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COUNTRY AND INDUSTRY EFFECTS IN EURO-ZONE CORPORATE PERFORMANCE THROUGH CLUSTER ANALYSIS

Summary: This study aims to examine whether and how industry and country factors affect corporate performance within euro zone. It is also meant to compare the relative importance of the two effects. A classification method of agglomerative clustering analysis was employed in order to verify whether the similarities between enterprises follow the country or the industry patterns more. The territory of the analysis was purposefully limited to 9 euro-zone countries, which is a highly integrated area, and therefore fairly homogenous.

Findings provide empirical evidence that both country and industry effects can be observed within the examined population. Although none of the two kinds of factors seem to dominate, an increasing role of industry factors can be observed in comparison with previous findings. The main practical implication of the study is therefore the growing importance of cross-industry diversification strategies in comparison to the traditional cross-country investment diversification.

Key words: country effect, industry effect, corporate performance.

1. Introduction

This study focuses on external aspects of corporate performance, specifically on the country of origin of an enterprise and its industrial sector. Both factors are believed to have a significant impact on corporate activity and therefore economic results, which are reflected in financial ratios. The country effect can be defined as the occurrence of certain factors specific for a particular country and therefore affecting economic entities of that country in a similar way. Industry effect is interpreted likewise. In the first, theoretical part of the paper the results of the previous studies concerning country and industry effects are being discussed. The following empirical research attempts to verify which of the two effects prevails when influencing the financial condition of enterprises in the euro-zone.

2. Review of studies on country and industry effects

The review of research over the two effects in question shows that until the early 90's capital allocation was mainly based on the assumption that national factors are the main source of stock return variability. Therefore the international diversification

was considered the most effective method of reducing this variability in assets management. The main conclusion from literature review in this area is the domination of country effects over industry effects as determinants of returns [Grubel 1968, p. 1299-1314; Levy, Sarnat 1970, p. 668-75; Lessard 1974, p. 32-38; Grinold, Rudd, Stefek 1989, p. 79-88; Heston, Rouwenhorst, 1994, p. 3-27; 1995, p. 53-58; Rouwenhorst 1999, p. 57-64; Griffin, Karolyi 1998, p. 351-373; Kuo, Satchell 2001, p. 1-28; Serra 2000, p. 127-151; Phylaktis, Xia 2006, p. 459-475]. However, some other studies, especially more recent ones bring new results in the area, which emphasize the role of industry factors [King 1966, p. 139-190; Meyers 1973, p. 695-705; Roll 1992, p. 3-41; Weiss 1998, p. 6-8; Freimann 1998, p. 32-41; Baca, Garbe, Weiss 2000, p. 34-40; Cavaglia, Brightman, Aked 2000, p. 41-54; L'Her, Sy, Tnani 2002, p. 70-79; Flavin 2004, p. 1137-1158]. Nowadays more practitioners tend to recognize global strategies based on cross-industry sections as more effective. The shift is often explained as a natural consequence of globalization and is attributed to the capital markets integration. A clear lack of literature coherence in terms of relative significance of the two effects was the main reason for reconsidering the problem within the European perspective.

3. Data description

The examined population involves 9 European Union countries (Austria, Belgium, Germany, Finland, France, Italy, Netherlands, Spain and Portugal), all of which belong to the euro-zone. This makes it a group of countries with a high level of integration. The choice of countries was purposefully limited to the long-harmonized territory of the euro-zone in order to examine the relative importance of country and industry effect within this fairly homogenous area. Inclusion of some other countries, especially relatively new EU members could exaggerate the influence of country effect due to significant economic differences. For each of these countries, 13 industrial sectors were analysed, according to the NACE classification (at one-digit level). The symbols in Table 1 are used for easier identification of industries in further analyses.

Based on harmonized, aggregated data from yearly financial reports a number of ratios were calculated for each country, year and industry in the 7 years' period from 1999 to 2005. The source of the data is the European Commission, which publishes the financial reports in the BACH database. The analyzed ratios were categorized into three groups presented in Table 2. Most of the ratios are stimulants, with the exceptions of ratios P_7 , P_{11} , P_{12} , P_{13} , L_9 , L_{10} , S_2 , S_3 , S_6 , S_7 and S_8 , which are considered anti-stimulants. In conclusion, the following study involves 32 financial ratios for 9 countries in a 7-year period. In total, and taking into account the missing data items, there were 23660 observations.

Table 1. Industrial sections by NACE

NACE	Section	Symbol
A	Agriculture, hunting and forestry	AGR
B	Fishing	FSH
C	Mining and quarrying	MIN
D	Manufacturing	MNF
E	Electricity, gas and water supply	ELE
F	Construction	CST
G	Wholesale and retail trade	TRD
H	Hotels and restaurants	HOT
I	Transport, storage and communication	TRS
K	Real estate, renting and business activities	RLE
M	Education	EDU
N	Health and social work	HLT
O	Other community, social and personal service activities	COM

Source: author's own compilation based on BACH database.

Table 2. Financial ratios employed in the analysis

Profitability and turnover ratios		Liquidity ratios		Long-term solvency ratios	
P ₁	Gross operating profit/ Turnover	L ₁	Current assets/Short-term creditors	S ₁	Gross operating profit/Interest paid on financial debts
P ₂	Net operating profit/Turnover	L ₂	(Current assets - Stocks)/ Short-term creditors	S ₂	Long-term creditors/Assets
P ₃	Net profit/Turnover	L ₃	(Current investments + Cash)/ Short-term creditors	S ₃	Long-term creditors/Equity
P ₄	Net profit/Equity	L ₄	Costs of materials and consumables/Stocks	S ₄	Equity/Assets
P ₅	Net profit/Assets	L ₅	Turnover/Accounts receivable	S ₅	Long-term creditors/Net wor- king capital
P ₆	Net profit/Net working capital	L ₆	Cash/Assets	S ₆	Interest paid on financial debts/ Turnover
P ₇	Costs of materials and consumables/Turnover	L ₇	Current assets/Assets	S ₇	Interest paid on financial debts / Financial debt
P ₈	Turnover/Assets	L ₈	(Current assets - Stocks)/ Assets	S ₈	Provisions for liabilities and charges/Assets
P ₉	Turnover/Fixed assets	L ₉	Stocks/Net working capital		
P ₁₀	Value added/Turnover	L ₁₀	Stocks/Current assets		
P ₁₁	Staff costs/Turnover	L ₁₁	Turnover/Net working capital		
P ₁₂	Wages and salaries/Value added				
P ₁₃	Financial income/Turnover				

Source: author's own compilation.

4. Methodology

A natural procedure when dealing with a relatively large number of data is organizing the elements of the population according to some criteria, i.e. classifying them. Classification of objects which are combinations of both countries and industries should provide some information about the domination of one of the two effects in question. Therefore two opposing hypotheses could be formulated:

1) country factors have higher influence on corporate performance than industry,

2) industry factors have higher influence on corporate performance than country.

If different industry sectors from the same country had a tendency to group in the same clusters, it would mean that the first hypothesis is true. However, if the same industry from different countries was classified into the same cluster, whereas countries were dispersed, regardless of industry, the other hypothesis would be favoured. It might also occur that none of the above statement is favoured, as there might be clusters where it is difficult to indicate a dominating element of either a country or industry.

Agglomerative hierarchical clustering analysis is a useful tool which can be employed in order to answer the above question. Identifying the nature of each cluster either as country-dominated or industry-dominated groups will help reveal the prevailing effect. One of the numerous grouping methods which enables to distinguish internally homogenous categories of objects is the agglomerative cluster analysis [Hartigan 1975]. The higher the aggregation level, the smaller the similarity of objects from different groups of the organised structure. Classification of objects can be based on various characteristics. The criterion used in the following analysis is the general corporate performance measured with the use of financial ratios.

The algorithm of the applied agglomeration method groups the objects with the use of squared Euclidian distance, which requires previous standardisation of all variables. The ratios were normalised according to [0;1] unitarisation formula. In order to determine the distances between new clusters formed by linked objects, i.e. the amalgamation procedure, the hierarchical Ward's method was chosen, which employs analysis of variance for estimating the distances between clusters [Milligan 1996, p. 341-375].

The diagnostic variables in cluster analysis should be characterized with significant variability and independence. These conditions mean that from the initially suggested set of ratios those that do not discriminate the analyzed objects should be excluded. Similarly, the effect of doubling the information carried by different variables should also be eliminated.

The variability of ratios was examined with the use of variability coefficient. Within the set of proposed variables, none of them is a stable variable. In each case standard deviation is at least a few times bigger than the mean. However, taking into

account the interdependence of variables, several of them had to be eliminated because of correlation coefficient exceeding the arbitrarily accepted level of 0,7. As a result the following ratios were eliminated from further analysis: $P_1, P_3, P_9, P_{11}, L_2, L_6, L_8, L_{10}, S_5$ and S_6 .

5. Results

The results of cluster analysis for sectors in countries are presented in figure 1. Due to some missing data, the analysis involves the total of 107 cases.

Cutting the branches of the tree-diagram where the linkage distance is 10 allows for the identification of twelve clusters of a similar homogeneity and number of objects. The first cluster (starting from the top of the graph) is a group of rather national character, as there are seven different sectors, most of which represent Netherlands. Even stronger country effects can be observed in the second cluster, which is dominated by industrial sectors from Finland. Although there are four sectors of hotels and restaurants from different countries in the third cluster, the country effect also seems slightly stronger here because of the presence of even more different sectors from the same country, namely Italy. However the fourth cluster is clearly dominated by industry effect, as it is concentrated mainly around just one sector: trade, and at the same time represents almost all countries analysed.

Some common influences of trade and construction sectors can also be seen in the next and fifth cluster, although they are dominated by national factors of Portugal and Austria, which are the only countries represented in this group. Austria is also the most frequent element in the sixth cluster, although it is much less obvious here which of the two kinds of factors prevails. Neither of the two effects seems to dominate in the following – seventh cluster, as there are both country (France, Spain) and industry (construction) factors present. However, the linkage distances between different sectors from France are slightly shorter than those between construction industries from different countries, which would prove that objects are more similar across countries than across industries. A similar situation can be observed in the eighth cluster, which can be described as both Spain and transport-dominated. The last four clusters, however, are clearly dominated by industry effects. They can be described as an electricity and transport group (cluster 9), education and health care (cluster 10), mining cluster (11) and real estate cluster (12).

In conclusion, taking into consideration the character of each cluster in terms of evaluation of the relevant importance of country and industry factors, it can be said that although the nature of most clusters can be easily identified, it is still difficult to say which of the two effects has more influence on corporate performance. Five of the clusters were described as country-dominated, another five as industry-dominated and the remaining two clusters were a combination of both types of factors. The definite indication of the prevailing effect is even more difficult, as in the industry-

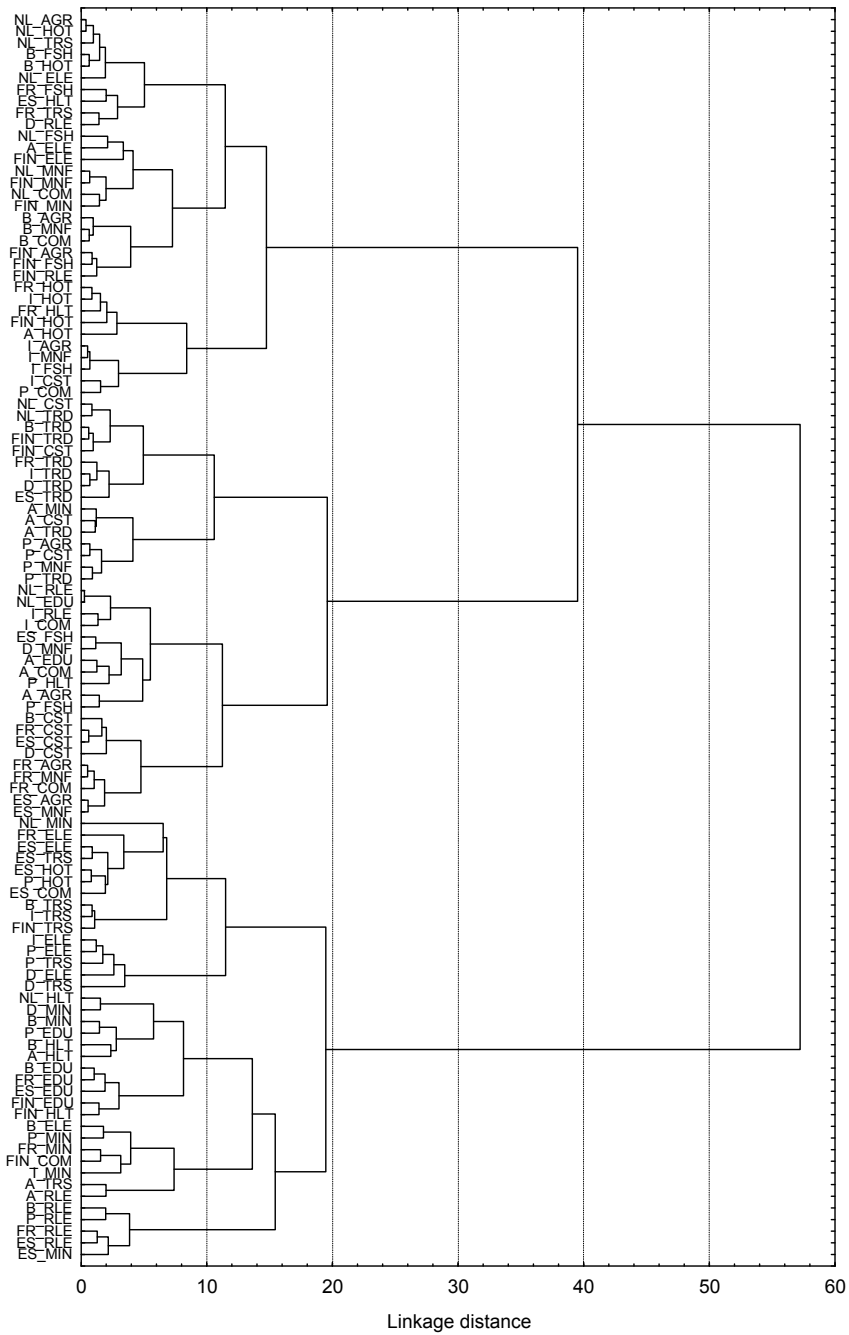


Fig. 1. Dendrogram. Ward's clustering method

Source: author's own compilation based on BACH database.

dominated countries, there are also certain symptoms of country effects. Similarly, the country-dominated clusters are not free from industrial influences.

Another conclusion from the cluster analysis is that there are certain objects (countries and industries) which are particularly vulnerable to the examined effects. Country effects are most clearly observable in the case of Finland, Netherlands, Italy and Portugal. The sectors most susceptible to common industrial factors are: trade, construction, education, health care and real estate.

6. Conclusions and implications

Evaluating the relative importance of country and industry effect is an important subject of recent research performed mainly in order to recommend appropriate investment strategies based mainly either on international diversification in the case of country-domination effects or on cross-industry diversification in the case of industry-domination effects.

With reference to the main aim of the research, which was to verify which of the two effects is more significant in influencing corporate performance, it can be said that according to the analysis, both kinds of factors are almost equally important. Even though in some cases national factors were more visible as determinants of corporate financial condition, there were also some obvious indications in other cases that the opposite is true. Therefore, although both effects are present, none of them can be definitely recognized as the dominant, at least within the analysed population.

These conclusions raise certain important implications in terms of optimizing investment diversification strategies. The growing importance of industry factors, which seem to level with country-specific influences, suggests that the role of cross-industry diversification strategies should also increase. Therefore a combination of national and industrial diversification strategies seem more effective than traditional cross-country strategies.

However, it should be borne in mind that the above recommendation refers to the analyzed territory, i.e. a group of nine highly-integrated countries, all of which are members of the euro-zone. Considering a bigger number of countries in the analysis, or performing the research in other continents could verify the hypothesis differently and probably expose the bigger role of regional factors.

It can be expected that, according to the tendency initiated by the end of the previous century, the role of industry-specific effects will continue to grow. Consequently, the importance of international diversification is likely to decrease gradually. The probability of such changes seems to grow as the integration processes progress.

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EFEKT KRAJU I SEKTORA W KONDYCJI FINANSOWEJ PRZEDSIĘBIORSTW STREFY EURO Z ZASTOSOWANIEM ANALIZY SKUPIEŃ

Streszczenie: Celem podjętego badania jest weryfikacja hipotezy dotyczącej występowania i sposobu oddziaływania czynników sektorowych i krajowych na kondycję finansową przedsiębiorstw w strefie euro. Celem analizy jest również ustalenie relatywnej ważności tych dwóch rodzajów czynników. Aby zweryfikować hipotezę, zastosowano metodę klasyfikacji w postaci aglomeracyjnej analizy skupień. Zakres terytorialny analizy celowo ograniczono do 9 krajów strefy euro jako obszaru o wysokim stopniu zaawansowania procesów integracyjnych, a zatem stosunkowo homogenicznego.

Wyniki badania pozwalają wnioskować, że zarówno czynniki sektorowe, jak i krajowe mają swój udział w kształtowaniu kondycji finansowej przedsiębiorstw. Mimo że badanie nie doprowadziło do zidentyfikowania żadnego z efektów jako dominującego, widoczny jest wzrost znaczenia czynników sektorowych w zestawieniu z dotychczasowymi badaniami. Głównym wnioskiem wynikającym z analizy jest wzrost znaczenia międzysektorowej dywersyfikacji inwestycji w stosunku do tradycyjnej metody dywersyfikacji międzynarodowej.