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Corporate Financial Indicators According NACE, Processing, and Applications — Case of Slovakia

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Abstract: Qualified management in general and, therefore, the management of economic entities on corporate level and ongoing processes requires both, timely and content-reliable data. The data are largely taken from the final accounts of individual businesses. Notwithstanding the above, data for individual reporting units are often incomplete, value-unrealistic, or significantly different from analogous indicators of other undertakings with a similar business focus. These facts weaken the usefulness of such data for an in-depth analysis.

The main goal of this paper is to present the up to date results of the author´s study of the sectoral (NACE) values for selected financial indicators (as ROA, ROE, EBITDA, …) frequently applied in corporate economics. The studied data are selected from the final balance sheets of more than 900 thousand small and medium enterprises operating in Slovakia at least three full years. The generalized statistical distributions of the sectorial indicators calculated for 389 randomly selected companies are presented as the core results of this study.

Key words: data quality; creative accounting; financial ratios; ROA; ROE; EBITDA

JEL codes: G10, G34, H32

1. Introduction

Efficient management in general and, therefore, the management of economic entities on corporate level and ongoing processes requires both, timely and content-reliable data. The data is largely extracted from the final accounts of individual businesses, which are defined by their uniform structure, the scope of the indicators monitored and definition of their content. Notwithstanding the above, data for individual reporting units are often incomplete, value-unrealistic, or significantly different from analogous indicators of other undertakings with a similar business focus.

Problems are even more serious, when national data is compared, or complemented with data generated in foreign economic and/or statistical system. These facts hinder or at least weaken the usefulness of such data for the more sophisticated analyses, modeling, and comparative economic and social studies.

There are various attempts, many projects and active institutions trying to solve these problems and to assist in improving statistical data quality in general. The important role in this effort is played by relevant international institutions.

The attempt to develop efficient, internationally accepted system for statistical data collection, processing

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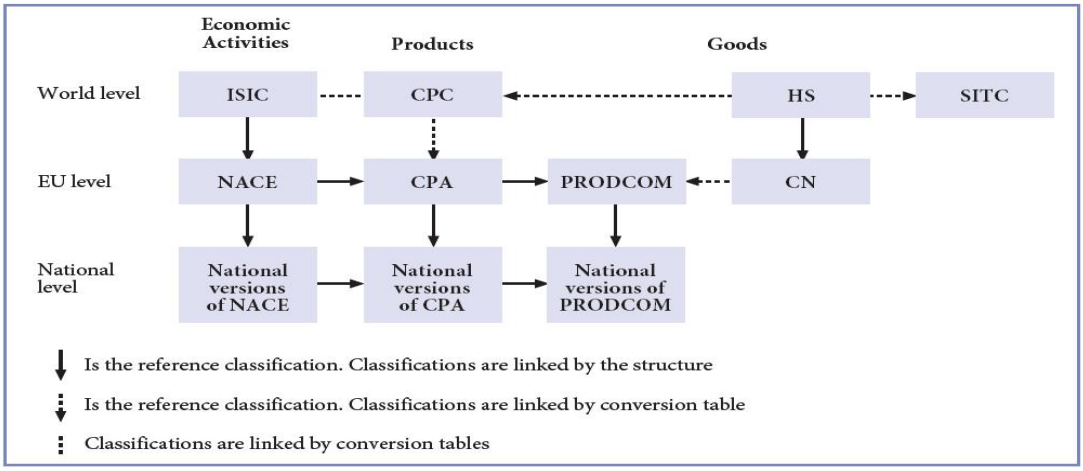
and archiving requires enormous energy, financial and material support, as well as full cooperation and support from political bodies in individual countries, on EU level as well as on United Nations bodies' level. The below scheme presents the core levels, components and agents taking part in this endeavor.



Source: https://www.europeandataportal.eu/en.

In this structure economic activities are classified and reported on world level under the International Standard Industrial Classification (ISIC), on EU level under the NACE[1] classification system, while on national levels some versions of NACE are adopted. The NACE is a four-digit classification providing the framework for collecting a large range of statistical data according to economic activity of individual enterprises within the European statistical system (ESS).

Concerning the products, the world level adopted the Central Product Classification (CPC), EU level adopted the Classification of Products by Activity (CPA), while on national levels also some versions of the same system are used.

The statistics on the production of manufactured goods is provided by the EU PRODCOM system (ec.europa.eu/eurostat/web/prodcom). The Harmonized Commodity Description and Coding Systems (HS) allows participating countries to classify traded goods on a common basis for customs purposes.

The Combined Nomenclature (CN) "is a tool for classifying goods, set up to meet the requirements both of the Common Customs Tariff and of the EU's external trade statistics".

The Standard International Trade Classification (SITC) is maintained by the United Nations and recommended for analytical purposes. It fulfils also special role in reporting export and import statistics and for international comparisons of commodities and manufactured goods.

All actors of the above indicated programs in data collection produce their own specific directives and guidelines for their member countries, or member institutions to assist them in correct application of the methodological requirements in data collection and data processing with aim to enable their efficient global acceptance and use.

The main goal of this paper is to present the up to date results of the author's study of the sectoral (NACE) values for selected financial indicators, frequently applied in corporate economics. The studied data are selected

[1] The term NACE is derived from the French Nomenclature Statistique des Activités économiques dans la Communauté Européenne).

from the final balance sheets of more than 900 thousand small and medium enterprises operating in Slovakia. The generalized statistical distributions of the sectoral indicators are presented as the core results of the author's study.

The paper presents the results on group of randomly selected 389 entrepreneurial entities which were statistically analyzed according to the submitted methodology. The selected indicators are presented through statistical parameters for the group of companies as well as for their subgroups. The developed financial indicators enable the authorities to check the correctness of partial accounting data, which are later utilized in the calculation of the tax base.

2. Current Results and Studies on Accounting and Statistical Data Quality

Availability and access to reliable statistical data is frequently commented in academic journals, as well as in public media. There are many reasons for that. Results of economic and social development, presented by governments and other official authorities, are evaluated, and scrutinized and confronted by various nonpartisan institutions for what the objective data is needed. The data for these purposes should be accessible in real time, in requested content and structure in user friendly and easy understandable form. Another reason for demand for reliable data is narrowly linked with the other scientific studies expecting such data as input data for their own studies (Vlaeminck S., 2013).

Any deficiencies in referred statistical data, namely their incompleteness in content or time coverage, can cause various slowdowns in research, or public service projects. To find the ultimate solution to these problems is not an easy task, as expressed by McCullough (McCullough B. D. & McGeary, Kerry Anne & Harrison, Teresa D., 2006), who pointed out that "results published in economic journals are accepted at face value and rarely subjected to the independent verification that is the cornerstone of the scientific method. Most results published in economics journals cannot be subjected to verification, even in principle, because authors typically are not required to make their data and code available for verification."

In case of the corporate economic entities, these facts can weaken the usefulness and acceptability of such data for an in-depth analysis of the group of companies concerned and for the derivation of universally valid relationships among their performance indicators (Oby Ayodotun J. et al., June 2018). It also weakens the possibility of mutual comparing the companies whose databases are inconsistent and reduce the more sophisticated applications of accounting data. This can lead to some question on usefulness and applicability of the economic data in general.

Processing of incomplete data sets by statistical methods, with the aim of identification and quantification of their mutual relationships, raises the questions on possible negative impact of missing and incorrect values. Problem of missing and incorrect data cannot be solved simply by standard procedures such as elimination of extreme values, or mechanical imputation of missing values (Little R. J. A. & Rubin D. B., 2002; Vroomen Mac Neis J. et al., 2016).

The notion of ***extreme values*** in the case of economic indicators calls for specific assessment criteria based on deeper knowledge of the economic relations and the context of how they are changed over time and how they are collected under which methodology. All this can help with correct interpretation and understanding of the extreme values (Towe Ross, Tawn Jonathan, Eastoe Emma, & Lamb Rob, 2020).

Discussion on reliable date covers rather broad spectrum of issues. To keep the discussion more concrete, we narrow it on the data, produced by the corporate accounting system (Sterheimer K., 2018).

The subsequent applications of such data can be utilized with the assumption that even the so-called *reliable data* of corporate accounting is not statistically exactly defined. The methodology for their collection provides rather a broad option for their "creative construction" and consequently their copying into the archived accounting documents. A possible solution is only through the comparison of these extreme values with identical indicators of other enterprises.

3. Reliable Data and Their Statistical Identification

The concept of *reliable data* refers to characteristics like inputs and outputs of the tracked entities with defined content, the way they are collected, updated, archived, and processed.

An essential document defining the obligations of intelligence units at the micro level is known as International Financial Reporting Standards (IFRS). The IFRS are developed by an independent body based in London, the International Financial Reporting Standards Foundation, and International Accounting Standards Board (IASB). Their implementation within the EU is specified by the EU Commission Directive 2013/34/EU. It stipulates that all business operators must process their consolidated financial reports in accordance with the single system of international standards. They enable the subsequent comparisons of the results of businesses as well as an in-depth analysis of their activities. Also, the search for bottlenecks in production or marketing processes is possible (EU, 2013).

The proper classification of enterprises with respect to IFRS standards allows the creation of the NACE groups and the quasi-homogeneous subgroups of enterprises at different levels. This justifies accepting them as individual industry standards. The knowledge of these standards can be utilized by reporting firms for checking their own accounting data prior to their savings into a standardized database of consolidated reports. This creates a possibility for auditors and auditing institutions to adopt such standards for their checking activities, which could be executed more easily, faster and in more qualified mode. Particularly by comparing the results between enterprises in the same NACE groups or subgroups, or by comparing them with the derived sectoral standards (EU, 2018).

At the level of macroeconomic reporting in the international environment, as guidance documents are most often reported the System of National Accounts (SNA, UNDESA, 2018) and Compilation Guide on Inventories (Eurostat and OECD, UN, 2017). These internationally respected documents arose on the land of the United Nations Statistical Commission in 1947 and 2017. Since their inception, they have undergone several major updates, the last one being held in 2018. The SNA represents a set of standards on how to collect data on the economic results of individual countries and enterprises. Consequently, these results are mutually comparable and consistent with accepted concepts and definitions, classification, and accounting rules. The National Accounts system is one of the pillars of macroeconomic statistics and the basis for economic analysis and the development of economic policy scenarios at national and economic clusters.

Several specialized international organizations have developed rules on the collection and processing of information on specific products and services provided by their member States, largely incorporated into the United Nations system. As an example, the World Trade Organization (WTO, 2019) should be named.

The World Customs Organization cooperates closely with the WTO and manages the most significant, globally implemented tools for organizing trade and customs data. This platform is called the Harmonized System (HS) of the trade and tariffs. The Handbook (HS Classification, WCO, 2013) introduces the Harmonized

Commodity Description and Coding System usually referred to as the Harmonized System or the "HS". This system links the goods or downstream technological components with their statistical and custom specifications.

The HS system is valid since 1988 and is managed by the World Customs Organization. The main objective of the above-mentioned instruments is to contribute to maintaining the legislative and statistical clarity of the business environment where an international exchange of goods and services is carried and where the GDP is calculated. In case of the international trade, all statistical information provided by both, the reporting country, and the partner country of the business relationship, must comply with the formal requirements of the IFRS, SNA and HS systems. Consistent methodological monitoring of the formation of gross domestic product in accordance with the SNA rules and the customs measures has a clear positive impact on the quality of statistical information reflected by these processes. Consequently, they contribute to a qualified estimation of the macroeconomic development indicators of the countries concerned, namely to the estimation of the development of the gross domestic product, which is one of the most important and generally respected macroeconomic indicators (Aitken A., 2019).

All the above presented methodological tools are intended to support the production, collection, processing, and distribution of economic data on micro and macro levels. Our aim to present how these tools could be employed in data producing and data collection processes on the level of corporate level, particularly under the NACE system.

4. Research Objectives, Methodology and Data

The accounting data, in accordance with their definition, should be a "non-distorted information mirror" of economic, financial, production and distribution processes. Its actors are suppliers, manufacturers, distributors, dealers, financial institutions, as well as public authorities. Their mutual interaction generates information that is methodically processed, summarized, and presented publicly under the established rules in a broad-based system of accounting documents.

In checking the primary data, it is necessary to analyze and to treat data that differ significantly from the same indicators of undertakings with similar size, sector classification, legislative structure, and business history.

The higher attention deserves the data that are statistically classified as the "outliers". The simple elimination of them according to strict statistical rules is not the only and correct solution for the authorization of the data. Their identification and quantification can be an incentive for further and deeper economic analysis or for managerial decisions.

From data obtained, subsequently by appropriate sorting and eliminating the extreme values in data files, it is possible to derive statistically quasi-homogeneous sets of enterprises in grading according to the legislative form, size, NACE group and more. Subsequently, it is possible to derive the sectoral indicators for individual variables and groups of enterprises. The industry or branch standards are represented by a set of parameters of descriptive statistics as mean, median, modus, standard deviation, and quadrant values, skewness, and kurtosis.

In the first phase we focus on creating a primary database that allows us to verify the reliability and efficiency of calculation algorithms and the presentation and interpretation of the selected ratio indicators for measuring and evaluating activity, profitability efficiency and performance of enterprises within the meaning of their definition (Zalai K., 2006) and in line with the new requirements of the ATAD directive. We calculate the selected financial ratios according the following relationships:

1) ROA - Return on Assets
2) ROE - Return on Equity
3) EBITDAS - EBITDA in Sales
4) VAinS - Share of value added in sales (1)
5) NVAinS - Share of newly value added in sales
6) AT - Assets of Turnover
7) ITT - Inventory Turnover Time
8) MD - Maturity of Debts

In the line with the accepted rules, the above ratios are calculated only for enterprises for which:

$$\text{ROA and ROE and VA in S and NVA in S} > 0 \quad (2)$$

For all ratios, the following statistics are calculated:

- Descriptive statistics — minimum, maximum, mean, median, mode, standard deviation, kurtosis, and skew
- Quartile values and number of enterprises in each quartile
- Number of enterprises with specific values of ratios (< 0, = 0)

All enterprises fulfilling condition (2) create the database of so-called standard entities, which could be used for further studies and possibly for deriving the probability distribution of values of sectoral ratios.

The ratio indicators provide the useful information on general economic performance evaluation of companies. However, the ratio indicators lack the clear direct reflection of the input and output factors, which contribute to generating final economic effect of individual companies. Having in mind this, we perform deeper analysis of assets, sales and inventories, as key production factors. Initial data is extracted from the final accounting balance sheets for 2018 year.

5. Results and Discussion

Initial step in our analysis was to “clean” the set of 900 000 companies on the data quality and data reliability. Also, we decided to consider for the following analyses only entities with reliable for at least four last years. We found relatively high proportion of the incorrect, dubious, and missing data. Finally, we identified the group of 68 371 companies with reliable data. These companies were split into three groups — the small, medium, and large ones according to the volume of their assets and annual turnover on sales. This division is consistent with the EU recommendations.

In Table 1 we present detailed information on number of companies in each subgroup in absolute and relative values. Our primary interest were 64 764 the small and medium enterprises which represented almost 95% of total number of companies in Slovakia, as shown in Table 1.

Out of grouping of all small enterprise we selected randomly 393 companies for full data processing. The complete results covering the financial ratios and their statistical parameters are presented in Table 2 under several sections.

The first section presents the descriptive statistics for each financial ratio and these values could be used for further in-dept data analysis. The second section presents the quartile values of the ratio indicators. The third and four sections presents the number of companies according to their quartile values. The last two section presents the information on number of companies with special values of ration indicators. Such data could be effectively

adopted in identification of highly incorrect initial accounting data.

Table 1 Distribution of Entrepreneurial Entities in Slovakia According Their Size

Distribution of enterprises according to assets and annual turnover on sales (all in 1000 Euros)				
	Turnover on sales			
Assets	O1 (< 700)	O2 (700, 8000)	O3 (> 8000)	Total
A1 (< 350)	50159	1559	323	52041
A2 (350, 4000)	5704	7342	323	13369
A3 (> 4000)	339	1172	1450	2961
	56202	10073	2096	68371
Distribution of enterprises according to assets and annual turnover on sales %				
	Turnover on sales (1000 Euros)			
Assets (1000 Euros)	O1 (< 700)	O2 (700, 8000)	O3 (> 8000)	Total
A1 (< 350)	73.4	2.3	0.5	76.1
A2 (350, 4000)	8.3	10.7	0.5	19.6
A3 (> 4000)	0.5	1.7	2.1	4.3
	82.2	14.7	3.1	100

Table 2 Overview of the Financial Ratios for Selected 393 Companies of NACE 011

Selected ratios									
	ROA	ROE	EBITDA/S	NVHvS	NVAinS	Assets turnover	TZ	Inventory turnover	Maturity of debts
	Measures of position								
Minimum	0.04	0.01	0.32	-168.58	-157.22	0.81	0.03	0.00	0.00
Maximum	92.97	1286.12	484.02	99.26	118.43	99.72	1522.28	1200.00	922.21
Average	8.88	24.31	32.91	-13.57	17.14	56.34	21.65	113.31	68.34
STDEV	12.85	76.17	34.96	31.03	30.45	27.84	130.25	133.26	103.21
Median	4.43	10.81	25.71	-10.91	19.96	58.00	4.19	84.85	37.80
Kurtosis	11.44	203.70	76.85	5.69	6.18	-1.02	99.05	22.69	18.20
Skewness	3.03	13.19	6.98	-1.30	-1.26	-0.33	9.82	3.70	3.59
Quartile	Quartile values								
0-Minimum	0.04	0.01	0.32	-168.58	-157.22	0.81	0.03	0.00	0.00
1	1.45	3.57	15.72	-22.46	6.12	33.14	1.99	28.15	6.34
2-Median	4.43	10.81	25.71	-10.91	19.96	58.00	4.19	84.85	37.80
3	11.21	25.26	39.97	1.69	32.18	80.17	9.11	154.76	80.57
4-Maximum	92.97	1286.12	484.02	99.26	118.43	99.72	1522.28	1200.00	922.21
Quartile	Number of companies with quartile								
1	99	99	99	99	99	99	99	99	99
2	98	98	98	98	98	98	98	98	98
3	98	98	98	98	98	98	98	98	98

4	98	98	98	98	98	98	98	98	98
Sum	393	393	393	393	393	393	393	393	393
Quartile	Share of companies within quartile in %								
1	25	25	25	25	25	25	25	25	25
2	25	25	25	25	25	25	25	25	25
3	25	25	25	25	25	25	25	25	25
4	25	25	25	25	25	25	25	25	25
Sum	100	100	100	100	100	100	100	100	100
Cluster	The number of companies with specific values								
< 0	0	0	0	284	74	0	0	0	0
= 0	0	0	0	0	0	0	0	56	53
AVG+-1STDEV	354	386	365	325	320	235	387	357	360
AVG+-2STDEV	375	390	386	367	369	393	388	381	372
AVG+-3STDEV	383	390	388	384	386	393	389	389	382
Outliers-	0	0	0	8	6	0	0	0	0
Outliers+	10	3	5	1	1	0	4	4	11
Cluster	The ratios with specific values in %								
< 0	0.0	0.0	0.0	72.3	18.8	0.0	0.0	0.0	0.0
= 0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	14.2	13.5
AVG+-1STDEV	90.1	98.2	92.9	82.7	81.4	59.8	98.5	90.8	91.6
AVG+-2STDEV	95.4	99.2	98.2	93.4	93.9	100.0	98.7	96.9	94.7
AVG+-3STDEV	97.5	99.2	98.7	97.7	98.2	100.0	99.0	99.0	97.2
Outliers-	0.0	0.0	0.0	2.0	1.5	0.0	0.0	0.0	0.0
Outliers+	2.5	0.8	1.3	0.3	0.3	0.0	1.0	1.0	2.8

The above presented results are important for in-depth studies on the accounting data quality of all companies. They can be used as the standard values for comparing mutually various companies with aim to identify their strong and weak sections in their economic activities. For practical application, we propose to use the graphical presentation of the statistical distribution of some selected tabulated data, namely ROA, ROE and EBITDA.

Such presentation, Figure 1, makes the obtained statistical result easy understandable. It shows the statistical distribution of the ROA for values for entire group of 393 companies.

Combining the graphical presentation and table data the following conclusions could be made — the ROA values for these 393 companies lay within interval between 0.4 and 92.97. The quartile values show that 50% of all companies report ROA values between 1.45 and 11.21. This finding enables the auditing authority to check randomly not only the completeness of the reported data, but also their quality.

The graph shows also that almost 90% of companies report ROA values less than 20 and only very small proportion of companies report ROA values over 40. These findings should be analyzed in connection with other financial ratios of the same company, or with similarly profiled companies.

The ROE distribution for the same group of companies shows Figure 2.

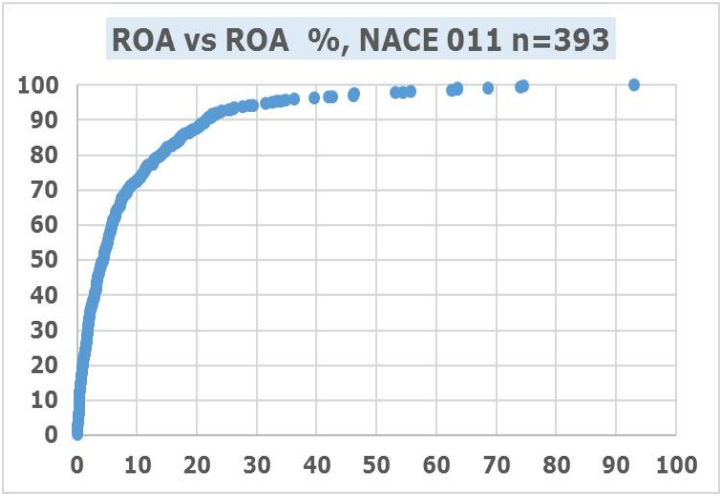


Figure 1 Distribution of the ROA Values

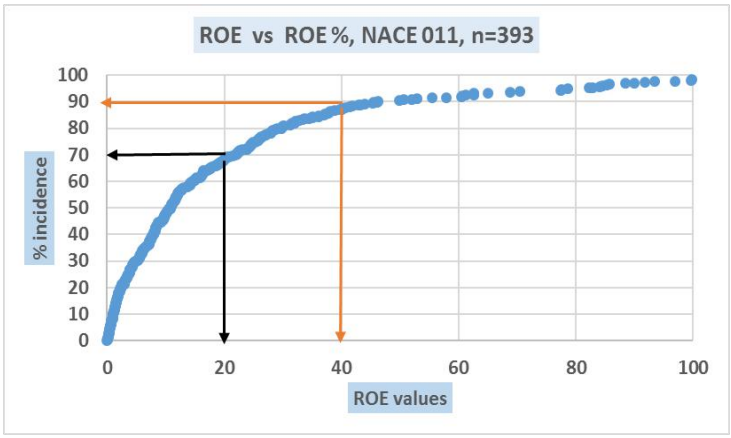


Figure 2 Distribution of the ROE Values

The graphical presentation indicates that about 70% of companies report ROE values less than 20. Based this presentation we can estimate that about 20% of companies report the ROE value between 20 and 40.

Slightly different distribution of EBITDA values presents Figure 3.

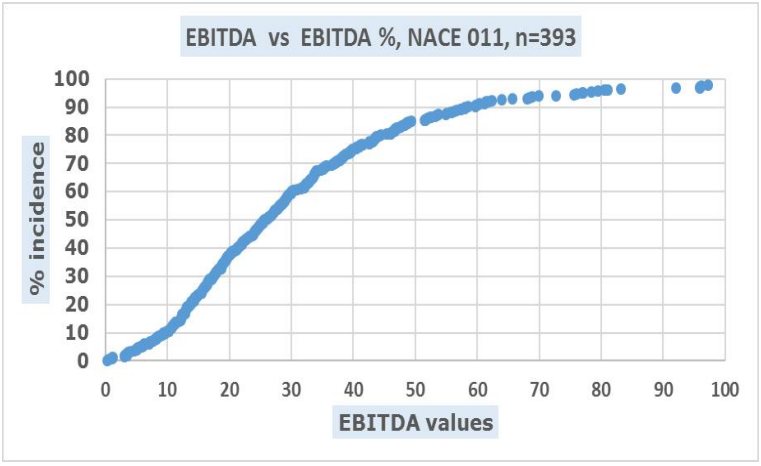


Figure 3 Distribution of the EBITDA Values

In this situation the median value 25.71 divides the total group of companies into two subgroups with the same number actively broad interval of companies. Despite the EBITDA values, more than 92% of them lay within interval round mean plus and minus one standard deviation.

Figures 4, 5 and 6 compare the ROA, ROE and EBITDA values for two different groups of companies. The first set of companies is represented by all 393 studied companies, while the second group of 115 companies represent only the "small" companies. Their distributions are very similar. These findings offer a useful argument in discussing the role in size of companies in values of their ratio values. To derive the general conclusion on importance of the NACE factor would, however, require more data processing.

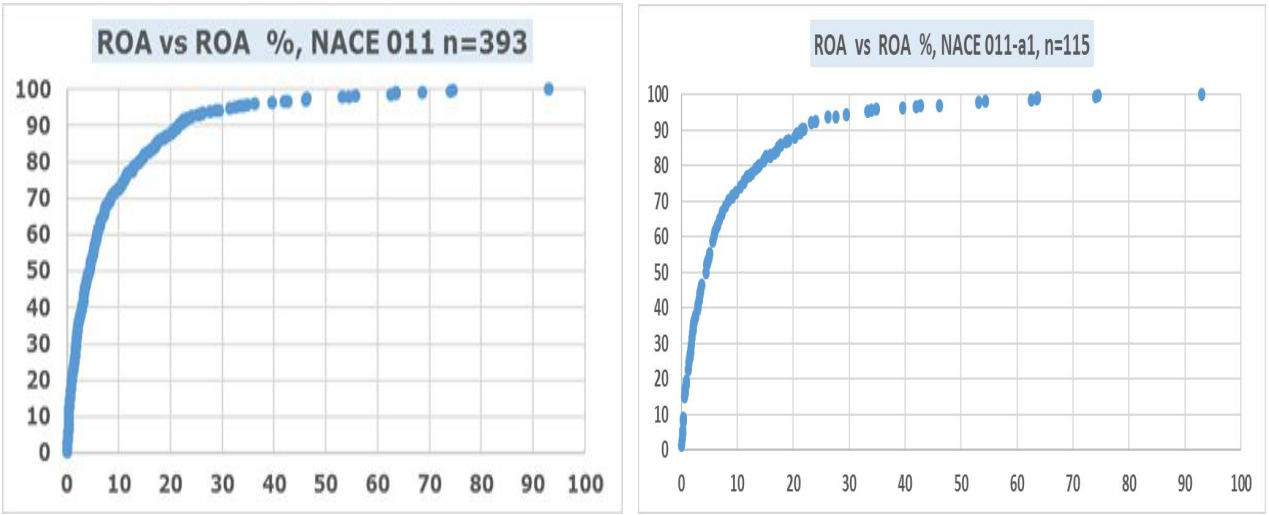


Figure 4 Distribution of the ROA values for groups NACE 011 and NACE 011-a1.

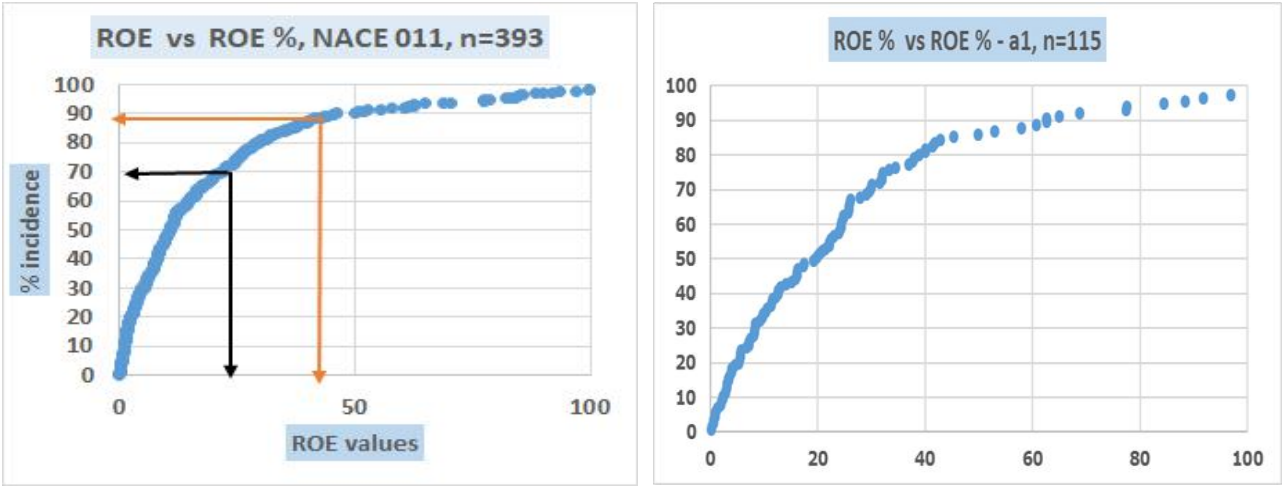


Figure 5 Distribution of the ROE Values for Groups NACE 011 and NACE 011-a1

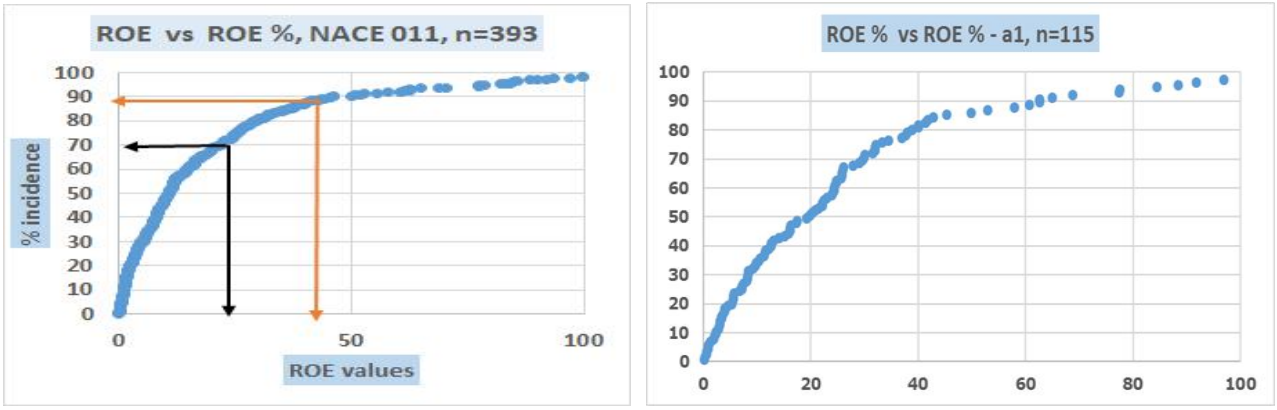


Figure 6 Distribution of the EBITDA values for groups NACE 011 and NACE 011-a1

Our current research is concentrated on in-dept study of accounting procedures on corporate levels in protecting quality of primary data before they are statistically processed and/or adopted for various modelling procedures.

6. Conclusions

The aim of this paper was to present the current theoretical views and opinions on the quality of statistical data, their collection, checking their correctness, processing, and archiving into publicly accessible data sets. Particular attention is devoted to the primary data generated by entrepreneurial entities classified under various NACE groups. Namely, their quality is analyzed, and various numerical tools are offered for checking their quality and consistency with the relevant data for the other entrepreneurial units belonging to the same NACE subgroupings.

The purpose of such approach is to present the outputs which are reliable in presenting economic situation of the studied companies and enabling their mutual comparison. This could be useful both, for individual company as well as for all its potential technological and marketing partners. Statistical data quality is presented not only as the microeconomic problem, related to the mutual relation among the various members of the market environment. The data quality is discussed also as a requirement of the OECD/G20 initiative, expressed in the Base Erosion and Profit Shifting document (BEPS) based on the International Finance Reporting Standards (IFRS). The paper points the harmfulness of violations of these requirements by disrupting the stability and efficiency of the tax and derivative system.

The developed and presented sectoral indicators could be used as an efficient tool in checking the accounting data on their correctness, before they are adopted for modelling and calculations of various important economic indicators as GDP and/or tax base. In such way, they can contribute to improving the quality of modelling tools in economic analyses, which is consistent with our original research aims.

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