

Article

Influence of Macroeconomic Factors on Financial Liquidity of Companies: Evidence from Poland

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Abstract: The objective of this study is to examine the relationship between macroeconomic variables and the financial liquidity of companies. In this context, two main research questions were formulated. Firstly, which macroeconomic variables impact the financial liquidity of companies? Secondly, what is the direction and strength of the influence of these macroeconomic variables on the financial liquidity of companies? This study employed panel data analysis conducted on an unbalanced panel of 5327 Polish enterprises over the period 2003–2021. The primary research method employed was linear regression (pooled OLS) with robust standard errors clustered at the firm level. The main results of this study indicate that (1) the majority of macroeconomic variables, which illustrate the overall efficiency of the economic system (GDP per capita, ratio of foreign trade goods balance to GDP, CPI, and money supply), demonstrate a positive relationship with corporate liquidity; only the consumption-to-GDP ratio exhibits a negative relationship; (2) a positive relationship was observed between the number of building permits for housing and financial liquidity; (3) variables from the informal institutional environment indicate a positive relationship for the employment rate and a negative relationship for the share of the pre-working age population in the overall population; (4) the relationship between the ratio of internal expenditures on research and development to GDP and corporate liquidity is positive. This study addresses limitations of previous research by examining the impact of macroeconomic factors, particularly those from the institutional and technical environment, on corporate financial liquidity.

Keywords: financial liquidity of companies; macroeconomic factors; firm performance; corporate performance factors; financial risk management; panel data; statistical modeling



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1. Introduction

This article examines the relationship between macroeconomic factors and corporate financial liquidity. In a wider context, it explores the link between the overall economic environment and corporate performance, with particular attention to financial liquidity.

This article presents the findings of the initial phase of research project investigating the impact of macroeconomic factors on corporate liquidity. The results of the subsequent phase, namely, the analysis of the moderators of these relationships, have already been published (Nowicki et al. 2024). As both phases of the research employed the same dataset and partly similar methodology, this article does not aim to provide an exhaustive account of the results. Instead, it refers the reader to Nowicki et al. (2024) for further information. However, it is necessary to briefly reiterate the issues presented in that article, as they are essential to an understanding of the findings of this first phase.

Financial liquidity is a crucial aspect of financial analysis and is defined as a company's capacity to fulfil its financial obligations in a timely manner (Mikołajewicz and Nowicki 2021). Its importance in evaluating a company's economic situation and financial management arises from its potential to precipitate bankruptcy if compromised. Consequently,

a comprehensive understanding of the mechanisms and factors influencing a company's financial liquidity is imperative for effective financial management.

The broader economic landscape exerts a significant influence on enterprise liquidity, shaping the operational conditions they face. However, the link between fluctuations in macroeconomic factors and corporate financial liquidity remains relatively unexplored within economic analysis. This paucity of theoretical frameworks and empirical investigations highlights the necessity of allocating attention to this issue. The relationship between changes in macroeconomic factors and the financial liquidity of enterprises remains relatively under-researched in economic analysis. The dearth of both theoretical and empirical research prompted the undertaking of this study. While the impact of macroeconomic factors on firms' performance has been examined, prior studies have identified statistically significant relationships only for a few variables, such as inflation, GDP, or unemployment rate (Khan and Kouser 2021; Grover et al. 2023; Msomi 2023; Cheong and Hoang 2021; Pervez and Ali 2024; Palečková and Přečková 2023). The determinants of firms' liquidity have been less frequently studied than other aspects of corporate finance. Typically, studies focus on firm-specific factors (Farooq et al. 2023; Cheng and Liu 2022; Ciukaj and Kil 2020). The number of studies examining the macroeconomic impact on corporate liquidity is relatively limited, yet they underscore the significance of this topic (Nowicki et al. 2024; Wang 2021; Wijerathna et al. 2024; Dottori and Micucci 2018). This highlights a notable research gap in this field. This research gap also extends to European emerging economies, such as Poland, where the impact of macroeconomic variables is poorly studied (Gajdka and Pietraszewski 2022). Furthermore, previous research has either concentrated on a single industry (Jaworski and Czerwonka 2022) or only on listed companies (Gajdka and Pietraszewski 2022), and analyzed a limited set of macroeconomic variables. The aforementioned studies have focused on a number of macroeconomic variables, including GDP, inflation, unemployment, and interest rates (Wang 2021; Wijerathna et al. 2024; Chen and Mahajan 2010). Furthermore, previous studies have not encompassed a duration as extensive as that proposed in this research (Jaworski and Czerwonka 2022; Gajdka and Pietraszewski 2022). This encompasses varying economic conditions, including the tumultuous two-year period marked by the COVID-19 pandemic.

Taking into account the existing research gaps, the aim of this study is to examine the relationship between macroeconomic variables and the financial liquidity of enterprises.

The objective of this study was achieved through empirical research conducted on Polish enterprises. The research sample and methodological assumptions are identical to those presented in (Nowicki et al. 2024) as the results presented in this article relate to a different stage of the same research. The investigation scrutinized data from approximately 6300 enterprises, spanning 21 industries classified according to the Polish Classification of Activities (300 companies \times 21 industries = 6300). Financial data for the enterprises were sourced from the EMIS (Emerging Markets Information Service) database, while macroeconomic data were extracted from the Macroeconomic Data Bank. The analysis encompassed the years 2003 to 2021. The primary research methodology employed was linear regression on panel data (pooled OLS), utilizing robust standard errors clustered by firm, conducted on an unbalanced panel consisting of 5327 enterprises spanning the years 2003 to 2021. The principal dependent variable was the natural logarithm of the current liquidity ratio. As part of robustness tests, the quick ratio, treasury ratio, and coverage ratio were also employed. Among the macroeconomic variables under scrutiny, only a subset demonstrated a statistically significant relationship with corporate financial liquidity. This study incorporated control variables based on prior research (Arslan-Ayaydin et al. 2014; Ferreira and Vilela 2004; Lins et al. 2010; Yun 2009; Dang 2020), along with binary variables for sectors and years, in order to account for their fixed effects.

The findings of our study indicate that the majority of macroeconomic variables, which are used to assess the overall efficiency of the economic system (GDP per capita, ratio of foreign trade goods balance to GDP, CPI, and money supply), demonstrate a positive relationship with corporate liquidity. This is partly consistent with previous studies in

this field. However, the consumption-to-GDP ratio exhibits a negative association with financial liquidity, which is a novel observation. With regard to the variable representing the formal institutional environment, a positive relationship was identified between the number of building permits for housing and financial liquidity. The variables representing the informal institutional environment indicate a positive relationship for the employment rate, which is inconsistent with previous studies, and a negative relationship for the share of the pre-working age population in the overall population. In the case of variables from the technical environment, it was established that the relationship between the ratio of internal expenditures on research and development to GDP and corporate liquidity is positive.

The novelty of the results of our study lies in the comprehensive examination of 74 macroeconomic variables in the context of their impact on corporate liquidity. To the best of our knowledge, this is the first such comprehensive study. Furthermore, this study includes variables from hitherto overlooked areas of the macro-environment, such as the formal and informal institutional environment and the technical environment, making it novel in this dimension as well. Furthermore, the design of the research sample, which includes companies from 21 economic sectors, both listed and unlisted, small, medium, and large companies, enhances the generalizability of the results. Finally, the results of the present study partly confirm and partly contradict the results of previous studies, for example, with regard to variables such as GDP per capita or CPI. Conversely, the results of our study diverge from those of previous studies, for instance, with regard to the employment rate. Consequently, the results of our study should be regarded as a novel contribution to the field.

Conversely, the novelty of the research is most evident in the statistically significant results obtained for macroeconomic variables that have not been previously studied. The results reveal a positive relationship between the ratio of the balance of foreign trade turnover to GDP or the share of entities with foreign capital in all entities and the financial liquidity of enterprises. Additionally, there is a negative relationship between the consumption-to-GDP ratio and financial liquidity. Furthermore, the number of housing units for which permits were issued is positively correlated with financial liquidity. Finally, the ratio of internal expenditures on R&D to GDP is positively related to corporate liquidity. These findings demonstrate the novelty of the research conducted.

The practical implications of the results obtained can be seen from the perspective of both managers and policymakers. From a managerial perspective, a more comprehensive understanding of the macroeconomic factors influencing corporate liquidity should inform the design of measures to prevent liquidity deterioration when macroeconomic forecasts indicate a potential deterioration in corporate liquidity. This is particularly pertinent given that loss of liquidity can lead to corporate bankruptcy.

From the perspective of policymakers, the results of our study should provide guidance for the appropriate selection of macroeconomic policy tools to strengthen the liquidity of the corporate sector. In this context, it is crucial to gain insight not only into the relationship between corporate liquidity and those macroeconomic variables for which statistically significant relationships have been confirmed, but also into the absence of such a relationship for other variables.

The paper is structured as follows: Section 2 outlines the literature review and research questions; Section 3 details the methodology employed in this study, encompassing the sample, variables, and analytical approach; Section 4 presents the research findings along with discussions comparing them to previous studies and outlining future research directions; finally, Section 5 summarizes the conclusions drawn from this study.

2. Literature Review and Research Questions

The relationship between changes in macroeconomic factors and the financial liquidity of companies remains relatively under-researched within the framework of economic analysis. The existing scarcity of both theoretical considerations and empirical research served as one of the motivations for dedicating these studies to this issue. Scientific evidence

is relatively limited, and the cognitive results presented in them often lack consistency. Moreover, the range of macroeconomic variables that have been previously studied appears to be incomplete, suggesting that there are numerous potentially significant variables that have not yet been investigated in terms of their impact on corporate financial liquidity.

It is of paramount importance for a company to maintain an adequate level of financial liquidity, as its absence directly contributes to corporate insolvency. An examination of the manner in which macroeconomic factors influence corporate financial liquidity is an integral component of broader research on corporate performance.

While the literature indicates that internal factors typically exert a greater influence on firm performance than external ones (Hawawini et al. 2003; Makhija 2003), the relevance of external environmental factors cannot be entirely discounted. The macroeconomic landscape significantly affects companies' financial liquidity and establishes the framework for their operations. Recent studies have demonstrated that companies are exposed to a significant degree of risk due to the volatility and uncertainty of the business environment, both domestically and globally (Batra and Kalia 2016).

However, the relationship between fluctuations in macroeconomic factors and the financial liquidity of companies remains relatively unexplored territory in economic analysis. The existing scarcity of both theoretical models and empirical studies has drawn attention to this issue. Scientific evidence is limited, and the results frequently lack coherence. Additionally, the assortment of macroeconomic variables previously scrutinized seems insufficient, indicating that numerous potentially influential variables are yet to be explored regarding their impact on corporate financial liquidity.

Previous research on the impact of macroeconomic factors on company performance has frequently prioritized examining profitability over financial liquidity. In recent studies in this area, profitability measures have been employed as proxies for firm performance. In terms of methodology, panel regression techniques have been employed, including pooled OLS, random effects, and fixed effects (Grover et al. 2023; Khan and Kouser 2021; Msomi 2023). Furthermore, a generalized method of moments has been employed (Cheong and Hoang 2021; Palečková and Přečková 2023; Msomi 2023; Doruk 2023). Nevertheless, these studies have generally been able to identify a statistically significant relationship between firm performance and one or two macroeconomic factors. The studies point to economic variables such as inflation (Khan and Kouser 2021; Grover et al. 2023), GDP (Msomi 2023), or inflation and GDP (Cheong and Hoang 2021; Pervez and Ali 2024). A limited number of studies have demonstrated a statistically significant relationship for more than two macroeconomic variables. These include the unemployment rate, exchange rate, and population change (Palečková and Přečková 2023). Recent studies, although still focusing on developed economies (Cheong and Hoang 2021), are increasingly examining developing economies (Grover et al. 2023; Khan and Kouser 2021; Pervez and Ali 2024; Doruk 2023). Some studies are limited to specific activities, such as insurance activities in African countries (Msomi 2023) or the Czech Republic (Palečková and Přečková 2023).

A substantial body of research in this field has focused on the banking sector, demonstrating that bank profitability is influenced by a range of factors, including GDP, inflation, market concentration, and bank-specific characteristics (Demirgüç-Kunt and Huizinga 1999; Khrawish 2011; Sufian 2009; Sufian and Noor 2012; Karadzic and Dalovic 2021). Studies on manufacturing firms and Greek companies have demonstrated the influence of industry concentration, major macroeconomic changes, and crises on profitability (McDonald 1999; Asimakopoulos et al. 2009; Sami and Mohamed 2014). Overall, both macroeconomic conditions and industry-specific factors significantly shape firm profitability across sectors.

It is understandable to prioritize research on the impact of macroeconomic factors on company performance, particularly profitability over financial liquidity. Profitability is one of the primary drivers of a company's value, and maximizing value is widely recognized as a business goal in a market economy (Jensen 2001). Nevertheless, it is important to recognize that from the perspective of biological theories of the firm, the fundamental objective of enterprises is survival (Gruszecki 2002; Curwen 1976). Interpreted through

the lens of corporate finance, this implies that a company's objective is to uphold financial liquidity, as its depletion leads to bankruptcy.

Theories that seek to explain the level of liquidity in a company include agency cost theory, pecking order theory, and trade-off theory. The agency cost theory postulates that, due to the existence of information asymmetries and conflicts of interest between managers and shareholders, managers tend to maintain high levels of cash in order to improve their control over assets and increase their own benefits (Jensen and Meckling 1976). Consequently, the agency cost theory postulates that maintaining high liquidity ratios is a tool for managers to seek personal gain, which tends to have a negative impact on firm performance.

The pecking order theory postulates that in the context of an imperfect capital market, the order of financing is determined by the increasing cost of capital from various sources. This order is as follows: internal capital, debt financing, and equity financing (Myers and Majluf 1984). The pecking order theory suggests that due to the adverse selection problem, having high liquidity ratios can contribute to better corporate performance.

The trade-off theory posits that high liquidity confers both benefits and costs on firms. When the marginal revenue from holding cash is equal to the marginal cost, this indicates that the optimal level of cash is attained. Deviations from this level, whether upwards or downwards, can have an adverse effect on firm performance (Kraus and Litzenberger 1973).

Previous examinations of financial liquidity have frequently focused on the relationship between financial liquidity and profitability, yielding inconsistent results (Mahmood et al. 2023; Wahyudi 2023; Czerwińska-Kayzer et al. 2021; Zhang et al. 2022; Jaworski and Czerwonka 2021). Furthermore, recent studies in the field have employed panel regression, incorporating pooled OLS and generalized method of moments (GMM) techniques (Zhang et al. 2022).

Despite the extensive literature on financial liquidity research (Arslan-Ayaydin et al. 2014; Ferreira and Vilela 2004; Lins et al. 2010; Yun 2009; Dang 2020), it predominantly focuses on the impact of firm-specific factors on financial liquidity (Farooq et al. 2023; Cheng and Liu 2022; Ciukaj and Kil 2020). Conversely, studies investigating the influence of macroeconomic variables on financial liquidity are comparatively scarce. For example, an international study by Chen and Mahajan (2010) examines the impact of macroeconomic conditions on corporate liquidity (cash holdings) across 34 countries from 1994 to 2005. It evaluates variables such as GDP growth rate, inflation, short-term interest rate, and government deficit, emphasizing the importance of macroeconomic variables in conjunction with traditional firm-specific factors in determining corporate liquidity. It is noteworthy that such studies frequently regard cash holdings (the ratio of cash to total assets net of cash) as a variable that characterizes financial liquidity.

Research on the impact of macroeconomic variables on cash holdings has predominantly concentrated on a limited set of factors. Nevertheless, these studies have demonstrated the considerable influence of macroeconomic conditions on liquidity (Wang 2021; Wijerathna et al. 2024). Dottori and Micucci (2018) demonstrated that the increase in liquidity levels of Italian firms between 2011 and 2015 was primarily attributable to macroeconomic influences, such as declining interest rates.

Empirical evidence indicates that the level of cash holdings is contingent upon the prevailing macroeconomic conditions and related uncertainties in both developed and emerging economies (Erel et al. 2021; Ki and Adhikari 2022; Memari et al. 2022; Guizani and Ajmi 2023). There is a notable research gap regarding European emerging markets, such as Poland, where the impact of macroeconomic factors on cash holdings is underexplored. Gajdka and Pietraszewski (2022) based on pooled OLS and fixed-effects panel regression found a statistically significant positive relationship between GDP growth and cash holdings, while other macroeconomic variables were insignificant. This is partly due to the study's small sample size of listed companies, highlighting the need for further research.

Although a study on the liquidity of Polish companies by Lyroudi and Bolek (2014) does not explicitly address the macroeconomic factors influencing liquidity, it empiri-

cally examines the liquidity of non-financial companies in Poland, utilizing static measures of financial liquidity such as the current and quick ratios as pertinent metrics for financial liquidity.

Some research focusing on macroeconomic impacts centers on the financial liquidity of banks, considering them as specific economic entities. For example, [Mahmood et al.'s \(2019\)](#) study, despite focusing on Pakistani banks, sheds light on the impact of various factors on bank liquidity, including GDP, monetary policy, bank size, and profitability. Their findings are based on fully modified OLS panel regression and reveal that total deposits, GDP, bank size, and unemployment negatively impact bank liquidity, whereas monetary policy, bank crises, and profitability positively affect liquidity, with inflation showing an insignificant relation.

Similarly, the study by [Qehaja et al. \(2022\)](#) also focuses on banks, providing insights into how macroeconomic factors specifically affect bank liquidity. Notably, the study revealed that GDP per capita and the unemployment rate positively influence bank liquidity, while the inflation rate has a negative effect, based on pooled OLS, random-effects, and fixed-effects panel regression.

In accordance with the subject matter discussed in this article, it would be beneficial to explore research on the influence of macroeconomic factors on working capital management. In their review of working capital management studies, [Jaworski and Czerwonka \(2022\)](#) identified that only three of the 16 studies considered macroeconomic factors as determinants of corporate liquidity. The aforementioned studies employed a common macroeconomic factor, namely, GDP ([Nyeady et al. 2018](#); [Moussa 2019](#); [Dang 2020](#)). This is analogous to the circumstances observed in the preceding area of research on the overall determinants of firm performance, where macroeconomic variables are seldom incorporated, and when they are, the list of macroeconomic variables included is typically not extensive. Another example of such research is found in the study by [Reyad et al. \(2022\)](#), which investigates the impact of economic policy uncertainty (EPU) and foreign exchange risk (FX risk), two of the most prominent macroeconomic risk factors, on working capital management (WCM) and, consequently, firm performance. The study employs the EPU index and FX risk as measures of macroeconomic risk factors, with the cash conversion cycle serving as an indicator of working capital management. Their most important method employed was GMM. The findings indicate that US, German, and Chinese firms adopt a more conservative approach to WCM management during periods of economic policy uncertainty, whereas UK firms adopt a more aggressive stance. Conversely, foreign exchange risks prompt firms from the USA, the UK, and China to extend their cash conversion cycle levels due to concerns over value depreciation, while the opposite holds true for German firms. [Jaworski and Czerwonka \(2022\)](#) conducted an investigation into the impact of firm-specific and macroeconomic factors on the liquidity of EU energy sector companies. Utilizing pooled OLS, random-effects, and fixed-effects panel regression, they found a negative correlation between GDP growth and liquidity, and a positive correlation between unemployment and liquidity. Although this study focused solely on the energy sector and used a limited set of variables, it highlights the importance of considering macroeconomic factors as potential determinants of liquidity.

A summary of the principal studies on the relationship between macroeconomic variables and liquidity, organized according to the macroeconomic variables analyzed, is presented in [Table 1](#).

Table 1. Macroeconomic variables and corporate liquidity—literature summary.

Authors, Year	Sample Years	Dependent Variable	Independent Variable	Sign of Relationship	Sample Size	Country	Method
(Jaworski and Czerwonka 2022)	2011–2018	Cash conversion cycle, current liquidity ratio and level of working capital	Unemployment rate	Positive	48,976 observations	25 EU countries	Pooled OLS, RE, and FE panel regression
(Qehaja et al. 2022)	2008–2020	Banking liquidity	Unemployment rate	Positive	390 observations	28 EU countries, Turkey, and Switzerland	Pooled OLS, RE, and FE panel regression
(Mahmood et al. 2019)	2000–2017	Bank liquidity	Unemployment rate	Negative	NA	Pakistan	Fully modified OLS
(Qehaja et al. 2022)	2008–2020	Banking liquidity	GDP per capita	Positive	390 observations	28 EU countries, Turkey, and Switzerland	Pooled OLS, RE, and FE panel regression
(Chen and Mahajan 2010)	1994–2005	Cash holdings	GDP growth	Positive	36,782 firm-year observations	34 countries	FE panel regression
(Jaworski and Czerwonka 2022)	2011–2018	Cash conversion cycle, current liquidity ratio and working capital	GDP growth	Negative	48,976 observations	25 EU countries	Pooled OLS, RE, and FE panel regression
(Gajdka and Pietraszewski 2022)	2001–2019	Cash holdings	GDP growth	Positive	284 firms	Poland	Pooled OLS and FE panel regression
(Nyeadi et al. 2018)	2007–2014	Working capital	GDP growth	Negative	28 firms	Ghana	GMM
(Moussa 2019)	2000–2010	Cash conversion cycle, working capital	GDP growth	Negative	68 firms	Egypt	GMM
(Mahmood et al. 2019)	2000–2017	Bank liquidity	GDP growth	Negative	NA	Pakistan	Fully modified OLS
(Chen and Mahajan 2010)	1994–2005	Cash holdings	Inflation rate	Positive	36,782 firm-year observations	34 countries	FE panel regression
(Qehaja et al. 2022)	2008–2020	Banking liquidity	Inflation rate	Negative	390 observations	28 EU countries, Turkey, and Switzerland	Pooled OLS, RE, and FE panel regression
(Reyad et al. 2022)	2006–2020	Cash conversion cycle	Economic policy uncertainty	Positive/negative (depending on country)	13,532 firms	US, UK, Germany, China	GMM
(Wang 2021)	1989–2016	Cash holdings	Economic policy uncertainty	Positive	272,623 observations	22 countries	Pooled OLS regression, WLS
(Reyad et al. 2022)	2006–2020	Cash conversion cycle	Foreign exchange risk	Positive/negative (depending on country)	13,532 firms	US, UK, Germany, China	GMM

Source: own elaboration.

A review of the literature reveals that the relationship between changes in macroeconomic factors and the financial liquidity of companies remains relatively unexplored within the realm of economic analysis. The existing shortage of both theoretical frameworks and empirical research has motivated studies to address this gap. Scientific evidence is relatively scarce, and the range of previously examined macroeconomic variables appears incomplete, suggesting that numerous potentially significant variables have yet to be investigated regarding their impact on corporate financial liquidity.

The existing literature on the impact of macroeconomic factors on corporate liquidity is limited in scope. Studies have often focused on companies within a single sector (Jaworski and Czerwonka 2022) or only on listed companies (Gajdka and Pietraszewski 2022). Furthermore, these studies typically consider only a few basic macroeconomic variables, such as GDP growth, inflation, unemployment, or interest rates (Wang 2021; Wijerathna et al. 2024; Chen and Mahajan 2010). This represents a significant research gap that the present study aims to address. The present study includes a representative sample of Polish companies across all sectors, both listed and unlisted, and encompassing small, medium, and large entities. Initially, we considered 74 macroeconomic variables from various areas, which were then narrowed down based on their statistical significance in regression models. As indicated by the literature review, the list of examined macroeconomic variables is not only incomplete, but also disorganized. Consequently, in this study, a comprehensive analysis of the relationship between macroeconomic variables and corporate liquidity was conducted, utilizing a classification of macroeconomic variables that divides them into the following groups (Dawidziuk 2020; Nowicki et al. 2024):

1. Variables reflecting the overall efficiency of the economic system;
2. Variables related to the formal institutional environment;
3. Variables related to the informal institutional environment;
4. Variables reflecting the technical environment.

It is notable that previous studies frequently concentrated on examining the connections between macroeconomic variables and firm performance utilizing variables that reflect the overall efficiency of the economic system. However, there has been limited investigation into the relationships with macroeconomic variables from other domains (Jaworski and Czerwonka 2022; Wang 2021; Wijerathna et al. 2024; Chen and Mahajan 2010; Qehaja et al. 2022; Mahmood et al. 2019).

Macroeconomic variables that reflect the overall efficiency of the economic system include gross domestic product (GDP) and other variables that describe the economic cycle, exchange rates, inflation rates, interest rates, and so forth. Previous research has focused on macroeconomic variables that reflect the overall efficiency of the economic system, which is easily understood given the well-described impact of this area on business operations in macroeconomic theory (Thomas 2021).

The technical environment is defined as the array of the available methods that facilitate the transformation of resources into products or services (Griffin 2002). These shifts in scientific and technological advancement have led to modifications in production technology or product innovation. Variables associated with the technical environment encompass the pace of technological change, government expenditure on research and development (R&D), the extent of telecommunications infrastructure development, transportation infrastructure development, the overall innovativeness of the economy, and others. In recent years, these changes have accelerated, thereby underscoring their growing significance for business operations.

In addition to the two aforementioned areas, the role of the institutional environment is becoming increasingly significant. This environment is understood as a system of economic and social institutions that regulate the market and the role of the state. The significance of institutions, both formal and informal, is emphasized. Their quality and mutual relationships impact the functioning of economic entities (Poniatowicz et al. 2020). In the context of a game, institutions can be considered analogous to the rules that determine the behavior of individual players (North 1990). Formal institutions are hierarchically

structured rules, including elements such as constitutions, regulations, standards, codes, and statutes (Bossak 2008). Variables related to the formal institutional environment include the number and complexity of legal acts governing business operations, permits for construction, antitrust laws, and more.

In contrast, informal institutions comprise unwritten rules that exist outside official channels. They encompass customs, social conventions, codes of conduct, and traditions (North 2005). The fundamental distinction between formal and informal institutions lies in their genesis: informal institutions emerge spontaneously, are not part of the legal system, and are not created or enforced by the state. In contrast, they emerge and persist within the private sphere (Williamson and Kerekes 2011). Variables related to the informal institutional environment can include demographic factors, such as societal mobility, employment levels, educational attainment, and life expectancy of the population.

In light of the pivotal role played by macroeconomic variables from these four domains in the context of business entities, this study aimed to investigate the manner in which these variables interact with corporate financial liquidity.

In consideration of the extant knowledge on this subject, the following research questions were formulated:

1. Which macroeconomic variables impact the financial liquidity of companies?
2. What is the direction and strength of the influence of these macroeconomic variables on financial liquidity of companies?

It is worth noting that this study did not formulate hypotheses in a dogmatic manner; instead, it sought to identify problems and research questions. This approach yielded a wealth of intriguing interpretations, which is acceptable in the fields of economics, finance, and management sciences. According to the recommendations of scientific methodologists, it was recognized that hypotheses are not always necessary in these fields of science. If these conditions were to be met, they would have to be simultaneously new, general, clear, non-contradictory, and testable. The authors have concluded that meeting all of these conditions would be somewhat impossible, due in part to the nature of the subject matter covered, the method employed in this study, as well as its limited framework (Nowicki et al. 2024).

3. Methodology

A comprehensive methodological description is provided in the article by Nowicki et al. (2024). However, the issues necessary to understand the methodological approach in the first phase of this study of the impact of macroeconomic variables on liquidity are detailed below.

3.1. Sample

This study made use of databases, with the EMIS database and the Macroeconomic Data Bank being the primary sources of data. The data pertaining to companies were sourced from the EMIS database, while the data concerning macroeconomic factors were obtained from the Macroeconomic Data Bank. The research focused on companies registered in Poland across 21 sections of the Polish Classification of Economic Activities (PKD), thereby defining the spatial scope of this study. The data sources provided access to information on over 682,000 companies registered in Poland. This study encompassed all companies for which the necessary financial data could be obtained to calculate selected indicators. Other criteria, aside from data availability, allowed for the inclusion of smaller entities, which are often overlooked in various economic studies. This comprehensive approach, incorporating the full spectrum of entities in the research sample, including small businesses, represents one of this study's strengths. This study's timeframe spanned from 2003 to 2021.

As part of its on-demand data service, EMIS randomly chose an initial sample of 300 companies for each of the 21 industries, with the aim of reducing the occurrence of missing variables that are crucial components of relevant financial ratios. The determination of the sample size was guided by statistical criteria. In standard economic studies,

the typical minimum sample size varies depending on the methodology and variables used (Tabachnick and Fidell 2014), from 96 observations (with an alpha of 1.96 and an estimation error of 0.10) to a preferred size of 272 observations (with an alpha of 1.65 and an estimation error of 0.05). For this study, the figure was rounded up to 300. With regard to the 21 PKD sections, the initial expectation was that a sample of 6300 companies would be obtained ($300 \times 21 = 6300$). However, the final number of observations was slightly lower than anticipated due to the specifics of panel research (Dańska-Borsiak 2009) and the limited representation (below 300 companies) in certain PKD sections. It is important to acknowledge that the sample, comprising companies that consistently report financial data, may display some bias. However, this may not pose a significant concern.

Following the removal of outliers and observations with missing data, as mandated by the adopted research methodology, this study employed fewer than 6300 companies, with the number of companies fluctuating over time. Univariate outliers were identified and eliminated using the interquartile range (IQR) method (Spatz 2011). An observation was classified as an outlier if its value fell below the first quartile minus 150% of the IQR or exceeded the third quartile plus 150% of the IQR (Hogan and Evalenko 2006). Any outlying values were excluded from the sample.

The combination of two datasets subject to the aforementioned constraints results in an unbalanced panel comprising 74,067 firm-year observations, representing 5327 distinct firms spanning the years 2003 to 2021.

3.2. Variables

3.2.1. Dependent Variable

The primary dependent variable is the logarithm of the current ratio, which is calculated as the ratio of current assets to short-term liabilities, in accordance with the following formula:

$$\text{current ratio} = \text{current assets} / \text{current liabilities}, \quad (1)$$

The variable was subjected to transformation using the decimal logarithm in order to mitigate the skewness of its distribution and align it closer to a normal distribution (Tabachnick and Fidell 2014). In order to test the robustness of the results, additional ratios were employed, including the quick ratio, treasury ratio, and coverage ratio. These were calculated according to the following formulas:

$$\text{quick ratio} = (\text{current assets} - \text{inventories} - \text{short-term deferred assets}) / \text{current liabilities}, \quad (2)$$

$$\text{treasury ratio} = \text{cash and cash equivalents} / \text{current liabilities}, \quad (3)$$

$$\text{coverage ratio} = \text{operating profit} / \text{interests}, \quad (4)$$

All of these variables underwent transformation using the decimal logarithm.

3.2.2. Macroeconomic Variables

From 72 macroeconomic variables scrutinized, a statistically significant relationship with the corporate financial liquidity was observed for several of them. The relationship between macroeconomic variables and corporate financial liquidity was explored by categorizing them into four groups, as previously mentioned in the article (Dawidziuk 2020). The categories were as follows:

1. Variables reflecting the overall efficiency of the economic system;
2. Variables related to the formal institutional environment;
3. Variables related to the informal institutional environment;
4. Variables reflecting the technical environment.

Among the variables reflecting the overall efficiency of the economic system, a number of variables were incorporated. These included the following:

- GDP per capita (variable GDPperCapita);
- Ratio of consumption to GDP (variable ConsumptionToGDP);

- Ratio of foreign trade goods balance to GDP (variable ForeignTradeGoodsBalanceToGDP);
- Consumer price index (variable CPI);
- Money supply (logarithm—variable LogMoneySupply).

The formal institutional variable representative is the number of flats for which permits have been issued or notifications have been made with a building project (variable LogFlatsPermits). This variable underwent transformation using the decimal logarithm as well.

Among the variables pertaining to the informal institutional environment, we include the following:

- Employment coefficient (variable EmploymentCoeff);
- Pre-working age population percentage ratio (variable PreworkingAgePopulationPercentage).

The representative variable for the technical environment is the ratio of domestic (internal) research and development expenditures to GDP, which is denoted as variable IRDcapexToGDP.

As previously stated, in previous studies, the relationships between macroeconomic variables and other factors typically involved variables reflecting the overall efficiency of the economic system. However, the relationships with macroeconomic variables from other areas were rarely investigated (Jaworski and Czerwonka 2022; Wang 2021; Wijerathna et al. 2024; Chen and Mahajan 2010; Qehaja et al. 2022; Mahmood et al. 2019).

3.2.3. Control Variables

Drawing from prior research (Arslan-Ayaydin et al. 2014; Ferreira and Vilela 2004; Lins et al. 2010; Yun 2009; Dang 2020), the subsequent control variables were taken into account in the analysis:

- The age of the company in years (variable CompanysAge);
- The ratio of liabilities to total assets (variable LiabilitiesToAssets);
- The ratio of non-current assets to total assets (variable NoncurrentAssetsToAssets);
- The size of the firm, measured by the decimal logarithm of total assets (variable LogAssets);
- The profitability, measured by the ratio of operating profit to revenues from sales (variable ROSoperational).

Furthermore, dummy variables representing industry effects and year effects were incorporated into the analysis.

3.3. Research Design

The main research approach employed was regression analysis. In particular, a linear regression model was utilized within this framework, with its parameters estimated using the ordinary least squares method. Panel data analysis was conducted on an unbalanced panel comprising 5327 Polish enterprises over the period from 2003 to 2021. In each model, the estimated standard errors were adjusted for heteroskedasticity clustered at the firm level (Petersen 2008).

The regression analysis conducted as part of the research encompassed all information from the sample (pooled OLS). The basic form of the linear regression model is as follows:

$$\text{LogCR}_{it} = \alpha_0 + \beta_1 \text{MACRO}_t + \beta_2 \text{CompanysAge}_{it} + \beta_3 \text{LiabilitiesToAssets}_{it} + \beta_4 \text{NoncurrentAssetsToAssets}_{it} + \beta_5 \text{LogAssets}_{it} + \beta_6 \text{ROSoperational}_{it} + \text{IndustryEff}_i + \text{YearEff}_t + \varepsilon_{it}$$

where:

LogCR_{it}—dependent variable, representing the logarithm of the current ratio for firm *i* at time *t*.

MACRO_{*t*}—one of the macroeconomic variables at time *t*, i.e., GDPperCapita, ConsumptionToGDP, ForeignTradeGoodsBalanceToGDP, CPI, LogMoneySupply, LogFlatsPermits, EmploymentCoeff, PreworkingAgePopulationPercenta, or IRDcapexToGDP.

Variables 2 to 6—control variables for firm *i* at time *t*, i.e., CompanysAge_{*it*}, LiabilitiesToAssets_{*it*}, NoncurrentAssetsToAssets_{*it*}, LogAssets_{*it*}, and ROSoperational_{*it*};

IndustryEff_{*i*}, YearEff_{*t*}—variables corresponding to fixed effects for industries and years.

The subscripts *i* and *t* account for the variability in the data across firms and over time.

To investigate the influence of macroeconomic variables on the financial liquidity of enterprises, each macroeconomic variable was introduced subsequently into the model, resulting in the construction of ten linear regression models.

The analyses were conducted using SPSS (IBM SPSS Statistics 29) and Gretl software (Gretl 2024a-git).

4. Results and Discussion

4.1. Descriptive Statistics of Regression Variables

A regression analysis was conducted on an unbalanced panel of Polish companies. The final sample comprises 74,097 observations representing 5327 unique firms for the period 2003–2021. Descriptive statistics for the dependent, independent, and control variables in both phases of our study, as well as Pearson correlation coefficients between relevant variables are presented in the article (Nowicki et al. 2024). As previously stated, this article presents the results of the initial phase of research into the impact of macroeconomic factors on corporate liquidity. The results of the subsequent phase, namely, the analysis of the moderators of these relationships, have already been published (Nowicki et al. 2024). It is noteworthy that descriptive statistics for the current ratio indicate that for the majority of the research sample there should not be any problems with liquidity. The Pearson correlation coefficients between the independent variables (both macroeconomic and control) and the dependent variable are very low, which is advantageous for modelling. Only for two variables does their absolute value exceed 0.05 (−0.263 for the variable NoncurrentAssetsToAssets and −0.075 for the variable LogAssets), and they are statistically significant at the 0.01 level. The high correlation between macroeconomic variables should not present a problem in the modelling approach, as economic variables are introduced into the models individually and the correlation between macroeconomic variables and control variables is low (Nowicki et al. 2024).

4.2. Multivariate Regression Analysis and Discussion

The relationship between macroeconomic variables and the financial liquidity of companies is examined by regressing the log-transformed current ratio on various macroeconomic and control variables using pooled panel (cross-sectional time-series) regressions with robust standard errors clustered at the firm level. As previously stated, our initial list contained 72 macroeconomic variables, but only 10 of them were found to be statistically significant in panel regression models. Table 2 presents our main results. The table comprises ten distinct models, labelled m1 to m10. In each model, the dependent variable is the logarithm of the current ratio (LogCR). The explanatory variables include a range of macroeconomic metrics, five firm-specific control variables, as well as year and industry fixed effects. The macroeconomic variables were introduced to each model separately, resulting in ten distinct models.

Table 2. Cont.

Variable	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10
Industry effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
const (Intercept)	0.61815 *** (0.021581)	0.53720 *** (0.024233)	0.59419 *** (0.020479)	0.74870 *** (0.043985)	0.23179 ** (0.090337)	0.48662 *** (0.032624)	0.54309 *** (0.023489)	0.70034 *** (0.033925)	0.55872 *** (0.021859)	0.59205 *** (0.020460)
N	74,067	74,067	74,067	74,067	74,067	74,067	74,067	74,067	74,067	74,067
n	5327	5327	5327	5327	5327	5327	5327	5327	5327	5327
Adj R2	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115	0.115

Robust standard errors adjusted for clustering by firm are reported inside the parentheses and ***, ** denote statistical significance at the 1% and 5% levels, respectively. Unreported industry controls are based on PKD classification. Source: own computations.

The F-statistic (42, 5326) for each of the models presented in Table 2 is statistically significant (p -value < 0.01). Furthermore, there is no issue of multicollinearity among the variables in the presented models. All variables have a variance inflation factor (VIF) lower than 10. The highest VIF levels were observed for the following variables: ForeignTrade-GoodsBalanceToGDP (VIF = 8.14), CPI (VIF = 6.41), IRDCapexToGDP (VIF = 4.87), and PreworkingAgePopulationPercenta (VIF = 4.18). For the remaining macroeconomic variables, the VIF was below 4, and for the control variables, the VIF only slightly exceeded 1.

The models in Table 2 are ranked according to macroeconomic variables grouped into four categories. First, the regression models for macroeconomic variables illustrating the overall efficiency of the economic system are presented.

The first model indicates a positive relationship between the ratio of the balance of foreign trade turnover to GDP and the financial liquidity of enterprises. The obtained beta coefficient (0.002504) indicates that a 1% increase in the ratio of the balance of foreign trade turnover to GDP is associated with a 0.0025% increase in the logarithm of the current liquidity ratio, holding other variables constant. This relationship is theoretically justified because increased balance of foreign trade generally contributes to economic prosperity, benefiting enterprises, also in terms of financial liquidity.

The relationship between the variable describing the share of entities with foreign capital in all entities and financial liquidity is also positive. The beta coefficient (0.004382) indicates that a 1% increase in this percentage leads to a 0.0044% increase in the logarithm of the current liquidity ratio, holding other variables constant. We interpret that an increase in the share of entities with foreign capital reflects positive economic conditions and signals investment in the economy, which typically translates to improved results in the corporate sector. It is crucial to acknowledge that previous studies investigating the relationship between macroeconomic variables and liquidity have predominantly focused on variables related to overall economic system efficiency (Wang 2021; Wijerathna et al. 2024; Chen and Mahajan 2010). Nevertheless, these studies have not considered variables such as the ratio of the balance of foreign trade turnover to GDP or the share of entities with foreign capital in all entities. This undoubtedly demonstrates the novelty of the research conducted.

The relationship between GDP per capita and financial liquidity is positive. A 1% increase in GDP per capita corresponds to a 0.0000034% increase in the logarithm of the current liquidity ratio. This result aligns with theoretical predictions suggesting that economic prosperity and societal wealth contribute to increased financial liquidity for businesses. This particular finding is consistent with the outcomes of previous studies (Chen and Mahajan 2010; Qehaja et al. 2022), while not confirming results that contradict them (Jaworski and Czerwonka 2022; Nyeadi et al. 2018; Moussa 2019; Mahmood et al. 2019). It is crucial to highlight that in the research conducted by Chen and Mahajan (2010), cash holdings were employed as a proxy for financial liquidity. Our study corroborates a positive relationship between the measure of economic growth (GDP per capita) and the financial liquidity of enterprises, utilizing alternative financial liquidity ratios, including the current ratio and, within robustness tests, the quick ratio, treasury ratio, and coverage ratio.

The subsequent model indicates a negative relationship between the consumption-to-gross domestic product ratio and the financial liquidity of enterprises. The obtained beta coefficient (−0.001753) suggests that a 1% increase in the consumption-to-GDP ratio results in a 0.0018% decrease in the logarithm of the current liquidity ratio, holding other variables constant. This relationship can be explained by the fact that an increase in consumption in the economy may lead to a decrease in the investment share within GDP, which in turn affects corporate financial liquidity. Once more, this is the inaugural study to our knowledge to indicate a relationship between the consumption-to-gross domestic product ratio and the financial liquidity of enterprises.

The two subsequent models indicate a positive relationship between the consumer price index (CPI) and corporate financial liquidity, as well as between the money supply in the economy and financial liquidity. A 1% increase in the CPI leads to a 0.0037% increase in

the logarithm of the current liquidity ratio, and a 1% increase in the logarithm of the money supply corresponds to a 0.0208% increase in the logarithm of the current liquidity ratio.

The theoretical justification for this relationship lies in the fact that an increase in the money supply (which, according to monetary theory, can lead to inflation) is typically associated with economic growth (Thomas 2021). We argue that enterprises benefit from this growth, leading to enhanced financial performance and liquidity. Additionally, rising inflation leads to social acceptance of price increases implemented by enterprises, which simultaneously improves their financial liquidity.

This finding corroborates the results of previous research (Chen and Mahajan 2010), while refuting the conclusions of other studies that have reached opposing conclusions (Qehaja et al. 2022). Our study also corroborates the positive relationship between inflation rate and the financial liquidity of enterprises, employing other financial liquidity ratios.

The model for the variable representing the formal institutional environment revealed a positive relationship between the number of housing units for which permits were issued and corporate financial liquidity. A 1% increase in the logarithm of building permits was found to result in a 0.0293% increase in the logarithm of the current liquidity ratio. The theoretical justification for this relationship is that the variable serves as a leading indicator of economic activity. In other words, its growth signals economic revival. Consequently, this relationship may not only result in improved liquidity for individual enterprises during economic upturns but also anticipatory improvements in overall corporate financial liquidity in line with predicted economic recovery. And again, this study represents the inaugural investigation, to our knowledge, that has identified a relationship between the number of housing units for which permits were issued and corporate financial liquidity. This finding contributes to the growing body of knowledge in this field and highlights the novelty of this research.

The following two models examine variables from the informal institutional environment. The relationship between the share of the population in the pre-working age group and corporate financial liquidity is negative. This implies that a 1% increase in this variable is associated with a 0.0045% decrease in the logarithm of the current liquidity ratio. The theoretical justification for this relationship can be found in the inverse correlation between the share of the population in the pre-working age group and the share of the population in the working age group. Specifically, an increase in the pre-working age population is usually equivalent to a decrease in the working age population. Consequently, this situation raises operating costs for enterprises and negatively impacts their results.

The relationship between the employment rate in the economy and financial liquidity of enterprises is positive. Empirical evidence indicates that a 1% increase in the employment rate is associated with a 0.0008% increase in the logarithm of the current liquidity ratio. The theoretical rationale behind this relationship is similar to the impact of an increase in the share of the working age population in the overall population. An elevated employment rate not only signals economic growth but also signifies favorable trends for businesses in the labor market, positively influencing their results and financial liquidity.

This finding is inconsistent with the outcomes of some previous studies (Qehaja et al. 2022; Jaworski and Czerwonka 2022), with the distinction that in the aforementioned research, the macroeconomic variable was the unemployment rate, which exhibited a positive relationship with liquidity. In our research, however, we examine the variable of the employment coefficient, which demonstrates a positive relationship with financial liquidity, which is incoherent with previous findings.

The final model illustrates a positive relationship between a variable representing the technical environment and corporate liquidity. This study indicates that a 1% increase in the ratio of internal expenditures on research and development (R&D) to GDP is associated with a 0.0177% increase in the logarithm of the current liquidity ratio. The direction of this relationship aligns with theoretical expectations, as this variable serves as a measure of economic innovation, particularly the intensity of R&D activities. Consequently, improvements in this area typically result in positive outcomes for the entire economy (Zhou 2020).

Given that the corporate sector in Poland contributes significantly to R&D expenses, it is not surprising that this variable has a positive impact on the financial liquidity of enterprises. However, this variable has the potential to generate both positive and negative effects on financial liquidity. The potential positive effect is associated with business development and an innovative economy, while the potential negative effect relates to increased costs and expenditures of enterprises. The presented model demonstrates that the potential positive effect outweighs the negative one. In this case again, this study represents the inaugural investigation acknowledging a relationship between the ratio of internal expenditures on R&D to GDP and corporate financial liquidity.

In summary, among the variables that illustrate the overall efficiency of the economic system, only the consumption-to-GDP ratio exhibits a negative association with corporate liquidity. The remaining variables (GDP per capita, ratio of foreign trade goods balance to GDP, consumer price index (CPI), and money supply) demonstrate a positive relationship. Regarding the variable representing the formal institutional environment, a positive relationship was observed between the number of building permits for housing and financial liquidity. The variables from the informal institutional environment indicate a positive relationship for the employment rate and a negative relationship for the share of the pre-working age population in the overall population. Finally, in the case of variables from the technical environment, it was established that the relationship between the ratio of internal expenditures on research and development (R&D) to GDP and corporate financial liquidity is positive.¹

While the primary focus of this study is on the factors influencing corporate financial liquidity, its implications extend beyond this domain to encompass the broader impact of macroeconomic factors on liquidity. Our findings can be interpreted from the perspective of the corporate sector and the overall macroeconomy.

On the one hand, the results of our research can inform financial risk management, as they demonstrate the impact of macroeconomic factors from areas that have been somewhat overlooked in previous studies on corporate financial liquidity. Furthermore, for the purposes of financial risk management and more broadly for financial management, financial liquidity is a crucial area, as difficulties in this domain can lead to bankruptcy. For instance, an understanding of the positive relationship between CPI and corporate liquidity should inform managerial decision-making in a way that anticipates and addresses potential liquidity challenges. In the event of a projected decline in CPI, as observed in Poland in 2024, proactive measures to safeguard liquidity should be implemented. Similarly, an understanding of the positive relationship between GDP per capita and corporate liquidity should prompt managers to take preemptive action in the event of a decline in GDP per capita, ensuring that the entities they manage maintain adequate liquidity levels.

On the other hand, our findings can also be useful for policymakers, as they provide guidance for the proper selection of macroeconomic policy tools that affect the financial liquidity of enterprises. For instance, the positive relationship between the employment coefficient and corporate liquidity should prompt policymakers to take protective measures in advance to mitigate liquidity problems in the corporate sector, should emerging forecasts of an increase in the unemployment rate materialize, as is the case in Poland in 2024. Similarly, an understanding of the positive relationship between the share of the population in the pre-working age group and liquidity should prompt policymakers to incorporate this dimension into the analysis of negative demographic trends in countries such as Poland. Furthermore, this understanding should inform the decision-making process by taking into account the potential negative effects on liquidity in the business sector.

This study is subject to limitations concerning sample selection and methodology. Primarily, it exhibits bias towards a specific country, thereby restricting the generalizability of its findings. Additionally, while linear regression analysis of panel data is commonly utilized in similar studies, it comes with its own set of limitations. However, we employed best practice solutions to ensure the validity of our inferences. Moving forward, future research endeavors should concentrate on broadening the geographic scope while main-

taining a diverse range of analyzed macroeconomic variables. Furthermore, an additional avenue for the future research would be to explore the relationships between the variables in question within specific subsets of companies and during distinct time periods. This could provide further insights into the factors influencing the observed relationships.

5. Conclusions

The objective of this study was to examine the relationship between macroeconomic variables and the financial liquidity of enterprises. The distinctive feature of this study is its comprehensive examination of the relationships between a wide spectrum of macroeconomic factors and the financial liquidity of enterprises. Initially, 74 macroeconomic variables were investigated. The classification of macroeconomic variables was employed, dividing them into four groups: overall efficiency of the economic system, formal institutional environment, informal institutional environment, and technical environment (Dawidziuk 2020). Only factors where statistically significant relationships were established were presented in this article. This approach uncovered macroeconomic variables whose associations with corporate financial liquidity had not been previously explored. For example, in previous studies, the relationships between macroeconomic variables have typically involved variables reflecting the overall efficiency of the economic system. However, the relationships with macroeconomic variables from other areas covered by the current study were previously rarely investigated (Jaworski and Czerwonka 2022; Wang 2021; Wijerathna et al. 2024; Chen and Mahajan 2010; Qehaja et al. 2022; Mahmood et al. 2019). These include variables related to the formal and informal institutional environment, as well as variables reflecting the technical environment. What also distinguishes our research from other studies is the design of the research sample, which included randomly selected companies representing 21 industries, belonging to different groups, i.e., both listed and unlisted, large, medium, and small. This represents a significant advantage over other similar studies, which frequently focus on listed companies, which are predominantly large enterprises (Gajdka and Pietraszewski 2022).

The primary findings of this study are as follows: In terms of the relationship between macroeconomic variables and corporate liquidity, it can be observed that among the macroeconomic variables that illustrate the overall efficiency of the economic system, only the consumption-to-GDP ratio exhibits a negative association with financial liquidity. The remaining variables (GDP per capita, ratio of foreign trade goods balance to GDP, the share of entities with foreign capital in all entities, consumer price index (CPI), and money supply) demonstrate a positive relationship. These results contribute to the existing body of knowledge in a number of ways. With regard to the relationship between GDP per capita and liquidity, the present results corroborate those of certain previous studies (Chen and Mahajan 2010; Qehaja et al. 2022), while contradicting the findings of other studies that suggested a negative relationship (Jaworski and Czerwonka 2022; Nyeadi et al. 2018; Moussa 2019; Mahmood et al. 2019). The results obtained in this study confirm those presented by Chen and Mahajan (2010) in the case of CPI and money supply, while contradicting those of Qehaja et al. (2022). With regard to the impact on liquidity of macroeconomic variables such as the ratio of the balance of foreign trade turnover to GDP, the share of entities with foreign capital in all entities, or the consumption-to-gross domestic product ratio, the results of our study indicate statistically significant relationships. To the best of our knowledge, these are the first such relationships to be identified. This demonstrates the novelty of our research.

With regard to the variable representing the formal institutional environment, a positive relationship was observed between the number of building permits for housing and financial liquidity. This study represents the inaugural investigation to our knowledge that has identified a relationship between the number of housing units for which permits were issued and corporate financial liquidity.

Variables from the informal institutional environment indicate a positive relationship for the employment rate, which is inconsistent with previous studies (Qehaja et al. 2022;

Jaworski and Czerwonka 2022), and a negative relationship for the share of the pre-working age population in the overall population. With regard to the latter variable, our study represents the first to indicate a statistically significant relationship between the share of the pre-working age population in the overall population and corporate liquidity.

In the case of variables from the technical environment, it was established that the relationship between the ratio of internal expenditures on research and development to GDP and corporate liquidity is positive. With regard to the theoretical justification of the aforementioned results (Zhou 2020), it is pertinent to note that our study indicates that the positive effect of innovative business development on corporate liquidity outweighs the negative effect of increased R&D expenditure. Furthermore, our study is the first to establish a statistically significant relationship between the ratio of internal R&D expenditures to GDP and corporate liquidity.

In conclusion, the novelty of the results of our study lies in the comprehensive examination of 74 macroeconomic variables in the context of their impact on the liquidity of enterprises. To the best of our knowledge, this is the first such comprehensive study of its kind. Furthermore, the inclusion of variables from hitherto neglected areas of the macro-environment, such as the formal and informal institutional environment and the technical environment, contributes to the novelty of the results. Furthermore, the construction of a research sample comprising enterprises from 21 sectors of the economy, including both listed and unlisted, as well as small, medium, and large enterprises, has a positive effect on the generalizability of the results. Finally, the findings of this study partly confirm and partly contradict those of previous studies, for example, with regard to variables such as GDP per capita or CPI. Conversely, the results of our study diverge from those of previous studies, for instance, with regard to the employment rate. Consequently, the results of this study should be regarded as a novel contribution to the field. However, the novelty of the research is most evident in the statistically significant results obtained for macroeconomic variables that have not been previously studied. The results indicate a positive relationship between the ratio of the balance of foreign trade turnover to GDP or the share of entities with foreign capital in all entities and the financial liquidity of enterprises. Additionally, there is a negative relationship between the consumption-to-GDP ratio and financial liquidity. Furthermore, the number of housing units for which permits were issued is positively correlated to financial liquidity. Finally, the ratio of internal expenditures on R&D to GDP is positively related to corporate liquidity. These findings demonstrate the novelty of the research conducted.

Our findings are of significant importance for the design of appropriate solutions supporting financial risk management. They reveal the influence of macroeconomic variables from areas previously omitted in research, such as the institutional and technical environment, on corporate financial liquidity. From the perspective of financial risk management, there is no more significant issue than financial liquidity. Problems in this area can lead to bankruptcy. In this context, the findings of our research are of significant importance not only from the perspective of the corporate sector but also for policymakers in selecting appropriate macroeconomic tools to impact the liquidity of enterprises.

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Note

- ¹ As a robustness check, we repeated our analysis for the quick ratio, treasury ratio, and coverage ratio as a dependent variable. Our conclusions remain unchanged.

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