Ekonomicko-manazerske spektrum
2025, Volume 19, Issue 1, pp. 129-141

ASSESSING FINANCIAL STABILITY THROUGH DEBT INDICATORS IN THE SLOVAK ENGINEERING SECTOR

Erika Kovalova[1,a,*] and Janka Grofcikova[2,b]

[1]University of Zilina, Faculty of Operation and Economics of Transport and Communications, Univerzitna 1, 010 26 Zilina, Slovakia
[2]Matej Bel University in Banska Bystrica, Fauclty of Economics, Tajovskeho 10, 975 90 Banska Bystrica
[a]erika.kovalova@uniza.sk, [b]janka.grofcikova@umb.sk
[*]Corresponding author

Cite as: *Kovalova, E., Grofcikova, J. (2025). Assessing financial stability through debt indicators in the Slovak engineering sector, Ekonomicko-manazerske spektrum, 19(1), 129-141.*

Available at: *dx.doi.org/10.26552/ems.2025.1.129-141*

Received: 20 March 2025; Received in revised form: 18 May 2025; Accepted: 4 June 2025; Available online: 30 June 2025

Abstract:
Research background: In the context of increasing economic volatility and competitive pressure, the financial stability of industrial enterprises has become a critical area of analysis. The mechanical engineering sector, as a capital-intensive industry, is particularly sensitive to the structure and level of indebtedness. Financial analysis, especially debt analysis, plays a central role in identifying the financial health of enterprises. Appropriate capital structure enhances long-term sustainability, while excessive reliance on external financing may increase insolvency risk. The Slovak mechanical engineering sector, although economically significant, remains underexamined in this context.
Purpose of the article: This study aims to assess the financial stability of enterprises in the Slovak mechanical engineering sector by analyzing indebtedness indicators and identifying differences based on company size and legal form. It further seeks to evaluate compliance with selected financial principles such as the golden balance and parity rules.
Methods: The research is based on secondary data obtained from the Moody's database for the period 2019–2023, covering enterprises under NACE section C25, C28, C29, C30. Descriptive statistics and non-parametric methods, specifically the Kruskal–Wallis test, were used to examine the influence of size and legal form on six key debt indicators: total indebtedness, credit indebtedness, debt-to-equity ratio, interest coverage, financial leverage, and insolvency.
Findings & Value added: The average total debt remained below the 70% threshold, indicating moderate indebtedness. Statistically significant differences were found in four out of six indicators depending on company size, while legal form influenced only credit debt. The sector exhibited consistent undercapitalization and partial non-compliance with the golden balance rule, raising concerns about long-term financial sustainability. This article contributes to the existing literature by providing sector-specific evidence on indebtedness in the Slovak engineering industry. It offers practical recommendations for improving financial management practices, especially in terms of capital structure optimization, risk mitigation, and strategic planning. The findings are relevant for financial analysts, company managers, and policymakers focused on industrial development and economic resilience.

Keywords: financial analysis; indebtedness; engineering sector; capital structure; financial stability

JEL Classification: C12; D24; G32; L60; M21

1. Introduction

It is very rare for a company to finance all its activities solely from its own resources; thus, in the real economy, companies inevitably incur debt. The term indebtedness refers to the fact that a company uses external sources—namely debt—to finance its assets and is therefore leveraged. Similarly, exclusive reliance on equity financing is not feasible, as companies lacking sufficient equity would typically be unable to obtain credit (Uradnicek et al., 2016). One of the primary tasks of financial management is to determine the total required capital and subsequently select appropriate sources for its acquisition. The objective of indebtedness analysis is to identify the optimal balance between equity and debt financing, thereby establishing an appropriate capital structure (Valaskova et al., 2023).

Indebtedness, or the proper configuration of capital structure, significantly affects a company's financial stability. A high proportion of equity capital renders a company more independent and stable, as it does not have to repay interest on borrowed funds. Such companies are also more attractive to investors, given that a lower level of indebtedness provides greater potential for growth. Conversely, a low equity ratio implies financial vulnerability and increases uncertainty for creditors (Zalai et al., 2016).

Generally, equity capital is more expensive than debt capital. Shareholders expect returns on their investments that exceed typical bank deposit yields. Dividends are usually higher than loan interest payments, which is why equity is considered costlier. Furthermore, dividends are paid from net profit after taxation, which further increases their cost to the company (Kliestik et al., 2020).

The economic environment and the market are constantly evolving, making it necessary to apply new methods for calculations of various financial aspects. This is why financial analysis plays an important role in supporting the financial management of companies (Karas and Reznakova, 2020). The necessity of financial analysis is also emphasized by Du Jardin (2025), who argue that relying solely on financial analysis based on past results is no longer sufficient; it should be supplemented with non-financial measurement methods. They analyzed methods of financial performance and found that companies typically prepare financial analyses independently and regularly, using internal systems, while determining which indicators are most applied (Kliestik et al., 2019; Valaskova et al., 2020).

It is crucial for companies to prepare their financial statements in a way that allows comparison over time, ensuring consistent accounting procedures. Durica et al. (2019) highlighted important information about financial analysis methods, sources, and databases within the Slovak business context. One such database is CRIF – Slovak Credit Bureau, which offers business, consumer, and marketing information. However, the accessibility of this database is limited, as it is not affordable for all interested parties. The study concluded that well-organized information and data sources are essential for effective financial analysis (Durica and Frnda, 2021).

A comprehensive understanding of a company's current financial position is essential for effective management. Financial analysis serves as a fundamental tool to evaluate the overall financial health of an enterprise, providing critical insights that support strategic decision-making and planning processes. Financial analysis of indebtedness is especially important, as it offers a detailed view of the company's capital structure and enables assessment of the

balance between equity and external financing sources (Niessner et al., 2022; Valaskova et al., 2018).

The origins of financial analysis trace back to the advent of monetary systems. Over time, the methods and techniques have evolved in response to prevailing economic conditions. While the structure and depth of analysis have changed significantly, the fundamental principles and objectives have remained consistent (Slosarova and Blahusiakova, 2017). The modern form of financial analysis, as recognized today, originated in the United States. In Slovakia, the term gained wider relevance only after 1989, concurrent with the transition to a market-oriented economy (Kovacova et al., 2019a).

Financial and economic analysis is a core component of financial management, providing essential feedback on company performance across various domains. It enables managers to assess whether strategic objectives have been met and to identify areas requiring corrective actions or risk mitigation (Baculikova and Sochulakova, 2016).

Until 1992, the term "economic activity analysis" was more commonly used in Slovakia in relation to financial assessment. These analyses reflected conditions of the centrally planned economy and were based on mandatory indicators. Although some methodological elements overlapped with modern financial analysis, the two approaches are not directly comparable due to fundamental differences in economic systems. Today, the terms financial analysis and financial-economic analysis are widely accepted and used in Slovakia (Valaskova et al., 2017).

Financial analysis is predominantly applied within business enterprises and is generally understood as a comprehensive assessment of a firm’s financial position. Temporally, it is divided into ex post and ex ante analysis: ex post analysis evaluates past financial performance, while ex ante focuses on current data to forecast future financial conditions (Durica et al., 2023).

The primary aim of financial analysis is to assess a company's financial health, identify potential weaknesses that could lead to future difficulties, and highlight strengths that can be leveraged for sustainable development (Kovacova and Kliestik, 2017).

The functions and objectives of financial analysis stem from the needs of financial decision-making, which is central to corporate financial management. Effective decision-making requires thorough understanding of managed phenomena, their interrelationships, accurate evaluation of data, and careful consideration of risks and uncertainties.

The purpose and methodology of financial analysis vary depending on several factors. To achieve accurate and actionable results, certain methodological principles must be followed, including ensuring qualitative attributes of financial information such as relevance, reliability, and comparability—essential for professional analysis (Elexa, 2015).

The relevance of financial analysis results largely depends on the user's perspective and relationship to the analyzed entity. Users are generally classified into three groups: internal users, equity stakeholders, and external third parties (Kovacova et al., 2019b). Blahusiakova (2020) distinguishes two primary groups: internal and external users, based on access to source data that underpin financial indicators.

Data forms the critical foundation of financial analysis. Slosarova and Blahusiakova (2017) assert that primary sources of information for corporate financial analysis are financial accounting statements, with the balance sheet, income statement, and notes being particularly important in Slovakia.

Methodologies in financial analysis range from basic mathematical techniques to complex analytical models, which have become increasingly standardized over time (Jencova, 2020). Slosarova and Blahusiakova (2017) categorize these methods into basic (elementary) and advanced financial analysis techniques.

Among elementary methods, ratio analysis is one of the most frequently used tools. It offers insights into a company's historical financial condition by examining relationships between financial statement items. Typical ratio categories include liquidity, activity, profitability, and indebtedness (Karas, 2022).

Indebtedness analysis focuses on a firm's long-term solvency and ability to meet obligations from external sources. The optimal ratio of external financing depends on business type and the level of risk acceptable to creditors and shareholders (Gregova et al., 2020).

Valaskova et al. (2020) emphasize that debt ratios are essential for monitoring the structure of corporate financial resources. The balance between equity and debt financing significantly affects financial stability.

According to Gurcik (2018) and Jencova (2020), key indicators of indebtedness include total debt ratio, self-financing ratio, financial leverage, credit indebtedness, and interest coverage ratio. Advanced analytical methods aim to provide a holistic view that helps identify early warning signs of potential insolvency (Horvathova et al., 2023). Economic statistics play a crucial role in quantifying economic phenomena under specific conditions, representing economic reality through measurable indicators (Duricova et al., 2025).

2. Methodology

This section outlines the methodological framework applied in the analysis of corporate indebtedness within the Slovak mechanical engineering sector. The research is based on quantitative financial analysis techniques supported by the statistical evaluation of secondary data. The primary data source was the Moody's database, covering the period 2019–2023. The sample includes companies classified under NACE division C (Manufacturing), specifically section C28 – Manufacture of machinery and equipment not elsewhere classified.

The primary objective of the study was to assess the level of indebtedness and financial autonomy among enterprises operating in this sector. The analysis focused on key financial indicators:

- total debt ratio – proportion of total liabilities to total assets;
- equity ratio – proportion of equity to total assets;
- financial leverage – ratio of total liabilities to equity;
- interest coverage ratio – calculated as EBIT divided by interest expenses.

For each indicator, descriptive statistics were computed, including mean, standard deviation, median, and quartile distribution. Firms were further segmented according to:

- company size: micro, small, medium, and large enterprises;
- legal form: limited liability companies (Ltd.), joint-stock companies (JSC), and others;
- geographic region: administrative divisions within Slovakia.

Data processing and analysis were conducted using Microsoft Excel and SPSS software. Descriptive statistics and cross-tabulation were employed to examine structural patterns. Subsequently, a nonparametric analysis of variance (ANOVA) using the Kruskal–Wallis test was applied in SPSS due to the non-normal distribution of the dataset, which invalidates parametric testing (Teplicka, 2016).

The objective was to assess whether selected debt-related indicators—total debt ratio, credit debt, debt-to-equity ratio, interest coverage, financial leverage, and insolvency coverage—differ significantly across enterprise size categories (small, medium-sized, large, and very large) (Maros, 2024).

The hypotheses tested were:

H_0 (null hypothesis): *Enterprise size has no statistically significant effect on the selected debt indicators*.
H_1 (alternative hypothesis): *Enterprise size has a statistically significant effect on the selected debt indicators*.

The significance level was set at $\alpha = 0.05$.

The Kruskal–Wallis test was also used to evaluate whether the legal form of enterprises influences variability in indebtedness indicators (Titko et al., 2021). This analysis examined whether statistically significant differences exist in total indebtedness, credit indebtedness, debt-to-equity ratio, interest coverage ratio, financial leverage, and insolvency coverage, based on legal form—limited liability companies (Ltd.) versus joint-stock companies (JSC).

Hypotheses for this test were:
H_0 (null hypothesis): *Legal form has no statistically significant effect on the selected indicators of indebtedness*.
H_1 (alternative hypothesis): *Legal form has a statistically significant effect on the selected indicators of indebtedness*.

The significance level was again set at $\alpha = 0.05$.

Overview of the Slovak Mechanical Engineering Sector

The mechanical engineering industry represents a foundational pillar of the Slovak economy, playing a central role in ensuring long-term macroeconomic stability. The sector is characterized by a strong historical legacy and holds a prominent position within the national industrial structure. Its importance is reflected not only in its contribution to GDP and foreign trade but also in employment and labor market performance (SARIO, 2025).

According to the NACE statistical classification, the mechanical engineering sector comprises:

- NACE 25 – Manufacture of fabricated metal products, except machinery and equipment;
- NACE 28 – Manufacture of machinery and equipment n.e.c.;
- NACE 29 – Manufacture of motor vehicles, trailers, and semi-trailers;
- NACE 30 – Manufacture of other transport equipment (SK NACE, 2025).

Within the sector, NACE 29 dominates with approximately 72.10% share, followed by NACE 28 with 14.40%, NACE 25 with 12%, and NACE 30 with 1.5%.

Mechanical engineering enterprises are geographically dispersed throughout Slovakia. Regions with strong industrial traditions largely result from the historical presence of large engineering facilities. There is a significant interconnection between mechanical engineering and the automotive industry, the latter being the main driver of industrial investment in Slovakia.

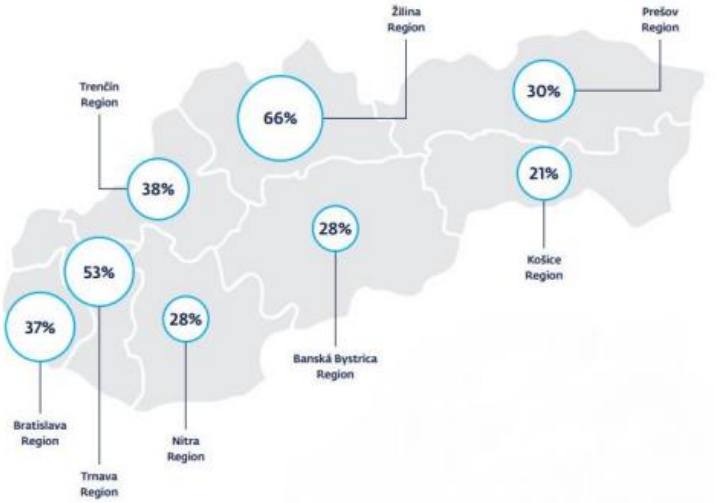
The automotive industry — the dominant sector of the Slovak economy — is primarily concentrated in the western regions, with major plants such as PSA Peugeot–Citroen (Trnava), Kia Motors (Zilina), and Volkswagen (Bratislava). These contribute substantially to passenger vehicle production. Additionally, Komarno hosts internationally recognized production of ships and boats, which is classified under broader automotive manufacturing.

Despite its strengths, the heavy specialization and investment concentration in the automotive sector create vulnerabilities. Slovakia ranks among the global leaders in vehicles produced per capita, exposing the economy to risks from external shocks. A global downturn or reduced vehicle demand could trigger increased unemployment and macroeconomic instability.

The Slovak mechanical engineering sector also includes production of rolling stock (locomotives, railcars) at plants in Martin, Trnava, ZOS Vrutky, and Tatravagonka Poprad.

Alongside automotive growth, the metalworking subsector has gained importance as a key industrial component, with enterprises engaging in advanced machining and metal-processing technologies. Figure 1 (SARIO, 2025) illustrates the regional contribution of enterprises to the sector's overall output, highlighting spatial disparities and industrial concentration within Slovakia.

Figure 1: The regional share of enterprises in the gross output of the engineering industry



Source: own processing based on SARIO (2025)

3. Results

Debt indicators represent essential tools in financial analysis, providing a detailed insight into a company's capital structure. Indebtedness should not be viewed inherently as a negative phenomenon; when managed effectively, a higher degree of financial leverage can lead to increased profitability and, consequently, higher market valuation. In essence, debt reflects the extent to which a company's assets are financed through borrowed capital. Since relying solely on either equity or debt is neither feasible nor optimal in the long run, one of the primary tasks of financial management is to determine the appropriate volume and optimal structure of capital. Therefore, debt analysis focuses on identifying the ideal ratio between equity and liabilities, which significantly affects a company's financial health and long-term sustainability.

The analysis of total debt and self-financing ratios helps to identify potential risks associated with asset financing and is thus essential in evaluating a company's financial stability.

Total debt indicates the extent to which a company's assets are financed by external capital and

serves as a credit risk indicator. It is one of the most important financial stability metrics and is frequently monitored. The generally recommended threshold is up to 50%, with an upper acceptable limit of 70%. In 2023, the average total debt ratio in the Slovak mechanical engineering sector reached 58.61%, meaning that approximately 0.59€ of every 1€ in assets was financed by debt. The highest recorded value occurred in 2019 at 61%. Despite fluctuations throughout the observed period, the indicator remained within acceptable bounds. A year-over-year decrease of 1.86% was recorded from 2022 to 2023.

The self-financing ratio reflects a company's financial independence and stability. Despite exhibiting fluctuations during the analyzed period, the indicator remained within recommended values and never dropped below 30%, indicating an adequate level of internal financing. This

reduced dependency on external sources and enhanced resilience to economic shocks. The best performance was observed in 2023, when the average self-financing ratio reached 41.39%, representing an increase of 2.76% compared to the previous year. The lowest values were recorded between 2019 and 2021, likely due to the impacts of the COVID-19 pandemic, with the lowest average in 2019 at 38.36%.

Short-term indebtedness reflects the degree to which a company uses liabilities due within one year. During the observed period, the indicator exhibited a fluctuating trend. The lowest value was recorded in 2023, when approximately 0.43€ of every 1€ in assets was financed through short-term debt, representing a year-over-year decline of 3.75% or an absolute change of 1.63. The highest level of short-term indebtedness was observed in 2019, at 0.44€ per 1€ of assets. These findings indicate that companies in the mechanical engineering sector tend to rely more on short-term financing, potentially increasing their exposure to liquidity risk.

Long-term indebtedness, in contrast to short-term debt, represents a more stable and favorable method of financing assets over the long term. This indicator, similarly, to short-term debt, can only assume non-negative values (Cisko and Kliestik, 2013; Camska and Klecka, 2020). In 2023, the average long-term debt ratio in the mechanical engineering sector reached 16.74%, indicating that 0.17€ of every 1€ in assets was financed by long-term liabilities. This represents an increase of 3.20% compared to the previous year. The highest value during the analyzed period was recorded in 2020 at 17.85%. Compared to short-term debt, long-term indebtedness showed greater stability, suggesting a balanced and sustainable capital structure across the sector.

The coverage of non-current assets (long-term assets) reflects adherence to the golden balance rule. The value of this indicator among mechanical engineering enterprises ranged from 0.49 to 0.93 during the analyzed period. In 2023, the coverage of non-current assets stood at 0.52, representing a decrease of almost 43% compared to the preceding year. In all analyzed years, the indicator remained below the threshold of 1, indicating undercapitalization. Non-compliance with the golden balance rule implies that long-term assets were not fully financed with long-term sources, suggesting a riskier financing structure in the sector (Karas and Reznakova, 2021).

In the final stage of the analysis, attention is directed toward evaluating the golden balance rule, the golden parity rule, and the golden risk equalization rule. These financial principles constitute fundamental guidelines for maintaining financial stability and ensuring an optimal equilibrium between equity and debt financing.

The golden balance rule posits that the maturity structure of a company’s assets should correspond to the maturity structure of its financing sources. Specifically, long-term assets should be financed through long-term capital, while short-term assets should be financed using short-term resources. In 2023, the ratio of short-term liabilities to current assets reached 0.97, indicating that 97% of current assets were covered by short-term funding. Compared to the previous period, this represents a decline of approximately 1%. These findings suggest that enterprises within the mechanical engineering sector should pursue improved alignment between asset structure and financing sources to enhance liquidity and minimize refinancing risk.

The golden parity rule asserts that the value of equity should not be lower than the value of fixed assets. This reflects a company's ability to finance long-term investments using its own capital. Throughout the analyzed period, the value of this indicator remained below 1.0, indicating consistent non-compliance with the rule. The most favorable outcome was observed in 2023, when the ratio reached 0.88, representing a 5.89% increase relative to the prior year. Conversely, the weakest performance occurred in 2019, with a value of 0.68. Persistent

violation of this principle suggests structural undercapitalization, which may compromise the long-term financial resilience of enterprises. Accordingly, firms in the engineering sector should prioritize the strengthening of equity capital to mitigate long-term financial risk.

The golden risk equalization rule stipulates that a company's equity should exceed its external liabilities, thereby signifying a stable financial position. During the observed period, the value of this indicator consistently exceeded 1.0, indicating that own resources surpassed external liabilities across all years—a highly favorable outcome. The strongest performance was recorded in 2023, with a ratio of 1.31, denoting that equity capital exceeded external liabilities by 31%. This represents a year-over-year increase of 10.58%. These results indicate a robust capital structure and suggest that engineering enterprises, on average, maintained a sound level of financial autonomy during the period under review (Karas and Reznakova, 2023).

This section summarizes the key empirical findings derived from the applied methodological framework, including the data collection, analysis, and verification of hypotheses related to the capital structure and financial stability of enterprises operating in the mechanical engineering sector.

Based on the comparison between the p-values and the predefined significance level ($\alpha = 0.05$), the results of the Kruskal–Wallis test indicate that for the indicators interest coverage and insolvency, the p-values (0.630 and 0.149, respectively) exceed the alpha threshold. Therefore, we fail to reject the null hypothesis (H_0) and conclude that the size of the enterprise does not have a statistically significant effect on these two indebtedness indicators.

In contrast, for the remaining indicators—total indebtedness, credit indebtedness, debt-to-equity ratio, and financial leverage—the p-values are below 0.05, indicating statistically significant differences between enterprise size categories. Consequently, the null hypothesis is rejected in favor of the alternative hypothesis (H_1), suggesting that enterprise size significantly influences these aspects of indebtedness. These results are summarized in Table 1.

Table 1: Debt indicators by enterprise size

Indicator	P-value	Hypothesis test result
Total indebtedness	0.000	Reject the null hypothesis
Credit indebtedness	0.047	Reject the null hypothesis
Debt-to-equity ratio	0.000	Reject the null hypothesis
Interest coverage	0.630	Do not reject the null hypothesis
Financial leverage	0.000	Reject the null hypothesis
Insolvency	0.149	Do not reject the null hypothesis

Source: own processing

These results suggest that enterprise size plays a significant role in determining the level and structure of corporate indebtedness, particularly with respect to total debt, credit debt, capital structure (debt-to-equity), and leverage. However, no significant relationship was found between enterprise size and the ability to cover interest obligations or mitigate insolvency risk.

Based on the comparison between the p-values and the predetermined significance level ($\alpha = 0.05$), the results indicate that only the credit debt indicator exhibits a statistically significant difference with respect to the legal form of enterprises. Specifically, the p-value for this indicator is 0.010, which is below the α threshold. Consequently, the null hypothesis (H_0) is rejected in favor of the alternative hypothesis (H_1), indicating that the legal form of the enterprise has a significant effect on credit indebtedness. These findings are presented in Table 2.

For all other analyzed indicators—total debt, debt-to-equity ratio, interest coverage ratio, financial leverage, and insolvency coverage—the p-values exceed the significance threshold,

Table 2: Debt indicators by legal form of enterprises

Indicator	P-value	Hypothesis test result
Total indebtedness	0.324	Do not reject the null hypothesis
Credit indebtedness	0.010	Reject the null hypothesis
Debt-to-equity ratio	0.324	Do not reject the null hypothesis
Interest coverage	0.723	Do not reject the null hypothesis
Financial leverage	0.324	Do not reject the null hypothesis
Insolvency	0.713	Do not reject the null hypothesis

Source: own processing

leading to the retention of the null hypothesis. This suggests that the legal form of enterprises does not significantly influence these debt-related indicators.

4. Discussion

The analysis of indebtedness within the Slovak engineering industry revealed that the overall debt ratio of enterprises did not exceed the recommended threshold of 70%, indicating a financially sound level of indebtedness in this sector. From an investor's perspective, this is considered favorable, as there is generally greater interest in enterprises that maintain lower levels of financial leverage.

The self-financing ratio remained above 30% throughout the observed period, which suggests that enterprises in the engineering industry can sustain their business operations through internally generated funds.

Short-term debt ranged from 41.87% to 44.10%, indicating a high reliance on short-term liabilities to finance operations. In contrast, long-term debt varied between 8.60% and 9.23%, which is deemed acceptable and reflects a stable long-term financial base with minimal additional financing costs.

The credit debt ratio, also within the range of 8.60% to 9.23%, demonstrates that enterprises in this sector do not heavily rely on bank financing. The interest coverage ratio exhibited considerable fluctuation, ranging from 28.04 to 222.85. The sharp increase in this indicator in the final year of the analyzed period suggests that engineering enterprises possess a strong ability to cover interest expenses, possibly due to post-pandemic recovery. The lowest values were recorded during 2020–2021, likely reflecting the financial strain caused by the COVID-19 pandemic. Interest burden ranged from 3.75% to 15.69%, while the debt-to-equity ratio results indicate that enterprises in this sector generally maintain a healthy balance between equity and debt financing.

However, the fixed asset coverage ratio implies that some firms may face challenges in financing their non-current assets, raising concerns regarding the alignment of asset structure and capital sources. The cash flow debt ratio ranged significantly from -24.78 to 27.28, with values in 2019 and 2022 indicating that companies were unable to service their debt obligations from operational cash flows. The results for the financial leverage indicator suggest that enterprises in this industry utilize debt capital to finance their operations, though within acceptable limits.

The financial independence ratio, ranging from 1.04 to 1.18, suggests that companies are generally capable of covering liabilities using internal resources. Furthermore, the capital adequacy ratio ranged between 2.33 and 4.10, indicating a state of overcapitalization within the sector.

The insolvency ratio, recorded between 5.81 and 6.92, points to primary insolvency risks, i.e., companies may be unable to settle their obligations in a timely manner. However, this finding requires further validation through a liquidity analysis.

The application of statistical methods confirmed that selected debt indicators are significantly influenced by enterprise size, legal form, and NACE classification. Specifically: (i) firm size significantly affects the interest coverage and insolvency indicators; (ii) legal form has a statistically significant influence on credit debt; (iii) the NACE classification impacts the insolvency indicator; and (iv) for the remaining debt indicators, no statistically significant relationship was identified with enterprise size or legal form.

Overall, the financial analysis focused on indebtedness suggests that the Slovak engineering industry maintains a relatively stable financial condition. Enterprises generally preserve a healthy level of indebtedness and are capable of financing operations through equity capital.

Nonetheless, certain areas warrant attention, particularly regarding short-term debt levels, fixed asset coverage, capital adequacy, and insolvency risks. It is advisable for engineering enterprises to improve liquidity, which can help mitigate insolvency risks. This could be achieved through working capital optimization.

Moreover, strict adherence to the golden balance rule is crucial, as it serves as a key instrument for ensuring financial stability. This implies maintaining an appropriate proportion between equity and debt capital. Enterprises should aim to increase the share of equity in their capital structure.

In general, engineering firms should place greater emphasis on: (i) financial planning; (ii) the quality of financial analysis; (iii) continuous education and reskilling of employees; and (iv) innovation.

Long-term financial planning enhances the ability to respond effectively to economic fluctuations. High-quality financial analysis provides valuable insight into the firm's financial position, facilitating informed decision-making and strategic foresight.

Ongoing training and upskilling are essential considering technological and innovative advancements, which may affect workforce qualifications. Innovation plays a critical role by enabling process optimization, which can lead to cost reductions, increased competitiveness, new business opportunities, and higher-quality products and services.

5. Conclusions

The primary objective of this study was to identify, evaluate, and compare key financial parameters of enterprises operating within a specific segment of the national economy—namely, the engineering industry—with a particular focus on debt-related indicators. In addition to conducting a detailed financial assessment, the research also aimed to propose actionable recommendations to enhance the financial stability and long-term sustainability of the analyzed enterprises.

The study first elaborated on the theoretical foundations of financial analysis, emphasizing its methodologies, tools, and relevance for assessing corporate financial health. Special attention was given to the analysis of indebtedness, including the interpretation of core debt-related ratios. These conceptual frameworks were then applied in the empirical part of the research, which utilized a dataset of enterprises from the engineering sector, classified according to the NACE statistical framework. A set of key debt indicators was used to conduct a comprehensive evaluation of the sector's financial position.

The findings of the analysis revealed several critical insights. While the sector demonstrates a relatively stable level of overall indebtedness—remaining below the commonly accepted threshold—the analysis also uncovered risk-prone areas. Notably, issues related to short-term debt exposure, fixed asset coverage, and primary insolvency were identified as potential threats to financial resilience. The observed fluctuations in credit indebtedness and interest coverage

further highlight the variability in financial health among enterprises, some of which may face challenges in maintaining adequate liquidity and solvency, especially during adverse economic conditions.

Furthermore, the statistical analysis confirmed that debt indicators are not uniform across all enterprises. Variations were found based on firm size, legal structure, and sectoral classification. This suggests that tailored financial strategies, sensitive to firm-specific characteristics, are essential for effective financial management and risk mitigation.

Based on these results, the study proposes a series of targeted measures aimed at improving financial stability in the engineering sector. These include enhancing liquidity management through working capital optimization, reinforcing equity capital to ensure a healthier capital structure, and adhering to fundamental principles of financial balance such as the golden balance rule. Additionally, the promotion of long-term financial planning, continuous professional development, and innovation adoption is emphasized as crucial for reinforcing the sector's resilience against external shocks.

In conclusion, the contribution offers both theoretical enrichment and practical value. The findings serve as a relevant reference point for financial managers, investors, and policymakers interested in strengthening the economic performance and sustainability of enterprises in capital-intensive industries. Future research should aim to extend this analysis across different time periods or economic sectors to validate the generalizability of the findings and refine the proposed recommendations.

Author contributions: All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding: This research received no external funding.

Data Availability Statement: Data sharing is not applicable to this article

Acknowledgments: This research was financially supported by the Slovak Research and Development Agency Grant VEGA 1/0494/24: Metamorphoses and causalities of indebtedness, liquidity and solvency of companies in the context of the global environment.

Conflicts of Interest: The authors declare no conflict of interest.

References

Baculikova, N., & Sochulakova, J. (2016). *Financno-ekonomicka analyza*. Trencin: FSEV TnUAD.

Blahusiakova, M. (2020). *Vyvoj financneho zdravia podnikov vybranych odvetvi v Slovenskej republike v kontexte pandemie COVID-19* (1st ed.). Bratislava: Letra Edu.

Camska, D., & Klecka, J. (2020). Comparison of prediction models applied in economic recession and expansion. *Journal of Risk and Financial Management, 13*(3), 52. https://doi.org/10.3390/jrfm13030052

Cisko, S., & Kliestik, T. (2013). *Financny manazment podniku II*. Zilina: EDIS.

Du Jardin, P. (2025). Designing ensemble-based models using neural networks and temporal financial profiles to forecast firms' financial failure. *Computational Economics*, *65*(1), 149-209. https://doi.org/10.1007/s10614-024-10579-4

Durica, M., & Frnda, J. (2021). *Using data mining methods to predict financial distress*. Zilina: EDIS.

Durica, M., Frnda, J., & Svabova, L. (2019). Decision tree based model of business failure prediction for Polish companies. *Oeconomica Copernicana*, *10*(3), 453-469. https://doi.org/10.24136/oc.2019.022

Durica, M., Frnda, J., & Svabova, L. (2023). Artificial neural network and decision tree-based modelling of non-prosperity of companies. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *18*(4), 1105–1131. https://doi.org/10.24136/eq.2023.035

Duricova, L., Kovalova, E., Gazdikova, J., & Hamranova, M. (2025). Refining the best-performing V4 financial distress prediction models: Coefficient re-estimation for crisis periods. *Applied Sciences*, *15*(6), 2956. https://doi.org/10.3390/app15062956

Elexa, L. (2015). *Business financial analysis* (1st ed.). Banska Bystrica: Vydavatelstvo Mateja Bela v Banskej Bystrici Belianum.

Gregova, E., Valaskova, K., Adamko, P., Tumpach, M., & Jaros, J. (2020). Predicting financial distress of Slovak enterprises: Comparison of selected traditional and learning algorithms methods. *Sustainability*, *12*(10), 3954. https://doi.org/10.3390/su12103954

Gurcik, L. (2018). *Podnikatelska analyza a kontroling* (1st ed.). Nitra: Slovenska polnohospodarska univerzita v Nitre.

Horvathova, J., Mokrisova, M., & Baca, M. (2023). Bankruptcy prediction for sustainability of businesses: The application of graph theoretical modeling. *Mathematics*, *11*(24), 4966. https://doi.org/10.3390/math11244966

Jencova, S. (2020). *Financno-ekonomicka analyza podnikatelskych subjektov* (4th revised and expanded ed.). Presov: Bookman.

Karas, M. (2022). The hazard model for European SMEs: Combining accounting and macroeconomic variables. *Journal of Competitiveness*, *14*(3), 76–92. https://doi.org/10.7441/joc.2022.03.05

Karas, M., & Reznakova, M. (2020). Cash Flows Indicators in the Prediction of Financial Distress. *Engineering Economics*, *31*(5), 525-535. https://doi.org/10.5755/j01.ee.31.5.25202

Karas, M., & Reznakova, M. (2021). The role of financial constraint factors in predicting SME default. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 1*6*(4), 859–883. https://doi.org/10.24136/eq.2021.032

Karas, M., & Reznakova, M. (2023). A novel approach to estimating the debt capacity of European SMEs. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *18*(2), 551–581. https://doi.org/10.24136/eq.2023.017

Kliestik, T., Valaskova, K., Kliestikova, J., Kovacova, M., & Svabova, L., (2019). *Prediction of financial health of business entities in transition economies*. Zilina: EDIS.

Kliestik, T., Valaskova, K., Lazaroiu, G., Kovacova, M., & Vrbka, J. (2020). Remaining financially healthy and competitive: The role of financial predictors. *Journal of Competitiveness*, *12*(1), 74–92. https://doi.org/10.7441/joc.2020.01.05

Kovacova, M., & Kliestik, T. (2017). Logit and Probit application for the prediction of bankruptcy in Slovak companies. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, *12*(4), 775-791. https://doi.org/10.24136/eq.v12i4.40

Kovacova, M., Kliestik, T., Valaskova, K., Durana, P., & Juhaszova, Z. (2019a). Systematic review of variables applied in bankruptcy prediction models of Visegrad Group countries. *Oeconomia Copernicana*, *10*(4), 743–772. https://doi.org/10.24136/oc.2019.034

Kovacova, M., Valaskova, K., Durana P. & Kliestikova, J. (2019b). Innovation management of the bankruptcy: Case study of Visegrad Group countries. *Marketing and Management of Innovations*, *4*, 241–251. http://doi.org/10.21272/mmi.2019.4-19

Maros, M. (2024). *Ekonomicka statistika*. Nitra: Univerzita Konstantina Filozofa v Nitre.

Niessner, T., Gross, D. H., & Schumann, M. (2022). Evidential strategies in financial statement analysis: A corpus linguistic text mining approach to bankruptcy prediction. *Journal of Risk and Financial Management, 15*(10), 459. https://doi.org/10.3390/jrfm15100459

SARIO. (2025). *Mechanical engineering industry in Slovakia*. SARIO. https://www.sario.sk/sites/default/files/sario-mechanical-engineering-industry-in-slovakia2025-02-28.pdf

SK NACE. (2024). SK NACE podla ICO. SK NACE. https://www.sknace.sk/sk-nace-podla-ico/

Slosarova, A., & Blahusiakova, M. (2017). *Analyza uctovnej zavierky* (1st ed.). Bratislava: Wolters Kluwer SR.

Teplicka, K. (2016). *Ekonomicka statistika* (1st ed). Kosice: TU FBERG.

Titko, M., Novak, L., & Janosikova, M. (2021). *Prakticka statistika*. Zilina: EDIS.

Uradnicek, V., Kral, P., Bielikova, T., Cut, S., Stachova, M., & Kollar, I. (2016). *Variacne metody predikcie financneho zdravia podnikov v podmienkach dynamickeho prostredia* (1st ed). Banska Bystrica: Belianum.

Valaskova, K., & Podhorska, I. (2017). Prediction models in the context of international environment. In *Globalization and its socio-economic consequences* (pp. 2792–2800). University of Zilina.

Valaskova, K., Gajdosikova, D., & Belas, J. (2023). Bankruptcy prediction in the postpandemic period: A case study of Visegrad Group countries. *Oeconomia Copernicana*, *14*(1), 253–293. https://doi.org/10.24136/oc.2023.007

Valaskova, K., Gavurova, B., Durana, P., & Kovacova, M. (2020). Alter ego only four times? The case study of business profits in the Visegrad Group. *E&M Economics and Management*, *23*(3), 101–119. https://doi.org/10.15240/tul/001/2020-3-007

Valaskova, K., Kliestik, T., & Kovacova, M. (2018). Management of financial risks in Slovak enterprises using regression analysis. *Oeconomia Copernicana*, *9*(1), 105-121. https://doi.org/10.24136/oc.2018.006

Zalai, K., David, A., Snircova, J., Moravcikova, E., Hurtosova, J., & Tucnikova, D. (2016). *Financno-ekonomicka analyza podniku* (9th revised and expanded ed.). Bratislava: Sprint 2.