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The Territorial Impact of Indebtedness: Sectoral Analysis in Slovak Environment

Katarina VALASKOVA[1*], Dominika GAJDOSIKOVA[2], Pavol DURANA[3]

Abstract

The structure of corporate financial sources is monitored using different indebtedness ratios. The proportion of own resources and debts affects the level of corporate financial stability. That is why the level of indebtedness should be analysed in enterprises and monitored to avoid any financial problems or distress. The primary goal of this paper is to analyze indebtedness in the Slovak environment using a sample of 15,716 enterprises from various sectors using the statistical classification of economic activities in the European Community (NACE classification) and to identify relationships between them. The study estimates the indebtedness by several indebtedness ratios (total indebtedness ratio, self-financing ratio, current indebtedness ratio, non-current indebtedness ratio, equity leverage ratio, and insolvency ratio) over a 5-year horizon (2015-2019). To meet the objective of the paper, the cluster analyses were applied using the squared Euclidean distance and the Ward´s method of the agglomeration. The results indicate that there are clusters of sectors with homogeneous patterns of indebtedness and thus with similar capital intensity levels.

Keywords: indebtedness, financial stability, cluster analysis.

JEL Classification: D22, G33, L25.

1. Introduction

Business performance is a key to the successful operation of a business and its long-term survival. A very important part is the financial analysis, which expresses the corporate performance, evaluates its goals, and sets the basis for further planning of target organizations. Every company is better off prevailing in financing its own resources over debts. Durana et al. (2021) state that the financial performance of companies is also affected by macroeconomic influences such as the global crisis or state intervention. As the financial stability of enterprises is also determined by

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[1] University of Žilina, Žilina, Slovakia, katarina.valaskova@fpedas.uniza.sk.
[2] University of Žilina, Žilina, Slovakia, dominika.gajdosikova@stud.uniza.sk.
[3] University of Žilina, Žilina, Slovakia, pavol.durana@fpedas.uniza.sk.
* Corresponding author.

internal factors, they should be carefully analysed, especially those factors which determine the level of indebtedness. Thus, the primary goal of the study is to analyze the level of indebtedness in the Slovak environment using a sample of 15,716 enterprises from various sectors and identify relationships between them, which may help identify sectors with homogeneous patterns of indebtedness and thus recognize which sectors are mostly stable and independent.

The paper is divided as follows: The Problem Statement section summarizes recent papers published in the field. The Aims of the research section sets the purpose of the paper, the methodological steps applied in the analysis are portrayed in the Research Methods. The results of the cluster analysis performed in the Slovak environment are presented and discussed in the Findings section.

2. Problem Statement

Monitoring the level of indebtedness in enterprises is an essential part of managerial activities when mapping the probability of potential financial risks (Campos and Cysne, 2021). The optimal capital structure does play an important role (Rowland et al., 2021) and also the typical debt limits for different countries (Butkus et al., 2021; Novak et al., 2021). Campos and Cysne (2021) studied debt limits for 18 emerging countries and found that there is no common debt limit for all of the countries. Markova and Svihlikova (2019) observed the situation in the Visegrad countries and found that indebtedness is also one of the crucial indicators of the monetary development of a country. The importance of the country-level factors in the process of over-indebtedness in Europe was also investigated in the study by Angel and Heitzmann (2015). Goncalves et al. (2020) investigated the impact of political cycles on corporate debt policy. They analysed some specific indebtedness indicators using the Wilcoxon test and cluster analysis and proved that there were no statistically significant differences in debt levels between political cycles.

The role of the micro and mezzo factors is also evident, as declared by Padmaja and Ali (2019) or Toederescu and Mocanu (2010). Devesa and Esteban (2011) proved the importance of solvency, liquidity, and asset structure when determining the level of indebtedness. Following the research of Ngo and Le (2021), the debt structure is significantly related to firm size, firm quality, liquidity, leverage, asset maturity, taxation, and macro-variables. The optimal level of the short- and long-term indebtedness of small and medium-sized enterprises in different sectors has been of interest to researchers for several years. Gomez and Cabarcas (2019) analysed the indebtedness level of the metalworking sector, highlighting the importance of business objectives and financial performance. Farcnik et al. (2015) noted the relevance of sector-specific performance and thus explored bonds between indebtedness and the tourism sector. The financing patterns and determinants of indebtedness in the manufacturing sector were measured by Majumdar (2014), who confirmed the importance of current liabilities in the process of debt financing. Culkova et al. (2018) evaluated the indebtedness in the selected economic sectors using corporate financial reports. The outputs of their research, measuring the level of total indebtedness, financial leverage, and insolvency ratios, proved that there are

some sectors with a high level of indebtedness in which future business activities can be significantly threatened. In their research, Manova et al. (2018) confirmed that the ability of an enterprise to develop in the market is strongly determined by its financial performance. Using the cluster analysis, they were able to cluster sectors according to selected financial parameters.

3. Research Questions / Aims of the Research

The quantification of the indebtedness is very important for all enterprises operating on the market to declare their stability, competitiveness, and sovereignty. Yang et al. (2015) revealed that there are specific factors influencing short- and long-term debts and that these factors are different between different sectors. They underlined the importance of investigating debt decisions of enterprises in all sectors. Thus, the fact that business entities and their debt levels should be consistently measured and evaluated was the main force to identify clusters of sectors with homogenous patterns of indebtedness and with similar capital intensity levels under specific economic conditions. Thus, the following hypothesis was set:

H1: There is a significant occurrence of homogenous patterns of indebtedness across the sectors in specific Slovak conditions.

4. Research Methods

To analyse the indebtedness level across the sectors, the Orbis database was used to build a dataset of 17,992 enterprises. The selected companies met the condition that the value of their total assets was at least € 300,000 in the period under review (2017-2019) to ensure that all enterprises in the dataset are in stable financial positions and have a similar economic background. After removing the not available and outlying values, a final sample of 15,716 Slovak enterprises was set.

Using the financial data of the analysed enterprises, the selected indebtedness ratios were calculated (total indebtedness ratio, self-financing ratio, current indebtedness ratio, non-current indebtedness ratio, equity leverage ratio, and insolvency ratio) over a 5-year horizon. Their descriptive statistics are summarized in Table 1.

With all the descriptive statistics for all ratios, the cluster analysis was run. The main task of this analysis is to find and identify homogeneous subgroups (clusters) of the monitored set of enterprises in different economic sectors (classified by NACE). In general, sectors within a cluster are similar based on a specific level of indebtedness, and at the same time, sectors in different clusters have different development of indebtedness ratios.

Table 1. Descriptive statistics of analysed indebtedness ratios

Ratio	mean	med.	st. dev.	min	max	coef. var.
total indebtedness ratio	0.6353	0.6547	0.3737	-0.0169	3.7872	0.5882
self-financing ratio	0.3647	0.3453	0.3737	-2.7872	1.0169	1.0245

Ratio	mean	med.	st. dev.	min	max	coef. var.
current indebtedness ratio	0.4553	0.4147	0.3379	-0.0478	3.4797	0.7422
non-current indebtedness ratio	0.1800	0.0595	0.2726	-0.0180	1.9905	1.5146
equity leverage ratio	6.2622	2.6811	29.946	-54.832	429.596	4.7820
insolvency ratio	2.7943	1.8417	2.6864	-0.2018	17.4097	0.9614

Note: TI total indebtedness ratio, SF self-financing ratio, CI current indebtedness ratio,
NCI non-current indebtedness ratio, EL equity leverage ratio, INS insolvency ratio.
Source: By authors, based on research.

The principle of clustering is the computation of distances between objects. In the paper, the Ward´s method and the squared Euclidean distance were used. This type of distance is used if a progressively higher weight should be given to further objects:

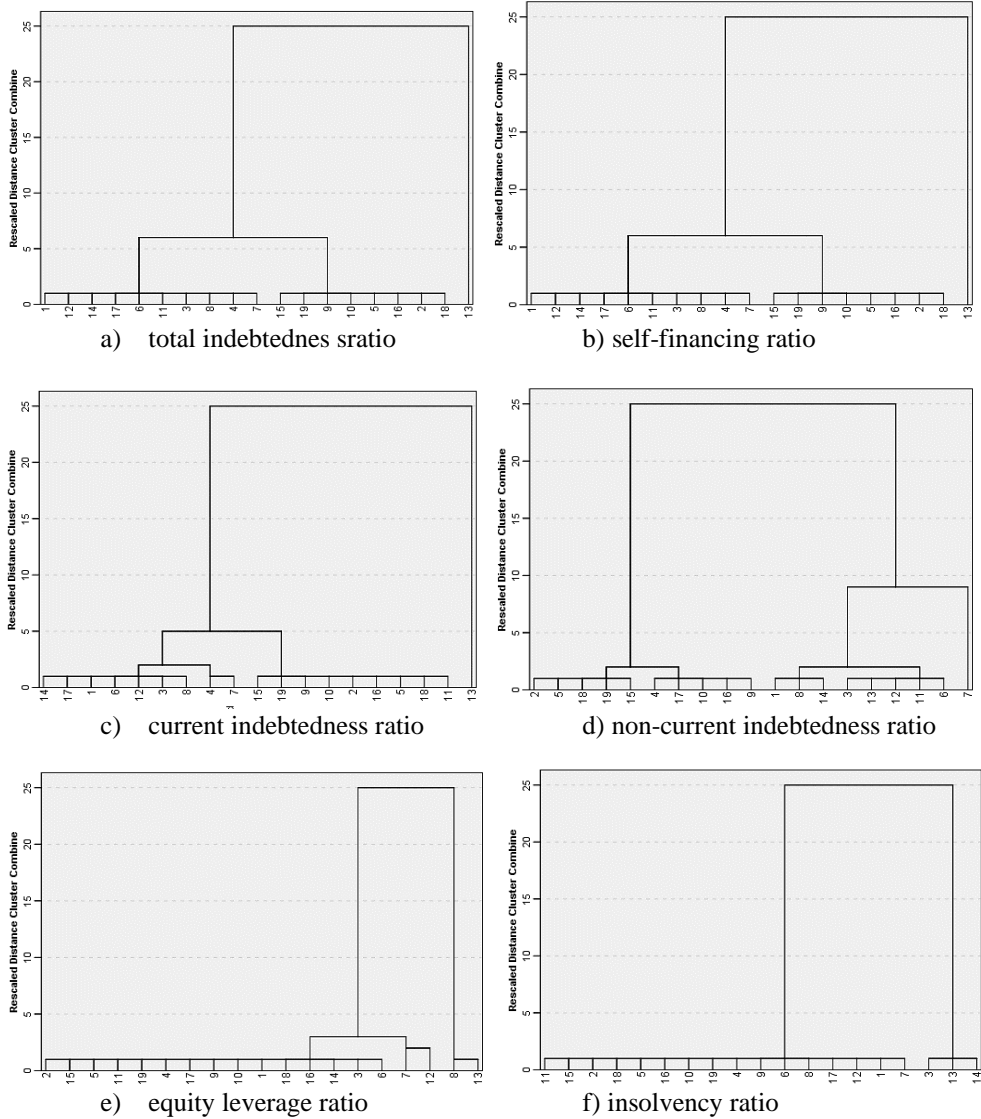$$d_{ij} = \sum_{k=1}^{K} (x_{ik} - x_{jk})^2 \qquad (1)$$

where d_{ij} is the distance between objects, K is the number of quantitative variables, x_{ik} is the value of the k-th variable for the i-th object, x_{jk} is the value of the k-th variable for the j-th object. Ward's hierarchical agglomerative clustering method is based on an analysis of variance, i.e., the minimum growth of the sum of the squares deviates from the average by adding a new object to the cluster, which leads to the formation of clusters of similar shape and size. The clustered sectors are then portrayed in the dendrogram to reveal homogenous patterns of indebtedness across the sectors.

5. Findings

The results of the cluster analysis were used to find the sectors with similar levels of indebtedness, which were measured by selected indebtedness ratios. The dendrograms for each indebtedness ratio are presented in Figures 1a-f. It may be said that the outputs of the cluster analysis confirmed that there is a significant occurrence of sectors with similar indebtedness.

The total indebtedness ratio measures the ratio of total debt to total assets. The higher the level of equity, the higher the reserves for creditors in case of financial problems. Therefore, the interest of creditors is to minimize the debt levels, since the debt is cheaper compared to equity (Mrzyglod et al., 2021; Kovacova, Lazaroiu, 2021). The value of this indicator should not exceed 70 % (which is the optimal debt-to-total-assets ratio). The cluster analysis proved that the economic sectors can be divided into three groups based on their total indebtedness (Figure 1a). Exactly the same results can be observed for the self-financing ratio (Table 2), which measures the level of financial independence and stability of an enterprise (its value should not be less than 20-30%). Both these indicators determine the structure of corporate financial sources (their sum is 100%), and the clusters or economic sectors are the same (Figure 1b).

Figure 1. Dendrograms (indebtedness ratios)

a)   total indebtednes sratio

b) self-financing ratio

c)   current indebtedness ratio

d) non-current indebtedness ratio

e)   equity leverage ratio

f) insolvency ratio

Note: Numbers on the horizontal axis indicate the sectors, i.e. 1 is for NACE A, 2 for B, 3 for C, 4 for D, 5 for E, 6 for F, 7 for G, 8 for H, 9 for I, 10 for J, 11 for K, 12 for L, 13 for M, 14 for N, 15 for O, 16 for P, 17 for Q, 18 for R, 19 for S.
Source: By authors, based on research.

Table 2. Clusters (total indebtedness and self-financing ratios)

Cluster	C1	C2	C3
Number of sectors	10	8	1
Economic activities (NACE codes)	A, C, D, F, G, H, K, L, N, Q	B, E, I, J, O, P, R, S	M

Source: by authors, based on research.

If the company uses debt capital to a large extent, it is appropriate to monitor the structure of debt in the form of partial indicators of the financial structure. Therefore, the current and noncurrent indebtedness ratios were computed. These indicators measure the ratio of current (noncurrent) liabilities to total assets. The optimal limits are generally not given, however, considering the non-current indebtedness, these debts represent a relatively convenient system of financing, as at the time of debt analysis, it is not necessary to meet full cash requirements. The clustering of NACE sectors according to the level of non-current indebtedness ratio is presented in Figure 1c, and it is evident that five homogeneous clusters were formed (Table 3).

Table 3. Clusters (non-current indebtedness ratio)

Cluster	C1	C2	C3	C4	C5
Number of sectors	5	5	3	5	1
Economic activities (NACE codes)	B, E, O, R, S	D, I, J, P, Q	A, H, N	C, F, K, L, M	G

Source: By authors, based on research.

Figure 1d records the clusters of economic activities in the Slovak environment by current indebtedness ratio. Four homogeneous groups were determined (Table 4).

Table 4. Clusters (current indebtedness ratio)

Cluster	C1	C2	C3	C4
Number of sectors	7	2	9	1
Economic activities (NACE codes)	A, C, F, H, L, N, Q	D, G	B, E, I, J, K, O, P, R, S	M

Source: By authors, based on research.

The equity leverage ratio indicates the share of a shareholder´s equity in total liabilities and evaluates how much leverage an enterprise is using. The higher the level of the ratio, the greater the risk to shareholders. The dendrogram (Figure 1e) specifies three clusters of NACE sectors by leverage ratio, Table 5.

The last indicator considered is the insolvency ratio, which monitors the ratio of total liabilities to total receivables. If the value of the ratio is higher than one, then primary insolvency is observed in an enterprise; otherwise, there is secondary insolvency (for values of the ratio that are lower than one). The agglomerative clustering method reveals only two clusters of economic sectors (Figure 1f). The first

cluster consists of three sectors (C, M, and N), the other analysed sectors form the second homogeneous subset.

Table 5. Clusters (equity leverage ratio)

Cluster	C1	C2	C3
Number of sectors	7	2	2
Economic activities (NACE codes)	A, B, C, D, E, F, I, J, K, N, O, P, Q, R, S	G, L	H, M

Source: By authors, based on research.

Thus, to summarize the findings and answer the research question, the outputs of the cluster analysis confirm the existence of homogenous patterns of indebtedness across the sectors in Slovak conditions. It was shown that the sectors A (Agriculture, forestry and fishing), C (Manufacturing), D (Electricity, gas, steam, and air conditioning supply), F (Construction), G (Wholesale and retail trade), H (Transport and storage), K (Financial and insurance activities), L (Real estate activities), N (Administrative and support service activities), and Q (Human health and social work activities) are usually grouped together (except for the non-current indebtedness ratio), so the level of indebtedness measured by the selected ratios is identical in these economic sectors. Almost all sectors belong to the tertiary sector, providing services for people, governments, and other industries. The tertiary sector is strongly influenced by consumer moods, per capita income, and the size of the welfare state (Wang et al., 2021), which may be the reason for a similar debt policy. Some specificities may be observed with sector M (Professional, scientific, and technical activities), which is usually alone in the cluster. These activities require a high level of education and provide users with highly specialized knowledge and practical experience, which may explain the heterogeneity of this economic section.

The cluster analysis has been used by a number of researchers to analyse debt policy by different factors (e.g., Goncalves et al., 2020; Bethlendi et al., 2019; Pocol et al., 2022). Campos and Cysne (2021) used cluster analysis to group emerging countries based on their debt limits. Their findings show that those countries whose debt-to-GDP ratio exceeded the given limits had problems with new loans to finance their debts or needed help from international institutions. Curea et al. (2020) investigated the performance of enterprises in Central and Eastern European countries. They studied the financial performance of enterprises using both hierarchical and nonhierarchical cluster analysis. Their findings show identical groups of enterprises with homogeneous attributes in financial performance. The study by Wortmann and Stahl (2016) also formed distinct clusters of enterprises in the European Union countries in terms of competitiveness, indebtedness, and economic performance. Suchanek et al. (2013) applied cluster analysis to divide enterprises into high and low performing groups based on their profitability, activity, indebtedness, and liquidity. As declared by Stryckova (2016), there are several differences in debt policy in industrial sectors, which were confirmed by the analyses of 15,716 Slovak enterprises.

6. Conclusions

Indebtedness indicators are used to monitor the structure of corporate financial resources. The share of equity and debt affects the financial stability of a company. A company with a high share of its own resources is stable and independent. However, the company is unstable with a low proportion of equity. Moreover, indebtedness may not only be a negative characteristic of the company, as its growth can contribute to its overall profitability and higher market value, but it also increases the risk of financial instability. The set of indebtedness indicators is very rich. Most of them express the financial structure of the company, i.e. about the composition of liabilities; others are used to assess the corporate ability to repay debt in terms of profit generation, but also cash flows. Therefore, the level of indebtedness in Slovak companies was analysed on a sample of representative indebtedness indicators (total indebtedness ration, self-financing ratio, current and non-current liability ratios, equity leverage ratio, and insolvency ratio) and clusters of sectors with homogenous patterns of indebtedness were determined using the Ward´s hierarchical agglomerative clustering method.

Despite the fact that the results help determine sectors with similar indebtedness levels and thus with similar capital intensity levels, there are some limitations of the study considering the environment in which the analysis was performed, the statistical methods used, as well as the computed ratios, which will be eliminated in future studies.

Acknowledgment

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