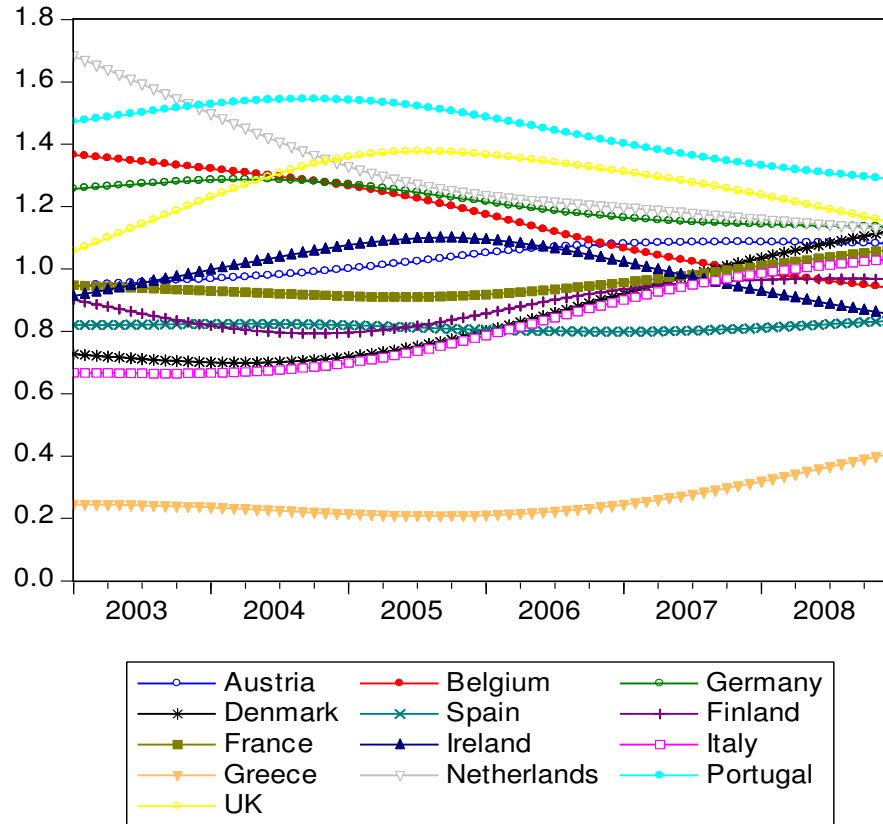


Figure 4 Transition paths for each country's ST lending rates (1995-2002)

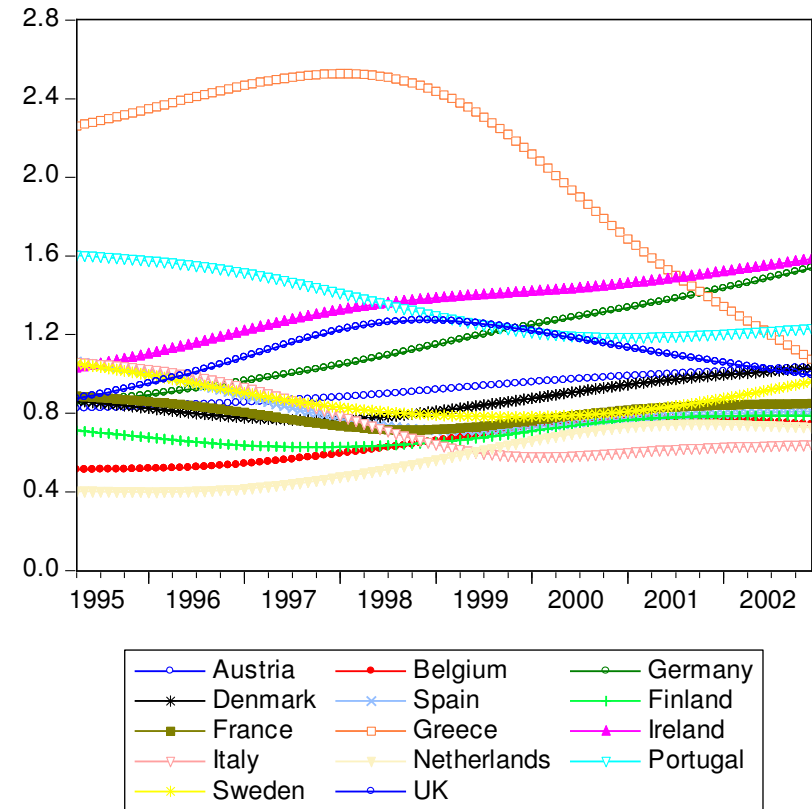


Figure 5 Transition paths for each country's 1yr lending rates (2003-2008)

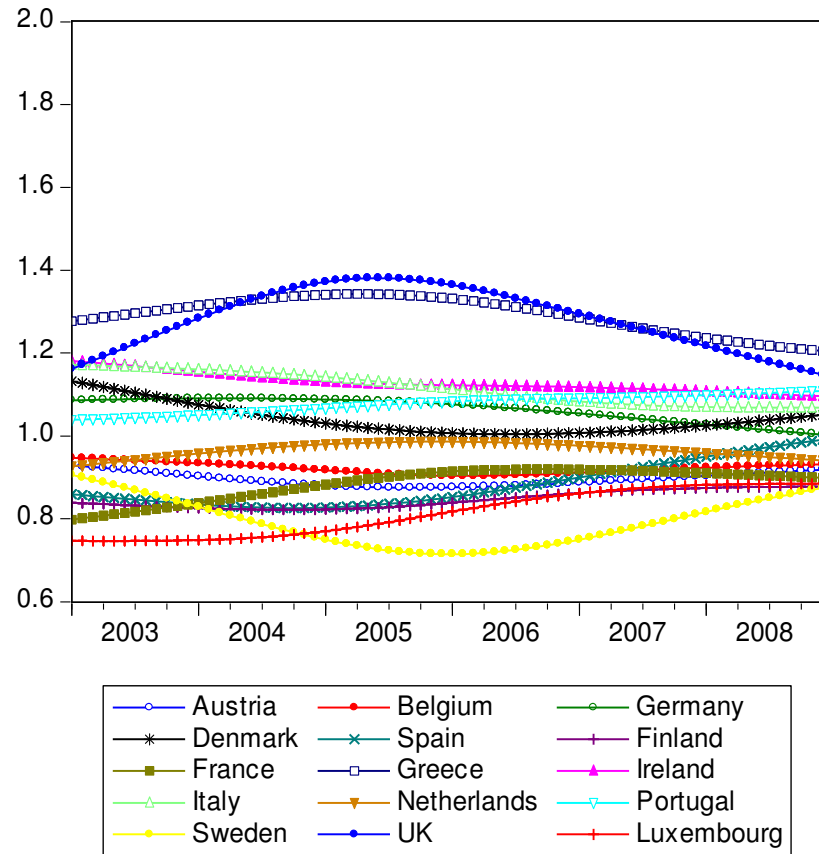


Figure 6 Transition paths for each country's overdraft rates (2003-2008)

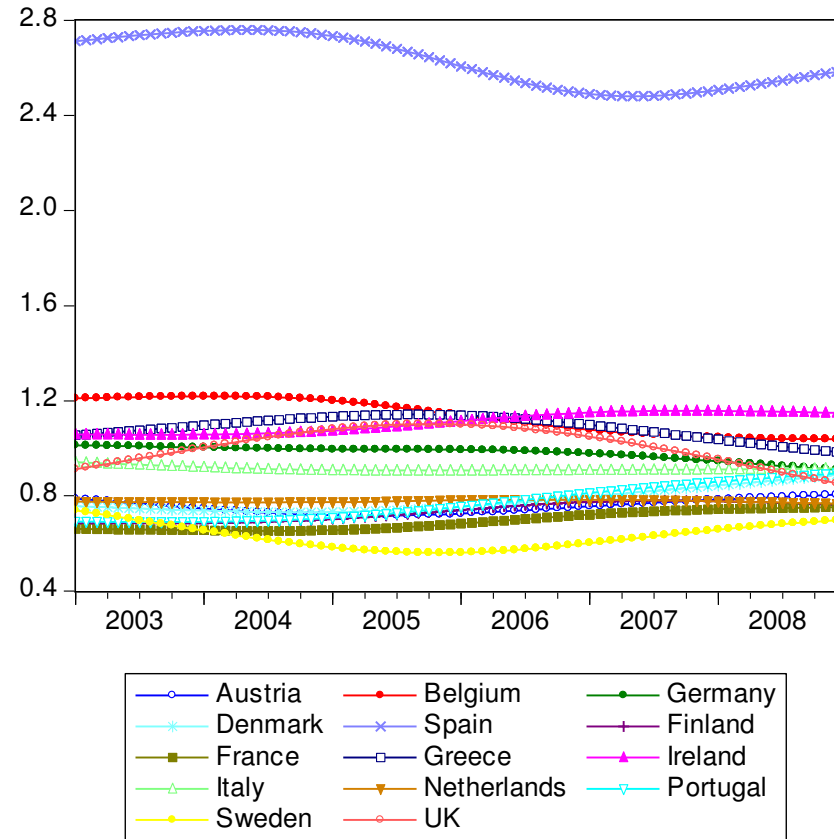




Figure 7 Transition paths for each country's 1-5yrs lending rates (2003-2008)

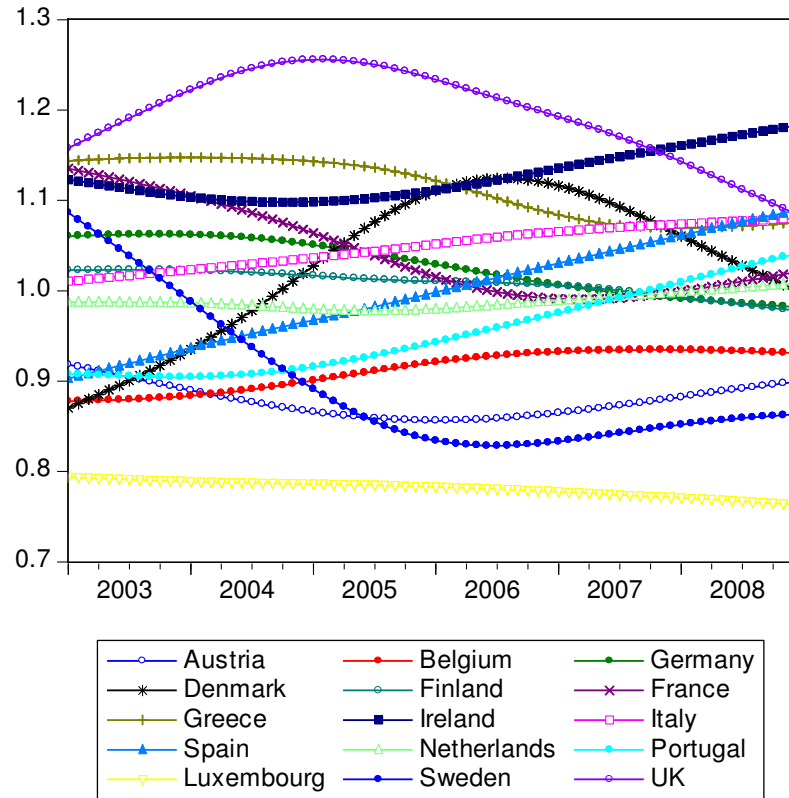


Figure 8 Transition paths for each country's > 5yrs lending rates (2003-2008)

