

*Preliminary communication*  
(accepted October 12, 2017)

# MULTIVARIATE ANALYSIS OF PROFITABILITY INDICATORS FOR SELECTED COMPANIES OF CROATIAN MARKET

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## **Abstract**

In this paper, the profitability indicators are analysed for the first hundred companies of the Croatian market, which are classified according to the net profit. The profitability indicators included in the analysis are the following: EBIT margin, EBITDA margin, net profit margin, return on assets (ROA), return on invested capital (ROI) and return on capital employed (ROCE). By implementing the factor analysis, six chosen profitability indicators have been reduced to two factors, thus solving the multicollinearity problem, which is one of the prerequisites for the cluster analysis. For two extracted factors, the factor scores are calculated and used in the following cluster analysis. By implementing the cluster analysis, selected companies are grouped into clusters according to their similarity in accomplished results that are measured by profitability indicators. The hierarchical and non-hierarchical cluster analyses are conducted and resulted into two clusters where ten companies were in the first cluster, while the other ninety were in the second cluster.

**Keywords:** factor analysis, cluster analysis, profitability indicators, multivariate analysis, profit theories.

*Jel Classification:* G32

## **INTRODUCTION**

Profitability indicators are at the beginning of decision-making process on operations, maintaining efficiency and future business stability by providing concrete and realistic information on the company's financial aspects. In particular, the value of the profit indicator is that managerial decision-makers can serve as radar for indications of changes in business, investment and financing.

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Given the number of profit indicators, multivariate analysis methods can help in making choices which indicators to use. By applying factor analysis, it is possible to derive a large number of indicators on a smaller number of factors, while with the cluster analysis, it is possible to group mutually similar companies that do not necessarily belong to the same economic branch.

## 1. THEORETICAL FRAMEWORK

In a free company system, economic profit plays a significant role in guiding decisions made by thousands of independent, resource-intensive competitors. The very presence of profit determines the type and amount of goods and services that are produced and sold, as well as the ultimate resource demand. There are six profit theories that indicate how profits determine the aforementioned items and try to explain the differences between the company's profits. According to Rupcic (2016), these theories, which are presented in the following part, are useful for management purposes, especially for decision-making on entering a particular industry, but also for assessing the existing industry in which the company is located (assessment of growth and development opportunities).

Risk profit theory points out that economic profit is generated as compensation to the company's owner for taking risks by investing and later performing the business itself (McGuigan, Moyer, and Harris 2014). In this way, companies operating in high-risk industries aim at achieving high returns on the investment.

The friction theory of profit or the theory of dynamic equilibrium emphasizes that profits arise due to the friction or deviation of long-term equilibrium. Since static equilibrium exists only in theory, the dynamic equilibrium governs the economy where all factors affecting supply and demand are constantly changing and causing profit or loss.

Monopoly profit theory is one of the most frequently mentioned and focuses on the link between the level of profits and the monopoly position of the company. The term "monopoly position" refers to the position of an undertaking in the market that has gained or has taken advantage of the terms of business in relation to other companies. In other words, the company, which has a monopoly, is the only bidder for a certain product on a particular market. Due to this position and the fact that it is protected, the company is able to reduce production and set higher prices than those in the market of perfect competition and thus increase its net profits.

Technical theory of profit or theory of profits based on the technical efficiency of dealing with issues of how available resources to maximize. Managers face complex issues while thinking about optimizing the value creation process. Given that the central problem of the theory of production, therefore, reduced to the achievement of production efficiency, the main questions they refer to it which inputs to use, how much and in what way.

Innovative Theory of Profit or Schumpeter's Theory of Profit Schumpeter points out that the higher profit rate the company achieved as a result of the successful introduction of innovation. Thus, profits are the result of the dynamic changes that arise in the production process due to the introduction of modern production technology.

Profit theory based on managerial efficiency or compensation theory is closely related to Schumpeter's innovation theory. Namely, this theory points out that companies that have above-average efficiency also realize above-average profits. In other words,

managing a manager more successfully in their domains of work, i.e. in managing a company, they are themselves more profitable.

### 1.1. Profitability ratios

Financial analysis is an essential tool used by managers to gain a breakthrough in the financial situation in the company and make decisions related to its business. Although the information that comes from the financial analysis is not comprehensive and does not take into account the overall business of a company because of its sole focus on the financial aspect, the indicators provide a basis for management or decision-making. Financial ratios represent a relationship between two or more economic sizes and allow comparison of business operations of different sizes (Sedlacek 2015; Novy Marx 2013; Imrohorglu and Tuzel 2013; Pervan and Visic 2012; Norvaisene and Stankeviciene 2007).

The financial analysis consists of three broad areas—profitability analysis, risk analysis, and resource and asset analysis. Depending on what information is needed, financial indicators are divided into several types of indicators. Thus, in accordance with time and information requirements, financial indicators are divided into liquidity ratios; solvency ratios; activity ratios; economic ratios, profitability ratios and investment ratios.

Profitability analysis is an estimate of the company's return on investment. It focuses on the sources and levels of company's profits. Furthermore, it involves the identification and measurement of the influence of different drivers of profitability. It also includes an assessment of the two main sources of profitability – the margins (part of sales that are not reimbursed) and turnover (capital utilization) and, in addition, focuses on the reasons for changes in profitability and earnings sustainability, according to the opinion Subramanyam and Wild explained in the book *Overview of Financial Statement Analysis*, in year 2009.

Profitability analysis combines measurement of both company's profit margins (e.g. net profit margin and EBIT margin) and return indicators (e.g. return on assets). They represent indicators that measure the return on invested capital, i.e., estimate the extent to which corporate income exceeds the different cost measures. Profitability indicators are most often analysed when conducting financial analysis because they are often considered the highest management effectiveness. Moreover, different economic areas have different levels of profit. For this reason, it is important to have a good understanding of the industry so that the indicators provide a better and more comprehensive overview of the situation. The most commonly used profitability indicators are: net profit margin, EBITDA margin, EBIT margin, return on equity return on invested capital (ROI), return on equity and return on capital employed.

The EBIT margin (acronym of *earnings before interest and taxes*) shows how much EBIT earnings (profit before interest and taxes) remain to the company for each cash unit of operating income after settling regular expenses / operating expense. A higher level of EBIT margin is desirable because such companies retain a larger part of their income after covering business expenses than those that have a lower value of this indicator.

The EBITDA margin (acronym of *earnings before interest, taxes, depreciation, and amortization*) shows the percentage of earnings at the EBITDA level (profit before interest, taxes and depreciation) in relation to the company's operating income, or part of

the income remaining to the company after settling the regular costs / operating expense (e.g. material costs, payroll costs, etc.). As a rule, a higher value of this indicator is favourable; as it indicates that such companies have a better cost structure since they have the ability to retain a larger part of the income after covering business-operating expenses.

ROI (*return on investment*) is an important indicator of the company's long-term financial strength and it selects key measures from the income statement and balance sheets to estimate profitability. This indicator, i.e. return on invested capital, shows the profit before interest and tax ratio and the invested capital (capital and reserves increased financial liabilities). It should be noted that the value of operating (operating) short-term liabilities (short-term non-financial liabilities, such as obligations to suppliers, employee obligations, etc.) is excluded in the denominator, for which interest or return to owners is not paid. As with other return indicators, the higher the value of the indicator, as it suggests more efficient management of the company's assets, is preferred here.

ROA (i.e. *return on assets*) is calculated as the ratio of net profit/loss and average assets. This indicator, most often shown in percentages, shows how much of a unit of net profits can be generated from one asset unit (Lesakova 2007). Since the net profit/loss category of results belongs to the owners of the company and the property is financed by the owner's equity and debt, the variation of the formula for this indicator in the numerator adds to the cost of financing – interest or the return on assets is shown as the profit before interest and tax average assets. Higher values of this measure are better since they indicate greater efficiency in the use of company resources.

The ROE indicator or *return on equity* shows the return on equity invested by the owners in the company's business, i.e. the profits made by the company using the capital invested by the owner. The ROE indicator puts the net operating result (profit or loss) and the average value of the equity capital to the ratio. The higher value of this indicator is more favourable for the company, as it indicates a more powerful power to generate the results per unit of the invested capital.

The last indicator is ROCE (acronym of *return on capital employed*) that complements the previous ROE indicator by adding debt or equity debt to reflect the company's total paid-in capital. ROCE measures profitability by showing how successful a company is using its capital to make a profit (Subramanya and Wild 2009). Low profit margins (numerator) or high levels of invested capital (denominator) cause the low value of the ROCE indicator, while the reverse is true for high ROCE.

Although profitability indicators are an inevitable and necessary tool when encompassing the financial situation, these ratios need to be interpreted with caution highlight Subramanyam and Wild (2009) because factors affecting the numerator may be related to those that affect the denominator. One example is when companies can improve their business and sales cost ratio by reducing sales-driven costs (such as advertising). While such an action can shorten the net profit margin in the short run, the reduction of these types of costs would probably adversely affect profitability indicators, as it will lead to a long-term decline in sales or loss of market share.

## 1.2. Role of profitability ratios in decision-making process

In order to achieve efficient and successful long-term business operations, the importance of financial and non-financial information is essential. Namely, Bakhoda and

Mayeli in paper 2016 „Role of Financial Information in Management Decision Making Process“, stand out that in order to achieve the goals of growth and stability of the company, managers need adequate information on the financial aspects they own.

The primary and fundamental purpose of the financial statements is to provide information and information about the company's financial position and performance, including information on profitability and cash flows. The information presented in the financial statements – including financial notes, discussion and management analysis – enables the company managers to assess the financial position and performance of the company and the trends in that performance (Henry and Robinson, 2009). The purpose of the financial statements is to use the financial information prepared by the company to assess past, present and future results as well as the financial position of the company for the purposes of investment, loans and other economic decision (Subramanyam and Wild 2009).

The particularity of profit indicators is their ability to point to strategic changes in business, investment and financing. According to Nuhu (2014) presented in the paper Role of Ratio Analysis in Business Decisions, indicators are like symptoms as they do not clearly identify where and what the problem is, but they rather direct managers to the area where there is a potential problem. In this way, indicators can help detect the discretionary business decisions that a decision is made and apply to which part of the company. A company manager can make and make the right decisions only if the relevant data is accurately analysed. Thus, profitability indicators are an effective management tool that can be useful for planning future activities and the interpretation of financial activity outcomes during the decision-making process (Halici and Erhan 2013).

Indicators are at the very beginning of the path leading to management and decision-making on operations, maintaining efficiency and future business stability by providing concrete and realistic information on the company's financial aspects. As such, the indicators are recognized as good managers' assistance and because they facilitate comparisons both between unobtrusive numbers as well as between different parts of the business, as well as among the various companies belonging to various branches of the economy and markets. When indicators are continually monitored and analysed from time to time, they can provide an early warning system to detect new trends in financial performance, Luckham was pointed out in 1982 year. Therefore, ratios should be used as a system of symptoms observed over time rather than viewed individually and isolated on each indicator.

By reviewing individual components that make up a specific profit indicator, a manager can discover important relationships and bases for further comparisons of disclosure of conditions and trends that are otherwise difficult to detect (Subramanyam and Wild 2009). In addition, with the aim of reducing risk, the manager is used to profit indicators to encompass profitability and growth of the company, but also to value the efficiency of its management. In this way, ratios are an additional indicator of whether the manager of the company is going in the right direction. It is important to note that the level of return on invested capital depends primarily on the skill, resourcefulness, ingenuity and motivation of management. Given that the management of a company is responsible for the company's business activities, it makes decisions on financing, investing and doing business, selects the action, plans the strategy, and executes the plans. Return on invested capital, especially when calculated at intervals of one year or longer, is a relevant measure of company's managerial efficiency.

In order for profitability indicators to be properly used, it is necessary to understand how a particular company operates, especially from a financial point of view. Also, when analysing indicators, some kind of benchmarking is required across the industry in order to obtain a true image of company status. Managers analyse company and financial reports from competing companies to assess profitability and risk of competition. Such an analysis enables mutual comparisons to assess relative strengths and weaknesses and compare performance (Subramanyam and Wild 2009). Namely, if the company is looking insulated, without taking into account other competitors and the context of the associated economy of that economy, the manager will most likely not understand the real reasons why changes in the financial indicators have occurred. For this reason, industry standards for companies of similar size, co-operative data, or data from previous years are useful for recognizing improvements or worsening financial situations and thus serve as a good basis for management analysis

## **2. METHODOLOGY**

The paper analyzes the profitability indicators for the first hundred companies of the Croatian market, ranked according to the net profit realized in 2015 in the Republic of Croatia. Furthermore, the aim is to classify above mentioned companies according to the 6 profitability indicators: EBIT margin, EBITDA margin, net profit margin, return on assets (ROA), return on invested capital (ROI) and return on capital employed (ROCE). For the classification of those selected companies the cluster analysis is applied. However, prior to its application, factor analysis is performed on those 6 selected profitability indicators to extract a smaller number of factors and thus avoid the problem of multicollinearity which should not be present in the cluster analysis

First, the principal components approach to factor analysis is performed and for the extracted factors, the factor scores are calculated. Those calculated factor scores are then used in the cluster analysis. The hierarchical cluster analysis is conducted to choose the number of clusters and according to given results the two-cluster solution is chosen. Then the non-hierarchical cluster analysis is performed for the chosen two-cluster solution where ten companies are in the first cluster and the other ninety are in the second cluster.

## **3. RESEARCH RESULTS**

The first step in multivariate analysis is the validation of data, i.e. testing the fulfilment of the prerequisites for the application of multivariate methods. After that validation, the factor analysis and cluster analysis are performed, and the results are discussed.

### **3.1. Factor analysis results**

Prior to the application of the factor analysis, it is necessary to check if the preconditions for its implementation are fulfilled. For this purpose, several indicators are used, such as correlation matrix, anti-image covariance matrix and the Kaiser-Meyer-Olkin measure.

Inspection of the correlation matrix and anti-image covariance matrix reveals that the data is suitable for the application of factor analysis. Further, the values of Kaiser-Meyer-

Olkin (KMO) measure should be examined. These values range from 0 to 1, and if they are less than 0.5 then the data is not suitable for further analysis. Table 1 shows the KMO values for each individual variable and the overall value. It can be seen that all values are greater than 0.5. According to all mentioned conditions the data is suitable for the application of factor analysis.

**Table 1.** Values of Kaiser-Meyer-Olkin measure

Variable	KMO values
EBITDA margin	0.5663
EBIT margin	0.5710
ROA	0.6281
ROI	0.6760
ROCE	0.8006
Net profit margin	0.7673
Overall	0.6442

It is characteristic for the principal components approach to factor analysis that the factors are extracted based on the Kaiser-Guttman criterion. According to that criterion, the factors, which possess the eigenvalues greater than 1, are extracted. Table 2 gives the eigenvalues, proportions and cumulative proportions. Thus, all variables used in the analysis will be grouped either on Factor 1 or on Factor 2 with eigenvalues of 2.2176 and 2.8891 respectively.

**Table 2.** Eigenvalues, proportions and cumulative proportions

Factor	Eigenvalue	Proportion	Cumulative proportions
Factor 1	2.8891	0.4815	0.4815
Factor 2	2.2176	0.3696	0.8511
Factor 3	0.5376	0.0896	0.9407
Factor 4	0.2662	0.0444	0.9851
Factor 5	0.0855	0.0143	0.9993
Factor 6	0.0039	0.0007	1.0000

In the initial matrix shown in Table 3, it is not apparent which variables would belong to which factor, thus the initial matrix is not interpretable. Therefore, the varimax rotation is performed and its results are presented in Tables 4 and 5.

**Table 3.** Initial matrix

Variable	Factor 1	Factor 2	Communalities
EBITDA margin	0.6621	-0.6988	0.9267
EBIT margin	0.6800	-0.6814	0.9327
ROA	0.7963	0.5423	0.9283
ROI	0.8342	0.4357	0.8858
ROCE	0.7036	0.5704	0.8204
Net profit margin	-0.3964	0.6750	0.6128

Table 4 shows that the cumulative proportion for two extracted factors remained the same, 0.8511. This means that these two factors together explain 85.11% of the total variance.

**Table 4.** Eigenvalues, proportions and cumulative proportions after the rotation

Factor	Eigenvalue	Proportion	Cumulative proportions
Factor 1	2.6496	0.4416	0.4416
Factor 2	2.4572	0.4095	0.8511

Table 5 shows that the structure of the rotated factor matrix has been changed and that two factors are clearly visible. Furthermore, communalities remained unchanged compared to the initial matrix communalities.

**Table 5.** Rotated factor matrix

Variable	Factor 1	Factor 2	Communalities
EBITDA margin	0.1136	0.9559	0.9267
EBIT margin	0.1420	0.9553	0.9327
ROA	0.9626	0.0407	0.9283
ROI	0.9293	0.1488	0.8858
ROCE	0.9050	-0.0373	0.8204
Net profit margin	0.0852	-0.7782	0.6128

Based on the rotated matrix in Table 5, it is possible to group variables into their corresponding factors. Consequently, ROA, ROI and ROCE represent the first factor, while EBITDA margin, EBIT margin and net profit margin are another factor. As a further indication and proof of successful factor analysis, serves the fact that profitability ratios divided themselves naturally and as it was expected prior the performed analysis. Namely, on the basis of this division, the profit indicators were found to be at the same factor named *profit*, while the return indicators were at the other factor named *return*.

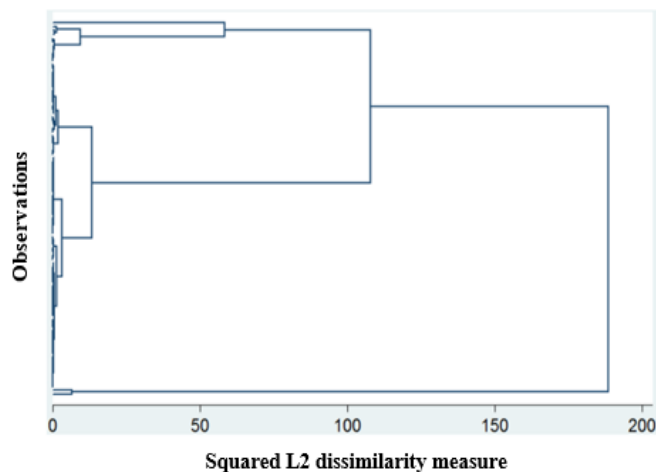
After the performed factor analysis, the factor score calculation is followed. The factor scores for each observation are calculated in order to replace the analysed variables with the new, smaller number of variables.

### 3.2. Cluster analysis results

In this paper, the aforementioned results of the factor analysis and calculated factor scores are used as input variables for the cluster analysis. Since the multicollinearity is avoided with factor scores and original variables have been replaced with new and reduced number of overall factors (from initial six to two), cluster analysis will be performed based on calculated factor scores for all 100 observations.

In order to obtain the best possible final results of cluster analysis, hierarchical and non-hierarchical cluster analyses are used. First, the hierarchical Ward's method is performed to reach the number of clusters. The result of Ward's method can be graphically displayed through a dendrogram which provides a graphical representation of information from which observations are grouped together at different levels of diversity.





**Figure 1.** Dendrogram

Based on the visual interpretation of the dendrogram given in Figure 1, two cluster-solution is chosen. Following the cluster number identification, the non-hierarchical k-means method is performed. This method is well-upgraded with Ward's method because as it is possible to obtain visual information about the number of clusters with Ward, while the k-means method comprises information on how data is classified in these clusters. The result of k-means cluster analysis is allocation of companies in two clusters, where ten companies belong to the first cluster, while the other ninety belong to the second cluster.

### 3.3. Discussion of results

As already stated, the purpose of cluster analysis is the classification of those objects with similar properties and characteristics in the same cluster. Thus the results of the cluster analysis implementation are clusters that are between themselves heterogeneous, while within it extremely homogeneous.

Given that the original data refer to the 2015 financial statements, it is necessary to observe the economic aspect in relation to the business and economic developments that preceded that year. Namely, although companies that are ranked according to the highest net profit realized in 2015 in the Republic of Croatia have been analysed, there are very different features and, accordingly, the relative and impact of economic trends on certain companies. Thus, the economic recovery that started in the last quarter of 2014 continued in 2015, and GDP in 2015 was really higher by 1.6% than in 2014 (Kordej-De Villa 2016). Such a favourable situation certainly contributed to the positive success of the business sector.

Furthermore, considering that, e.g., the fact that observed large company is ranked as the best company according to the achieved net profit, it is not necessarily related to the assumption that such a company will achieve the best results for all financial ratios and profitability indicators. On the contrary, in this analysis, there was a grouping of

companies according to their similar results, more precisely, according to types of profitability indicators. Namely, ten companies ranked in the first cluster found their homogeneous properties in terms of return indicators (ROA, ROI and ROCE), as they have been always ranked at the very top regarding the achieved values for these indicators. Certainly, though there were some discrepancies in this regard, that cluster of companies is continuously present among the top achievers for return indicators. Other companies were similar in that, unlike these, had similar movements in EBITDA margins, EBIT margin and net profit margins. More specifically, companies from other cluster groups achieved high values in the above-mentioned indicators, they also achieved solid results in indicators dominated by companies from the first cluster group, and vice versa. What made it crucial that a particular company finds belonging to a particular cluster is the arithmetic mean of the ranked ordinal number at which the company was positioned for each group indicator (i.e. for each factor score). For example, observed medium-sized company was the 31<sup>st</sup> in the best EBITDA margin, 23<sup>rd</sup> on EBIT margin and 10<sup>th</sup> on net profit margins. Although he achieved high rankings for variables within the *profit* factor, for *return* they still had higher-ranking positions (18 per ROA, 27 per ROI, and 3 per ROCE).

Companies within the first cluster generated ROA values ranging from 0.11% up to 2.09%, while the realized value ROI variables ranged from 0.47% to 2.71% with the exception of one medium-sized company and small company who had somewhat lower values. These lower values have been offset by obtaining high values within both ROA and ROCE indicators. In addition, generated ROCE values for these ten companies ranged from a minimum of 0.36% up to 1.13%.

## CONCLUSION

In this paper, profitability indicators for the first hundred companies are analysed. The selected companies are classified according to their value of net profit on the Croatian market. The following profitability indicators are included in the analysis: EBIT margin, EBITDA margin, net profit margin, return on assets (ROA), return on invested capital (ROI) and return on capital employed (ROCE).

In particular, the importance of profitability indicators lies in their ability to give clues to managers regarding strategic changes in business, investment and financing. Although the indicators do not give a concrete answer, they rather direct managers toward a potential problem by pointing out the symptoms. It is important to consider the fact that profitability indicators ought to not be viewed in isolation, but within the aggregate context with the whole company, other competitors and the associated economic sector of this economy. Furthermore, it is important to emphasize that managers aim to make business decisions in a modern management economy in order to maximize the value of the company itself, and thus the primary goal is not to maximize profits. They are therefore willing to sacrifice profits in the short term and even bear losses in order to achieve long-term profit and stability, and thereby contributing to the value of the company.

By implementing factor analysis on six variables, the number of profitability indicators has been reduced to two. Thus, the multicollinearity problem is solved, which represents one of the prerequisites for the cluster analysis. Additionally, for the purpose

of further analysis, factor scores for the extracted factors are calculated. As a result, EBITDA margin, EBIT margin and net profit margin got grouped under the factor named *profit*, while the remaining variables – ROA, ROI and ROCE – got positioned under the factor named *return*. Thus, the number of factors from the initial six variables fell to two factors.

The aim of the cluster analysis is to group those companies that are similar to each other in separate clusters. Because of clustering, the resulted clusters are heterogeneous. In order to achieve the optimal result, it was needed to perform both hierarchical and non-hierarchical cluster method. Through the graphical representation (dendrogram), which is a result of hierarchical cluster method (Ward method) implementation, the number of clusters is determined. Furthermore, with application of a non-hierarchical method (k-means), the companies have been sorted according to the given number of clusters.

In the perspective of further development of this analysis, it would be advisable to penetrate the deeper aspect of the observed variables for comparison with the results obtained in this paper. In order to get a further explanation why certain companies achieved better performance in EBITDA margin, while others gained better success with return indicators, it is necessary to compare the overall financial position of each company. In addition, it is of significant importance to take into the account the state of the economic branch to which they belong and which economic developments have favoured such a result. A number of recommendations are desirable for further analysis. For instance, application of factor and cluster analysis on a sample of companies classified according to the same activity (NACE 2007 classification). This would give an interesting insight into which companies have are achieving better financial results in terms of profit indicators, which companies have fundamental propensity to achieve better results within the profit indicators and which within the return indicators. Moreover, it is recommended to bring the whole analysis on a higher level by including international dimension, hence performing benchmarking and clustering of companies in European union member, that belong to either same economic branch or different industries. The aim of such analysis would be to gain an insight how companies that operate in the same economic industry but across different European countries achieve different results, i.e. possess different biases for achieving better ranking in various profitability indicators.

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