

Macro-Regions, Countries and Financial Ratios: A Comparative Study in the Euro Area (2000-2009)

Macrorregiões, Países e Rácios Financeiros: Um Estudo Comparativo na Zona Euro (2000-2009)

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Abstract/ Resumo

During the sovereign debt crisis that has hit Europe, many economists and political actors have questioned if a common strong currency can accommodate countries and regions that clearly exhibit very different macroeconomic performances. The aim of this paper is to contribute to a deeper discussion of this problem, by analyzing the disparities within the Eurozone beyond the usual macroeconomic point of view. This study analyses differences among financial ratios belonging to a representative set of firms from six Euro area countries. The analysis covers the first decade of the 21st century and investigates patterns in these ratios and the existence of possible clusters and breaks in the data series after 2008, the beginning of the present financial crisis. The empirical and statistical analyses confirm these changes as well as the existence of territorial clusters that show the relevance of future macro-regional strategies across Europe, following the creation of the first European Union macro-regional strategy in 2009.

Keywords: cluster analysis; European Union; financial crisis; financial ratios; macro-regions.

JEL Codes: C12; C38; G3; R12, R58.

Durante a crise da dívida soberana que atingiu a Europa, muitos economistas e agentes políticos têm questionado se uma moeda comum forte pode acomodar países e regiões que exibem desempenhos macroeconómicos claramente diferentes. O objetivo deste artigo é contribuir para uma discussão mais aprofundada deste problema, através da análise das disparidades na Zona Euro para além do habitual ponto de vista macroeconómico. Este estudo analisa as diferenças entre os rácios financeiros pertencentes a um conjunto representativo de empresas de seis países da zona euro. A análise abrange a primeira década do século XXI e investiga a existência nesses rácios de eventuais padrões, bem como a existência de possíveis agrupamentos e quebras na série de dados depois de 2008, o início da atual crise financeira. As análises empíricas e estatísticas confirmam estas quebras, bem como a existência de agrupamentos territoriais que mostram a relevância de futuras estratégias regionais a um nível macro em toda a Europa, na sequência da criação da primeira estratégia macrorregional na União Europeia em 2009.

Palavras-chave: análise de clusters; crise financeira; macrorregiões; Rácios financeiros; União Europeia.

Códigos JEL: C12; C38; G3; R12, R58.

Acknowledgments: Joaquim P. Pina is pleased to acknowledge financial support from Fundação para a Ciência e a Tecnologia (grant UID/ECO/04007/2013) and FEDER/COMPETE (POCI-01-0145-FEDER-007659).

1. INTRODUCTION

Since 1975, the European Commission dedicates a large amount (approximately one third) of its budget to regional policies, exceeding by far the practice of other major economic blocks like the United States of America (del Campo *et al.*, 2006; 2008). This allocation of financial funds is based on the analysis of one indicator — the relative GDP per capita (the regional GDP *per capita* in percentage of the average GDP *per capita* of the European Union) — computed for each of the European NUTS 2. However, the NUTS 2 regions can exhibit clear differences inside their borders, comprising, e.g., rich urban metropolises and poor and desertified rural areas (Soares *et al.*, 2003), which may lead European Governments to change the historical delimitation of regions in order to optimize the access to cohesion funds by different regions within their countries. This was the case when the Portuguese authorities decided in 2002 to change the borders of the Lisbon and Vale do Tejo Region in order to reduce it mainly to the Lisbon Metropolitan Area (Soares and Coutinho, 2010).

Even with this response of country authorities to the resource allocation model of the European Union, the 2008 crisis shed light to the fact that there are similarities in terms of wealth and economic development that are larger than the national borders. For instance, regions in southern Mediterranean countries are in general more equal among them than with regions of the rich northern countries of Europe. These large territories, that we would call macro-regions, require transnational strategies across Europe (Dubois *et al.*, 2009). They encompass communities and regions from different countries, which have common or complementary assets, are facing common challenges and have common objectives (Blais, 2012). An important question then is to what point these macro-regions are identifiable in terms of the privileged receivers of regional funds — the firms in the different countries. And so, to what point the financial and economic performances of these firms sustains the importance of looking at a larger scale in terms of the convergence of regional economies. This is the goal of this paper, to contribute to identify supra national patterns in terms of the usual corporate financial performance.

Financial ratios are important indicators of the health of companies. They inform us of the

capability of companies to pay their debts, of the sustainability of their financial structure and of their performance in terms of profitability and value creation. In general terms, two kinds of uses for financial ratios can be identified (Whittington, 1980; Barnes, 1987). One is the positive use, as in Altman (1968), Back (2005), or Soares *et al.* (2011a), with a focus on the estimation of empirical relationships that enable to identify the risk of credit and eventual situations of financial distress or pre-bankruptcy.

The other use of financial ratios is essentially normative, related with the comparison of the ratios with a standard, usually the average of the industrial sector (Lev, 1969; Gallizo *et al.*, 2003). In this normative context, a relevant research matter is the existence of spatial and size effects. To what extent are financial ratios influenced by the economic and legal environment or by the size of the companies? Several authors have dealt with this question in different comparative studies, and involving diverse regions of the world. Choi *et al.* (1983), e.g., studied the country effect comparing Japan and South Korea data. The authors confirmed the existence of a country effect and concluded on the misuse of ratio analysis when comparing firms from countries with macroeconomic and legal differences. Claessens *et al.* (1998) analyzed nine East Asian countries and also found marked differences among them in terms of the performance and financial structure of their firms. The same happened with Hagigi and Sponza (1990), for Italian and North American companies; Fuglister (1997), for Chinese and North American firms; Soares *et al.* (2011b) for Portuguese and Spanish firms; Liu *et al.* (2013), for Chinese and Japanese firms; and Etter *et al.* (2006), who studied firms from the United States of America and from six Latin-American countries. Within Europe, one can refer the works of Soares and Pina (2014), Serrano Cinca *et al.* (2002) and Serrano Cinca *et al.* (2005). These studies confirm the existence of differences among countries, and, in particular, this last study states that clusters exist and are mainly related to geography and not to size. The authors identified three clusters: a Latin cluster, a Scandinavian cluster, and a Germanic cluster.

In the present paper, the aim is to deepen this empirical research in the particular context of countries within the Euro Zone, countries that share simultaneously a common currency

and standard accounting principles. The paper will be focused on the following research questions: (i) *are there significant differences in financial ratios of firms across the euro area?* (ii) *Based on firms' financial ratios, can we identify different clusters of countries?* (iii) *Are there noticeable effects of the 2008 crisis?*

The remaining of this paper is organized as follows. The details of the data and of the methodology followed in this research are presented in section 2. Section 3 presents the results and layouts of the multivariate statistical methods applied to the sample of financial ratios from corporates in six European countries; finally, the main conclusions are presented in Section 4.

2. DATA AND METHODOLOGY

The data considered in this paper were extracted from the Bank for the Accounts of Companies Harmonised — European Sectoral references Database (BACH-ESD)¹, created under the aegis of the European Committee of Central Balance-Sheet Data Offices (ECCBSO). Originally, the first dataset (BACH) included information concerning the financial statements of companies in nine countries (Austria, Belgium, France, Germany, Italy, the Netherlands, Poland, Portugal and Spain), aggregated by sector and by size class. In turn, the ESD dataset included dispersion statistics (quartiles and weighted average) of financial ratios for non-financial companies belonging to the same countries, except Poland. The data were also aggregated by sector, size and country. The two datasets were merged in 2010 (Banque de France and ECCBSO, 2010).

In this paper we will analyze mainly six financial ratios, covering profitability (analyzed before taxes to avoid distortions induced by different fiscal systems), leverage and liquidity, for the following countries: Germany, Belgium, Spain, France, Italy and Portugal (Table 1). Additionally, the complete set of twenty-eight ratios listed in the appendix will also be

considered in the case of cluster analysis by size. We restricted the analysis to these six countries because of data availability for all ratios and covering the full sample period 2000-2009. Particularly, the cases are: Netherlands does not have information for the working capital ratio for all the sizes, and actually does not have data since 2008 in the revised version of BACH database; Austria does not cover all the twenty-eight ratios used for conducting the cluster analysis by size. Other countries –Czech Republic, Luxembourg, Poland and Slovakia- are more recent in the database and do not cover the full period under analysis. Furthermore, it should be noted that the database covers only data from 2000 onwards and has been influenced by changes in accounting systems since 2009/2010 and the merging of the two datasets in 2010. This is the justification for focusing the analysis in the first decade of the current century, not far from the length of a business cycle and stopping before the implementation of macro-regional strategies in Europe.

For every ratio the medians are analysed considering, for each year, all industrial sectors, all class sizes and each of the six countries above. All data is aggregated, there is no information from individual firms in the database. Observations for the ratios with a negative denominator or zero values were excluded. The choice for medians instead of weighted means was dictated by its robustness in the presence of outliers in the data. The methodological framework includes descriptive empirical analysis, multivariate statistical methods (cluster analysis) and nonparametric testing. Data analysis was carried out using IBM SPSS Statistics version 20 and involved cluster analysis as a way of searching for similarities among the observations. The choice for a hierarchical clustering method was justified by the fact that the number of clusters was unknown and, to the analysis of similarities, it was essential to have access to a layout of the agglomeration process, a tree diagram or dendrogram.

¹ BACH-ESD database: Banco de España, Banco de Portugal, Banque de France, National Bank of Belgium, National Bank of Poland, Centraal Bureau voor de Statistiek (the Netherlands), Centrale dei Bilanci - Cerved srl, Deutsche Bundesbank, Oesterreichische Nationalbank. We gratefully acknowledge the *BACH-ESD team* for allowing us to use their database. All results and their interpretation are solely our responsibility.

Table 1 – Financial ratios considered in the analysis

	Indicator	Abridged description	BACH-ESD ratio
<i>Liquidity</i>	Working capital ratio	Working capital/Sales	R20
<i>Leverage</i>	Equity ratio	Equity/Total assets	R22
	Interest burden	Interest/EBITDA	R06
<i>Profitability</i>	Return on Sales	EBITDA*/Sales	R03
	Return on assets	EBIT**/Total Assets	R10
	Return on equity before taxes	Profit or loss before taxes/Equity	R11

* EBITDA – Earnings Before Interest Taxes Depreciation and Amortization.

** EBIT – Earnings Before Interest and Taxes.

3. QUESTIONS AND RESULTS

Let us start with the first question: *(i) are there significant differences in financial ratios of firms across the euro area?*

On a glance, looking at table 2, the answer is yes. Over the decade, the profitability measures — Return on Assets (ROA) and Return on Equity before taxes (ROE) — are clearly higher for firms in the most powerful economies: Germany and France. Portugal, with the lowest GDP *per capita*, shows the lowest ROE and ROA. In turn, the Return on Sales (ROS) bears an inverse relation. The higher income countries have firms with lower ROS (Belgium, Germany and France), whereas the others have higher ROS (Portugal, Spain and Italy). However, a high ROS may coexist with a lower ROA when asset turnover is low, as a result of lower productivity, a less efficient use of resources, or a reduced market scale, as in Portugal:

$$ROA = \frac{EBIT}{ASSETS} = \frac{sales}{assets} \times \frac{EBIT}{sales} \quad (1)$$

The firms leverage as read from the Equity Ratio in Table 2 is globally high, revealing times of an easy access to credit, with the Equity Ratio increasing in 2008-2009, but still lower than the usual rule of thumb of 33 per cent. Following the Equity Ratio values, Italy, with the lowest ratio of 19.2, has the highest Interest Burden, a ratio with a large range of values. The lowest values are those for France, Germany and Spain, where the former two and Belgium have also the lowest liquidity stance, which may signal a more efficient asset management.

The second question - *(ii) Based on firms' financial ratios, can we identify different clusters of countries?* – was tested by conducting a hierarchical cluster analysis, following the facts from Table 2. The cluster analysis classified the 60 cases in the sample, each of them comprising the six ratios for a pair country-year (one case is, e.g., the six financial ratios for Germany in 2004). Among the hierarchical methods, various algorithms were considered to assure robustness of the results, and all reported similar findings. Figure 1 shows the dendrogram of the average linkage between groups method, using Euclidean distances. In average linkage the distance between two clusters is the average distance between pairs of observations, one in each cluster.

The results show the existence of grouping by countries, not by years, almost without mingles of different countries during the ten years of the sample. Three major clusters are identified. The first group aggregates France and Germany. The second contains, in the early step, Portugal and Spain, and then includes Italy. Finally, Belgium is a singleton, which only in the last step joins the remainder countries. These set of results are consistent with the evidence already offered in Table 2.

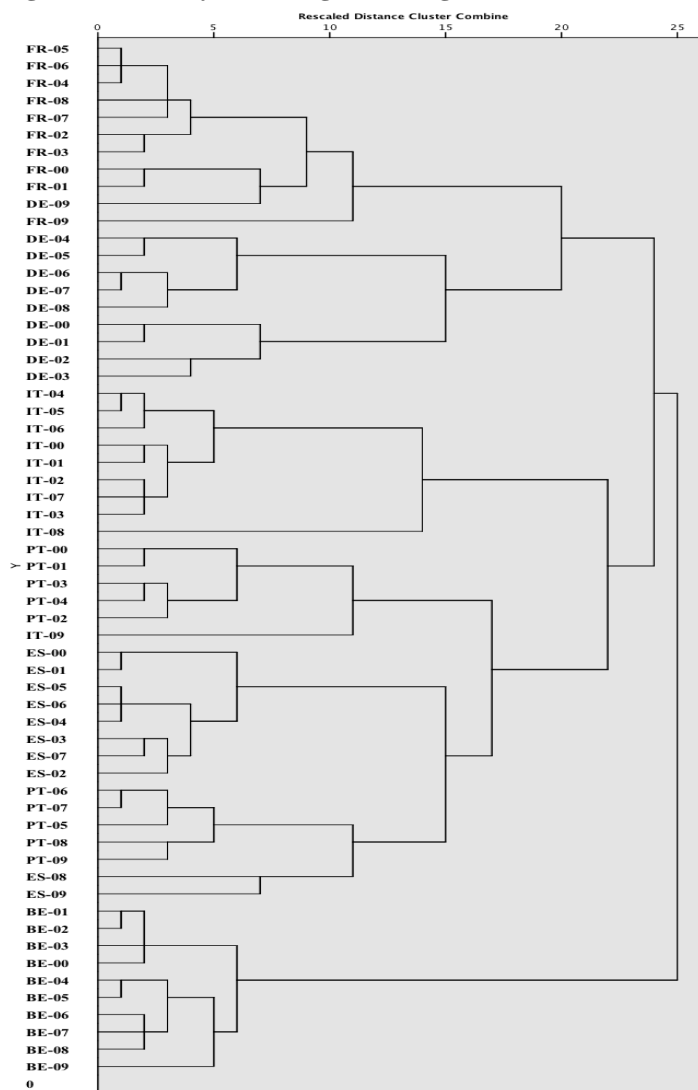
As said above, the database also considers the size class of the companies. The classification into three size classes is based on the turnover criterion of the European Commission classification (see European Commission, 2005). Class 1 corresponds to small (and micro) enterprises, with a turnover less than € 10 Millions; class 2 corresponds to medium enterprises, with a turnover from € 10 Millions to € 50 Millions; class 3 corresponds to large enterprises, with an annual turnover over € 50 Mil-

Table 2 – Firms’ Financial Ratios by country (Median values 2000-2009)

	Return on sales	Return on assets	Return on equity before taxes	Working capital ratio	Interest burden	Equity ratio
Belgium	5.0	4.4	12.7	8.6	16.7	31.0
Germany	5.2	5.8	19.6	10.6	12.0	23.7
Spain	5.9	5.2	14.1	17.6	12.3	34.5
France	5.6	5.4	19.0	9.3	8.2	28.2
Italy	5.9	4.2	15.8	21.2	19.8	19.2
Portugal	6.7	4.2	10.0	13.4	19.7	28.9
All	5.8	4.6	15.6	11.0	14.2	27.2
All (00-07)	5.9	4.7	16.0	11.2	14.5	27.1
All (08-09)	5.4	4.1	11.5	10.3	12.5	28.6

Source: Authors computations based on data extracted from BACH-ESD database.

Figure 1– Country clustering according to ratios for 2000-2009

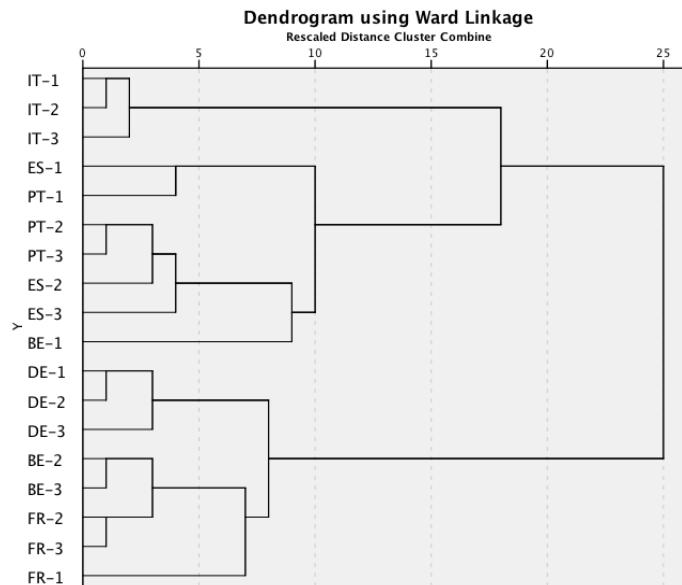


In the vertical axis, the two letters indicate the country and the two numbers the last digits of the year

lions; class 3 corresponds to large enterprises, with an annual turnover over € 50 Millions. So, we computed the averages of the medians of the financial ratios during the 2000-2009 period, respectively for each country and size (size classes 1, 2 and 3, as mentioned above) and considering all the 28 financial ratios. In order to test the importance of spatial versus the size effect, a similar procedure to the one adopted in Serrano Cinca et al. (2005) was followed. The dendrogram resulting from the subsequent cluster analysis — also using the Ward’s hierarchical method as the authors — can be seen in Figure 2. Three clusters are

identifiable. On bottom, there is a cluster involving Germany and France and medium and large companies from Belgium. Then, we have a cluster corresponding exclusively to Italy and, a third one, which includes Portugal, Spain and the small Belgian companies. The conclusion of this dendrogram is that the aggregation according to the nationality dominates the aggregation according to the size of the companies. Also, it can be remarked that the clusters of countries are basically the same of the previous figure.

Figure 2– Clustering of financial ratios by size and country. Each observation represents median values along the 2000-2009 period



Vertical axis: the first two letters — country; 1, 2 or 3 — small, medium or large company

The third question addresses the eventual change over time of the financial ratios: *(iii) Are there noticeable effects of the current crisis in the observed data for 2008 and 2009?*

Overall, as seen in the two bottom rows of Table 2, all the ratios seem to decrease during the last period, with the exception of the Equity Ratio, revealing, in this case, a more difficult access to external financing. A nonparametric Mann-Whitney U test was additionally used to test the differences in ratio medians for the two sub-periods — 2000/2007 and 2008/2009 — considering that the two subsamples are independent, since there is no guarantee that the same firms are included in both subsamples. Also, this test does not require the assumption of normal distribution of the data. The results are reported in Table 3.

Beyond the six ratios, a column was added including simultaneously data from the three profitability ratios. One can see that the changes over time in profitability and leverage are statistically significant at 5 per cent level, while the change in liquidity is significant at 10 per cent level. Only the Interest Burden has a smoother pattern, but the evolution of the ratios in the next future deserves further inspection as longer data span becomes available.

In terms of countries, the most striking fact is the existence of a break, specifically a cut, in the profitability ratios, in Italy and Spain. These countries have experienced financial difficulties since the beginning of the crisis. So as Portugal, but this country was also experiencing low growth and productivity problems since the beginning of the decade.

Table 3 – Differences in ratio medians — 2000-2007 vs 2008-2009 Mann-Whitney U test *p*-values

	Return on sales	Return on assets	Return on equity before taxes	<i>All three profitability ratios</i>	Working capital ratio	Interest burden	Equity ratio
Belgium	0.641	0.500	0.195	<i>0.668</i>	0.795	0.534	0.029
Germany	0.468	0.146	0.500	<i>0.400</i>	0.031 **	0.195	0.006 *
Spain	0.007 *	0.001 *	0.000 *	<i>0.001</i> *	0.004 *	0.500	0.468
France	0.437	0.300	0.009 *	<i>0.183</i>	0.551	0.604	0.018 **
Italy	0.000 *	0.001 *	0.000 *	<i>0.018</i> **	0.392	0.568	0.000 *
Portugal	0.003 *	0.337	0.604	<i>0.232</i>	0.213	0.437	0.049 **
All	0.012 **	0.004 *	0.001 *	<i>0.006</i> *	0.061 ***	0.589	0.014 **

*, ** and *** indicate, respectively, significance at 1 per cent level, 5 per cent level and 10 per cent level.

4. CONCLUSION

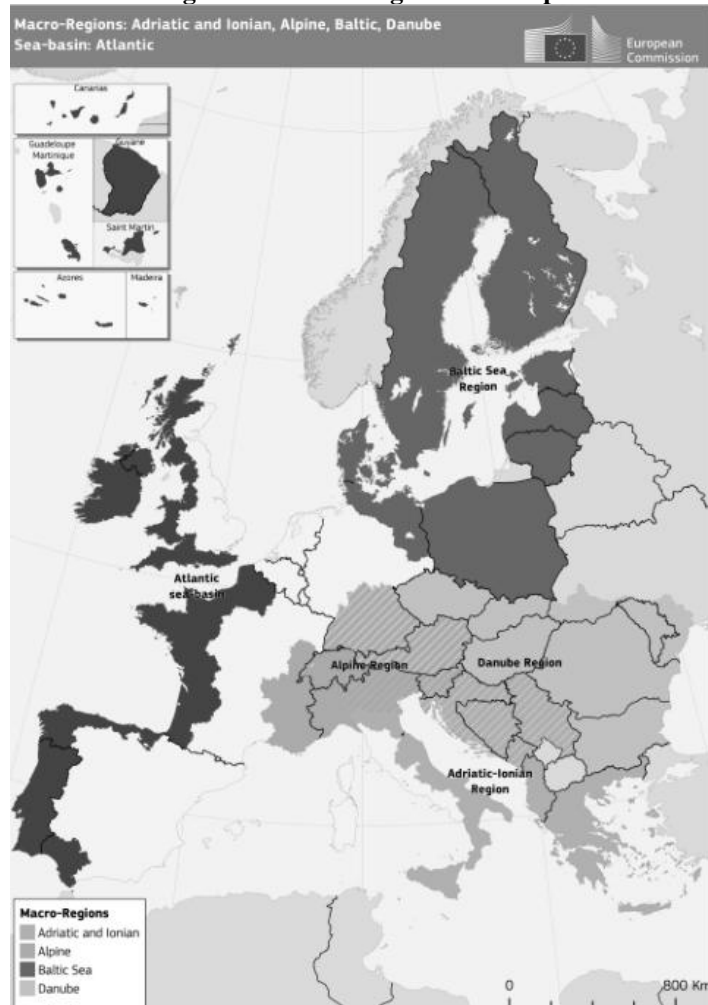
Through the use of nonparametric statistics and cluster analysis, two conclusions emerged from the analysis undertaken in the previous section. First, the evidence that European economy, namely Euro area countries, experienced two distinct periods, before and during the crisis started in 2008. The pre-crisis period was characterized by an easier access to credit sources, but also by the existence of competitiveness problems for countries with lower income and productivity. The onset of the crisis brought severe problems for all, namely in terms of a tighter access to credit. The analysis above showed that the second period considered in the sample (2008-2009) exhibits lower values for all ratios, except for the equity ratio, which increased.

The second conclusion in regard of the behavior of financial ratios confirmed a grouping by regional sets of countries. The differences, namely in terms of profitability, point out to the following groups: France and Germany; Portugal, Spain and Italy; Belgium. This conclusion lead us to a reflection that is already implicit in the title of this paper — that there are evident macro-regions in Europe and that these macro-regions have been neglected in

terms of the European regional strategies and of the subsequent allocation of financial resources at this level of acting.

In 2009, first with the Baltic Sea Region, and in 2011, with the Danube Region, the European Council launched the first two “European Union macro-regional strategies” (Blais, 2012). To the moment, the initiative has been confined essentially to northern and central Europe. The southern countries still seem to work essentially in isolation or, sometimes, in competition, and even in the forthcoming macro-regional strategies, the geographical limits seem questionable, as they extend to the North. This is the case of the coastal region of the Atlantic Arc, stretching between Southern Spain and Scotland (see figure 3 below). Beyond that, there is at the moment a predominant idea in European institutions that these macro-regional programs should not be financed in addition to the previously existent regional programs, which is an idea that can compromise substantially the growth of these strategies. Let us hope that the prolonged consequences of the 2008 crisis are leading the EU decision-makers to recognize the need for integrated macro-regional strategies for the southern European countries.

Figure 3 –Macro-Regions in Europe



http://www.balticsea-region-strategy.eu/attachments/article/590716/Macro-Regions_Alpine_Adriatic_Atlantic_Baltic_and_Ionian_Danube_A4P_01M-2.pdf

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APPENDIX

— The 28 ratios of BACH-ESD —

Operating costs, earning and profitability –

- R01 - Added value / Net turnover;
- R02 - Staff costs / Net turnover;
- R03 - Gross operating profit (EBITDA) / Net turnover;
- R04 - Gross Operating profit / Total net debt;
- R05 - Net operating profit (EBIT) / Net turnover;
- R16 - Net turnover / Total Assets;
- R10 - Net operating profit (EBIT) / Total Assets;
- R11 - Profit or loss of the year before taxes / Capital and reserves;
- R12 - Profit or loss of the year / Capital and reserves.

Working Capital –

- R17 - Inventories / Net turnover;
- R18 - Trade accounts receivables / Net turnover;
- R19 - Trade accounts payables / Net turnover;
- R20 - Operating working capital / Net turnover.

Financial Income and Charges —

- R07 - Interest and similar charges / Net turnover;
- R06 - Interest and similar charges / Gross operating profit;
- R09 - Financial income net of charges / Net turnover;
- R08 - Financial income net of charges / Gross operating profit.

Assets Structure –

- R13 - Financial fixed assets / Total assets;
- R14 - Tangible fixed assets / Total assets;
- R15 - Current assets / Total assets;
- R21 - Current investment and cash in hand or at bank / Total assets.

Liabilities Structure –

- R22 - Capital and reserves / Total assets;
- R23 - Provisions / Total assets;
- R24 - Bank loans / Total assets;
- R25 - Long and medium-term bank loans / Total assets;
- R26 - Short-term bank loans / Total assets;
- R27 - Long and medium-term debt / Total assets;
- R28 - Short-term debt / Total assets.