THE FINANCIAL CRISIS IMPACT ON THE DEGREE OF ECONOMIC INTEGRATION IN THE EU COUNTRIES

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Abstract

Our study aimed to assess the degree of heterogeneity of the macroeconomic framework of the 27 EU member countries, against the background of turmoil manifested in the international financial markets. In this regard, we applied a hierarchical cluster analysis technique, for two moments of time, countries being grouped according to the values recorded by a series of key macroeconomic and financial indicators. In the year 2008 we noticed an increase of the groups' number and fragmentation, due to the amplification of the economic gap in the pan-European area. Empirical analysis revealed the presence of some outlier countries (Bulgaria, Czech Republic, Cyprus, Romania, Poland, Slovenia, Hungary and Ireland) whose macroeconomic features are the most dissimilar with the other EU Member States. We concluded that the increase in countries heterogeneity, as a result of strong imbalances at national level, has a negative impact on the economic integration process and the achievement of real and monetary convergence.

Keywords: economic integration, financial crisis, 27-EU countries, macroeconomic heterogeneity, cluster analysis.

JEL Classification: C49, F15, G01

1. INTRODUCTION

The current financial crisis marked the end of a period characterized by pursuit of profit taking and increasing risk. To counteract the spreading of its adverse effects it was necessary the prompt and concerted intervention of central banks and governments, materialized in the taking of urgent measures, designed to restore confidence in international financial system. What in August 2007 seemed to be a problem of sub-prime mortgage market in the U.S., later it turned into a global financial crisis. Financial markets have started to record serious disturbances, threatening the financial institutions' robustness and their capacity to face the current shocks. Consequences of financial crisis continue to make their presence felt, after two years from the onset, the size of the losses generated being still unknown.

Accordingly, we can state that the actual financial crisis has affected, at different magnitudes, all national financial markets, and has propagated, indirectly, into the real economy, too. In Europe, it overlapped the comprehensive economic and financial integration process. The surveys made by several international organizations in tranquil times revealed an incomplete and insufficient degree of integration, particularly in the banking sector of EU countries. Hence, there is room for further integration, especially in terms of market completeness and cross-border activity, in order to ensure lower costs and higher product diversity.

The question that arises is: could be still achieved the objective of economic and financial integration of EU countries in the context of the current global crisis? In this respect, our study aims to assess the extent to which financial crisis has contributed to the loss of synchronization of the economic integration process of the 27 EU countries.

It is widely accepted that economic integration is a catalyst for sustainable economic growth. Although Balassa has defined five stages of economic integration (free trade area, customs unions, common market, economic union and complete economic union), in reality the border between them is much dimmed. For example, a common market which is allowed the free trading

of goods and services, movements of capital and labor, is not viable in the absence of coordination of economic policies at European level. At present, however, the economies of EU member states are confronted with major distortions and imbalances in terms of the volatility of currency exchange, unemployment, inflation rate, the share of public debt in GDP, the current account deficit, the different pace of GDP growth contraction, indirect taxation etc. In order to cut off the generalized economic slowdown and to restore a stable economic climate, EU member states are implementing a recovery plan designed to coordinate and align their economic policies, towards the achievement of a state of financial stability and economic growth.

In this paper, by applying a cluster analysis technique, we intend to detect countries in EU that show similar, homogeneous patterns according to a number of key macroeconomic indicators. Particularly, we want to assess the degree of cross-country economic homogeneity in terms of macroeconomic variables, for two reference time periods: the year 2006, characterized by strong, sustained economic growth, high rates of investments and consumption, increased pace of lending activity, optimistic expectations concerning revenues and standard of living, and 2008 which marked the beginning of a sharp deterioration of both financial and economic environment. Also, we analyze which countries tend to be in the same cluster, displaying common economic features, and how evolves the cluster composition over the two periods considered. The paper was structured as follows: section 2 provides a brief overview on the methodology applied; section 3 depicts the indicators employed in the analysis, the results obtained and their explanation and the last section summarizes the main findings.

2. METHODOLOGY-AN OVERVIEW

Cluster analysis is an unsupervised learning, exploratory technique, that identifies the complex relationships in a given dataset of variables, without imposing any a priori restriction. Consequently, the initial dataset doesn't need the distinct specification of a target variable (the dependent variable) and respectively, of predictor ones (independent variables). All variables have the same importance, because the analysis's goal is not to predict a certain value, but instead, to identify the presence of specific patterns or correlations among variables, to include the different variables or cases into more homogenous groups.

The entities' clustering is based exclusively on the similarities identified in the variables' structure. Yet, the results obtained are valid only for the ex-ante defined sample, they cannot be generalized to the entire sector/economy. According to Romesburg [2004], this technique represents "*a mathematical microscope for looking at the relations of similarity among a given set of objects. It cannot be used for making statistical inferences about these relations to a larger population. Any inferences a researcher makes by studying the tree are made by using reasoned analogy rather than by using formal statistical methods*".

Cluster analysis focuses on the examination of the interdependencies between variables, its finality consisting in gathering similar entities into more homogenous groups, named *clusters*. Therefore, when doing a cluster analysis there must be completed several stages:

- definition of the research goal, of the assumption to be tested and the selection of the most significant variables. In this respect, Sorensen, Gutierrez [2006] argue that the selection of variables to be included in the cluster analysis is of major importance, since it is the data themselves that structure the results. Leaving out or adding an important variable may hence alter the results significantly.
- applying a standardization procedure. Standardization is imposed when the variables are expressed in different units of measure, in order to lower the risk of misrepresentation of the resemblance relationships between the entities in the sample. Therefore, the variables will become dimensionless. Another advantage of the standardization procedure consists in the uniformization of the variables' influence, by eliminating extreme values, which are susceptible of generating biased results. Failing standardization, if one variable's values range between a large interval than the other ones, then this particular variable will benefit

of a greater importance in establishing the similarities between entities, denaturizing the results. In this study we chose a normal standardization, determined as the ratio of (*the current value of a variable – average value)* to *standard deviation*.

- selecting a clustering procedure. Economic literature has consecrated three main procedures: k-means clustering, hierarchical clustering and two-step clustering. The clustering procedure we chose to implement was the *agglomerative hierarchical clustering,* because it allows the grouping of resembling countries, without specify ex-ante a pre-established number of clusters. The agglomerative technique places, firstly, each country into a distinct group, then proceeds to the merger, at each step, of the two countries that have the least dissimilarity into successively larger clusters, according to the agglomerative method chosen.
- selecting an appropriate method for data aggregation. The most frequent applied methods are *single linkage* (nearest neighbor), *complete linkage* (furthest neighbor) and *average linkage*. In this study we have applied, comparatively, all the three methods above mentioned.
- choosing a unit of measure or an algorithm for the distance/similarity between countries, according to data type (interval, count, binary variables). It is important to mention that, in this case, the distance isn't measured in physical units, but in terms of resemblance between the intrinsic characteristics of the countries considered. One must compute a *resemblance coefficient*, whose meaning can be interpreted in terms of a *similarity coefficient*, or as a *dissimilarity coefficient.* Therefore, the bigger the similarity coefficient' value, the more resembling the two countries. Instead, a high value of the dissimilarity coefficient indicates a low resemblance. As a measure for the distance between countries, we have decided to employ the *squared Euclidean distance* because, in the process of group building, it places greater emphasis on outliers that depict extreme values and is suitable for continuous variables. The studies of Wolfson [2004] and Gutierrez, Sorensen [2006] propose the same approach, too.
- interpretation of the dendrogram (binary tree) and identification of optimal number of clusters. In practice, it is recommended that the branches of the tree be cut at a level which coincides with a large jump in the clustering levels of two consecutive nodes. The establishment of the correct number of clusters is, however, a subjective process, depending on the analyst's experience. As Norušis [2008, pp. 364] points out, to find a good cluster solution, one must observe the characteristics of the clusters formed at successive steps and decide when it is achieved an interpretable solution or a solution that has a reasonable number of fairly homogeneous clusters.

3. RESULTS AND INTERPRETATIONS

As stated in the previous sections, the aim of our paper is to evaluate which EU countries depict similar experiences according to the dynamics registered by some business cycle variables. The selected key macroeconomic indicators, which are able to monitor the effects of the financial crisis impact on the economy are:

- *the reserve assets excluding gold*. In line with the 5th edition of the IMF Balance of Payments Manual, this item comprises Special Drawing Rights (SDRs), the reserve position in the Fund, loans to the IMF, deposits with foreign banks, foreign treasury bills, foreign bearer bonds, loans extended to foreign banks and accrued interest;
- *key interest rates* set by central banks in EU 27 to indicate the trend interest rates should follow and signal the monetary policy stance;
- *the Harmonized Index of Consumer Prices* which measures the change in prices of all goods and services purchased by urban consumers (households);
- *government debt ratios as percent of GDP*. Data were collected from the European Commission and were computed as follows: the general government sector comprises the subsectors central government, state government and local government as well as social

security funds. Debt is valued at nominal value, and foreign currency debt is converted into national currency by using year-end market exchange rates;

- *the unemployment rates;*
- *annual change (%) of real GDP*. It is defined by European Commission as the value of all goods and services produced less the value of any goods and services used in their creation;
- *annual change (%) of industrial production, excluding construction.* It is known also as the production index, which is an economic indicator reflecting production and industrial activity;
- *current account as a percent of GDP* which covers all transactions (other than those in financial items) that involve economic values and occur between resident and nonresident entities.

In Table 1 we have synthesized the output obtained for the two years considered, under the assumption of three different algorithms for computing the distance between clusters. We have formulated our conclusions keeping in mind the results obtained by applying all three linkage techniques, as they are qualitatively similar and relatively stable.

Table 1. Clusters' membership

2006	**Single linkage**	**Complete linkage**	**Average Linkage**
	Malta, Portugal, Cyprus, Spain, Slovenia, Ireland, *Greece*	*Malta, Portugal, Greece, Cyprus, Spain*	*Malta, Portugal*, Italy, *Cyprus, Greece*, Belgium, *Spain*
	France, *Germany*	*Germany*, Italy, Belgium, *France*	*France*, *Germany*
	Denmark, Netherlands, United Kingdom, *Sweden*	*Denmark, Sweden, Netherlands, United Kingdom*	*Denmark, Sweden, Netherlands, United Kingdom*
	Luxembourg	Ireland,*Luxembourg*, Slovenia	Ireland, Slovenia, *Luxembourg*
	Italy, *Finland*, Belgium, *Austria*	*Austria, Finland*, Czech Republic	*Austria, Finland*, Czech Republic
	Slovakia, Poland	*Slovakia, Poland*	*Slovakia, Poland*
	Estonia, Latvia, Lithuania	*Estonia, Latvia, Lithuania*	*Estonia, Latvia, Lithuania*
	Romania	Hungary, *Romania*	*Romania*
	Bulgaria	*Bulgaria*	*Bulgaria*
	Hungary		Hungary
	Czech Republic		
2008	**Single linkage**	**Complete linkage**	**Average Linkage**
	Netherlands, Austria	*Netherlands, Austria*, Denmark	*Netherlands, Austria*, Denmark
	Germany, France, United Kingdom, *Luxembourg,Sweden Finland*	*Finland, Sweden*, Ireland,*Luxembourg*	*Finland, Sweden*, Ireland, *Luxembourg*
		Germany, France, Italy,United Kingdom	Germany, France, Italy,United Kingdom
	Greece, *Portugal*, *Malta, Belgium*	*Greece*, *Portugal*, *Belgium, Malta*, Spain, Slovakia	*Greece*, *Portugal*, *Malta, Belgium*
	Italy	Estonia, Latvia, Lithuania	Estonia, Latvia, Lithuania
	Slovenia	Czech Republic, Poland	Czech Republic
	Ireland	Hungary, Romania	Hungary
	Bulgaria, Lithuania	*Bulgaria*	*Bulgaria*
	Cyprus	Cyprus, Slovenia	Cyprus, Slovenia
	Spain, Slovakia		Poland
	Czech Republic		Spain, Slovakia
	Poland		Romania

	Denmark		
	Estonia		
	Latvia		
	Hungary		
	Romania		

According to the empirical results obtained for 2006, we have observed the following clustering patterns:

- Malta, Portugal, Greece, Cyprus and Spain have been identified by all the three linkage methods as being characterized by a synchronization of their economic cycles, according to the macroeconomic and financial variables considered.
- France and Germany are always in the same cluster.
- Denmark, Sweden, Netherlands and United Kingdom form a homogenous and stable cluster.
- Ireland, Slovenia and Luxembourg are positioned almost in all cases in the same cluster.
- Austria, Finland and Czech Republic are, in most cases, in the same cluster.
- Slovakia and Poland is another stable cluster
- Estonia, Latvia and Lithuania (the Baltic) are always included in the same cluster. This is not a surprising finding, as it is known that their business cycles are highly correlated and synchronized.
- Italy and Belgium are always in the same cluster.
- Hungary, Romania and Bulgaria are the outlier countries, meaning that they have particular, atypical economic characteristics, dissimilar to any other EU country.

Our findings relative to clusters' structure are similar with those obtained by Gutierrez and Sorensen [2006], which have applied the same hierarchical clustering technique, but for 11 euro area countries, for the period 1998-2004. This confirms that, in times of financial stability and sustained economic growth, some particular countries display a natural tendency to cluster together, their economic cycles being more synchronized relative to other EU states.

Also, according to Crowley's [2008] findings, the clusters' structure is influenced by geographical issues. Indeed, most clusters tend to form around neighboring countries, especially euro area member ones, while non-member countries tend to cluster together (such as the Baltic) or to be outliers (Hungary, Romania and Bulgaria). This result is not surprising, being in line with the theory of the optimal currency area, which states that foreign trade within euro area is susceptible of business cycles synchronization between nearby countries.

Focusing on the common patterns identified through the three linkage approaches for the year 2008, we have remarked the following clustering of EU countries:

- Netherlands, Austria and Denmark are almost always positioned in the same cluster. As in 2006, Netherlands and Denmark share the same cluster. All of them depend heavily on foreign trade with other EU countries (particularly with Germany), exports counting for more than 60%. GDP is expected to fall in 2009 by about 4%, unemployment rate will rise at 4,2% , inflation rate is projected to decrease at around 1%, the budget deficit is expected to range between 2,5 – 3% of GDP and the current account deficit will rise up to 3% of GDP.
- Finland, Sweden and Luxembourg compose a new cluster, without having a corresponding in the previous period. These countries are characterized by low inflation rates, of about 1,1%, the fall in GDP growth is projected to overpass 5,3%, the jobless rate was set at over 7% and the budget deficit is expected to be above the three percent limit (3,2 -4%).
- Germany, France, Italy and United Kingdom. Germany and France are still in the same cluster, as in 2006. The macroeconomic environment in these countries is characterized by unemployment sharp rise, GDP fall between 3% (France) and 6% (Germany), monetary policy interest rates close to 1%, inflation near zero (Germany, France) or close to 1% (Italy, UK). The budget deficit is expected to increase substantially in 2009 (well above 4%) as the recession hits tax revenues. Public debt will exceed 50% of GDP in 2009 and subsequent years.

- Greece, Portugal, Malta and Belgium. This cluster proved to be relatively stable over the two time periods analyzed, Belgium being the country that joined last this group. All of them display similar features of the key macroeconomic indicators. EC has warned them with the opening of the excessive deficit procedure as their budget deficit is well above the imposed limit of 3% of GDP. Real GDP growth is set to contract in 2009 with about 1, 3% in Greece and over 4% in the other three countries. Inflation will be low, ranging between 1, 8% and 3%, but persistently above the euro area average. Jobless rate is expected to reach 7-8%. Current account deficit contracted to around 7% of GDP. The high public debt and fiscal slippages limit the room for discretionary granting of fiscal stimulus.
- Spain and Slovakia seem to share common expectations regarding their economic environment in 2009. The inflation rate will be near 2%, budget deficit will mount to 5% and public debt to 30%, will face a persistent decline of unemployment rate of about 13% and GDP is expected to contract by over 4%. However, in perspective, it is expected that by end-2010 Spain faces a sharp rise of unemployment, up to 20%, meanwhile inflation will fall near zero.
- Estonia, Latvia and Lithuania are still in the same cluster, as in 2006. The projections for 2009 indicate similarities relative to their economic evolution: unemployment rate exceeding 10%, GDP fall of over 13%, inflation rate of about 3%, a current account deficit less than 3% and a budget deficit of about 5%.
- Bulgaria, Czech Republic, Cyprus, Romania, Poland, Slovenia, Hungary and Ireland are the outlier countries, each having its own cluster.

Relative to 2006 we have noted a significant increase in the number of outlier countries, meaning that they recorded a particular evolution of the macroeconomic and financial climate, that makes them dissimilar to any other country in the sample considered. For instance, in Czech Republic the downturn in real GDP was mainly due to the falling of investment activity and recession in major export markets, which overlapped the weak domestic demand. For the current year it is expected that GDP growth decrease by about 4, 1%. The government has adopted anti cyclical measures, by easing fiscal policy. The decline in volatile prices led to a sharp slowdown in inflation in 2008, which is expected to approach zero in 2009.

Bulgaria will record a contraction in the GDP growth of 3, 8%. Inflation is projected to reach 3, 5% and the unemployment rate will exceed 7%. If most European countries had been warned by the EC with regard to their excessive budget deficit, this is not the case of Bulgaria, the deficit being expected to rise at 1% of GDP. The major problem for the economy consists in the large current account deficit, which reached 24% of GDP in 2008. Although it is assumed to fall at 13, 3% in 2009 because of a sharp contraction in domestic demand, it is still difficult to be financed, so that it is believed that Bulgaria will require some financial assistance from the IMF and the EU.

Hungary is expected to record a sharp fall in real GDP growth in 2009, of about 6, 1%, in the context of the same deep decline of domestic and export demand (exports being the main source of economic growth). Unemployment rate is assumed to reach double-digit figures, inflation is expected to rise as a result of the pro cyclical fiscal policies implemented by government (focusing on indirect taxation by increasing value-added tax and excise tax). The budget deficit is expected to increase in 2009, until the upper limit of 3% of GDP imposed on by European Commission. The current-account deficit is expected to narrow in 2009 at 2, 7% of GDP.

The Polish economy, although hit by the crisis, didn't record a sharp decline of the main macroeconomic variables. GDP growth slowed down only by 0, 2 percentage points, being still positive at year-end, and is expected to fall in 2009 with only 0, 4%. Unemployment rate increased slightly, while investments and export growth recorded a moderate contraction. Until now the recession was relatively moderate because of small trade dependence, moderate indebtedness of the private sector, income tax cuts. The main concern of policy makers is the worsening of budget deficit, which is expected to go well above the ceiling of 3 percent imposed by European Commission. Also, the public debt is expected to rise up to 60% of GDP.

Slovenia's economy is highly dependent on foreign trade, as it exports about 70 percent of its production, mainly to EU members Germany, Italy, Austria and France. This high level of openness has significantly exposed it to adverse economic conditions in its main trading partners. The GDP is set to fall with 6%, the budget deficit will exceed 4, 8% of GDP and unemployment rate will rise to 6, 2%. Inflation is assumed to reach 0,5%.

Ireland is experiencing a severe contraction in the GDP growth, of 9, 8%. According to OECD, the peak wasn't reached yet, GDP fall being expected to reach 14%. The budget deficit could reach 12% of GDP in 2009 and the unemployment rate is expected to rise at about 12, 2%. Inflation rate is projected to be low, at 1, 7%. Government intends to apply pro cyclical measures, such as substantial public spending cuts, wage lowering and increases in taxation.

Cyprus is the only country in the euro zone expecting positive GDP growth in 2009, projections ranging between 0, 3% and 0, 7%. Inflation is forecasted to drop to around 0.9% as the domestic economy, especially tourism and constructions, slowed down. Cyprus continued to have one of the lowest unemployment rates in the EU, of about 4, 7% and a budget deficit of only 0, 8%.

Romanian economy is expected to contract in 2009 by over 6%. The high degree of indebtedness of households and private sector and negative expectations concerning the dynamics of unemployment rate and wage policy contributed to a sharp decline in private consumption and investments. Imports severely contracted, which led to a severe adjustment of the current account deficit. Although inflation rate follows a descendent slope, there are still inflationary pressures caused by the depreciation of national currency and the rise of volatile and administered prices. The budget deficit is expected to significantly exceed 3% of GDP, as income collected to budget decreased significantly. Public debt is assumed to rise at 19% of GDP. As a consequence, the government has to adopt pro cyclical measures, consisting in tax rises and employees dismissals, although the economic slowdown has to be counteracted by anti cyclical actions.

Relative to clusters' structure over the two time periods, one can note that, overall, it remained relative stable. The propagation of financial turmoil across EU countries overlapped on the intrinsic vulnerabilities of each country, which contributed to an increase of the heterogeneity of their economic framework and a slowdown of the process of economic integration.

4. CONCLUSIONS

Although the economic and financial crisis has affected both emerging and developed countries, its magnitude and implications on the national economies had been deeply different. Our paper aimed to assess the extent to which the current turbulent context has increased the divergence and heterogeneity between the 27 EU countries, in terms of the dynamics registered by some key macroeconomic variables.

A first conclusion is that the foreign trade was one of the transmission channels that linked developed countries, directly affected by the financial crisis, with the small emerging economies, dependent on trade.

Another finding suggests that some of the developed countries, where asset prices and financial leverage increased the most, were less affected as they appear to have escaped relatively lightly in terms of GDP loss. This is mainly the case of UK, an important financial center, which has the most diversified credit market in general, and the most complete market for mortgage products, being the only one in Europe that granted subprime loans. Although it was the first European country that declared entering recession, its GDP loss is expected to be of 4, 3% in 2009. At the opposite, Romania, Slovenia, Hungary, Ireland and The Baltic are experiencing a sharp fall in GDP growth.

The main observation we can depict, by analyzing countries' clustering, is that, no matter what method for data aggregation we apply, the latest countries that join the group are always Bulgaria, Hungary, Romania, Poland and the Baltic. The high values of the dissimilarity coefficient indicate a higher degree of heterogeneity between the above mentioned countries and the rest of EU

countries. They are the most atypical in terms of macroeconomic features, both before and after the crisis onset.

In 2008 the generalization of recession throughout European countries has increased the macroeconomic discrepancies, slowing the pan-European economic integration process, fact suggested by a biggest group fragmentation relative to 2006.

To conclude with, we appreciate that, because of the financial and economic connections between EU countries, it is obvious that the recovery will be particularly externally driven, that countries cannot action in a separate, independent way. Therefore, stronger economic activity of foreign countries would contribute, firstly, to the recovery of the domestic GDP growth and will propagate through the trade channel to other countries. On the financial side, because of the increasing importance of foreign-owned banks in national banking systems, the restoring of the global market will depend on restoring the confidence, soundness and normal functioning of internal financial markets.

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