

# Dependencies between financial ratios among companies listed on the Warsaw Stock Exchange

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**Abstract:** The dependencies between liquidity, profitability and indebtedness ratios are usually quite unclear. Many empirical studies provide insight into this issue. However, research results are varied and often inconsistent. Hence, it was decided to verify the relationships between the title groups of indicators, taking into account the Polish capital market. The research methodology included mainly the literature review and data analysis (using descriptive statistics and correlation). The research sample consisted of the majority of companies listed on the Warsaw Stock Exchange and covered the period 2015–2019. Based on this analysis, the following conclusions were drawn. Regarding liquidity ratios, it is worth pointing out that their values are strongly differentiated. On average, it seems that analyzed entities were characterized by quite a safe level of liquidity. Most of the companies were also generating income (in more than 60% of cases). The level of their indebtedness was medium, but coverage ratios were at a fully satisfactory level on average. The relationships between liquidity and profitability indicators were varied, there was no significant correlation between them. An increase in profitability/ liquidity on average led to slightly negative or no relevant changes in liquidity/ profitability. For the dependence between profitability and indebtedness, it was rather a negative one. Similarly, a negative correlation was observed in the case of the liquidity and the level of indebtedness.

**Keywords:** financial ratios, liquidity, profitability, indebtedness

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## 1. Introduction

Financial analysis is one of the most common and important issues that concern enterprises. The analysis of assets, liabilities, revenues and costs is often a source of valuable information to managers, allowing them to make more accurate management decisions. As parts of financial analysis, there are usually extracted preliminary analyses (for instance of balance sheet or income statement) and ratio analysis. The second of these is often focused on measuring liquidity, profitability and indebtedness. In the literature of the subject, there are different opinions concerning the relationship between these groups

of indicators. For example, an increase in indebtedness may result in the necessity of paying higher interests and thus lower profitability. Then again, more liabilities might allow financing new investments resulting in an increase in profitability. Therefore, the dependencies between a mentioned group of indicators are quite unclear. Hence, it was decided to check how these relationships are shaped on the Polish capital market.

The aim of this paper is to verify if there are any (positive or negative) significant relationships between liquidity, profitability and indebtedness ratios on the example of Polish listed companies. The study was based on the data from the Warsaw Stock Exchange (WSE) for the period 2015–2019. Applied research methods consist of literature review, empirical data analysis, induction and deduction methods.

## 2. Liquidity, profitability, indebtedness and ratio analysis

Liquidity is understood as the ability to pay current obligations, so it refers to short-term requirements. Liquidity risk is strongly linked to the timing of cash inflows and outflows (Subramanyam, 2014). The most frequently used measures in the context of liquidity are internal indicators, as current ratio and quick ratio (Arnold, 2005).

Profitability is defined as “reflection, in the most synthetic form, of efficiency of business management” (Sierpińska and Jachna, 2004). It refers to involved capital or funds expenditures. It can be stated that when the company is generating income, its profitability is positive. However, it is essential to measure profitability ratios’ changes by years. The most popular indicators are: return on assets, return on equity and return on sales, that express the ratio of net income to assets, equity and sales revenues, respectively.

Debt is a part of sources of funding that is obtained from external origins. It might affect the company’s performance in different ways, including debt service cost and, then again, greater development opportunities. Some insight into the impact of debt on a company’s performance might be provided by financial gearing. It is positive when the cost of debt is lower than return on assets. It is worth pointing out that many firms are considered as underleveraged, these companies may increase the debt with quite a low cost in order to generate higher income (Eckbo, 2007).

The ratio analysis, which usually contains liquidity, profitability and indebtedness analysis, is based on the relative (in the form of fractions) measurement of specific quantities. It is a generally used kind of financial analysis especially due to its simplicity and speed of analysis. Common knowledge of financial indicators and their availability to comparison over time are also not insignificant advantages (Gabrusewicz, 2014). Financial ratios are also useful in the context of comparing the company’s situation with the industry in which it operates. Taking this into account, they are often used in practice.

## 3. Dependencies among groups of indicators

Relationships between indicators from different groups might be calculated by using statistical tools. One of the ways for measuring these dependencies is the analysis of correlation (Andrzejewski and Mazur-Maślanka, 2017). First, however, before empirical analysis, it is meaningful to concentrate on the results of previous research in the area. It is worth noting that most of the studies were focused on relationships between two groups of indicators—liquidity and profitability, liquidity and indebtedness or profitability and indebtedness.

### 3.1. Liquidity and profitability

The relationship between liquidity and profitability can usually be twofold. It seems, however, that the belief that correlation between liquidity and profitability is negative is a dominant one. It is pointed out that the achieved short-term profit is most often used as a source of receivables financing, not being a source of cash financing (Jaworski, Czerwonka and Mądra-Sawicka, 2018). Enterprises with low stocks of liquid assets reduce the costs associated with their maintenance. This approach allows for higher profits, but is also associated with an increased risk of losing liquidity. Then again, companies focusing on maintaining proper financial liquidity engage additional financing for this purpose. It is usually associated with the freezing of capital in inventories or short-term receivables (Waściński and Kruk, 2010). What is more, according to K. Stępień (2012), overliquidity may lead to a decrease in income. Hence, to a decline in profitability. Similarly, T. Maślanka (2019) states that in the literature on the subject, opinions about the negative impact of liquidity on profitability are common.

However, empirical studies taking into account the relationship between liquidity and profitability led to different results. For example, research on the example of agricultural companies in Poland (Wasilewski and Felczak, 2011) and banks in Ghana (Lartey, Antwi and Boadi, 2013) showed a positive relationship between these measures. The existence of a strong positive dependence was pointed out also by T. Maślanka (2009). Similar results were obtained by G. Vintilă and E. Nenu (2016), whose research showed a positive link between return on assets and quick liquidity. Then again, the study conducted by T. Waściński and M. Kruk (2010) indicated a decrease in profitability as a result of an increase in the liquidity of the examined entities. An ambiguous relationship between profitability and liquidity was distinguished by Q. Saleem and R. Rehman (2011). These researchers indicated that the increase in ROA led to an increase in the liquid ratio, increase in ROE led to an increase in quick and current ratios, but increase in ROS led to decrease in current ratio. Another study, by D. Zawadzka, R. Ardan and E. Szafraniec-Siluta (2011), indicates that growing ROA results in improvement in quick ratio, while ROA has a negative impact on that measure of liquidity. Further, J. Jaworski, L. Czerwonka and M. Mądra-Sawicka (2018) pointed out that there was no significant relationship between profitability and liquidity. Consistent results were obtained by T. Maślanka (2019), for most of the entities analyzed. M. Rehman, M. Khan and I. Khokhar (2015) also reached similar conclusions. The result of their study showed no statistically significant dependence in 5 out of 6 cases. Taking into account the relationship between indicators such as Return on Equity (ROE), Return on Assets (ROA) and ratios referring to liquidity—Quick Ratio (QR), Current Ratio (CR) and Cash Ratio (CAR), only between ROA and CR it was indicated that the variables were positively related. Based on the results of the signalled studies, no positive or negative relationship between liquidity and profitability can be clearly stated.

### 3.2. Liquidity and indebtedness

Liquidity is strongly connected with current liabilities. When their level is growing, it might be more difficult to maintain stable liquidity. Then it is necessary for current assets to grow to negate the effect of risen liabilities. Maintaining financial liquidity at an appropriate level can be considered a manifestation of the ability to pay liabilities. At the same time,

companies also need to take out short-term loans to cover liquidity shortages (Demirkol and Acigkoz, 2020). From this perspective, a negative relationship between indebtedness and liquidity seems to be expected. Typically, increases in liquidity appear to be associated with falling indebtedness. This direction of dependence was confirmed by N. Šarija and M. Harc (2012). According to the study conducted on the example of more than a thousand Croatian enterprises, there was an observable negative relationship between liquidity and leverage, and so indebtedness. The consistent result was obtained by P. Bórawski (2008) on the example of Polish farms and by J. Jaworski and L. Czerwonka (2018) on the example of several hundreds of business entities in the period 1998–2016. Also, J. Gryko (2011) indicated a negative correlation between the level of debt and financial liquidity among public companies. J. Bereźnicka (2011) obtained quite compliant results. Her research showed a negative dependence between current liabilities and liquidity. However, for liquidity and overall liabilities, there were no significant relationships.

The literature on the subject indicates that the relationship between debt and liquidity may also be positive. A higher level of liquid assets allows companies to incur larger liabilities, while at the same time providing a kind of collateral for them (Sibilkov, 2004). There are also empirical studies that do not confirm the existence of a negative relationship between liquidity and indebtedness. The analysis by Y. Hristozov (2020) is one of them. The author points out that on the basis of thousands of Bulgarian companies there are no significant dependencies between measures taken into account. Anderson (2002) indicated a positive relationship between liquid assets and long-term debt. Such dependence can be explained by the prudential motive in the company's activities. However, in general, empirical studies focusing on the relationship between liquidity and debt usually provided information about their negative correlation. Such a conclusion can be drawn both on the basis of analyses by foreign and Polish authors. Therefore, it seems that a negative relationship between these measures can be expected among companies listed on WSE.

### 3.3. Profitability and indebtedness

Dependencies between profitability and indebtedness are different. It is caused by the specificity of various kinds of debt, the ability to generate a financial surplus and the quality of company's management. The concept of financial leverage deserves attention in this context. According to it, an increase in indebtedness of a given enterprise may lead to changes in its profitability, especially in reference to shareholder's funds, and these changes might be both positive or negative. It depends, among other things, on the current level of indebtedness. If the increase in debt leads to an improvement/declination in return on equity, a positive/negative effect of financial leverage is observable (Czekaj and Dresler, 2005). Hence, it is unclear what relationship could be expected between profitability and indebtedness. Then again, dependencies between these measures might be explained by signalling theory, agency theory or tax theory. According to the first one, the existence of asymmetry of information may lead to a positive correlation between profitability and indebtedness. Referring to the agency theory, it can be said that there might be either a positive (agency cost of equity between shareholders and managers) or a negative (agency cost of debt between shareholders

and lenders) relationship. In reference to the tax theory, it is difficult to predict the direction of the dependence (Kebewar, 2013).

Previous research has provided empirical insight into dependencies between analyzed measures. The study by K. Mijić and D. Jakšić (2017) leads to the conclusion about the existence of a negative relationship between profitability and indebtedness. Similar findings based on the research were put forward by M. Shubita and J. Alsawalhah (2012) and M. Kebewar (2013). On the basis of their research, H. Habib, F. Khan and M. Wazir (2016) indicated an increase in the cost of debt servicing along with an increase in its level. This state of affairs led to a reduction in the profitability of the analyzed companies. Also, G. Vintila and E. Nenu (2016) indicated a negative correlation between the level of indebtedness of the enterprise and the return on equity. However, the results of studies based on the Polish market were different. A. Sajnog (2010) stated that on the basis of Polish industrial companies, in many cases there is either a positive or a negative relationship between profitability and indebtedness. Therefore, it cannot be clearly stated what the average direction of this relationship is. Further, M. Jerzemowska and A. Hajduk (2015) pointed to the existence of a positive correlation between the analyzed measures in the case of commercial and service companies. In general, it seems that negative relationships dominate between these measures. However, the example of the Polish market is rather a different one. There seems to be a slightly positive dependency between these measures.

#### 4. Research methods

The main objective of the research is to check how relationships between liquidity, profitability and indebtedness ratios are reflected in the reality of the Polish capital market. For this purpose, based on the literature review, the following hypotheses were formulated:

(H1) There is no significant positive or negative relationship between liquidity and profitability ratios.

(H2) There is a negative relationship between liquidity and indebtedness ratios.

(H3) There is a positive relationship between profitability and indebtedness ratios.

The study covers the period 2015–2019. The research was conducted on the example of companies listed in WSE (not only on the Main Market, but also on NewConnect). Most of the enterprises from the financial sector (especially banks) were excluded from the sample, particularly due to the different structure of their financial statements. Business entities were chosen because of their data availability (data were collected from the Orbis database: <https://orbis.bvdinfo.com>). Hence, the sample does not cover all companies, but most of them (more than 75% of publicly listed companies in Poland). The number of analyzed entities by years is presented below:

Table 1. Number of analyzed entities by years

	2015	2016	2017	2018	2019
<b>Number of entities</b>	638	661	662	644	630

Source: Author's own elaboration.

The research was focused on financial ratios. Three indicators from each group (liquidity, profitability, indebtedness) were selected. The list of them is presented below:

1) liquidity:

- current ratio (CR);
- quick ratio (QR);
- cash ratio (CAR);

2) profitability:

- return on assets (ROA);
- return on equity (ROE);
- return on sales (ROS);

3) indebtedness:

- debt ratio (DR);
- coverage of fixed assets with fixed capital (CFFC);
- coverage of liabilities with cash surplus (CLCS).

Formulas used for computing financial ratios are as follows:

$$1) \quad CR = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$2) \quad QR = \frac{\text{Current assets} - \text{Stock}}{\text{Current liabilities}}$$

$$3) \quad CAR = \frac{\text{Cash and equivalents}}{\text{Current liabilities}}$$

$$4) \quad ROA = \frac{\text{Net income}}{\text{Assets}}$$

$$5) \quad ROE = \frac{\text{Net income}}{\text{Shareholder's funds}}$$

$$6) \quad ROS = \frac{\text{Net income}}{\text{Operating revenue}}$$

$$7) \quad DR = \frac{\text{Liabilities}}{\text{Assets}}$$

$$8) \quad CFFC = \frac{\text{Shareholder's funds} + \text{Non-current liabilities}}{\text{Fixed assets}}$$

$$9) \quad CLCS = \frac{\text{Net income} + \text{Depreciation} + \text{Amortization}}{\text{Liabilities}}$$

As for the liquidity ratios, desirable value ranges can usually be found in the literature of the subject (for example—Czekaj and Dresler, 2005; Sierpińska and Jachna, 2004). For instance, the theoretical range for current ratio is [1,2;2], for quick ratio [1;1,2] and for cash ratio >0,2. When it comes to profitability ratios, they are stimulants—the higher their values, the better the company's ability to generate cash surpluses is assessed. In the case of indebtedness ratios, there can be found opinions that values not higher than 50% are appropriate for debt ratio. Coverage of fixed assets by fixed capital should be full (not lower than 100%). For CLCS, it is much more difficult to find the right range. It can be considered to be 0, indicating whether the entity is generating a cash surplus. Overall, however, it is worth mentioning that the desired values of given indicators significantly depend on the specificity of the activity of a given sector of the economy, or on the macroeconomic situation (Sierpińska and Jachna, 2004).

Due to the presence of numerous outliers, the analysis was performed after removing 5% of the lowest and 5% of the highest values for each indicator in a given year. In the beginning, descriptive statistics were calculated for ratios for individual years. However, for the purposes of this analysis, it is essential to measure dependencies among groups of indicators. Hence, correlation coefficients between liquidity, profitability and indebtedness ratios were computed further. The analysis was performed using the Statistica software.

## 5. Empirical analysis

Initially, the focus was on descriptive statistics for individual indicators, broken down by year. It has been shown in Tables 2–6.

Table 2. Descriptive statistics for ratios from 2015<sup>1</sup>

	Min	Max	Mean	St. dev.	Coef. var.	Q1	Q2	Q3
CR	0.29	9.34	1.93	1.53	79.06%	1.03	1.45	2.25
QR	0.20	8.75	1.51	1.46	96.96%	0.82	1.07	2.05
CAR	0.00	3.37	0.43	1.18	274.14%	0.18	0.18	1.25
ROA	-69.14%	17.59%	-0.39%	47.21%	-12,059.16%	1.06%	1.88%	17.36%
ROE	-133.52%	75.56%	5.19%	16.83%	324.25%	-2.70%	5.79%	9.14%
ROS	-694.59%	37.81%	-17.38%	61.03%	-351.06%	-2.66%	2.19%	10.67%
DR	9.30%	103.54%	49.28%	69.06%	140.14%	2.16%	47.67%	47.96%
CFFC	20.72%	1480.85%	193.50%	156.94%	81.11%	47.12%	126.76%	127.15%
CLCS	-99.24%	96.87%	12.23%	168.80%	1380.14%	10.93%	11.59%	129.35%

Source: Author's own elaboration.

Table 3. Descriptive statistics for ratios from 2016

	Min	Max	Mean	St. dev.	Coef. var.	Q1	Q2	Q3
CR	0.22	11.54	2.03	1.83	89.82%	1.01	1.42	2.33
QR	0.17	9.48	1.58	1.74	110.36%	0.81	1.05	2.02
CAR	0.00	3.60	0.44	1.37	312.81%	0.18	0.17	1.24
ROA	-52.86%	17.68%	-1.30%	50.42%	-3884.13%	0.81%	1.31%	16.00%
ROE	-115.70%	65.96%	2.07%	18.73%	905.34%	-3.79%	4.48%	8.42%
ROS	-495.25%	38.58%	-16.19%	49.92%	-308.27%	-5.11%	1.58%	10.10%
DR	7.55%	115.52%	50.26%	59.39%	118.16%	1.58%	49.60%	49.82%
CFFC	-118.33%	1454.58%	204.96%	177.29%	86.50%	46.33%	127.17%	128.19%
CLCS	-99.34%	112.67%	9.73%	190.10%	1953.26%	9.10%	10.06%	130.33%

Source: Author's own elaboration.

Table 4. Descriptive statistics for ratios from 2017

	Min	Max	Mean	St. dev.	Coef. var.	Q1	Q2	Q3
CR	0.18	11.12	2.02	1.86	92.17%	0.96	1.45	2.25
QR	0.11	9.28	1.52	1.72	113.46%	0.77	1.01	1.98
CAR	0.00	4.59	0.48	1.32	272.10%	0.17	0.19	1.27

<sup>1</sup> Q1, Q2, Q3—in sequence: quartile 1, 2 (median), 3; St. dev.—standard deviation; Coef. var.—coefficient of variation (the following tables use analogous markings).

	Min	Max	Mean	St. dev.	Coef. var.	Q1	Q2	Q3
ROA	-254.99%	16.60%	-2.87%	59.87%	-2082.78%	0.68%	1.20%	17.17%
ROE	-198.60%	85.64%	3.26%	20.98%	642.74%	-3.54%	5.44%	8.75%
ROS	-598.93%	36.00%	-20.75%	60.84%	-293.18%	-4.84%	1.68%	10.45%
DR	8.25%	165.69%	52.98%	70.98%	133.98%	1.67%	50.45%	50.53%
CFFC	-67.44%	1954.98%	204.14%	185.35%	90.79%	46.98%	128.56%	129.89%
CLCS	-81.43%	105.78%	9.91%	198.59%	2004.35%	8.34%	8.73%	131.39%

Source: Author's own elaboration.

Table 5. Descriptive statistics for ratios from 2018

	Min	Max	Mean	St. dev.	Coef. var.	Q1	Q2	Q3
CR	0.05	11.53	1.99	1.93	97.21%	0.97	1.36	2.15
QR	0.05	9.59	1.48	1.79	120.79%	0.71	1.00	1.90
CAR	0.00	5.01	0.46	1.37	300.93%	0.14	0.15	1.20
ROA	-72.31%	18.20%	-3.22%	62.48%	-1938.98%	0.76%	1.25%	15.09%
ROE	-200.00%	70.76%	0.90%	23.80%	2648.15%	-4.09%	5.28%	8.77%
ROS	-676.67%	75.21%	-29.71%	80.73%	-271.71%	-4.90%	1.66%	10.03%
DR	7.92%	204.72%	54.60%	90.20%	165.20%	1.63%	51.85%	51.87%
CFFC	-60.60%	4480.75%	197.66%	198.38%	100.36%	48.42%	127.15%	132.63%
CLCS	-93.13%	97.73%	9.69%	211.59%	2184.58%	8.70%	9.15%	132.21%

Source: Author's own elaboration.

Table 6. Descriptive statistics for ratios from 2019

	Min	Max	Mean	St. dev.	Coef. var.	Q1	Q2	Q3
CR	0.18	11.12	1.95	1.75	98.70%	0.93	1.39	2.30
QR	0.11	8.80	1.49	1.66	111.36%	0.71	0.99	1.99
CAR	0.01	3.69	0.43	1.31	300.93%	0.16	0.16	1.23
ROA	-74.10%	22.23%	-2.51%	54.22%	-2161.67%	1.01%	1.66%	17.34%
ROE	-103.15%	82.90%	3.77%	21.42%	568.80%	-3.32%	5.50%	9.23%
ROS	-425.23%	54.98%	-13.69%	46.29%	-338.14%	-4.12%	2.09%	10.84%
DR	7.65%	220.22%	55.88%	59.13%	105.81%	2.09%	53.05%	53.25%
CFFC	-146.39%	1920.59%	205.29%	192.29%	93.67%	47.73%	125.39%	130.88%
CLCS	-91.37%	216.28%	12.55%	206.18%	1643.50%	10.43%	11.12%	129.45%

Source: Author's own elaboration.



Descriptive statistics for the liquidity ratios were at a similar level in each of the years 2015–2019. This indicates a fairly stable situation in terms of covering current liabilities with liquid funds among the analyzed companies. In the case of the current ratio, the variation in the value of this ratio was one of the smallest in the sample. The mean value indicates that the value is near the high end of the theoretically valid range. However, on the basis of quartiles, over 25% of the analyzed companies struggle with liquidity shortage, and over 25% with overliquidity. Similar conclusions can be drawn from the quick ratio. As for the cash ratio, less than half of the entities reach the level recognized as correct in the literature of the subject. However, entities that are in the minority are characterized by an average significant cash overliquidity. Overall, in terms of liquidity, analyzed companies are fairly average.

At first, regarding profitability indicators, it is worth noting that the differences in signs between the chosen statistics on ROA, ROE, and ROS (for instance in the case of the mean and quartile 1) result from the removal of outliers in the sample, as mentioned earlier. It is also important that in some cases ROE distorts the picture (e.g. for the generated profit with negative equity, the value of the ratio is negative, and for the net loss through the prism of negative equity—positive). The profitability ratios are significantly diversified. The means for ROA and ROS take negative values, however the corresponding medians are positive. This indicates the presence of units that incurred very significant net losses in relation to the sum of assets or sales revenues (which is also confirmed, among others, by the minimum values for ROS in individual years). However, for each of the analyzed years, the number of entities generating a positive financial result (according to ROA, it was over 75% of the analyzed enterprises) exceeded the number of companies incurring losses. More than half of analyzed business units generated net profits corresponding to at least 1% of total assets or turnover. Such results allow the profitability of companies listed on the WSE to be considered slightly positive on average.

Indices relating to indebtedness are characterized by similar values of descriptive statistics in subsequent years. In the case of the debt ratio, it is relatively low, for most companies. In total, nearly 75% of entities are characterized by debt not exceeding 50% of assets, considered quite safe in the literature on the subject. The maximum value of this ratio above 100% indicates, however, the existence of companies whose liabilities value exceeds the value of assets, therefore equity is negative. This proves their bankruptcy in the economic sense. In most cases, the coverage of fixed assets with capital employed is full (the ratio's values then exceed 100%). However, over 25% of entities have less than 50% coverage of their fixed assets, which may cause problems in their business operations in the future. Cash surplus was generated by over 75% of entities in each year of the analysis. It made it possible to cover liabilities and related payments to varying degrees. In some cases, however, cash deficiencies were close to the value of liabilities, which indicated significant losses among such entities. In general, indebtedness indicators can be assessed rather positively among the analyzed companies.

Summing up, it is also worth noting that the study covered various sectors of the economy, which undoubtedly influenced the diversification of the results. This conclusion can also be applied to the correlation analysis, which is the next part of the study.

In the following part of the analysis, attention was drawn to the relationship between the liquidity, profitability and indebtedness ratios. Correlation matrices showing such relationships are presented in Tables 7–11.

Table 7. Correlation matrix for ratios from 2015<sup>2</sup>

	CR	QR	CAR	ROA	ROE	ROS	DR	CFFC	CLCS
CR	1.000								
QR	0.758**	1.000							
CAR	0.473**	0.627**	1.000						
ROA	0.171**	0.118*	0.107	1.000					
ROE	0.088	0.068	0.062	0.904**	1.000				
ROS	0.062	-0.011	-0.032*	0.591**	0.553**	1.000			
DR	-0.406**	-0.339**	-0.310**	-0.075*	0.093	0.014	1.000		
CFFC	0.464**	0.377**	0.253**	0.136**	0.135**	0.087	-0.015*	1.000	
CLCS	0.272**	0.239**	0.19**	0.684**	0.499**	0.476**	-0.376**	0.102	1.000

Source: Author's own elaboration.

Table 8. Correlation matrix for ratios from 2016

	CR	QR	CAR	ROA	ROE	ROS	DR	CFFC	CLCS
CR	1.000								
QR	0.848**	1.000							
CAR	0.608**	0.655**	1.000						
ROA	0.087*	0.040*	0.059	1.000					
ROE	0.068	0.030	0.046	0.899**	1.000				
ROS	0.012	-0.031	-0.005*	0.609**	0.529**	1.000			
DR	-0.429**	-0.359**	-0.351**	-0.003*	0.024	0.068	1.000		
CFFC	0.399**	0.346**	0.222**	0.109*	0.096*	0.014	-0.023*	1.000	
CLCS	0.149**	0.126**	0.187**	0.778**	0.603**	0.53**	-0.254**	0.045	1.000

Source: Author's own elaboration.

Table 9. Correlation matrix for ratios from 2017

	CR	QR	CAR	ROA	ROE	ROS	DR	CFFC	CLCS
CR	1.000								
QR	0.784**	1.000							
CAR	0.610**	0.693**	1.000						
ROA	0.128**	0.100*	0.090	1.000					

<sup>2</sup> \*, \*\*—in sequence: statistically significant at  $p < 0.05$ ;  $p < 0.01$  (the following tables use analogous markings).

	CR	QR	CAR	ROA	ROE	ROS	DR	CFFC	CLCS
ROE	0.104	0.086	0.068	0.886**	1.000				
ROS	0.013	-0.021	-0.006*	0.565**	0.509**	1.000			
DR	-0.450**	-0.368**	-0.359**	-0.052*	0.022	0.015	1.000		
CFFC	0.439**	0.325**	0.222**	0.096*	0.096*	0.088	-0.065*	1.000	
CLCS	0.182**	0.208**	0.159**	0.776**	0.586**	0.493**	-0.302**	0.008	1.000

Source: Author's own elaboration.

Table 10. Correlation matrix for ratios from 2018

	CR	QR	CAR	ROA	ROE	ROS	DR	CFFC	CLCS
CR	1.000								
QR	0.778**	1.000							
CAR	0.559**	0.663**	1.000						
ROA	0.085*	0.008*	-0.003	1.000					
ROE	0.061	0.008	0.017	0.830**	1.000				
ROS	0.014	-0.037	0.043*	0.469**	0.413**	1.000			
DR	-0.434**	-0.368**	-0.390**	-0.102*	-0.109	-0.005	1.000		
CFFC	0.498**	0.504**	0.427**	0.078*	0.035*	0.011	-0.126**	1.000	
CLCS	0.215**	0.089*	0.097*	0.775**	0.561**	0.447**	-0.318**	0.065	1.000

Source: Author's own elaboration.

Table 11. Correlation matrix for ratios from 2019

	CR	QR	CAR	ROA	ROE	ROS	DR	CFFC	CLCS
CR	1.000								
QR	0.832**	1.000							
CAR	0.579**	0.665**	1.000						
ROA	0.130**	0.096*	0.064	1.000					
ROE	0.085	0.051	0.021	0.654**	1.000				
ROS	0.011	-0.024	-0.144**	0.507**	0.391**	1.000			
DR	-0.556**	-0.467**	-0.334**	-0.193**	-0.035	-0.011	1.000		
CFFC	0.474**	0.354**	0.235**	0.158**	0.124**	0.084	-0.153**	1.000	
CLCS	0.268**	0.277**	0.219**	0.716**	0.492**	0.422**	-0.395**	0.084	1.000

Source: Author's own elaboration.

The presented correlation matrices indicate similar values observed between individual indicators in the subsequent years of the analysis. If the linear relationships were statistically

significant in 2015, they were also statistically significant in the following years of the study at  $p < 0.05$  (although the correlation between ROS and CAR took different signs).

A positive correlation of considerable strength was observed between the ratios of current and quick liquidity and return on assets. In the case of ROS and cash ratio indicators, their correlation in the analyzed sample turned out to be negative. On the basis of these results, it can be concluded that the hypothesis about the lack of statistically significant relationships between the measures of liquidity and profitability is partially reflected in the reality of the Polish capital market—6 out of 9 correlations were not statistically significant, while the others, mentioned above, led to different conclusions.

All of the liquidity ratios taken into account showed a significant negative correlation with the company's indebtedness level, which is reflected in the debt ratio. Then again, the correlation coefficients between the CR, QR, CAR and CFFC and CLCS indices were positive. Companies whose liquidity increases, finance their fixed assets to a greater extent with fixed capital. Conversely, generating a cash surplus favours, on average, an increase in liquidity among the analyzed entities.

A statistically significant correlation can be seen between ROA and DR. On the basis of these observations, it can be concluded that the increase in debt reduces the average profitability of the company, the negative effect of financial leverage is materializing. The coverage of fixed assets with fixed capital is significantly positively correlated to the ROA and ROE ratios. The higher the average profitability of a given entity, the more secure the entity's long-term financial situation. The coverage of liabilities with cash surplus also shows a significant, positive linear relationship with profitability ratios, which is not surprising as one of the components shaping the cash surplus is net profit. In the light of these results, the hypothesis relating to the negative correlation between profitability and debt indicators seems to be partially empirically confirmed (it concerns especially the level of debt, which is illustrated by the DR measure).

## 6. Summary

The literature review shows that there are often ambiguous potential dependencies between liquidity, profitability and indebtedness ratios. The empirical study conducted as part of this analysis, aimed at verifying the relationship between the title measures on the example of the Polish capital market, led to the following conclusions:

- 1) Most of the analyzed entities are characterized by liquidity at quite a safe level, often even overliquidity. The distribution of cash ratio values was, however, slightly different—more than half of analyzed companies have their values below theoretically safe level. Conversely, it is crucial to note that values of liquidity ratios are highly diversified due to industries.
- 2) The majority of enterprises taken into account were generating financial surplus. This may indicate the ability of these entities to cover their liabilities, develop a business or pay dividends to shareholders.
- 3) Analyzed companies are on average characterized by a medium level of indebtedness. However, for almost 75% of entities, their fixed assets were fully covered by fixed cap-

ital. What is more, coverage of liabilities by financial surplus was also on a positive, satisfying level, on average. The companies, despite moderate indebtedness, generated cash surpluses, allowing for gradual debt repayment.

- 4) Dependencies between profitability and liquidity are varied. On average, there was no significant correlation between these measures (there were some, although its signs were different). This result of the study is confirmed by previously mentioned research (for instance Maślanka, 2019; Rehman, Khan and Khokhar, 2019).
- 5) Relationships between liquidity and indebtedness are rather negative (taking DR into account). Growing debt may seriously affect a company's ability to pay its current liabilities, and it is true for a part of enterprises taken into account in the research. The study result confirms the outcome of the research by N. Šarija and M. Harc (2012) and J. Gryko (2011).
- 6) Most of the cases of companies are generating negative effects of financial leverage. An increase in debt is not reflected in the growth of profitability. It might be caused for instance by a too high level of existing debt of these companies or by the high cost of debt service. These conclusions are consistent with the results of studies conducted by most of the authors mentioned (for example Shubita and Alsawallah, 2013; Kebewar, 2017) but contrary to the Polish ones (Sajnóg, 2010; Jerzemowska and Hajduk, 2015).

In general, the results presented above might have some practical implications. Managers, aware of the average negative effect of financial leverage among Polish listed companies, may be willing to more accurately analyze potential sources of financing, for example in terms of the cost of servicing them, but also the possibility of modifying the arrangements. Further, the lack of an unequivocal relationship between liquidity and profitability may indicate a significant differentiation among companies—some of them accumulate cash surpluses, increasing liquidity, while others get rid of funds, which often exposes them to liquidity shortage. A company's policy of allocating financial surpluses can provide valuable information about future opportunities and threats to its business. Negative relationships between indebtedness and liquidity indicate that the analyzed economic units repay their debts in the event of overliquidity, so they operate in accordance with the assumption of rationality. However, when the level of debt rises, it may cause some problems in keeping liquidity at a safe level, what managers should take into account.

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## Zależności pomiędzy wskaźnikami finansowymi na Giełdzie Papierów Wartościowych w Warszawie

**Abstrakt:** Zależności między wskaźnikami płynności, rentowności i zadłużenia są zwykle dość niejasne. Wiele analiz empirycznych dostarcza wglądu w tę kwestię. Jednak wyniki takich badań są zróżnicowane i często niespójne. Wobec tego zdecydowano się zweryfikować relacje pomiędzy tytułowymi grupami wskaźników, biorąc pod uwagę polski rynek kapitałowy. Metodologia badania obejmowała przede wszystkim przegląd literatury i analizę danych (z użyciem statystyk opisowych i korelacji). W próbie badawczej uwzględniono większość spółek notowanych na Giełdzie Papierów Wartościowych w Warszawie, obejmowała ona lata 2015–2019. Na podstawie tej analizy wysnuto poniższe wnioski. W odniesieniu do wskaźników płynności warto zwrócić uwagę,

że ich wartości są silnie zróżnicowane. Przeciętnie wydaje się, że analizowane podmioty charakteryzowały się dość bezpiecznym poziomem płynności. Większość jednostek generowała też dochód (ponad 60% przypadków). Poziom ich zadłużenia był przeciętny, ale wskaźniki pokrycia kształtowały się zazwyczaj na w pełni zadowalającym poziomie. Relacje pomiędzy wskaźnikami płynności i rentowności były zróżnicowane, nie było między nimi istotnej korelacji. Średni wzrost rentowności / płynności prowadził zaś do nieznacznie ujemnych lub żadnych istotnych zmian w płynności / rentowności. Zależność między rentownością a zadłużeniem była natomiast raczej ujemna. Podobnie ujemną korelację zaobserwowano w przypadku płynności i poziomu zadłużenia.

**Słowa kluczowe:** wskaźniki finansowe, płynność finansowa, rentowność, zadłużenie