

# Determinants of the capital structure of Polish industrial enterprises

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**Abstract:** The subject of the article covers the determinants of the capital structure. The aim of this study is to examine the relationship between the capital structure and the liquidity, profitability, age and size of Polish industrial companies. The literature review allowed for the formulation of hypotheses that Polish enterprises shape the capital structure in accordance with the theory of the hierarchy of financing sources. According to this hypothesis, five detailed hypotheses were selected. In order to verify the hypotheses, statistical methods such as basic descriptive statistics and the Pearson correlation coefficient were used. The sample consists of 100 companies listed on the Warsaw Stock Exchange. The study covers the years 2010–2019. The research results confirm the negative relationship between liquidity and debt. Companies that have difficulties with meeting their current liabilities to a greater extent use borrowed capital financing. There is also a negative correlation between profitability and debt. This means that enterprises that use foreign capital to a greater extent are less profitable. The hypothesis that larger companies have higher levels of debt is also confirmed. In addition, it has been noted that older companies are more likely to use long-term debt. On the basis of the obtained results, it can be concluded that the capital structure of Polish industrial enterprises is consistent with the theory of the hierarchy of financing sources. The research complements the existing research on the issues of shaping the capital structure. It provides results based on current data, which makes it possible to use them in practice. The obtained results may facilitate the decision-making process in the scope of capital structure for enterprises.

**Keywords:** capital structure, capital structure theories, liquidity, profitability, industrial companies

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## 1. Introduction

Issues related to shaping the capital structure of enterprises have been the subject of both theoretical and empirical research for many years. The authors made attempts to determine the determinants of the capital structure. As a result of the research, many theories of capital structure emerged. One

of them is the theory of Miller and Modigliani, also known as the theory of the irrelevance of the capital structure (Modigliani and Miller, 1958). The authors concluded that in the conditions of a perfectly competitive capital market, the capital structure does not affect the goodwill. Then, in 1977, Miller confirmed the theory of the irrelevance of the capital structure. The creator proved that the introduction of personal income tax and legal persons means that debt financing does not affect the value of the enterprises (Miller, 1977). This theory was constantly developed as a result of which new theories emerged, including the signalling theory and the theory of the hierarchy of funding sources. These concepts emphasize various factors determining the company's capital structure. Numerous studies show that profitability and liquidity have a significant impact on the capital structure. According to the theory of the hierarchy of financing sources, enterprises prefer to finance their activities with equity. Thus, companies with higher profitability use less foreign capital to a lesser extent (Pinegar and Wilbricht, 1989). A different concept is illustrated by the signalling theory, according to which profitable companies are characterized by a high share of debt in the capital structure (Connelly et al., 2011).

The subject of shaping the capital structure is very complex. This is confirmed by numerous empirical studies, on the basis of which it is not possible to draw unequivocal conclusions. When analyzing the same factors, the authors often obtained different results depending on the selection of the sample (including the specificity of the industry, the period of research, the size of the sample).

The purpose of this study is to investigate the relationship between company liquidity, profitability, size, age and corporate debt. Based on the literature review, it is assumed that Polish enterprises shape the capital structure in accordance with the theory of the hierarchy of financing sources. In line with this assumption, five hypotheses were selected. It is assumed that both age, financial liquidity and profitability are negatively correlated with the company's debt, while the size of the enterprise shows a positive relationship with the capital structure. However, no current empirical studies confirming the hypotheses for Polish industrial companies have been found. Thus, in order to fill the research gap, the study covered a hundred industrial companies listed on the Warsaw Stock Exchange. In order to verify the hypotheses, statistical methods such as basic descriptive statistics and the Pearson correlation coefficient were used.

## 2. Literature review

The literature on the subject presents various approaches to the concept of capital structure. However, in the most general terms, the capital structure is determined by the proportions of the share of equity and foreign capital in the financing of the enterprise. Sometimes the capital structure is understood as the ratio of long-term debt to equity. Then again, the task of the capital structure theory is to define the method of making decisions within the financing of the company (Bętkowska, 2016).

The literature also discusses various classifications of factors influencing the capital structure. The most important determinants of the capital structure, the authors mention, among others, liquidity, profitability, size and age of the enterprise (Mađra-Sawicka and Kalisia,

2017). Financial liquidity is understood as the company's ability to pay its short-term liabilities on time (Kuciński, 2021). Profitability, alternatively, is defined as the financial condition of an enterprise expressed in terms of the financial result from economic activity. The profit level does not objectively reflect the company's profitability, so it is defined as the ratio of profit to the financial statement items such as sales revenues, equity, assets (Gawryś and Trippner, 2017).

Duliniec conducted a study on the basic determinants of capital structure. Based on the current state of research in the field of financing structure, the author concludes that when choosing sources of financing, enterprises are mainly guided by the current situation of the company and the conditions on the financial market. It also claims that the company's capital structure is the cumulative result of decisions made in the selection of financing sources. The main factors influencing these decisions include: company size, profitability, growth potential, materiality of assets, the average level of the leverage ratio for the industry and expected inflation (Duliniec, 2015).

Jerzemowska and Hajduk studied the relationship between the capital structure of companies and profitability. The authors cite the existing theories of capital structure, which, however, do not clearly define the direction of the impact of this relationship. The research sample included 196 companies listed on the Warsaw Stock Exchange in 2005–2010. The study proves a positive relationship between profitability and the capital structure of enterprises from the trade and services sector (Jerzemowska and Hajduk, 2015).

Hamrol and Siczko took up the subject of the capital structure of enterprises and the factors shaping it. The research covered companies listed on the Warsaw Stock Exchange. The hypothesis about the possibility of identifying factors influencing the structure of Polish enterprises was confirmed (Hamrol and Siczko, 2006).

The analysis of the capital structure on the Polish market was also carried out by Hajduk. The author, based on the review of empirical research and the results of own research, presents the classification of the most important determinants of the capital structure and discusses the methods of analyzing capital structure factors (Hajduk, 2018).

Sorana Vătavu explored the relationship between capital structure and financial performance. The sample included 196 Romanian companies from the manufacturing sector. The study covered the years 2003–2010. To analyze the capital structure, the ratios of long-term debt, short-term debt, total debt and total equity were used. Then again, the determinants of the results were return on assets and return on equity. Research shows that Romanian companies that finance their operations with equity and avoid debt achieve better financial results. Firms facing financial difficulties prefer more indebtedness (Vătavu, 2015).

Anila Çekrezi also conducted a study of the relationship between the structure of capital and the liquidity and profitability of companies. 65 unlisted Albanian companies in 2008–2011 were surveyed. Research results confirm the impact of liquidity, profitability and company size on financial leverage. The author also proves a significant positive relationship between size and financial leverage and a significant negative relationship between the profitability of total assets and financial leverage. The results show that the capital structure of enterprises varies depending on the industry (Çekrezi, 2013).

Kinga Mazur investigated the relationship of the capital structure with variables such as: asset structure, liquidity, company size, dividend policy, product uniqueness, development opportunities, profit volatility, effective tax rate. The aim of the article was to define the dominant theory of capital structure used by the studied companies. The sample covers Polish companies listed on the Warsaw Stock Exchange in 2000–2004. The research results show the dominant importance of the pecking hypothesis in the financing of Polish companies (Mazur, 2007).

Alipour, Mohammadi and Derakhshan also examined the factors influencing the capital structure. They surveyed production companies listed on the Iranian stock exchange in 2003–2007. The survey results show the relationship between profitability, liquidity, company size, financial flexibility, and asset structure with the capital structure of Iranian companies. Moreover, it was found that short-term debt plays an important role in the financing of the surveyed companies. The authors confirm the compliance of the research results with some theories of capital structure (Alipour, Mohammadi and Derakhshan, 2015).

Uremadu and Efobi emphasize the importance of the capital structure for the financial stability, profitability and liquidity of companies, especially in times of global financial crises. The sample includes data from 10 Nigerian companies for the period 2002–2006. The research results show the negative impact of long-term debt, the ratio of long-term debt to total liabilities and short-term debt to total liabilities on returns. The authors recommend Nigerian companies to maintain a balanced share of long-term debt in the capital structure (Uremadu and Efobi, 2012).

Sheikh and Wang studied the determinants of the capital structure of 160 production companies listed on the Karachi Stock Exchange in 2003–2007. The results show a negative relationship between the debt ratio and liquidity, profitability, asset structure and profit volatility, and a positive relationship with company size. The authors of the article confirm compliance with the compromise theory, pecking order theory and agency theory (Sheikh and Wang, 2011).

Najeb Masoud also researched the factors influencing the capital structure of companies. The study was conducted on a sample of Libyan listed companies and covered the years 2008–2013. The research results show that both the pecking order theory and the trade-off theory can explain the financial decisions of the surveyed companies. Researchers conclude that high rates of return and high price-earnings ratios contribute to the dominance of equity in the financing structure, as both factors reduce the cost of equity financing (Masoud, 2014).

### 3. Sample

This study covers companies listed on the Warsaw Stock Exchange. The data comes from the Notoria database containing financial statements of enterprises. The examined factors are characterized by different specifics depending on the industry, therefore they have an impact on decisions regarding the capital structure. In order to avoid erroneous results, only companies operating in industry were separated from all enterprises included in the database. Companies with missing data were excluded to minimize the error rate in the results obtained. After the selection, a sample of 100 companies remained. The data covers the period of 10 years (2010–2019). Thus, the database contains annual panel data of 100 Polish industrial companies, which gives 1000 annual observations.

## 4. Methodology

Statistical calculations used in the conducted research were performed with the SPSS software. The variables have been divided into two groups: dependent and independent. The dependent variables included financial liquidity, profitability, age and company size. Then again, debt ratios are independent variables.

Financial liquidity was measured using three ratios: the current, quick and increased liquidity ratio. Profitability was expressed using the return on assets (ROA) and return on equity (ROE) ratios. At the same time, the size of the company as the natural logarithm of total assets. The method of calculating individual indices concerning dependent variables is presented in Table 1.

Table 1. Dependent variables—the method of calculating

Dependent variable name	Formula
Current liquidity ratio	$\frac{\text{current assets}}{\text{short-term liabilities}}$
Quick liquidity ratio	$\frac{\text{current assets} - \text{inventories} - \text{short-term prepayments}}{\text{short-term liabilities}}$
Cash liquidity ratio	$\frac{\text{cash}}{\text{short-term liabilities}}$
Return on total assets (ROA)	$\frac{\text{net profit}}{\text{total assets}}$
Return on equity (ROE)	$\frac{\text{net profit}}{\text{equity capital}}$
The size of the company	$\ln(\text{total assets})$

Source: Sierpińska and Jachna, 2009.

The second group of analyzed variables were independent variables measured with the debt ratios: capital structure ratio, total debt ratio, long-term debt and short-term debt. The method of calculating individual indices for independent variables is presented in Table 2.

Table 2. Independent variables—the method of calculating

Independent variable name	Formula
Capital structure ratio	$\frac{\text{equity capital}}{\text{total liabilities}}$
Total debt ratio	$\frac{\text{total liabilities}}{\text{total assets}}$
Long-term debt ratio	$\frac{\text{long-term liabilities}}{\text{equity capital}}$
Short-term debt ratio	$\frac{\text{short-term liabilities}}{\text{equity capital}}$

Source: Sierpińska and Jachna, 2009.

The most frequently studied factors influencing the capital structure are: age, size of the company, industry, profitability and liquidity. The research conducted so far does not clearly reflect in what direction and with what force individual determinants of the capital structure affect. However, as there is sufficient evidence that the industry in which the company operates has a significant impact on its capital structure, only industrial companies were examined (Çekrezi, 2013). Taking into account the above literature review, four research hypotheses were formulated.

Hypothesis 1: The size of the enterprise is positively correlated with debt. Thus, the larger the company, the higher the debt level. This assumption results mainly from the asymmetry of information in smaller companies, as well as with difficult access to foreign capital.

Hypothesis 2: The age of the enterprise is negatively correlated with debt. Thus, the older the enterprise, the lower the debt level. This hypothesis is based on the theory of the hierarchy of funding sources. Older enterprises accumulate equity capital by resigning from external sources of financing.

Hypothesis 3: The age of the enterprise is positively correlated with long-term debt. Older enterprises are more likely to use long-term sources of financing.

Hypothesis 4: Liquidity is negatively correlated with debt. Thus, the greater the liquidity, the lower the debt level. Companies that have difficulties in paying their current liabilities prefer greater debt.

Hypothesis 5: Profitability is negatively correlated with debt. Enterprises financing their operations with equity and avoiding debt achieve better financial results.

Statistical methods such as basic descriptive statistics in the form of mean, median, minimum, maximum value and standard deviation were used to describe the research sample. However, in order to verify the hypotheses, the Pearson correlation coefficient was used due to the quantitative nature of all variables.

## 5. Results and their analysis

In order to pre-analyze the research sample, descriptive statistics (mean, median, minimum, maximum value, standard deviation) were calculated.

Table 3. Basic descriptive statistics

Variable	Mean	Median	Minimum	Maximum	Standard deviation
Current liquidity ratio	1.70	1.53	0.66	7.57	0.91
Quick liquidity ratio	1.09	1.06	0.34	3.24	0.47
Cash liquidity ratio	0.33	0.23	0.02	2.16	0.36
Return on total assets (ROA)	0.04	0.04	-0.24	0.17	0.06
Return on equity (ROE)	0.07	0.08	-0.53	0.69	0.14
The size of the company	13.24	13.12	10.01	2.10	1.75

Company age	44.80	24.00	8.00	246.00	43.36
Capital structure ratio	1.30	1.25	0.12	3.83	0.75
Total debt ratio	0.48	0.46	0.09	0.92	0.15
Long-term debt ratio	0.49	0.28	0.01	7.06	0.86
Short-term debt ratio	0.99	0.66	0.09	4.85	0.95

Source: Author's own elaboration.

The data collected in Table 3 show the descriptive statistics of the studied variables. When analyzing the three financial liquidity ratios, significant differentiation can be noticed. The average value of the current liquidity ratio is 1.70, the quick ratio is 1.09, and the cash ratio is 0.33. The lowest value of the cash liquidity ratio is at the level of 0.02. The average value of the return on total assets is 0.04 (standard deviation 0.06), the minimum value is  $-0.24$ , and the maximum value is 0.17. Then again, the average return on equity of the analyzed companies is 0.07, the minimum value  $-0.53$ , and the maximum value 0.69. The median size of the company was 13.12. The greatest differentiation of the studied sample occurs within the age of companies. The oldest company has been operating on the market for 246 years, and the youngest—only 8 years. The median for age is 24.00 years (standard deviation 43.36).

In the case of the capital structure ratio, there are slight discrepancies between the mean (1.30) and the median (1.25) with a standard deviation of 0.75. The total debt ratio ranges from 0.09 to 0.92. The smallest value of the short-term debt ratio is also 0.09, and the highest is 4.85. The median of the long-term debt ratio is 0.28.

Summarizing the above statistics, it can be stated that the sample is diverse in terms of the variables studied.

The next stage of the analysis is the verification of hypotheses. In order to verify the hypotheses, Pearson's correlation coefficient was calculated.

## 5.1. Verification of Hypothesis 1

First, the validity of Hypothesis 1 was examined. Thus, the relationship between the size of firms and individual debt ratios was checked. The hypothesis is that the size of the company is positively correlated with debt.

Table 4. Correlation between company size and debt ratios

	Pearson's r correlation coefficient	Significance (p)
Size		
Capital structure ratio	$-0.172$	0.087
Total debt ratio	0.198*	0.024
Long-term debt ratio	0.052	0.305
Short-term debt ratio	0.034	0.368

\* Correlation coefficients are significant with  $p < 0.05$

Source: Author's own elaboration.

The results of the correlation of the size of companies with individual indebtedness ratios of enterprises are presented in Table 4. When analyzing the collected data, it can be observed that a statistically significant correlation between the size of a company and its debt occurs only in the case of the total debt ratio. The value of Pearson's  $r$  correlation coefficient is, in this case, 0.198 with a significance level of 0.024. Thus, on this basis, we can confirm the validity of Hypothesis 1. A positive correlation indicates that the larger the size of the company, the greater the total debt ratio.

## 5.2. Verification of Hypotheses 2 and 3

In this part of the study, we examine the relationship between the company's age and individual debt measures. Hypothesis 2 assumes that there is a negative correlation between the company's age and its debt. At the same time, Hypothesis 3 provides that the older the enterprises, the higher the long-term debt ratio.

Table 5. Correlation between company age and debt ratios

	Pearson's $r$ correlation coefficient	Significance (p)
Age		
Capital structure ratio	-0.049	0.626
Total debt ratio	0.180	0.073
Long-term debt ratio	0.440*	0.001
Short-term debt ratio	0.125	0.215

\* Correlation coefficients are significant with  $p < 0.05$

Source: Author's own elaboration.

By analyzing the data collected in Table 5, we can conclude that the company's age is positively correlated with long-term debt. The value of Pearson's  $r$  correlation coefficient is 0.440 with a significance level of 0.001. However, in the case of the remaining indicators, there is a correlation at a significance level greater than 0.05. On this basis, the Hypothesis 2 cannot be confirmed, but the Hypothesis 3 turns out to be justified. It turns out that older enterprises make greater use of long-term external sources of financing.

## 5.3. Verification of Hypothesis 4

Then, the relationship between financial liquidity and debt was examined. Hypothesis 4 was verified, assuming that the higher the level of liquidity, the smaller the debt.

Table 6. Correlation between liquidity and debt ratios

	Pearson's $r$ correlation coefficient	Significance (p)
Current liquidity ratio		
Capital structure ratio	0.429*	0.001
Total debt ratio	-0.600*	0.001
Long-term debt ratio	-0.199*	0.023
Short-term debt ratio	-0.304*	0.001



Quick liquidity ratio		
Capital structure ratio	0.495*	0.001
Total debt ratio	-0.484*	0.001
Long-term debt ratio	-0.165	0.051
Short-term debt ratio	-0.272*	0.003
Cash liquidity ratio		
Capital structure ratio	0.318*	0.001
Total debt ratio	-0.492*	0.001
Long-term debt ratio	-0,002	0.491
Short-term debt ratio	-0.172*	0.044

\* Correlation coefficients are significant with  $p < 0.05$

Source: Author's own elaboration.

Analyzing the data in Table 6, we can see that all liquidity ratios have a negative correlation with the total debt, long-term debt and short-term debt ratios. Only in two cases the significance level is higher than 0.05, i.e. the correlation of the long-term debt ratio with the quick liquidity ratio and the cash liquidity ratio. The highest level of impact occurs in the case of the correlation of current liquidity with total debt, as the Pearson correlation coefficient  $r$  is  $-0.6$  with a significance level of 0.001.

On this basis, we can confirm Hypothesis 4, because the higher the level of financial liquidity, the lower the debt. When analyzing the data, a significant relationship between the capital structure ratio and financial liquidity can be observed. The Pearson  $r$  coefficient in the case of the relationship between quick liquidity and the capital structure is 0.495 (significance level 0.001). Thus, Hypothesis 4 should be extended to include the analysis of the relationship between the capital structure and financial liquidity. It can be concluded that companies with a higher ratio of total liabilities coverage with equity maintain a higher level of financial liquidity.

## 5.4. Verification of Hypothesis 5

In this part of the study, the relationship between the return on total assets, return on equity and individual debt ratios was analyzed. Hypothesis 5 assumes that greater profitability is associated with less debt.

Table 7. Correlation between profitability and debt ratios

	Pearson's $r$ correlation coefficient	Significance (p)
Return on total assets (ROA)		
Capital structure ratio	0.109	0.282
Total debt ratio	-0.210*	0.018
Long-term debt ratio	-0.318*	0.001
Short-term debt ratio	-0.125	0.107
Return on equity (ROE)		
Capital structure ratio	-0.075	0.460
Total debt ratio	0.052	0.304
Long-term debt ratio	-0.341*	0.001
Short-term debt ratio	0.093	0.178

\* Correlation coefficients are significant with  $p < 0.05$

Source: Author's own elaboration.

In order to verify Hypothesis 5, the correlation coefficients  $r$  Pearson ROA and ROE with individual debt ratios were calculated. The data are presented in Table 7. Significance at the assumed level lower than 0.05 occurs only in three cases. All statistically significant relationships are negative ( $p < 0.05$ ). The ROA correlation coefficient with total debt is  $-0.210$ , the ROA correlation coefficient with long-term debt is  $-0.318$ , and the ROE correlation coefficient with long-term debt is  $-0.341$ . Thus, Hypothesis 5 about the negative correlation of profitability with debt is confirmed.

## 6. Conclusions

It was expected that the larger the size of the company, it is associated with the greater debt. It can be concluded that the assumptions made are correct. Moreover, it is noted that they are in line with the funding source hierarchy theory. Among other things, it assumes that larger companies have better access to information, as well as a lower risk of liquidity loss, which allows for higher levels of debt (Gajdka, 2002).

It was assumed that the older companies have lower debt levels. The results of the study do not support this hypothesis. However, it is noted that the company's age is positively correlated with long-term debt. This means that older companies are more likely to use long-term debt.

It was presumed that more liquidity is associated with less debt. The study confirms the assumptions. This means that enterprises that have difficulties in paying their current liabilities have greater debt. Moreover, it is noted that companies achieving a higher ratio of total liabilities coverage with equity maintain higher liquidity.

It was also expected that the increase in profitability was associated with lower debt. The research results support the hypothesis. Thus, companies that finance their activities with greater equity capital are more profitable. Jaworski and Czerwonka obtained consistent results, concluding that increasing profitability should increase the share of equity in the capital structure (Jaworski and Czerwonka, 2018). At the same time, different research results were presented by Jerzemowska and Hajduk, pointing to a positive relationship between profitability and the capital structure of the trade and services sector, thus confirming the signalling theory. However, they emphasize that in the research conducted so far on the Polish market, there has always been a negative relationship in line with the theory of the hierarchy of financing sources (Jerzemowska and Hajduk, 2015).

On the basis of the obtained results, it can be concluded that the capital structure of Polish industrial enterprises is consistent with the theory of the hierarchy of financing sources. The research confirms and updates the previously conducted research. It should be noted the previously mentioned research by Jaworski and Czerwonka on the negative relationship between profitability and capital structure (Jaworski and Czerwonka, 2018). The results of the study also confirm Mazur's conclusions that the theory of the hierarchy of financing sources best describes the financial decisions of Polish companies (Mazur, 2007).

The added value is the selection of the sector of industrial companies that play a very important role in the Polish economy. It is also important that the study covers up to 10 years (2010–2019). Thus, the research is up-to-date and can be used in the practice of operating companies. It should be noted that the structure of capital is also influenced by other factors identified by other authors, which makes it possible to extend the research carried out in the future.

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## Determinanty struktury kapitału polskich przedsiębiorstw przemysłowych

**Abstrakt:** Tematyka artykułu obejmuje determinanty struktury kapitału. Celem niniejszego opracowania jest zbadanie zależności pomiędzy strukturą kapitału a płynnością, rentownością, wiekiem oraz rozmiarem polskich firm przemysłowych. Dokonany przegląd literatury pozwolił na postawienie hipotez wskazujących, że polskie przedsiębiorstwa kształtują strukturę kapitału zgodnie z teorią hierarchii źródeł finansowania. Zgodnie z tą hipotezą wyłoniono pięć hipotez szczegółowych. W celu ich weryfikacji zastosowano metody statystyczne takie jak podstawowe statystyki opisowe oraz współczynnik korelacji  $r$  Pearsona. Próbkę stanowi 100 spółek notowanych na Giełdzie Papierów Wartościowych w Warszawie. Badania obejmują lata 2010–2019. Wyniki badań potwierdzają ujemny związek płynności z zadłużeniem. Firmy mające trudności z regulowaniem zobowiązań bieżących w większej

mierze korzystają z finansowania kapitałem obcym. Zauważa się również ujemną korelację pomiędzy rentownością a zadłużeniem. Oznacza to, że przedsiębiorstwa korzystające w większym stopniu z kapitałów obcych są mniej zyskowne. Potwierdza się także hipoteza, że większe spółki mają większy poziom zadłużenia. Ponadto zauważa się, że starsze firmy chętniej korzystają z zadłużenia długoterminowego. Na podstawie uzyskanych wyników można wnioskować, że struktura kapitału polskich przedsiębiorstw przemysłowych jest zgodna z teorią hierarchii źródeł finansowania. Badanie stanowi uzupełnienie istniejących badań o problematyce kształtowania struktury kapitału. Dostarcza wyników na podstawie bieżących danych, przez co umożliwia ich wykorzystanie w praktyce. Otrzymane wyniki mogą ułatwić przedsiębiorstwom proces podejmowania decyzji w zakresie struktury kapitału.

**Słowa kluczowe:** struktura kapitału, teorie struktury kapitału, płynność, rentowność, firmy przemysłowe