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The Effect of Inflation on Companies' Performance: Firm-Level Evidence from the CEE Region

Author(s):

Anna Scemeleva

Irina Nagornova

Supervisor:

Olegs Matvejevs

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Abstract

The study examines the relationship between inflation and firms' financial performance indicators in Central and Eastern Europe (CEE region) over the period from 2005 to 2021. Using the ORBIS database, we compile one of the largest dataset of firm-level financial data for the CEE countries and use it to assess companies' performance. Moreover, we consider different measures of firms' financial performance and inflation types. In particular, we study the effect of headline inflation on various indicators of firms profitability and liquidity with further inflation decomposition into anticipated and unanticipated components, as well as demand-pull and cost-push inflation. We discover a positive, significant and robust effect of inflation on firms' profitability and liquidity. This effect tends to be larger for the predicted part of inflation but its magnitude is smaller for the unexpected inflation shock. We further find that, in line with theory, this effect mostly comes from demand-driven inflation, whereas cost-push inflation has a negative or insignificant impact on firms' profitability. The main novelty of our study is the first comprehensive analysis of the impact of inflation based on firm-level data which represent the population of firms of multiple European countries. It is important to study this relationship further, as understanding the link between inflation and profitability and liquidity on the firm level can have far-reaching policy implications.

Keywords: inflation, firms' performance, anticipated and unanticipated inflation, inflation forecasting, demand-pull and cost-push inflation, CEE region, firm-level data

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1. Introduction

Over the past years, the EU economy was characterized by moderate inflation that supported economic growth and social stability. However, the situation has sharply changed due to profound economic and political shocks. As a result, the inflation figures have been beating this century's records of advanced economies for several months. In October 2022, the annual inflation rate in the euro area countries hit a record of 10.6%; the uncertainty across the society made the overall financial system less stable (Eurostat, 2022).

Although the current events hit all records in an escalated inflation rate, these are not the only ones in the history of eurozone countries when inflation was way higher or lower than the 2% medium-term target of the ECB (European Central Bank, n.d.). One could also refer to the periods of the global financial crisis and the COVID-19 pandemic, where the overall inflation rate deviated from the benchmark. According to the European Commission (n.d.), some potential drivers of inflation in the euro area tend to be primarily associated with the volatility in oil and food prices. However, our research is not exclusively constrained to eurozone members in Central and Eastern Europe (CEE region). Referring to other European countries which have not adopted the euro, for some of them, we might observe even more pronounced periods of volatile inflation over the past decade (e.g. Serbia and Ukraine) due to country-specific reasons. The choice of the region to explore is primarily related to geographical considerations, lack of attention in the early literature on this topic, the data availability aspects in the Orbis database and potential sample size. Overall, our sample represents companies from 14 countries in total.

Inflation might significantly affect companies' valuation, resulting in resource allocation inefficiencies and harming productivity growth (Ibrahim & Ali, 2018). The managers of the companies and entrepreneurs should consider the risks associated with inflation while understanding the vulnerability in their business operations, assessing real costs, and developing strategies to handle the consequences from various aspects like investment distortion.

Inflation is related to price volatility, which can cause negative consequences on investment decisions due to increased uncertainty about the profitability of these investment projects (Ayyoub, Chaudhry & Farooq, 2011). Consequently, a decreased level of investment translates into lower economic growth. One of the other effects of inflation is associated with the economy's balance of payments when a country's export cost becomes relatively more expensive (Ayyoub, Chaudhry & Farooq, 2011). Inflation can also translate into the tax

system and impact borrowing and lending decisions (Ayyoub, Chaudhry & Farooq, 2011). The elevated inflation implies that firms face problems such as increasing prices in raw materials, changes in existing business models, and a decline in customers' purchasing power. Firms should be prepared to deal with the risks related to changes in operational conditions and allocate more resources to handle the effects of inflation and business challenges.

Overall, inflation could be associated with negative consequences on firms' performance and financial sustainability (Benabou, 1992; Russell, Evans & Preston, 2001; etc.). However, some of the research did not provide strong evidence for that argument (Cameron et al., 1996; Freeman & Yerger, 2000; Andler & Kovner, 2022 etc.). In addition, one of the relatively recent studies by Konchitchki (2011) claimed that there is no considerable effect of inflation detected in the firms' nominal financial statements while exploring US-listed companies.

Considering the relevance of the topic, the lack of attention in the recent literature to the link between inflation and companies in the CEE region, and the potential applicability of the results obtained in this study for further studies, entrepreneurs, managers, and policymakers, the main research question is formulated as follows: *How does headline inflation affect profitability and liquidity of companies?*

The analysis will be further extended with the inclusion of the expected and unexpected components of inflation (also mentioned as unanticipated inflation). It is suggested that unanticipated inflation might have even more severe consequences on business since businesses are not always capable of adjusting their business model and operation to these circumstances. Although unexpected inflation is not as often calculated and used for the analysis, there are some studies in the literature that highlight its relevance and applicability to study firms (from the early literature, we can refer to Bernard (1985), who studied the relationship of unanticipated inflation rate on stock prices). At the macro level, one might refer to the recent study of Dorval and Smith (2015), who examined the relationship between inflation and unexpected inflation on output growth. In general, unexpected inflation and its volatility might be associated with periods of uncertainty for investors and entrepreneurs, which are likely to have an impact on business performance. The effect of inflation expectations on various aspects like firms' investments, pricing strategies, and employment has also been researched in the literature. Many studies have investigated how inflation expectations translate into companies' economic decisions (Coibion, Gorodnichenko & Ropele, 2019). So, the first research sub-question is aimed to analyze: *How do anticipated and unanticipated inflation affect firms' financials?*

We see potential in distinguishing between the demand and cost components of inflation. Demand-pull inflation underpins the result of a rise in aggregate demand - this inflation goes up when the growth rate of aggregate demand significantly exceeds the growth of aggregate supply (Kibritçioğlu, 2002). In contrast, cost-push inflation is associated with an increase in cost components faced by producers, namely input prices, taxes, etc. (Kibritçioğlu, 2002). One could expect that these two channels might have a different effect on firms' performance. Finally, the second research sub-question is formulated as follows: *How do demand-pull and cost-push affect firms' financials?*

The novelty of our study is twofold. *Firstly,* we study the impact of inflation on firm financial indicators that have not been studied for the CEE region using firm-level data. In view of this, we are convinced that it is important that we put together one of the largest available dataset of firm-level financial statements - in total, we start with over 2.1 million companies researched across 17 years. *Secondly,* rather than focusing on headline inflation only, we go deeper into trying to analyze the impact of different constituents of inflation. In particular, we distinguish between expected and unexpected parts of inflation, as well as demand-pull and cost-push inflation.

The results of the paper suggest that there is a positive association between actual inflation and the profitability as well as liquidity of the companies. The findings of expected and unexpected inflation imply that companies are able to extract benefits from both in terms of profits, tend to increase their current ratio and corporate cash holdings, while the Cash Conversion Cycle (CCC) of companies is reduced.We further find that, in line with theory, this effect mostly comes from demand-driven inflation, whereas cost-push inflation has a negative or insignificant impact on firms' profitability.

We believe that our results could potentially serve as a valuable insight for firm managers and policymakers, especially monetary and macroprudential authorities. Our results suggest firms are able to increase margins as inflation grows, which, all else equal, reinforces the importance of central banks' inflation targeting policies. Such policies may prevent excessive surplus transfers from consumers to firms in times of high inflation.

The structure of the rest of the paper is built around five main sections. The literature review provides a broader outlook on inflation tendencies in the European region, investigates other studies that explore the established relationships between inflation and firm characteristics and describes the practical models to forecast inflation and estimate an expected and unexpected part of inflation. In addition, we extensively discuss the relevance and novelty of the study in the following section. The data is described right after in Section

3, with all collection and cleaning procedures performed before the analysis. Section 4 presents the employed methodology and highlights important methodological decisions, thereby establishing ground for quantitative analysis. Although the research design might not be enough to claim the causal effects, it might still provide a broader outlook on the relationship that persists between the variables of interest. The results and discussion of results section presents and analyses the outcome of the regressions addressing the research questions. Finally, the conclusion is devoted to a quick overview and summary of the study and key takeaways.

2. Literature Review

2.1. Understanding and Defining Inflation Phenomenon

One of the most general definitions of inflation attempts to explain the symptoms of inflation, where inflation is understood as a continuous process of price level rise of goods and services in the economy (equivalently, a drop in the value of money) (Laidler & Parkin, 1975). The purchasing power of money declines with the rise of inflation. It is often measured as a percentage change in the price, where one of the most prominent examples could be the consumer price index (CPI).

However, it is not the only way to approach the question of inflation. There are many concerns and debates about its precise definition, which introduces some flexibility around this question. Apart from the one discussed above, there are other sophisticated definitions of inflation provided by Bronfenbrenner and Holzmann (1963) that attempt to explore it deeper while interpreting the causes, effects, and characteristics of this phenomenon (Frisch, 1983).

Overall, we can highlight four potential explanations for inflation. First, inflation could be seen as a result of excess demand in the goods market where “too much money is chasing too few goods” (Frisch, 1983, p.10). The second type of definition relates to the rise of the money supply. This opinion was popularized by Friedman (1970), who explained inflation as a monetary phenomenon (Frisch, 1983). The third argument provided adds up to the symptom-based definition explored above. It is related to inflation being a general price increase with additional characteristics; one of these is that inflation is not fully anticipated, leading to further price rises through cost factors. It also should not be associated with changes, particularly an increase in employment and real output. Finally, the fourth definition considers external factors. In that case, inflation could be seen along with the changes in foreign exchange rates.

The conventional interpretation of inflation as a sustained rise of the general price level in the market for goods and services is related to the continuity of its changes and does not account for a one-time or short-run effect. It is a process of altering the equilibrium price level in the economy, which might be classified into demand-pull and cost-push components of inflation based on the underlying conditions of this price deviation.

However, these are not the only ways to distinguish various types of inflation; there are theories that highlight the time frame (short-run and long-run inflation), the rates of inflation (low-, high- and hyper-inflation), different types of market competition, inflation asymmetry, fiscal and monetary policies, and other factors (Kibritçioğlu, 2002). In our research, while exploring the association of headline inflation and firms' performance indicators, we extend the analysis around anticipated and unanticipated inflation as well as demand-pull and cost-push inflation.

2.2. Inflation Policy and Tendencies

The data sample employed in the study is constructed to cover countries located in the CEE region. Since most countries under the research are members of the European Union and eurozone, in the following section, we will briefly discuss inflation policy and tendencies in the European region with a primary focus on the euro area and the role of the European Central Bank (ECB).

Most members of the EU adopted the euro, where inflation is controlled by the ECB, and some other countries (like Denmark) have their currencies pegged to the euro (DNB, n.d.). The inflation rate directly impacts the economy, so it is crucial to have instruments to influence inflation fluctuations (DNB, n.d.). The primary goal of the ECB is a stable and foreseeable economy that complements both growth and employment. To achieve that goal, the ECB sets a 2% inflation rate as a reference and indirectly tries to impact inflation fluctuations by changing the key interest rates accordingly (European Central Bank, n.d.). For instance, when inflation is higher than 2% for a prolonged time, it increases interest rates; thus, less money is borrowed for investment, so inflation seizes.

According to the ECB, the main reason for unexpectedly low inflation following the great recession was a significant decrease in oil prices (Ciccarelli, Osbat, Bobeica, Jardet, Jarocinski, Mendicino, Notarpietro, Santoro & Stevens, 2017). This tendency is explored by the European Commission, which suggests that the main drivers of inflation in the EU are oil prices and the food sector, fruits and vegetables particularly (European Commission, n.d.). Inflation stays reluctant to changes in the services sector and other goods provision. However,

some noticeable price changes may occur in case of a significant production cost increase (European Commission, n.d.). Considering that, unforeseeable low inflation due to oil prices became a challenging objective for European monetary policy. At the ELB (effective lower bound) of interest rates, there is not much room to influence inflation, so some unconventional approaches, namely forward guidance and asset purchase, were used to stimulate the economy, which otherwise would end up in even deeper stagnation. Notably, Asset Purchase Programs showed high efficiency in increasing inflation expectations (Ciccarelli et al., 2017).

Although the European Monetary Union has more benefits for the members, namely price stability and trade of goods without let or hindrance, it may have noticeable drawbacks for eurozone countries whose economies drastically differ from the main western European countries like France and Germany. The dissimilarity of macroeconomic aspects among eurozone countries may make it more challenging to sustain monetary policy addressing the problems of all the members. Consequently, countries may not always be able to mitigate local shocks appearing within the domestic economy (Conrad, 1998).

Inflation has skyrocketed in the past year in the vast majority of euro area countries, especially in the Baltic countries. According to Eurostat (n.d.), at the moment of October 2022, the highest annual inflation was recorded there, namely at 21.7% in Latvia, 22.1% in Lithuania, and 22.5% in Estonia. On the other hand, France, Spain, and Malta had the lowest annual inflation, with 7.1%, 7.3%, and 7.4%, respectively. Liv Klingert suggests that the main reason for such a considerable inflation difference is countries' dependency on energy sources and food (Klingert, 2022). The Baltic countries, Estonia in particular, show the highest public consumer expenses in these two areas, as well as solid past dependency on Russia, which explains the reason for higher inflation. Contrary, countries like France are more energy-independent and show more versatility in consumer expenses. In addition, price caps were introduced by French authorities to mitigate rising prices in the energy sector (Klingert, 2022). Notably, Eastern European countries that have not adopted the euro have also experienced very high inflation in the past year.

2.3. Inflation Effect on Firms' Performance

High inflation might generally have a negative effect on firms. Price turbulence may create internal uncertainty and require additional resources allocated to the risk of even higher prices. However, the most visible effect that one can analyze is reflected in the changes in key characteristics of companies' balance sheets and ratios.

2.3.1. Inflation and Profitability

While assessing firms' performance, one of the central measures is the companies' ability to generate profits. The effect of inflation on profitability has been researched in early literature with no consensus around this relationship. Some of the studies suggest that inflation might influence profitability through many channels, among which are the rise in input prices, 'menu' costs, and challenges firms face while adjusting prices in the inflationary environment (Banerjee, Mizen & Russell, 2002; Ramadhanti, Amaliawiati & Nugraha, 2021). Overall, several studies have justified that the relationship between inflation and profitability is negative (Banerjee, Mizen & Russell, 2002), while others do not find strong evidence for this claim (Benabou & Konieczny, 1994, Ramadhanti, Amaliawiati & Nugraha, 2021), or even prove that the positive relationship persists (Ibrahim, & Ali, 2018; Andler & Kovner, 2022).

According to Almeida (2015), during the financial crisis and the increase in inflation, the firms with weak balance sheets increased prices more aggressively; however, the firms with strong balance sheets even managed to lower the prices for some of the goods. There is also a negative link between the country's current account deficit and price increase. Consequently, by analyzing the firm's balance sheet, one can make conclusions about the firm's response and performance during severe inflation fluctuations.

Gross profit is the first measure that changes the balance sheet due to inflation. According to Andler and Kovner (2022), gross profits positively correlate with inflation even when inflation is unusually high. To ensure coherent results, the authors exclude the oil, gas, and air transportation industries with inelastic demand for their services.

Research made by Asher and Cominetta (2022) analyzes the impact of inflation on the profit margin ratio. Authors come up with the conclusion that sharp growth in inflation leads to an increase in gross margin for the energy, industrial, material, and consumer sectors; however, a decline in the health and financial sectors. The justification of this relationship relies on the fact that inflation accompanied by real GDP growth does not hurt companies' profitability since it is materializing in the context of a growing economy, which is one of the factors that allow firms to pass higher prices on consumers (Asher & Cominetta, 2022). However, their findings suggest that in some cases, profit margins could even increase regardless of growth (Asher & Cominetta, 2022). Rising commodity prices could positively affect the materials, energy, industrials, and consumer staples sectors that are associated with relative fixed costs (Asher & Cominetta, 2022).

Another very recent research by Weber (2022) states that the profits of grocery producers are skyrocketing. The reason for such an increase in grocery prices in the US market is the sudden difficulties related to food and raw materials availability. Consequently, companies justify the rapid increase in prices by the uncertainty around the increase in prices for raw materials (Weber, 2022).

One of the most straightforward and widely used metrics among investors is the return on equity (ROE). Reilly (1996), using the DuPont formula (profit margin * asset turnover * financial leverage), shows that the main variable that drives aggregate ROE up in the inflationary environment is the profit margin. Following the analysis of ROE components, the authors find out that an increase in financial leverage from the increase in borrowings is compensated by the decrease in asset turnover, as during the uncertainty, the demand decreases. To sum up, the ratio of the profit margin increases during inflation turbulence.

The third aspect is the negative impact of inflation on the optimum markup set by firms. Inflation fluctuations imply greater uncertainty regarding price setting. According to Russell, Evans, and Preston (2001), there is a negative correlation between the markup and the inflation level, as in a period of inflation turbulence, firms choose to set a 'lower' markup than the profit-maximizing markup would suggest minimizing the potential losses. The way the authors approach this relationship is through the outlook of the asymmetric loss function, in which the costs of setting markup over the 'true' profit-maximizing markup are higher than pursuing a more conservative approach in markup setting (setting 'low' markup).

Another study performed by Benabou (1992) explores the effect of anticipated inflation, unanticipated inflation, and inflation uncertainty on the markups of companies in the US retail sector. He documented a statistically significant negative relationship between both expected and unexpected inflation on firms' markups, while it does not seem that inflation uncertainty and variability have an effect.

2.3.2. Inflation and Liquidity

Inflation might cause firms to adjust their liquidity to mitigate the risks and change the way the resources are managed.

Inflation for firms is associated with a period of uncertainty, which is why companies aggressively start to reduce capital budgeting (Mills, 1996). Working capital is sensitive to inflation, and its increase creates excess liquidity along with the increase in the weighted average cost of capital (WACC). In addition, WACC could also increase due to information asymmetry and a decrease in the quality of accounting forecasts that also arise from inflation

volatility (Mills, 1996). According to Mills (1996), WACC rises at the same rate as the inflation rate. As a result, companies suffer from a decrease in wealth without a corresponding increase in profitability.

The company might mitigate the consequence of inflation by decreasing the CCC. CCC is the crucial ratio that accounts for how much time a company needs to sell its inventory, how much time it takes to collect receivables, and how much time takes to pay bills without incurring penalties. In periods of severe inflation, companies try to reduce inventory days outstanding and days of receivables to manage to spend the cash before the money loses the purchasing power even more (C2FO, 2021). Consequently, by decreasing the CCC, a company gains additional resources to better hedge itself from the inflation crisis (C2FO, 2021).

Inflation is one of the factors that distort the balance between the costs and benefits of holding cash. While exploring the relationship between cash and inflation, one could refer to the recent studies of Fallah and Hashemi (2016), who have explored the effect of inflation and the operating cycle on firms' cash holdings. The authors analyzed the companies listed on the Tehran Stock exchange between the years 2003 and 2013 by employing a multivariate regression model. The primary objective of the study was to establish the relationship between inflation and the cash holding strategy perceived by companies, with a secondary aim to investigate the existence and the link between the operation cycle and cash holdings. They have found that the relationship between these variables was reversed until a certain level of inflation with an observed change to a direct relationship beyond the threshold. The results are consistent with the early study done by Wang, Ji, Chen, and Song (2013), who explored the set of listed companies in China's stock market. Overall, the authors have documented a significant negative relationship between firms' cash holding and inflation, with a noticeable reversal at a certain inflation level. A similar tendency was discovered by examining the effect of the operating cycle on cash.

Fallah and Hashemi (2016) outline that there are at least two main channels that could affect the liquidity of the companies. The first one is associated with the increase in the costs of holding liquid assets with the increase in inflation. It inclines firms to reconsider their cash holding strategy while reducing its level through the purchase of raw materials in advance or exchanging liquidity for real estate and gold, which would store or even increase value during the inflation spikes (Fallah & Hashemi, 2016). Another channel pushes firms to hold liquidity due to an increase in deposit reserve rates following inflation and/or due to potential

flexibility to ensure against uncertainty and business risks coming up with the rise of inflation rates (Fallah & Hashemi, 2016).

2.3.3. Inflation Effect on Other Aspects

Overall, apart from the effect on profitability and liquidity of the companies, inflation might disturb other aspects of firms' operation and performance. There are plenty of studies that attempt to research the relationship between inflation and firms' performance in terms of debt structure, investment, survival, productivity, and others.

Based on the macroeconomic theory, when inflation increases, a country's central bank raises the interest rates, and as a result, commercial banks as well raise interest rates on loans. For companies, it becomes more expensive to borrow additional resources for future projects. Consequently, inflation has an effect on the current and future company's investments. The paper of Zhang, Liu and Lv (2021) explores the link between inflation and investment through a company's inflation forecasts. They base their analysis around the rational expectations revolution, which suggests that inflation expectations are key determinants of agents' economic decisions and actual inflation. The main finding of the paper is that increasing inflation perception encourages companies to invest more, which is especially relevant to large manufacturers due to higher liquidity and probability of penetrating the credit market. However, when inflation perception diminishes, small firms demonstrate a tendency to restrict investments to a further extent.

Many studies explore the relationship between firm characteristics and the debt structure of the company, while the effect of macroeconomic variables is often neglected. This issue was approached by Hatzinikolaou, Katsimbris, and Noulas (2002), who examined the link between inflation and capital structure. Inflation and its volatility translate into inefficient corporate decisions, uncertainty about the future cash flow, tax shields and earnings, higher business risks and probability of insolvency, which consequently influence managers' stability perceptions and the budget structure (Hatzinikolaou, Katsimbris & Noulas, 2002). The authors claim that high inflation and high uncertainty about the upcoming periods will incline firms with uncertain cash flows, high business risk and a need for funds to issue new equity capital. At the same time, a debt issue is not the best option since the firm may be forced to issue new stock on unfavourable terms in the future. This makes Hatzinikolaou, Katsimbris, and Noulas (2002) estimate that an increase in inflation is negatively associated with the D/E ratio. The core finding of the paper is that inflation uncertainty, which is associated with business risk, along with expected real interest rate and

fixed-to-total assets ratio, has a decremental impact on companies' debt-to-equity ratio. Overall, they conclude that there is a strong negative correlation between inflation and a company's capital structure (D/E ratio).

As inflation creates for the company additional financial and operational difficulties, some of them decide to leave the market. Wu and Zhang (2001) realized the assumption that the number of firms should be fixed as the latest research shows that seemingly small changes in assumption can have an impact on the firm's survival rate. The authors use the general equilibrium cash-in-advance monopolistic competition model and increasing returns to scale to analyze the effect when the assumption is relaxed. To conclude, it was found that inflation reduces the number of firms and each firm's size. Moreover, inflation generates higher welfare costs and encourages firms to invest more in R&D activities.

The empirical link between inflation and productivity is broadly investigated in the literature (Sbordone & Kuttner, 1994; Smyth, 1995; Freeman & Yerger, 2000 etc.). Inflation might have a negative effect on productivity growth due to a number of reasons. First, it can be translated to the inefficient allocation of factor inputs (Tsionas, 2003). Second, during periods of high inflation, the informativeness of price signals decreases, which further translates into a decline in accurate price change reflection. It further disturbs the decision-making process of enterprises, which leads to more frequent errors and inefficient allocation of resources (Tsionas, 2003). Third, in periods of volatile inflation and high uncertainty, firms are inclined to increase the unproductive buffer stock holding in inventories and cut the costs associated with R&D activities (Tsionas, 2003). Finally, there is also a channel of tax reduction on depreciation and an increase in capital rents, which discourages capital accumulation (Tsionas, 2003).

In many studies, authors further distinguish the effect of inflation on productivity depending on the company's demand curve and the profit function. According to Konieczny (1990), at a low inflation rate, the output increases if the demand function is convex and stays the same if the demand function is linear. However, in real life, the demand function in most cases is concave, which is why the government should be attentive when implementing the monetary policy to stimulate the economy. In addition, the companies should make their expectations about aggregate inflation, keeping in mind the unexpected inflation component.

While exploring the link between inflation and productivity, there is no consensus on the general effect. Many empirical findings provide contradicting results, with Smyth (1995) documenting a statistically significant negative association between the variables, while

Sbordone and Kuttner (1994) and Freeman and Yerger (2000) suggest no evidence in favour of this phenomenon.

2.4. Unexpected Inflation, Inflation Expectations, Inflation Forecasts

This section complements the methodology part of our research when the unanticipated inflation component is estimated. A vast majority of the literature on the issues of the formation of inflation expectations and the learning associated with it (Orphanides & Williams, 2003). However, the main challenge in these studies relates to the measurement issues of expected and unexpected inflation. One of the ways one can extract data on inflation expectation and unanticipated inflation is based on survey data of households and experts, which is a widespread practice in the United States (like the Michigan Survey, ASA-NBER-Survey of Professional Forecasters, etc.).

While trying to identify the most effective ways to approach the question of inflation expectations, we discover vast literature where authors compare the results of the survey from households and experts who perform sophisticated econometric analysis to forecast inflation. Gramlich (1983) was one of the researchers who established that the data collected from randomly selected households tend to outperform experts' estimates. While observing a significant distortion in expectations among both households and experts, he concluded that this process is purely irrational.

In more recent publications, a similar analysis was performed while comparing the data on inflation expectations obtained from households and experts with naïve econometric forecasting techniques. The conclusions of Mehra (2002) suggest that econometric forecasts performed worse than the survey data, which was later consistent with the observations of Ang, Bekaert, and Wei (2005).

One of the recent studies by Coibion, Gorodnichenko, and Ropele (2019) relied on a qualitative research design for data collection. The authors managed to establish a causal relationship between the effect of inflation expectation and firms' economic decisions, exploring the companies operating in Italy. The authors highlighted the main issues related to this type of data and analysis in the existing literature. The most prominent obstacle is related to the lack of desirable information on the inflation expectation of firms, which puts a constraint on further analysis and limits the studies by the proxy of inflation expectation of households. The prior work of Coibion and Gorodnichenko, with the contribution of Kumar (2015), approached this problem while collecting data from the survey of firms in New Zealand. With the aim to explore the exogenous variation in inflation expectation of the

managers of those companies following the information treatment, the authors managed to identify the effects of inflation on profitability strategies, operational changes, and investment decisions of these companies.

Although the qualitative method of data collection might be more accurate in inflation expectation measurement, we acknowledge that the survey-based method has a limited implication in our research due to poor data availability and time constraint. It would suggest a deeper focus on one specific country, which contradicts the general objective of the research of exploring the firms that operate in the CEE region. Fortunately, there are other alternatives that proved to perform relatively well and might be more suitable for our type of analysis.

Unexpected inflation can also be proxied by taking the difference between the inflation forecasts and the actual inflation observed in the period. There are several econometric models that are used to estimate future inflation. The first one is a set of univariate time series models. The most widely used and relatively intuitive forecasting methods rely on two ARMA (p, q) models: an ARMA (1,1) model and a pure autoregressive model with p lags (AR (p)). The motivation for ARMA (1,1) model dates back to the rational expectations macroeconomics, where inflation is seen as a sum product of expected inflation and noise (Ang, Bekaert & Wei, 2005).

The Phillips-curve models gained attention in line with the emerging New-Keynesian school, which became one of the most widely used models to forecast inflation. The Phillips curve is aimed to establish the relationship between inflation and the unemployment rate in the economy. However, most modern models are not solely based on the naïve Phillips curve but rather consider Phelps-Friedman-critique and focus on changes in inflation and its correlation with the unemployment factor (El-Shagi, 2009). The results of the effectiveness of this approach are controversial. Some papers document an excellent performance of the model in the chosen study period (Stock & Watson, 2008), while some of the researchers are not that optimistic about the prediction power of that model (Atkeson & Ohanian, 2001).

The most recent study by Banbura and Bobeica (2020) explored whether the Phillips curve is capable of predicting inflation in the euro area. The forecast of inflation trends in the euro area is quite a challenging objective, especially after the period of the sovereign debt crisis. However, some adjustments to the Phillips curve (like consideration of the time-varying inflation trend) are vital to ensure better performance and promise a slight fit improvement compared to the univariate model of inflation (Banbura & Bobeica, 2020).

The paper of El-Shagi (2009) is one of the first studies that compare the effectiveness of inflation forecasting techniques and inflation expectations estimated using econometric

models rather than survey-based data. The general framework employed in the research dates back to Fama (1975), who attempted to estimate the unexpected component of inflation through the real interest rates. Contrary to past research, El-Shagi relaxes some assumptions about a constant planned real interest rate (El-Shagi, 2009). In that case, the author estimates the unexpected inflation by considering the interest rate development over time and its differences among countries.

Overall, the author concludes that it is the case that market inflation expectations tend to be slightly more accurate than the econometric forecast models can suggest; however, this difference is not statistically significant (El-Shagi, 2009). Moreover, El-Shagi (2009) documents that expectations are not solely formed on the past development of inflation. It is rather a sub-product of certain economic indicators that market participants assess.

In our research, we will extract the measure of unanticipated inflation to examine its effect on different firms' characteristics. While assessing risks, it is worth it for managers to account for projected inflation in a country the company operates in. It might further contribute to the decision-making process of resource allocation, budgeting, etc. Therefore, the analysis of the unexpected inflation component might approach the anticipation effect. Although this section provided an overview of widely spread approaches to project inflation and to estimate an unexpected part of observed inflation in a period, the final choice of methods applicable for this study is largely constrained by the availability and quality of the data required and is justified in the subsequent methodology section (Section 4.3.2.).

2.5. Research Gap and Contribution

To the best of our knowledge, there is a lack of studies in the literature attempting to explain the relationship between inflation and firms' performance in the European region, especially in the past decades. However, the relevance of this topic has significantly increased following the current political and economic events associated with the war in Ukraine. Although there were no severe inflationary periods over the most recent years, the findings of the study could still provide some insights into the behavioural characteristics of firms and potentially help policymakers understand what threats businesses face when inflation becomes higher.

During the literature review, it was concluded that it would be useful to extend the analysis by looking at the unexpected inflation component and its relationship with firms' performance characteristics. Unanticipated inflation generates a greater level of price uncertainty while creating price distortion and facilitating decision-making errors (Freeman & Yerger, 2000). As it is suggested by the theory, it further translates into lower productivity of

firms, pricing policy and operational efficiency with a suboptimal allocation of resources and reduction of long-term research expenditures (Freeman & Yerger, 2000). On top of the potential effect of unanticipated inflation on different firms' aspects, introducing the unexpected inflation component to the research design is beneficial in the way of accounting for the anticipation aspect. In contrast, the introduction of the expected inflation component will capture the effect of how inflation expectations are translated into business decisions, which dates back to the rational expectations theory.

To account for unanticipated inflation and inflation expectation, in many articles, the survey as the data collection method is employed, which sometimes provides outstanding accuracy; however, in some cases, a quantitative method might be preferable over that approach due to issues related to data availability and the fact that the qualitative methods can be subject to severe biases (Coibion, Gorodnichenko & Ropele, 2019; El-Shagi, 2009). There are studies that provide methodologies to forecast inflation and estimate unexpected inflation (El-Shagi, 2009); however, there is a lack of research on its usage for further analysis, especially while considering firm-level data (Bernard, 1985). In our research, we use various methods to estimate the expected part of the inflation, using both time series models and expert forecasts.

In addition to the consideration of the anticipated and unanticipated inflation, we are going to analyze the effect of demand and cost components of inflation on firms' performance while employing a common practice to distinguish between these factors.

Another aspect differentiating this study from existing research is manual data collection from the Orbis database, data availability and coverage. Instead of focusing on one country, our study would provide a broader outlook on the CEE region.

3. Data Description

3.1. Data Collection

Macroeconomic data with historical forecasts used in the research is extracted from the IMF and Eurostat databases, while firm-level data for both public and private companies is taken from the Orbis database. The Orbis database, which is commercially powered by Bureau van Dijk Electronic Publishing (BvD), contains information on key performance metrics from financial reports, which coverage and quality might vary in line with reporting requirements across countries.

In this research, we are interested in the period between 2005 and 2021. The sample period is constructed in a way to cover the periods of both relatively high and low inflation in

CEE countries during the past decades. The recent year of 2022 is omitted since the financial data for a large share of companies is still not available. Overall, one might notice that the data quality and coverage sufficiently improved starting from year 2011, which is a result of storage characteristics in the Orbis database (Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych & Yesiltas, 2015) and appears to be one of the data limitations in our research.

The choice of countries depended on the perceived quality and coverage of the data in Orbis. Therefore, the list of the CEE countries covered in the analysis is as follows: Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Serbia, Slovakia, Slovenia, and Ukraine. Other countries, namely Belarus, Bosnia and Herzegovina, the Republic of Moldova, and the Russian Federation were dropped from the analysis due to issues related to data quality and sample representation. Although Turkey is only partially located in the southeastern European region (but is a big trading partner of Europe), we decided to include it in our sample due to the frequency of relatively high inflation periods and a data accessibility advantage in the Orbis database.

3.2. Data Cleaning

Data arrangement and cleaning are crucial stages, especially while working with microdata. The Orbis database contains lots of data from balance sheets and companies' income statements across the globe. However, several challenges had to be addressed to prepare the data for the analysis.

Initially, considering the NACE classification of companies provided in Orbis, we exclude the financial and insurance industry (K) and industries classified from O to U from our sample due to industry-specific operational and financial aspects.

The Orbis database is not convenient for large data downloads, which is required for this analysis. Inappropriate downloading and filtering procedures might lead to data loss due to some inherent biases in the database. If these issues are not approached properly, it might result in poor data quality and national representation. The paper of Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015) provides detailed instructions on constructing a representative sample from the Orbis database with data collection and cleaning procedures. We primarily rely on the findings and suggestions described in their research. The cleaning procedure looks as follows:

1. Firstly, we remove all company-year observations with missing data on sales, employment, operating revenue, and total assets simultaneously.
2. We remove the entire company if the total assets figure is negative in any year.

3. As a second step, we drop the entire company if the employment (in persons) is negative or exceeds the threshold of 2 million employees in any year.
4. We drop all companies with negative sales in any of the years (while operating revenue can take a negative value).
5. Further, we exclude the entire company if the value of employment per million of total assets is larger than the 99.9 percentile of the distribution.
6. We drop the entire company if the value of employment per million of sales is larger than the 99.9 percentile of the distribution.
7. Following the same approach as in points four and five, we exclude the entire company if the value of sales to total assets is larger than the 99.9 percentile of the distribution.
8. As the next step, we get rid of the companies with negative tangible assets (which would represent machinery, buildings, stock, etc.) in any year.
9. For a given company ID year, missing strings that are unlikely to change (country, name, legal form, date of incorporation) will be replaced with the information for this company from the other years when this information is given.

The purpose of the described procedure is to get rid of obvious mistakes in the dataset. We further extend the cleaning procedure to account for misreporting that might occur. So, we do cleaning for spikes and jumps: We drop an entire company if, for this firm, a *variable* is 50 times larger or smaller than its previous and next value *for variables:* sales, operating revenue, fixed assets, and the number of employees (applicable for positive observations only). These are variables that normally change gradually, and we assume that a jump by a factor of more than 50 with a subsequent return to a previous level is likely due to a misimputation, where a certain observation was recorded with an incorrect order (e.g. thousands instead of units).

While looking at the summary statistics at this stage, we still might notice some inconsistencies that raise questions about the quality of the dataset. Following the same logic of data cleaning as in the proposed methodology of Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015), we extend the set of variables that are unlikely to have negative values and can be classified as typos, obvious errors, or extreme company-specific figures. We drop an entire company if, in its records, it has a negative value of the following variables: COGS, materials, current assets, current liabilities, loans, non-current liabilities, stock, interest expense, debtors, and creditors.

Appendix A provides an overview of the % of the observations (by country) that remained after each filtering step.

3.3. Data Manipulations

For the analysis, we need data on profitability and liquidity characteristics, which can be easily obtained in the database provided. Although Orbis contains data on different ratios like "ROE" and "Profit margin" reported by companies, we still calculate them manually to avoid potential inconsistencies that might appear across different firms and countries while calculating these variables or issues with the data availability and coverage on a specific ratio. Although, at a later stage, we perform the robustness test comparing the regression results for both self-calculated profitability metrics and the one extracted from the Orbis database.

To ensure the ratios are within reasonable intervals and have a logical interpretation, we introduce a certain set of rules. For instance, one of these states that ROE ratios should be calculated if the condition of non-negative equity value is satisfied (Nasdaq, n.d.); otherwise, the ratio might be misleading. A detailed calculation procedure for the main variables of interest can be found in Appendix B.

Finally, we get rid of the potential outliers or extreme ratio outcomes that could appear because of misreported values that have not been captured in the previous steps. To approach this issue, we perform a trimming of each of the ratios at 95/5 percent levels at the country-industry level (except for the variables that are bounded from below and/or above as a result of the filtering procedure and/or rules introduced).

3.4. Descriptive Statistics

The summary statistics of the main variables used in the research to estimate the effect of inflation on various company's performance characteristics are presented in Appendices D and E. Appendix D reveals the data on explanatory and control variables used in the regression setup, while Appendix E shows a descriptive statistic on manually calculated ratios (dependent variables) after the main filtering procedures. Appendix F and G describe the dataset in terms of the number of firm-year observations and its proportion in the total sample for a variety of countries and industries selected for the analysis, respectively.

Considering that, we might see most observations coming from Romania (21.2%), with the smallest proportion of 0.3% and 2.4% attributable to Turkey and Slovenia, respectively. Such a low representation of Turkey in the sample is related to a rather poor data availability. Regarding the industry split (Appendix G), a great proportion of companies

operate in wholesale and retail trade, repair of motor vehicles and motorcycles sector (G) (30%).

4. Methodology

4.1. Overview

The aim of the work is to explore how firms' profitability and liquidity are related to headline inflation and, in addition, how they are affected by expected and unexpected inflation as well as cost-push and demand-pull inflation.

To start with, we perform a simple regression analysis where on the left-hand side of the regression, we would have a number of firms' performance characteristics, while on the right-hand side, we would consider inflation itself (Section 4.2.). The financial characteristics might vary across different firms, so we add control variables such as age measured from the year of incorporation and number of employees (Zhang, Liu & Lv, 2021; Nelson, 2022). Among control variables at the macro level that potentially have a significant effect on the dependent variable, we include real GDP growth as a measure of the change in aggregate demand. Part of the pick-up in profitability of firms can happen simply due to regular economic growth – when the economy grows, this can positively affect people's income and lead to higher demand and profitability. By including real GDP growth in the regression, we are able to estimate the coefficient that shows the change of firms' financial performance because of inflation and isolate the part that can be explained by fluctuations in aggregate demand.

The analysis is further extended with the introduction of expected and unexpected inflation components (Section 4.3.). Firms' inflation expectations might form their business decisions. Unanticipated inflation might bring an additional effect and account for the anticipation issue. Firms might be prepared for the upcoming inflation and change their core operations and business structure to handle the difficulties associated with inflation. For the reasons of robustness check, we calculate the expected and unexpected inflation using widely spread inflation forecasting techniques. At the later stage, we will consider a decomposition into cost-push and demand-pull inflation to account for the potential supply and demand forces that might impact businesses differently.

4.2. Regression Analysis

4.2.1. Dependent Variables

The main objective of the paper is to examine the effect of inflation on different firms' performance characteristics. In this subsection, we are going to specify the aspects that will be researched. Overall, we are looking at two dimensions – profitability and liquidity. For each of the spheres, there are specific ratios that could be considered, which have also been studied in the literature.

To start with, we could look at the ***profitability*** measures. *ROE* is a core of attention among researchers (Reilly, 1996; Ibrahim & Ali, 2018) as well as investors who assess the financial stability of the company. In addition, we will closely look at *net profit margin* as one of the main profitability indicators. Based on the literature review, one of the ratios that are influenced by inflation is *CCC*, which will be assessed in this research in line with the *current ratio.* Another interesting effect could be observed while analyzing the effect of inflation on corporate *cash holdings*. These will be used as primary ***liquidity*** indicators in the analysis.

4.2.2. Regressions

We will proceed with regression analysis to capture the effect of inflation on firms' performance. A similar type of research design to study the association between inflation/inflation expectations/inflation uncertainty and firms' financials through the multivariate regression analysis was explored in the recent studies of Wang, Ji, Chen, and Song (2013), Odusanya, Yinuso, and Ilo (2018), Zhang, Liu, and Lv (2021), and Ramadhanti, Amaliawiati, and Nugraha (2021). Following common specifications, we proceed with estimating the following model:

$$(A)\ BasicVariable_{ict} = \beta_0 + \beta_1 * InflationMeasure_{ct} + \Sigma\beta_k * Controls_{kict} + c_i + \ni_{ict},$$

where $BasicVariable_{it}$ is our dependent variable, which stands for one of the firm performance characteristics. $InflationMeasure_{ict}$ is one of the estimates of inflation for a particular country *c* where the company *i* operates in the year *t*. For the *set of firm-level control variables*, we define that $Controls_{kict}$ are variables associated with size (expressed as a natural logarithm of the number of employees for non-zero values; companies with positive number of employees are retained only) and age of the company for a firm *i* operating in a country *c* in a year *t*.. While controlling for age, we introduce a nonlinear relationship: age + age^2 considering the business cycle of companies. For the macroeconomic controls, we considered an introduction

of the real GDP growth in a respective year. Lastly, c_i is a firm-fixed effect, which accounts for individual unobservable heterogeneity, and $\ni_{ict}$ is an error assumed to be normally distributed (with mean zero and unitary variance).

4.3. Unexpected vs Expected Inflation

For further research, we proceed with the analysis of the inflation decomposition into expected and unexpected components to study their relationship with the company's performance.

4.3.1. Historical Forecasts

The primary concern in the calculation of unanticipated inflation is data availability and quality of the data. Due to the unavailability of survey data from households and experts about the inflation expectation, in this research, we will employ another approach to the calculation of the inflation expectation and unexpected inflation, which relies on econometric analysis and models.

One of the most intuitive ways to extract the unexpected component of inflation is to look at the available historical *forecasts* of inflation *provided* by the IMF database. In that case, unexpected inflation might be estimated by taking the difference between the actual inflation observed in that period and the predicted/anticipated inflation rate.

There are two inflation forecasts recorded by the IMF from the historical publications of the WEO done in the spring and fall periods. In this case, the latest available figure (fall) will be taken to account for inflation projections.

$$\pi^{\text{unexpected}}_t = \pi^{\text{actual}}_t - \pi^{\text{forecast}}_t \quad (1)$$

It is one of the quickest ways to measure an unexpected component. However, for the robustness check, we are going to proxy unexpected inflation by the error terms of the inflation forecasting models. In the following paragraphs, we are going to describe the chosen inflation forecasting techniques that are relevant for unexpected component estimation in our research.

4.3.2. Inflation Forecasting Techniques

The extraction of unexpected inflation components while considering the residuals of the econometric models is not new to the literature (Alckock & Steiner, 2014; Dorval & Smith, 2015). Some of the widely used approaches to forecasting inflation (which further contributes

to unexpected component extraction for our research) are discussed in Section 2.4 in line with a summary of influential papers presented in Appendix C. The perceived pros and cons of each method in line with the data constraints are crucial aspects of the model selection process.

The choice of the methods for our research is primarily constrained by data availability issues. As a result, we do not consider surveys as a source of inflation expectation even though it was found that it has good precision in forecasting inflation (Mehra, 2002). The method based on the real interest data explored by El-Shagi (2009) did not suggest a better forecasting performance relative to other methods described in the research over the study period, even though it is data intensive. One might also consider the Phillips-curve model that gained its popularity under the emerging New-Keynesian school (El-Shagi, 2009). However, there are studies that question the forecasting performance of the model. For example, Atkeson and Ohanian (2001) confirm that Phillips-curve-based forecasts do not beat naive univariate inflation forecasts over the study period. These findings were later also supported in a more recent research done by Stock and Watson (2008), who documented an ambiguous performance of the model in different time episodes. Ang, Bekaert and Wei (2005) also highlight the idea that models with some strong theoretical backgrounds often have poor prediction power. Therefore, priority is given to other basic, widely used and relatively simple quantitative forecasting techniques described below.

Univariate Time-Series Models

The main models we will consider are the time-series models. Accounting for the variety of sophisticated approaches to forecast inflation, there is an observed tendency that univariate time-series models, which are relatively simple, provide superior accuracy and are hard to be beaten (El-Shagi, 2007; Hoa, 2017; Banbura & Behoica, 2020). Despite the relative simplicity of this approach, the time-series models are widely used in similar types of analysis. For instance, in examining the macro relationship between unexpected inflation and output growth, Dorval and Smith (2015) employed a time-series method to measure the unanticipated part of inflation.

In the case of inflation stationarity (Dickey-Fuller test), it is observed that the ARMA (p, q) model might have a decent forecasting performance. However, this approach has received a lot of critique from the researchers, as from the construction, it is biased to assume that present inflation is only correlated with the past because there could be some political and

geographical shocks that have a larger impact on the current inflation. However, it is one of the widely-used and relatively simple methods to estimate inflation.

The methodology for estimation of that approach is described in the paper of Ang, Bekaert, and Wei (2005), who consider both ARMA (1,1) model and a simple autoregressive model of p lags, in which the number of lags is determined based on the Schwartz criterion (BIC). ARMA (1,1) is a reduced-form model for inflation if expected inflation fits an autoregression model with one lag:

$$\pi_{t+1} = \mu + \varphi\pi_t + \Psi\varepsilon_t + \varepsilon_{t+1}, \quad (2)$$

while the standard specifications of the AR(p) model look as follows:

$$\pi_{t+1} = \mu + \varphi_1\pi_t + \varphi_2\pi_{t-1} + \ldots + \varphi_p\pi_{t-p+1} + \varepsilon_{t+1}, \quad (3)$$

where π_t denotes a quarterly inflation rate.

We proceed with the inflation rate forecast for the next year, which is expressed at the quarterly frequency. In this case, the estimations of the model of ARMA (1,1) are based on the maximum likelihood with the initial residual equal to zero. The forecast equation for that model is expressed in equation 4:

$$E_t(\pi_{t+4,4}) = \frac{1}{1-\varphi}\left[1 - \frac{\varphi(1-\varphi^4)}{(1-\varphi)}\right]\mu + \frac{\varphi(1-\varphi^4)}{(1-\varphi)}\pi_t + \frac{\varphi(1-\varphi^4)\Psi}{(1-\varphi)}\varepsilon_t, \quad (4)$$

while the forecast equation for an autoregression model with *p* lags is estimated in the following way:

$$E_t(\pi_{t+4,4}) = e'_1(I - \varphi)^{-1}(I - \varphi(I - \varphi)^{-1}(I - \varphi^4))A + e'_1\varphi(I - \varphi)^{-1}(I - \varphi^4)X_t \ , \quad (5)$$

in which e_1 denotes a vector of p x 1 with ones and zeros, which is constructed with all zero values everywhere except the first row. *A* and φ denote a companion from the AR(*p*) process:

$$X_{t+1} = A + \varphi X_t + U_{t+1}, \quad (6)$$

where all the variables are described in the matrix form:

$$X_t = \begin{bmatrix} \pi_t \\ \pi_{t-1} \\ \vdots \\ \pi_{t-p+1} \end{bmatrix}, A = \begin{bmatrix} \mu \\ 0 \\ \vdots \\ 0 \end{bmatrix}, \varphi = \begin{bmatrix} \varphi_1 & \varphi_2 & \cdots & \varphi_p \\ 1 & 0 & \ldots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \ldots & 0 \end{bmatrix}, \text{ and } U_t = \begin{bmatrix} \varepsilon_t \\ 0 \\ \vdots \\ 0 \end{bmatrix}. \quad (7)$$

4.3.3. Regressions With Decomposed Inflation (Expected vs Unexpected)

Once the inflation is decomposed into expected and unexpected components, we get back to our main tests. We start with the headline inflation and then use unexpected inflation component estimates together with the expected component ($InflationMeasure_{ict}$ is replaced

by its decomposition into $UnexpectedInflation_{ict}$ and $ExpectedInflation_{ict}$). So, as the next step, we estimate the following regressions:

$$(B)\ BasicVariable_{ict} = \beta_0 + \beta_1 * UnexpectedInflation_{ct} + \beta_2 * ExpectedInflation_{ct} + \Sigma\beta_k * Controls_{kict} + c_i + \ni_{ict}$$

4.4. Demand-pull and Cost-push Inflation Distinction

There are many academic studies that provide methodologies on the distinction between supply- and demand-driven inflation. One of the recent papers of Eickmeier and Hofmann (2022) is aimed at identifying and estimating structural demand and supply factors that drive inflation in the US. The authors rely their estimates on the theoretical model that imposes the sign restriction on factor loadings. Another study done by the Federal Reserve Bank of San Francisco (2022) approaches the same issue while investigating how much supply and demand factors are responsible for inflation in the context of the COVID-19 pandemic period. The paper describes the approach perceived while separating inflation into these components: the general approach was based on the microeconomic theory of changes in prices and quantities, which tend to increase following demand pressure and take the opposite direction during the supply shocks. The results disclose that food and household products are subject to supply-driven price changes more frequently, while motor-vehicle-related products experience frequent demand-driven price changes (Federal Reserve Bank of San Francisco, 2022).

Apart from the sophisticated methodologies explored in the literature, there is a common approach to distinguish between cost-push and demand-pull inflation. Marc Labonte (2008) claims that core inflation is widely used to account for demand-driven inflation (especially among policymakers), which is justified by the fact that the food and energy sectors are most sensitive to supply shocks. At the same time, while resolving the debate about the appropriateness of this measure, Anugrah and Pratama (2018) have found that only in the short run, core inflation might not be driven by demand-side factors; in the long run, it is. Within this research, we proceed with demand- and supply-driven inflation being proxied by core inflation and inflation in the food and energy sector inflation, respectively.

4.4.1. Regressions With Decomposed Inflation (Demand vs Supply)

As a proxy for demand-driven inflation, we use HICP core inflation[1] from the Eurostat database to account for the cost-driven inflation, we consider energy and unprocessed food[2] HICP from Eurostat.

The data for Ukraine is not available in Eurostat. Therefore, we calculate core (demand-driven) and cost-push inflation with the data (inflation sub-components and respective weights) extracted from the IMF database. In supply-driven inflation, we include: "Food and non-alcoholic beverages", "Alcoholic Beverages, Tobacco, and Narcotics", and "Housing, Water, Electricity, Gas and Other Fuels". For the calculation of demand-driven inflation, we consider everything except these three sub-categories.

Then, we augment our regression set-up by considering decomposed inflation into demand and supply factors:

$$(C)\ BasicVariable_{ict} = \beta_0 + \beta_1 * Demand\text{-}pull\text{-}Inflation_{ct} + \beta_2 * Cost\text{-}push\text{-}Inflation_{ct} + \Sigma\beta_k * Controls_{kict} + c_i + \ni_{ict}$$

5. Results and Discussion

5.1. Overview

The paper explores the overall effect of headline inflation, anticipated and unanticipated components of inflation and cost-push and demand-pull inflation on performance characteristics of companies operating in the CEE region (incl. Turkey) over the study period. The structure of this section is as follows. First, we will briefly present a summary of statistics of the main variables of interest. Second, the results and discussion of the results of regressions will be outlined under different specifications of actual inflation and its decomposition. The robustness tests will be performed at each stage. Lastly, research limitations will be specified in line with the set background for further research.

5.2. Regressions with Headline Inflation

As a primary test, we first run a regression with the actual inflation as an explanatory variable to study the association between inflation and firms' characteristics over the study period

[1] variable code: TOT_X_NRG_FOOD, full name "Overall index excluding energy, food, alcohol and tobacco"

[2] variable code: NRG_FOOD_NP

(Table 1). In this section, we will disclose the results of the model on selected profitability and liquidity.

Table 1. Impact of the Headline Inflation on Various Measures of Financial Performance of European Firms

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.176***	0.065***	0.155***	0.005***	0.001***
	(0.004)	(0.001)	(0.008)	(0.0003)	(0.00001)
imf_gdp_actual	0.416***	0.149***	0.044***	-0.003***	0.002***
	(0.006)	(0.002)	(0.013)	(0.0004)	(0.00002)
log(empl)	3.234***	-0.977***	-1.453***	-0.362***	0.013***
	(0.067)	(0.024)	(0.196)	(0.004)	(0.0002)
age	-5.316***	0.168***	2.453***	0.195***	-0.0002**
	(0.035)	(0.007)	(0.062)	(0.002)	(0.0001)
I(age2)	0.125***	0.002***	-0.033***	-0.003***	0.0001***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	7,338,740	10,342,322	4,936,115	10,831,058	6,783,424
F Statistics	19,515.400***	3,636.308***	1,438.835***	11,874.150***	3,743.258***

Notes: The table shows the result of the baseline regressions with actual inflation as the dependent variable. The sample includes all countries of the region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

5.2.1. Profitability

Table 1 presents the results of the regression that examine the relationship between the actual inflation and the profitability of companies in our sample. We see that there is a statistically significant increase in profit margin as the inflation in the same period increases. An increase in inflation by 1pp is associated with an increase in profit margins by 0.065pp, keeping other things constant. There are prior studies documenting a similar trend for companies' profitability indicators following inflation (Ali & Ibrahim, 2018; Andler & Kovner, 2022), while at the same time, these results tend to contradict the other findings in the literature (Odusanya, Yinusa & Ilo, 2018).

Some of the recent research attempted to examine whether companies can take advantage of an inflationary environment to increase their corporate profits (Andler & Kovner, 2022). During the first inflation spike, companies might experience greater profitability, which translates into a higher profit margin ratio. This phenomenon could be explained by the fact that companies have contracts with the suppliers for a fixed amount to pay for the raw materials for upcoming months/years, and the other side of major expenses like wages tend to be sticky and adjust slower (Milne & Arnold, 2023). The increase in profit margin ratio during the first inflation spike could also be explained by the consumers' strong preferences for particular consumption baskets, which slows their reaction to price increases (people may want to sustain the same purchases as long as possible even if prices go up). Consequently, the nominal revenue tends to increase, but the main costs do not increase at the same rate as revenue does, and it leads to an increase in the profit margin ratio. However, after some period, when the existing contracts with suppliers expire, and the consumers start to tighten their budget, the profit margin might decrease. Thus, higher margins in the same period do not necessarily mean that firms will be able to sustain them in the following years.

Despite the increase in the profit margin ratio, it does not suggest that firms ultimately benefit from high inflation as the cost of goods sold might increase during the next periods as contracts expire, and the purchasing power of customers could decline. At the same time, there might be sticky consumption preferences of the population, long contractual obligations with existing supplies, additional measures taken to escalate the profit, like the sale of financial assets to mitigate the negative consequences of inflation and satisfy the need for cash to finance operations, or other measures just temporarily boost profitability, leaving some uncertainty about a longer perspective.

As the next step to assess the company's profitability, we perform the same test on the ROE metric. According to the results in Table 1, one can conclude that ROE has a positive statistically significant relationship with the actual inflation operating in the CEE region, which is in line with the findings related to the profit margin of companies. So, one can notice a positive relationship between inflation and profitability metrics.

In the context of the current macroeconomic situation associated with the ongoing war in Ukraine, one could explore the actual tendencies that could be noticed among firms over the last year. As has been discussed, the inflation rates have skyrocketed, leaving much uncertainty on how enterprises are coping with it. Keeping in mind some early empirical findings that inflation is associated with lower profitability of firms, our results support the opposite view. Although there is no consistency in the results of the previous academic

research, our findings are consistent with the public discourse that has developed in recent months.

In particular, Canepa (2023) reports for Reuters that ECB policymakers have been presented with evidence that companies in the eurozone were able to improve profitability in 2022 even as energy costs surged. This comes despite the hike in the ECB's policy rates to increase the borrowing rates for businesses and households, weaken demand and avoid an inflation spiral (Canepa, 2023). Consumer goods producers had an average operating margin of 10.7% last year, which is by 25% higher than in 2019 (Canepa, 2023).

Arnold, Nilsson, Smith, and Strauss (2023) also report the tendency among firms, in particular car manufacturers, to use high inflation as justification for boosting their profit margins in 2022. The result of our analysis of inflation on profitability done while splitting the firms by industries (according to the NACE specification) suggest that the companies operating in agriculture, forestry, and fishing (A sector) benefit the most from inflation in terms of the profit margin and ROE (Appendix T) with almost all other sectors observing an increase in these metrics as well.

Another explanation among analysts is that unsatisfied demand during the coronavirus pandemic made customers less sensitive to prices as restrictions were lifted and, consequently allowed, companies to exploit inflation advantage in boosting their margins (Arnold, Nilsson, Smith & Strauss, 2023). Whatever the main cause of higher margins is, this dynamic is seen as very dangerous by the ECB as it can cause 'tit-for-tat' dynamics when employees, observing the good performance of firms, become more aggressive in wage demands. Christine Lagarde, the president of the ECB, has been public about this (Arnold & Chazan, 2023). The ECB has added a reference to profit margins in its monetary policy statement – this has not happened before (Arnold, Nilsson, Smith & Strauss, 2023).

Notably, our findings contribute to this discussion by highlighting that boosted margins are not a 2022 phenomenon, and in fact, it is a pattern observed in historical data. Some evidence from the US, where profit expansion started earlier, suggests that normalization in margins is not ruled out. As reported by Canepa (2023), a reversal has started in the US, albeit "slowly and unevenly".

5.2.2. Liquidity

We proceed with the analysis of the liquidity of the companies with respect to changes in inflation. To assess the liquidity aspect, we measure the effect on the CCC, the current ratio and corporate cash holdings.

In periods of inflation, firms are inclined to reduce the CCC to mitigate the business risk. As was explored in the literature, companies might experience a need for cash with rising costs of raw materials and core operations, which would force firms to take measures to get cash faster (Wang et al., 2013). Another aspect is associated with the loss of purchasing power of money, which further incentivizes firms to optimize their cash-holding strategy and so manage a faster CCC (Wang et al., 2013). On the other hand, in line with supply chain disruption associated with natural disasters or pandemics, inflation can also have a negative effect on the CCC since firms have to adjust the prices of goods and services to offset the increasing costs (Murphy, 2022).

Table 1 provides an overview of the regression results investigating the relationship between inflation and liquidity aspects of the pool of companies operating in the CEE region. While analyzing the effect of actual inflation on the CCC, we can observe a slight increase in the amount of time it takes a company to convert its resource inputs into cash. Despite the increase in demand and incentives for getting cash faster during the period of inflation, firms are not capable of managing the CCC efficiently. However, the size of the effect is negligible, despite the statistical significance. A 1pp increase in inflation increases the CCC by a 0.155 of day, which is 7.2% of the average CCC in our sample.

Regarding the current ratio, inflation tends to increase the cost of holding liquid assets (Evers, Niemann & Schiffbauer, 2020). One could expect a negative association of inflation and liquidity via a reduction in cash holdings of the firms considering the periods of moderate inflation and incentives to decrease and increase accounts receivable days and account payable days, respectively. On the other hand, companies might prefer to hold greater liquidity during the period of inflation to ensure against potential business risks, keep more money to account for increased costs, and/or extract benefits through higher deposit rates (Wang et al., 2013; Fallah & Hashemi, 2016).

Looking at the results of Table 1, one might conclude a positive association between inflation and the current ratio. The results suggest that firms are inclined to increase their liquidity, which supports the assumption of companies' pursuing a risk-averse behavior, keeping greater liquidity, despite the escalated costs of holding liquid assets. Another explanation might be linked with the increase in the profitability of the companies (as was discussed previously), at least in the shorter term, which translates into greater liquidity. The relationship between the actual inflation is statistically significant at the 0.1% significance level.

As was previously highlighted in the literature, at the macro level, companies respond to changes in the purchasing power of money by adjusting their cash-holding strategy (Wang et al., 2013; Fallah & Hashemi, 2016). In periods of high inflation, there might be a higher demand for cash to account for the effect of price increases on raw materials and other goods (Fallah & Hashemi, 2016). Therefore, on the one hand, inflation increases would result in a decrease in firms' cash holding through the channel of the purchase of raw materials to prevent cost increases once the inflation rate starts rising (Friedman, 1977; Fallah & Hashemi, 2016). On the other side, there is an intervention in monetary policies through increasing deposit reserve rates, improvements in lending conditions, and control of the credit scale in commercial banks. As a result, one might notice a change in the company's liquidity level with the conversion of the company's assets to cash and, consequently, an increase in cash holding. The results indicate that there is a slight increase in the cash holdings following the increase in inflation, which support the channels of keeping a greater level of liquidity for the number of reasons outlined in this section.

5.2.3. Robustness Tests - Headline Inflation

To check the robustness of the results, first, we consider different regression specifications with the headline inflation; second, we will compose several subsamples while excluding some of the countries from the pooled regressions.

There are several robustness tests performed within the research. Initially, we are going to consider the regressions in first-difference (FD), the results of which are presented in Appendix H. The test is handled for all variables of interest selected in our research. The coefficients obtained from the first-difference regressions coincide in terms of the direction of the effect with the previously outlined results.

In contrast to our baseline specification that considers firm-fixed effects alone, we include both firm- and time-fixed effects into regression to check the robustness of the results. The output of the test is presented in Appendix I, which highlights the same-direction effect described above.

For robustness purposes, we have also decided to change the control variables related to size and age while substituting the defined functions with categories. For the *basic set of control variables*, at this time, we define $Controls_{kit}$ as dummy variables of categories of age since incorporation (startup <=4 years, mature – between 5 and 9 years, old >=10 years) and size in terms of the number of employees according to Eurostat classification (micro-enterprises < 10 employees, small enterprises - between 10 and 49 employees, medium-sized

enterprises - between 50 and 249 people, large enterprises >= 250 employees) for a firm *i* in a year *t* (Eurostat, n.d.). According to Appendix J, we conclude that the effects investigated are robust.

While taking advantage of the availability of profitability metrics in Orbis, we decided to run the main regression setup with ROE and profit margin ratios extracted directly from the database. The main observation which could be noticed from the descriptive statistics presented in Appendix E is that both ratios are bounded from below and above, which makes ROE in the interval of -1000 to 1000 per cent and profit margins between -100 and 100 per cent. The outcome of the described robustness test is presented in Appendix K, and it is consistent with the previously discussed results.

Some of the recent studies consider leverage controls while examining inflation's relationship with the profitability of the companies. As the next test, we extend the list of control variables with debt-to-asset ratio (D/A) to account for its potential effect on profitability (Ramadhanti, Amaliawiati & Nugraha, 2021; Odusanya, Yinuso & Ilo, 2018). The regression results suggest that, after accounting for the leverage effect, the association between inflation and selected profitability ratios is robust (Appendix L).

Following a similar approach, we extend the control variable list for the corporate cash-holding ratio. Early literature suggests including the controls for the financial condition (short-term debt and net working capital) (Opler et al., 1999; Wang et al., 2013). After extending the list of control variables, we observe no changes in the relationship between inflation and firms' cash-holding strategy (Appendix M).

Next, it is also important to consider whether the results suggest robustness while considering different subsamples. As a final step, we consider running the main regression while excluding the largest countries (in terms of the number of firm-year observations) from our dataset, which together make up around 50% of the whole sample. First, we drop Romania, which accounts for 21.2% of the total number of firm-year observations. Second, we exclude both Romania (21.2%) and Bulgaria (16.7%), the two biggest data clusters. In addition to these countries, we also remove data for Ukraine (13.6%) and then Hungary (11%) as the latest. The results of these procedures are revealed in Appendix S. Overall, we can observe that there are no changes in the direction of the effect from headline inflation for all profitability and liquidity metrics. It would suggest that the results are not driven by the largest countries in our dataset.

5.3. Regressions with Decomposed Inflation (Expected vs Unexpected Inflation)

For a more detailed analysis of the effect of inflation on companies' performance, we decompose inflation into expected and unexpected parts (Table 2).

Table 2. Impact of the Expected and Unexpected Inflation on Various Measures of Financial Performance of European Firms (IMF Forecasts)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_unexpected	0.062***	0.068***	0.134***	0.001	0.001***
	(0.004)	(0.002)	(0.009)	(0.0004)	(0.00002)
imf_inf_forecast	0.772***	0.050***	0.265***	0.030***	0.001***
	(0.012)	(0.005)	(0.030)	(0.001)	(0.00005)
imf_gdp_actual	0.392***	0.149***	0.038***	-0.003***	0.002***
	(0.006)	(0.002)	(0.013)	(0.0004)	(0.00002)
log(empl)	3.241***	-0.977***	-1.441***	-0.363***	0.013***
	(0.067)	(0.024)	(0.196)	(0.004)	(0.0002)
age	-5.284***	0.167***	2.460***	0.198***	-0.0001
	(0.035)	(0.007)	(0.062)	(0.002)	(0.0001)
I(age2)	0.126***	0.002***	-0.033***	-0.003***	0.0001***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	7,338,740	10,342,322	4,936,115	10,831,058	6,783,424
F Statistic	16,643.980***	3,032.360***	1,201.839***	10,007.670***	3,159.944***

Notes: The table shows the result of the main regressions with decomposed inflation into expected and unexpected parts using historical IMF inflation forecasts for the whole region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

5.3.1. IMF forecasts

As the basic case, we use historical inflation forecasts extracted from the IMF database. Looking at the results, the proposed decomposition might further extend the outlook on firms' expectations phenomenon and subsequent adjustment and preparation procedures to upcoming inflation and additional effect coming from the unanticipated inflation, which eliminates the anticipation aspect. Table 2 reveals the results of the main regression combining all countries over the study period.

While examining the effect of expected and unexpected inflation on the profitability indicators of companies, we observe that once inflation is anticipated, it could positively impact the profit margin and ROE in that period (Table 2). Firms can take advantage of the information about the upcoming inflation by adjusting their business operations and strategic decisions while at the same time cutting some parts of costs and making pre-purchases of the raw materials. Building upon the reverse side of the discussion of Russell, Evans, and Preston (2001), firms could be inclined to extend their profit margins to account for some uncertainty and risks coming with inflation. However, even if inflation is unexpected, one might observe the same-direction effect on firms' profitability. Although, as it was discussed, unanticipated inflation might disturb business operations, which might consequently result in lower profitability of firms, our findings show the opposite. Overall, by analyzing the results presented in Table 2, we observe a positive effect on both ratios coming from both anticipated and unanticipated inflation components. It could be linked with fixed contracts and/or pre-purchase governing some of the companies' expenses like raw materials and/or relatively sticky wage costs, which might also serve as a hedge against unanticipated inflation. In the context of currently high inflation, this suggests that the normalization in margins, if any, is expected to be very slow, as firms may be able to make use not only of (mostly) unexpected inflation of 2022 but also of the expected elevated inflation in 2023 and 2024. This could, in turn, prolong the return to the ECB's 2% medium-term target.

Discussing the effect of anticipated and unanticipated inflation on the liquidity aspect of companies, one might notice that there is an increase in the CCC of the companies, irrespective of whether inflation is anticipated or not. Once inflation is anticipated, firms try to find ways to optimize their CCC through, for example, negotiating lower account receivable periods. At the same time, as it was discussed by Murphy (2022), inflation might harm the liquidity of firms. Both, anticipated and unanticipated inflation, capture a negative effect on liquidity for companies. Overall, it suggests that firms struggle to manage their CCC efficiently, even in the presence of incentives to cut it.

While considering the current ratio as another liquidity indicator, we observe that anticipated inflation does increase the liquidity of the firms via increased business risks and/or more favorable deposit/savings conditions, while unanticipated inflation further exaggerates the effect with increased uncertainty about the prices and inflation in the next period (although the coefficient near unexpected inflation is not statistically significant in the main regression setup). The findings are consistent with the Fallah and Hashemi (2016) described firms' behaviour under increased uncertainty and business risk pressure. The same

justification could relate to the results on companies' cash holdings, which tend to increase in line with higher inflation.

5.3.2. Robustness Tests – ARMA model (Expected vs Unexpected Inflation)

The ARMA (p,q) model could serve as a good predictor under the assumption of time-series stationarity. To investigate the applicability and relevance of its forecasting performance, we performed a Dickey-Fuller test to check for inflation stationarity over the selected study period. Inflation (quarterly data) proved to be stationary, passing a 10% significance level threshold for all of the countries in our research between the period of 2000 and 2021 (Appendix N). Appendix O visualized the data on headline inflation and inflation forecast from the IMF database and model over the study period. Next, we perform inflation forecasts to decompose inflation into expected and unexpected components, which is further used in the regressions to justify the robustness of the results.

The results of the regressions with expected and unexpected inflation decomposition suggested by the time-series forecasting model are presented in Appendix P. Overall, one can conclude that the findings are consistent with the previously outlined effects on profitability and liquidity metrics considering the IMF historical forecasts, which reveals the robustness of the results.

5.4. Demand-Pull and Cost-Push Inflation

In the context of demand-pull and cost-push inflation, we would like to take a deeper focus on its relationship with the profitability of companies.

As the first step, we consider the effect on the profitability of the companies. Demand and cost forces of inflation might drive the profits in opposite directions with upward and downward pressure, respectively. We observe that it is indeed the case while exploring the results of the regression presented in Appendix Q.

The rise of the cost factors associated with fuel and energy makes the companies' profitability shrink. One could consider another channel that affects firms due to the rise of cost-push inflation. Among the firms' primary expenses on wages, intermediate inputs and capital expenditure, the share of energy and food (the drivers of supply-side inflation) might not be that high as compared to the households. Cost-push inflation negatively affects firms through its primary effect on individuals, whose purchasing power diminishes, thereby pushing lower demand for production of firms even with higher value added.

The demand-pull inflation, in contrast, has a positive effect on the profitability of firms. This result is expected because inflation driven by increasing demand must imply that consumers' purchasing power has gone up. Therefore, firms may find it easier to increase prices, even if it comes at the risk of causing a price-wage spiral.

For robustness purposes and to eliminate the concern of the potential threat of correlation of the demand-pull and cost-push inflation, we perform the same test while considering the first-difference regression specification. Appendix R reveals the result of the test, which suggests that the previously discussed findings are robust for net margin (statistically significant coefficients); at the same time, for ROE, the positive sign near the demand-pull inflation lacks statistical significance under new regression specification, while the cost-push coefficient consistent with the previous observations.

In light of margin improvements in 2022, we note that, first, the positive effect of demand-pull inflation is estimated to be larger in absolute terms than the negative effect of cost-push inflation, and second, the coefficient for GDP is of several magnitudes higher than the coefficients for inflation. This suggests that in 2022, the increase in energy costs likely had a negative effect on the bottom line, but robust demand (euro area GDP rose 3.5%), in part due to reopening after Covid-19, outweighed this effect and allowed firms to comfortably pass on the high costs (Eurostat, 2023). This is in line with the argument made by Arnold, Nilsson, Smith and Strauss (2023).

5.5. Limitations

There are several limitations in the research resulting from time constraints and resource limitations that could potentially affect the results.

The biggest concern is related to the data source employed for data collection – Orbis, which is why some of the misreporting issues cannot be fully avoided. One should acknowledge that the data extracted from this database might be very noisy. Even after careful downloading and filtering procedures, it is still important to consider potential biases in the data that are unavoidable in this type of analysis.

The first issue is related to sample selection bias since we consider only companies that are included in the Orbis database. In addition, some of the observations will be dropped due to the unavailability of necessary variables to calculate the chosen performance ratios. Moreover, although the filtering procedure is aimed at getting rid of reporting errors and inconsistencies in the data, it is still important to acknowledge that there might be some figures that are not accounted for properly.

One of the important limitations of the dataset is coverage over the whole study period. Data availability significantly improved starting from 2011, with relatively lousy coverage for some companies in the years prior. It is associated with the storage capacity of the database, which cannot be entirely approached.

In addition, we might have a concern about the frequency of the data, meaning that for the analysis, we are going to use yearly data from the financial reports. It is the case since, for some companies, either it is not possible to get quarterly reports, or the data quality is poor. Therefore, our study is limited by yearly observations of the financial and operational performance of the companies.

To continue with, we can just mention earnings management issues that companies might perform to manipulate certain figures. For instance, one of the variables of interest in the study is associated with profitability characteristics. We could mention Net profit that might be overstated during the periods when the company might face difficulties. It could be done through the sale of financial securities or tangible assets of a firm.

It is crucial to recognize potential problems in the dataset, especially while working with firm-level data. Although a cleaning procedure employed in this research partially deals with some of the issues described in this section, it cannot deal with all discrepancies.

Apart from the limitations associated with the data source and quality, there are also aspects related to the chosen models to study the impact of inflation. One of the main concerns is related to the econometric models used to distinguish unanticipated components of inflation. Even though it is a widely employed practice in the literature, it is important to acknowledge the reliability of the relatively simple forecasting models to capture firms' inflation expectations; in other words, to what extent it is valid to serve as a benchmark to inflation expectation formation. The same is true for the decomposition into demand-pull and supply-push inflation. Other methods from the past literature could be considered to account for this issue. On top of that, one should also consider common issues with regression type of analysis, like the omitted variable bias that might persist in this research.

Lastly, it is crucial to outline the choice of countries. Although the CEE region is a relatively good choice in terms of the data availability aspects, most selected countries have not experienced severe and prolonged periods of high inflation volatility in the past decades, except individual country-year cases. Therefore, the applicability of the findings presented in this paper to the most *recent* high inflation spikes that are related to the war in Ukraine is not straightforward, which at the same time, opens a window of opportunity for further research.

5.6. Further Research

To explore the topic in more detail and approach some of the above-mentioned limitations, one could consider potential suggestions that could contribute to the development of further research.

The most relevant issues could be associated with the quality of the data available in the data source used for this research. The firm-level data for this research was extracted from the Orbis database, which required a lot of cleaning before analysis. To improve the precision of results, one could consider implementing a different (a more detailed, case-specific) filtering strategy to account for misreporting and inconsistencies in the data and/or gathering the data from other data sources (either requested from statistical bureaus of the countries or collected on a survey basis).

While exploring the relevance of the study for the European region in recent years, the analysis could be extended by researching the financial behaviour of firms under the current macroeconomic situation associated with the war in Ukraine. In this study, we do not cover this period in the quantitative analysis due to the lack of available financial data. However, we believe that the analysis of this specific event might bring lots of new insights into the financial stability of firms following periods of high inflation spikes and uncertainty.

Lastly, one could suspect a non-linear relationship between inflation and the variables analyzed in this research. There might be differences in firms' behaviour following deflation and inflation, which motivates them to analyze these periods separately. Further research could attempt to examine these associations while focusing on one of the performance indicators and building a more detailed theoretical background justifying these hypotheses. In addition, to account for the potential issues with the general regression analysis, especially omitted variable bias, the introduction of other control variables could be considered.

6. Conclusion

The relevance of the topic of rising inflation and its potential consequences is rising due to the ongoing war in Ukraine that affects the economy of European countries. It consequently incentivized us to investigate and understand the potential effects that inflation might have on firms.

The research is aimed at investigating the *associations* between inflation and firms' main performance indicators over the past two decades in the CEE region with a further consideration of inflation decomposition into anticipated and unanticipated inflation, as well as demand-pull and cost-push components. The main research question was aimed to identify

the overall impact of headline inflation on firms' profitability and liquidity, while two sub-questions were introduced to get into a more detailed analysis and distinguish the effects in dimensions of expected and unexpected inflation and supply- and demand-driven inflation.

Overall, we conclude that there is a positive relationship between headline inflation and profitability metrics explored. In addition, there is a positive relationship between inflation and the liquidity of firms, the latter being measured by the current ratio and cash holdings, while inflation tends to harm the CCC. The analysis was further extended with consideration of expected and unexpected components of inflation, which proved to have the same-direction positive effect on profitability ratios, current ratio and CCC. The effect of demand-pull and cost-push inflation on profitability was consistent with our expectations suggesting positive and negative forces on selected profitability metrics, respectively.

The study established only an association between inflation and firms' performance, but it is very important in view of almost non-existent literature exploring the effects of inflation on the firm level. It is important to study this relationship further, as understanding the link between inflation and profitability and liquidity on the firm level can have far-reaching policy implications. If the link is proven causal, it might imply that state support for enterprises can be justified only when inflation is driven by the supply side, but if second-round effects in the form of a demand-driven inflation shock kick in, margins rise, potentially providing justification for contractionary monetary and fiscal policy.

In the result discussion section, we have disclosed the primary limitations and opportunities that could be approached in further research on the related topics. The main concern could be associated with the noise in the data. To improve the results, one could consider alternative sources of data (survey-based or statistical bureaus) and/or subsequent adjustments to the filtering procedure, which might be easier achieved while having a deeper focus on country/industry/firm-specific cases.

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8. Appendices

Appendix A. Data Filtering

Country	Before	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	S&J	<0
Bulgaria	100%	35.7%	35.7%	35.7%	35.7%	35.6%	35.6%	35.6%	35.6%	35.6%	35.4%	35.4%
Czechia	100%	41.2%	41.0%	41.0%	41.0%	41.0%	41.0%	40.9%	40.8%	40.8%	40.1%	36.3%
Croatia	100%	40.2%	40.2%	40.2%	40.2%	40.1%	40.0%	39.7%	39.7%	39.7%	39.3%	39.3%
Estonia	100%	41.0%	41%%	41.0%	41.0%	40.9%	40.9%	40.7%	40.7%	40.7%	40.4%	39.8%
Hungary	100%	44.6%	44.5%	44.5%	44.5%	44.5%	44.2%	44.2%	44.2%	44.2%	43.2%	42.8%
Latvia	100%	40.4%	40.3%	40.3%	40.2%	38.6%	38.4%	37.5%	37.5%	37.5%	37.0%	37.0%
Lithuania	100%	40.6%	40.5%	40.5%	40.5%	40.4%	40.3%	40.2%	40.2%	40.2%	40.1%	39.5%
Poland	100%	35.3%	35.3%	35.3%	35.1%	35.1%	35.1%	35.0%	35.0%	35.0%	34.8%	34.3%
Romania	100%	39.4%	39.1%	39.1%	39.0%	38.9%	38.8%	38.6%	38.2%	38.2%	37.8%	33.7%
Serbia	100%	38.8%	38.8%	38.8%	38.8%	38.8%	38.6%	38.4%	38.4%	38.4%	38.1%	38.0%
Slovak Republic	100%	44.4%	44.3%	44.3%	44.3%	44.3%	44.2%	44.2%	43.8%	43.8%	43.3%	33.9%
Slovenia	100%	30.3%	30.3%	30.3%	30.3%	30.3%	30.3%	30.2%	30.2%	30.2%	30.0%	30.0%
Turkey	100%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%	4.1%
Ukraine	100%	41.2%	41.2%	41.2%	41.2%	40.9%	39.9%	39.4%	39.4%	39.4%	39.0%	38.8%

Notes: The table presents the *percentage* of observations remained after each filtering step by country described in Section 3.2. Steps 1 to 9 refer to the filtering methodology described in the paper of Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015). The last two columns depict the statistics after the adjustments to spikes & jumps (S&J) and misreporting issues (<0).

Appendix B. Ratio Calculations

	Variable	Formula	Rules (if any)
Profitability	ROE	Net profit for the year *t* scaled by Equity at *t-1*	Equity > 0
	Net margin	Net profit over Sales for the same period *t*	Net margin <= 100%
Liquidity	Current ratio	Current Assets over Current Liabilities for the same period *t*	
	CCC	Inventory Days + Debtor Days - Creditor Days	
Controls	Change in cash	Change in cash scaled by Total Assets for the same period *t*	
	Leverage (D/A)	The sum of current and non-current liabilities scaled by total assets for the period *t*	
	delta SDebt	The difference in current liabilities between *t* and *t - 1*, divided by total assets in year *t*	
	delta NWC	The difference in net working capital between *t* and *t - 1*, divided by total assets in year *t*	

Notes: The table presents the main formulas used to calculate the variables of interest to assess companies' profitability and liquidity as well as some controls that will be later employed for robustness checks. The rules (if any) are designed to keep ratios in reasonable intervals, provide a logical interpretation of the variables, and get rid of the potential misreporting in data.

Appendix C. Summary of Papers on Inflation Forecasting Techniques

Author(s) (year)	Coibion, Gorodnichenko & Ropele (2019)	El-Shagi (2009)		Ang, Bekaert & Wei (2005)	Banbura & Beboica (2020)
Country(s)	Italy	Australia, Canada, Denmark, Japan, New Zealand, Norway, Switzerland, Sweden, the UK, and the US		The US	Euro area
Objective	To study "the causal effect of inflation on firms' economic decisions."	To compare the performance of inflation forecasting techniques over the period of 1998-2007.		To investigate the four inflation forecasting techniques and their accuracy.	To examine the effectiveness of the models based on the Phillips curve to forecast inflation in the euro area over the period 1994-2018.
Method(s) to account for inflation expectations / unexpected inflation	**Survey** data collection method	**Unweighted model averaging -** Univariate time series models; Phillips-curve models; Time-variant Phillips curves; VAR forecasting; ALI	Unexpected inflation from **Real Interest Data**	**Four forecasting techniques:** ARIMA; regressions using real activity measures; term structure models; survey-based method.	The **Phillips curve** with specification.
Key Results/Findings	Higher inflation expectations force firms to rise prices, reduce employment and capital, and increase leverage.	There is slight evidence for expectations prevailing in the market to outperform econometric forecasting techniques, but the difference is not statistically significant.		Survey-based method tend outperform other methods. In the model averaging, more weight should be put on survey information.	The naïve univariate models are hard to beat (consistent with the findings of Atkeson & Ohanian, 2001); however, some extensions of the model like adjusting the Phillips curve model to time variant specification might offer improvements.
Advantages of the method(s)	Capture inflation expectations of individual enterprises. Appear to be more precise than standard forecasting techniques (Mehra, 2002).	Tend to perform best on average. Relatively quick and simple approaches. Widely used approaches, which find its recognition in	Is consistent with the theoretical background. The model is built around the adjusted version of the real ineptest parity. The authors account for diverse risk and the Mundell-Tobin-effect.	The models discussed in the paper are widely employed and assessed by the researchers to forecast inflation. The combination of the methods (putting optimal weights) is capable to improve the prediction power.	The widespread use of the Phillips curve models in the literature. Model averaging might "offer some hedge against the instability in the forecast performance".
Disadvantages of the method(s)	Underreporting bias & Data availability threats. Expectation formation is an irrational process (Gramlich, 1983)	Main drawbacks of the method dates to limitations of each approach. Uncertainty about the size of the weight to be put on each of the method to calculate the average value.	Complicated method which relies on lots of rigid assumptions (see E-Shagi, 2009, p.13) and is data demanding. Multicollinearity threat in the initial estimates, which cannot be "entirely corrected by the filtering mechanism". Bias associated with unobservable country-specific causes of inflation, which is likely to impact real interest rates.	The prediction power of methods varies over time. All the methods discussed have no or little applicability while forecasting PCE inflation.	The general limitations of this approach are vital to assess. The performance of simple Phillips curve models is episodic when studying over the long period of time.

Notes: Summary of the major papers discussed in Section 2.5. with pros and cons of the methods used to account for inflation expectations and unexpected inflation based on the limitations and general conclusions discussed in each research and authors' opinion. The table is made by the authors.

Appendix D. Descriptive Statistics: Inflation and Controls

Statistics	N	Mean	St. Dev.	Min	Pctl (25)	Median	Pctl (75)	Max
Actual inflation (%)	12,695,766	3.43	6.15	-1.60	0.77	2.46	3.82	48.68
Inflation forecst (IMF) (%)	12,695,766	3.22	2.92	-3.48	1.72	2.34	3.27	18.82
Unexpected inflation (IMF) (%)	12,695,766	0.20	4.56	-8.50	-1.54	-0.23	1.12	34.72
Inflation forecst (model) (%)	12,694,003	4.24	3.55	-0.35	2.19	3.01	4.57	21.28
Unexpected inflation (model) (%)	12,694,003	-0.85	4.32	-14.22	-2.61	-1.00	0.27	22.48
Inflation (cost-push) (%)	11,789,482	2.68	4.87	-6.70	-1.60	2.80	6.10	22.70
Inflation (demand-pull) (%)	11,789,482	1.98	2.04	-4.00	1.00	1.70	2.50	18.60
GDP growth (%)	12,595,766	2.32	3.52	-17.95	1.42	3.20	4.23	12.23
Age	12,647,573	10.27	8.15	0.00	3.87	8.38	15.38	324.00
delta SDebt	9,204,085	0.01	0.26	-2.16	-0.07	0.00	0.11	3.19
delta NWC	9,216,943	0.01	0.28	-4.32	-0.08	0.02	0.14	1.37
D/A	11,232,860	0.68	0.87	0.00	0.19	0.53	0.88	34.65
Employees	12,695,766	15.54	258.70	1	1	3	7	276,339

Notes: The table presents summary statistics for explanatory and control variables used in the analysis. The data conveys information on the number of firm-year observations, means, standard deviation, minimum and maximum values with distribution percentile values and median.

Appendix E. Descriptive Statistics: Ratios

Statistics	N	Mean	St. Dev.	Min	Pctl (25)	Median	Pctl (75)	Max
ROE (%)	7,359,317	27.4	63.54	-1,300.05	0.93	12.84	41.69	602.31
Net margin (%)	10,383,246	5.81	27.09	-1,222.94	0.01	3.4	13.39	100
ROE (Orbis) (%)	9,358,537	20.86	91.46	-999.97	1.5	15.68	46.76	999.97
Net margin (Orbis) (%)	10,929,135	7.1	26.34	-100	0	4.08	15.1	100
Current ratio	10,876,212	3.84	7.05	0	0.85	1.53	3.73	198.58
Inventory Days	6,318,028	56.54	81.79	0	0	17	82.01	365
A/R Days	7,662,853	62.17	99.52	0	3.17	28.08	73.79	730
A/P Days	5,823,385	117.02	155.05	0	10.22	53.78	156.62	730
Cash Conversion Cycle	4,952,641	2.16	157.71	-730	-34.44	11.13	67.92	1,089.29
Change in Cash (scaled)	6,812,686	0.1	0.23	-2.96	0.01	0.08	0.2	0.99

Notes: The table presents summary statistics for each ratio calculated for the analysis. The data conveys information on the number of firm-year observations, means, standard deviation, minimum and maximum values with distribution percentile values and median after the main filtering procedures and winsorization described in Section 3.

Appendix F. Dataset Description: Distribution by Countries

Country	Abbreviation	# of firm-year observations	% of sample
Bulgaria	BG	2 121 116	16.7%
Czechia	CZ	622 226	4.9%
Croatia	HR	621 479	4.9%
Estonia	EE	463 201	3.6%
Hungary	HU	1 390 876	11.0%
Latvia	LV	613 798	4.8%
Lithuania	LT	579 505	4.6%
Poland	PL	539 099	4.2%
Romania	RO	2 692 469	21.2%
Serbia	RS	534 486	4.2%
Slovak Republic	SK	454 815	3.6%
Slovenia	SI	300 808	2.4%
Turkey	TR	36 482	0.3%
Ukraine	UA	1 725 406	13.6%
Total	-	**12 695 766**	**100%**

Notes: This table described the proportion of the firm-year data after the filtering procedure for each country (with commonly employed country abbreviation) structured in the alphabetic order. The number of firm-year observations is presented in the figure in line with its proportion in the total sample. Source: Orbis by Bureau van Dijk.

Appendix G. Dataset Description: Distribution by Industries

Industry	NACE classification	# of firm-year observations	% of sample
Wholesale and retail trade; repair of motor vehicles and motorcycles	G	3 804 471	30.0%
Professional, scientific and technical activities	M	1 701 678	13.4%
Manufacturing	C	1 634 306	12.9%
Construction	F	1 349 089	10.6%
Transportation and storage	H	899 228	7.1%
Real estate activities	L	766 489	6.0%
Accommodation and food service activities	I	656 222	5.2%
Information and communication	J	634 342	5.0%
Administrative and support service activities	N	592 880	4.7%
Agriculture, forestry and fishing	A	472 164	3.7%
Water supply; sewerage, waste management and remediation activities	E	82 797	0.7%
Mining and quarrying	D	69 174	0.5%
Electricity, gas, steam and air conditioning supply	B	32 926	0.3%
Total	-	**12 695 766**	**100%**

Notes: This table described the distribution of the dataset as per each industry after the filtering procedure. The table presents the number of firm-year observations in each industry (with the data expressed as a percentage of the total sample) structured in the descending order. Source: Orbis by Bureau van Dijk.

Appendix H. Impact of the Headline Inflation on Various Measures of Financial Performance of European Firms (FD Regressions)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.127***	0.050***	0.064***	0.003***	0.001***
	(0.004)	(0.001)	(0.007)	(0.0003)	(0.00001)
imf_gdp_actual	0.151***	0.140***	0.108***	-0.005***	0.002***
	(0.005)	(0.002)	(0.011)	(0.0004)	(0.0002)
log(empl)	3.266***	-1.202***	-1.920***	-0.375***	0.008***
	(0.070)	(0.022)	(0.148)	(0.004)	(0.0002)
age	-6.527***	0.141***	1.456***	0.260***	0.003***
	(0.042)	(0.013)	(0.080)	(0.003)	(0.0001)
I(age2)	0.187***	0.004***	-0.022***	-0.004***	0.00003***
	(0.001)	(0.0005)	(0.003)	(0.0001)	(0.00000)
Observations	5,760,728	8,402,554	3,793,673	8,777,189	5,439,451
F Statistics	5,402.879***	2,191.968***	170.164***	4,099.966***	2,379.543***

Notes: The table shows the result of the regressions with actual inflation as the dependent variable under the first-difference regression set-up. The sample includes all countries of the region over the study period. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix I. Impact of the Headline Inflation on Various Measures of Financial Performance of European Firms (Time-Fixed Effects Included)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.251***	0.043***	0.295***	0.005***	0.0005***
	(0.005)	(0.002)	(0.012)	(0.0004)	(0.00002)
imf_gdp_actual	0.573***	0.088***	0.335***	-0.003**	0.0002***
	(0.015)	(0.005)	(0.035)	(0.001)	(0.0001)
log(empl)	3.367***	-0.973***	-1.528***	-0.368***	0.014***
	(0.067)	(0.024)	(0.196)	(0.004)	(0.0002)
I(age2)	0.125***	0.002***	-0.033***	-0.003***	0.0001***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	7,338,739	10,342,322	4,936,115	10,831,057	6,783,424

Notes: The table shows the result of the regressions with headline inflation as the dependent variable with firm- and time-fixed effects. The sample includes all countries of the region over the study period. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix J. Impact of the Headline Inflation on Various Measures of Financial Performance of European Firms (Controls – Categories)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.125***	0.071***	0.183***	0.008***	0.001***
	(0.004)	(0.001)	(0.008)	(0.0003)	(0.00001)
imf_gdp_actual	0.388***	0.153***	0.077***	-0.001	0.002***
	(0.006)	(0.002)	(0.013)	(0.0004)	(0.00002)
size_medium	-2.002***	-1.321***	1.847	0.221***	-0.013***
	(0.474)	(0.165)	(1.173)	(0.026)	(0.001)
size_micro	-9.115***	-2.404***	2.106	0.911***	-0.047***
	(0.546)	(0.195)	(1.378)	(0.031)	(0.002)
size_small	-4.996***	-2.096***	1.617	0.499***	-0.030***
	(0.531)	(0.190)	(1.332)	(0.030)	(0.002)
age_old	-4.083***	1.551***	6.163***	0.441***	0.008***
	(0.087)	(0.033)	(0.272)	(0.008)	(0.0003)
age_startup	19.097***	-0.378***	-8.697***	-0.702***	0.006***
	(0.105)	(0.030)	(0.243)	(0.007)	(0.0004)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	7,338,740	10,342,322	4,936,115	10,831,058	6,783,424
F Statistics	9,683.339***	1,706.587***	629.439***	3,910.466***	1,922.489***

Notes: The table shows the result of the baseline regressions with actual inflation as the dependent variable. The sample includes all countries of the region over the study period with firm fixed effects. As benchmark categories for the age and size control variables, we set dummies for mature and large companies, respectively. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix K. Impact of the Headline Inflation on Profitability (Orbis)

	Dependent variable:	
	ROE	Net Margin
	(1)	(2)
imf_inf_actual	0.274***	0.033***
	(0.006)	(0.001)
imf_gdp_actual	0.516***	0.137***
	(0.008)	(0.002)
log(empl)	3.083***	-1.309***
	(0.084)	(0.022)
age	-5.314***	0.208***
	(0.033)	(0.007)
I(age2)	0.117***	0.004***
	(0.001)	(0.0002)
Firm fixed effects	Yes	Yes
Year fixed effects	No	No
Observations	9,327,379	10,887,676
F Statistic	15,068.700***	6,064.166***

Notes: The table shows the result of the baseline regressions, while examining the effect of actual inflation on companies' profitability metrics. The ratios are directly extracted from the Orbis database. The sample includes all countries of the region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix L. Impact of the Headline Inflation on Profitability (Leverage Control)

	Dependent variable:	
	ROE	Net Margin
	(1)	(2)
imf_inf_actual	0.178***	0.061***
	(0.004)	(0.001)
imf_gdp_actual	0.432***	0.143***
	(0.006)	(0.002)
log(empl)	4.107***	-0.977***
	(0.065)	(0.023)
age	-6.034***	-0.052***
	(0.034)	(0.007)
I(age2)	0.129***	0.005***
	(0.001)	(0.0002)
dta_calc	-39.091***	-8.503***
	(0.223)	(0.047)
Firm fixed effects	Yes	Yes
Year fixed effects	No	No
Observations	7,217,787	9,923,819
F Statistic	39,801.850***	58,712.510***

Notes: The table shows the result of the regressions augmented with the leverage control, while examining the effect of actual inflation on companies' profitability metrics. The sample includes all countries of the region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix M. Impact of the Headline Inflation on Corporate Cash Holdings (Additional Controls)

	Dependent variable:
	Cash Holdings
imf_inf_actual	0.001***
	(0.00001)
imf_gdp_actual	0.001***
	(0.00002)
delta_nwc_calc	0.333***
	(0.001)
delta_sdebt_calc	0.014***
	(0.0004)
log_empl	0.011***
	(0.0002)
age	-0.003***
	(0.0001)
I(age2)	0.0001***
	(0.00000)
Firm fixed effects	Yes
Year fixed effects	No
Observations	5,554,558
F Statistic	189,052.000***

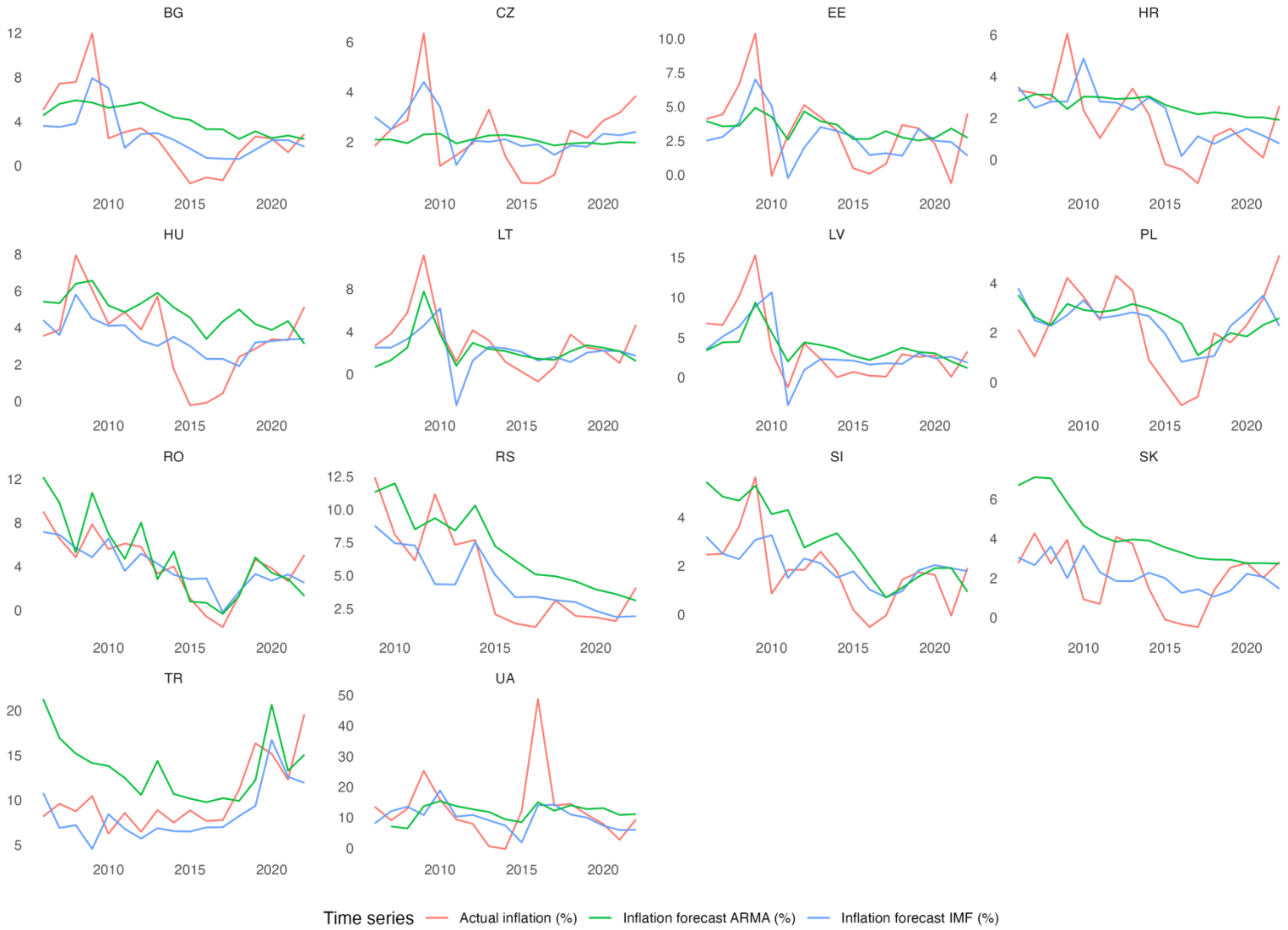
Notes: The table shows the result of the regressions augmented with controls for the financial condition, while examining the effect of actual inflation on corporate cash holdings. The sample includes all countries of the region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix N. The Results of the Dickey-Fuller Test

Country	Abbreviation	Test
Bulgaria	BG	"Stationary"
Czechia	CZ	"Stationary"
Croatia	HR	"Stationary"
Estonia	EE	"Stationary"
Hungary	HU	"Stationary"
Latvia	LV	"Stationary"
Lithuania	LT	"Stationary"
Poland	PL	"Stationary"
Romania	RO	"Stationary"
Serbia	RS	"Stationary"
Slovak Republic	SK	"Stationary"
Slovenia	SI	"Stationary"
Turkey	TR	"Stationary"
Ukraine	UA	"Stationary"

Notes: The table reveals the result of the Dickey-Fuller test on quarterly inflation data for each country (with its abbreviation) in the list of research over the period between the year 2000 and 2021. The status of stationarity ("Stationary") is attached if the time-series is stationary at (at least) 10% significance level.

Appendix O. Headline Inflation and Inflation Forecasts



Notes: The figure combines the data on actual inflation, inflation forecast (ARMA) and IMF historical inflation projection for each country in the sample over the study period. All figures are reported in percentages.

Appendix P. Impact of the Expected and Unexpected Inflation on Various Measures of Financial Performance of European Firms (Time-Series Forecasts)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
m_inf_unexpected	0.023***	0.068***	0.153***	0.005***	0.001***
	(0.005)	(0.002)	(0.011)	(0.0004)	(0.00002)
m_inf_forecast	0.899***	0.057***	0.915***	0.012***	0.001***
	(0.019)	(0.006)	(0.042)	(0.001)	(0.0001)
imf_gdp_actual	0.384***	0.141***	0.037***	-0.003***	0.001***
	(0.006)	(0.002)	(0.013)	(0.0004)	(0.00002)
log(empl)	3.296***	-0.983***	-1.386***	-0.362***	0.013***
	(0.067)	(0.024)	(0.196)	(0.004)	(0.0002)
age	-5.190***	0.159***	2.486***	0.196***	-0.0002**
	(0.035)	(0.007)	(0.063)	(0.002)	(0.0001)
I(age2)	0.125***	0.002***	-0.033***	-0.003***	0.0001***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	7,338,739	10,341,302	4,936,115	10,829,772	6,782,729
F Statistic	16,403.970***	2,965.562***	1,287.701***	9,883.997***	2,946.426***

Notes: The table shows the result of the main regressions with decomposed inflation into expected and unexpected parts using time-series model forecasts for the whole region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix Q. Impact of the Demand-pull and Cost-push Inflation on Profitability of European Firms

	Dependent variable:	
	ROE	Net Margin
	(1)	(2)
imf_supply	-0.172***	-0.020***
	(0.007)	(0.002)
imf_demand	0.837***	0.010
	(0.019)	(0.007)
imf_gdp_actual	0.455***	0.180***
	(0.008)	(0.002)
log(empl)	2.804***	-1.200***
	(0.075)	(0.026)
age	-5.431***	0.197***
	(0.038)	(0.008)
I(age2)	0.128***	0.002***
	(0.001)	(0.0002)
Firm fixed effects	Yes	Yes
Year fixed effects	No	No
Observations	6,812,268	9,610,675
F Statistic	15,210.100***	2,979.409***

Notes: The table shows the result of the main regressions with decomposed inflation into demand-pull and cost-push parts for the whole region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix R. Impact of the Demand-pull and Cost-push Inflation on Profitability of European Firms (FD Regressions)

	Dependent variable:	
	ROE	Net Margin
	(1)	(2)
imf_supply	0.001	-0.037***
	(0.007)	(0.002)
imf_demand	0.575***	0.049***
	(0.022)	(0.008)
imf_gdp_actual	0.060***	0.177***
	(0.007)	(0.002)
log(empl)	2.893***	-1.352***
	(0.076)	(0.023)
age	-6.962***	0.118***
	(0.044)	(0.013)
I(age2)	0.191***	0.004***
	(0.001)	(0.0005)
Observations	5,257,311	7,691,383
F Statistic	4,501.904***	1,806.191***

Notes: The table shows the result of the regressions with decomposed inflation into demand-pull and cost-push parts with first-difference (FD) specification for the whole region over the study period. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix S. Impact of the Headline Inflation on Various Measures of Financial Performance of European Firms (Excl. Countries)

A: Headline inflation (Without Romania)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.208***	0.075***	0.079***	0.005***	0.001***
	(0.004)	(0.001)	(0.008)	(0.0003)	(0.00001)
imf_gdp_actual	0.404***	0.132***	0.034**	-0.003***	0.001***
	(0.006)	(0.002)	(0.014)	(0.0005)	(0.00002)
log_empl	3.758***	-0.731***	-1.628***	-0.331***	0.013***
	(0.067)	(0.025)	(0.211)	(0.005)	(0.0002)
age	-4.308***	0.021***	2.813***	0.205***	-0.001***
	(0.033)	(0.007)	(0.065)	(0.002)	(0.0001)
I(age2)	0.099***	0.001***	-0.047***	-0.003***	0.0001***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	5,930,136	7,915,659	3,690,733	8,297,145	5,298,731
F Statistic	14,460.380***	1,579.538***	1,315.414***	9,701.209***	2,949.150***

B: Headline Inflation (Without Romania and Bulgaria)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.223***	0.078***	0.086***	0.005***	0.001***
	(0.004)	(0.001)	(0.008)	(0.0003)	(0.00001)
imf_gdp_actual	0.475***	0.134***	0.028*	-0.0003	0.002***
	(0.007)	(0.002)	(0.014)	(0.001)	(0.00002)

log_empl	3.850***	0.028	-1.121***	-0.296***	0.012***
	(0.078)	(0.026)	(0.219)	(0.005)	(0.0003)
age	-3.884***	0.054***	3.116***	0.157***	-0.001***
	(0.039)	(0.008)	(0.068)	(0.002)	(0.0001)
I(age2)	0.086***	0.0004*	-0.051***	-0.001***	0.00005***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	4,645,230	6,060,970	3,068,928	6,651,062	4,468,178
F Statistic	8,484.572***	1,309.554***	1,518.853***	6,503.964***	2,505.260***

C: Headline inflation (Without Romania, Bulgaria, and Ukraine)

Dependent variable:

	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.037*	0.057***	0.272***	0.014***	0.001***
	(0.021)	(0.006)	(0.053)	(0.001)	(0.0001)
imf_gdp_actual	0.217***	0.140***	-0.035*	-0.002***	0.001***
	(0.008)	(0.003)	(0.018)	(0.001)	(0.00003)
log_empl	2.880***	-0.046	-2.417***	-0.411***	0.012***
	(0.100)	(0.031)	(0.279)	(0.006)	(0.0003)
age	-3.414***	0.038***	3.204***	0.181***	-0.0005***
	(0.043)	(0.009)	(0.079)	(0.002)	(0.0001)
I(age2)	0.076***	0.00005	-0.048***	-0.001***	0.00005***
	(0.001)	(0.0002)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	3,557,559	4,708,875	2,145,578	5,112,650	3,182,835

F Statistic	4,370.159***	687.499***	1,275.106***	6,945.111***	1,341.216***

D: Headline inflation (Without Romania, Bulgaria, Ukraine, and Hungary)

	Dependent variable:				
	ROE	Net Margin	CCC	Current Ratio	Cash Holdings
	(1)	(2)	(3)	(4)	(5)
imf_inf_actual	0.352***	0.124***	0.272***	0.014***	0.003***
	(0.026)	(0.007)	(0.053)	(0.002)	(0.0001)
imf_gdp_actual	0.108***	0.092***	-0.034*	-0.008***	0.0005***
	(0.011)	(0.003)	(0.018)	(0.001)	(0.00003)
log_empl	2.222***	-0.199***	-2.447***	-0.324***	0.008***
	(0.136)	(0.038)	(0.280)	(0.008)	(0.0004)
age	-2.960***	-0.037***	3.213***	0.136***	0.002***
	(0.054)	(0.011)	(0.080)	(0.002)	(0.0001)
I(age2)	0.069***	0.001***	-0.048***	-0.001***	0.00002***
	(0.002)	(0.0003)	(0.002)	(0.0001)	(0.00000)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
Observations	2,570,982	3,407,945	2,117,693	3,773,503	2,092,321
F Statistic	1,877.739***	308.861***	1,264.003***	3,009.398***	1,207.531***

Notes: The appendix reveals the results of the baseline regressions with firm fixed effects and actual inflation as the dependent variable, while dropping some of the countries from the sample (Panels A-D). The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.

Appendix T. Impact of the Headline Inflation on Profitability of European Firms (By Industry)

	Dependent variable:												
	Net Margin												
	C	G	E	L	D	B	N	A	H	I	F	M	J
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
imf_inf_actual	0.062***	0.034***	0.057***	0.044***	0.118***	-0.048	0.110***	0.360***	-0.003	0.175***	0.033***	0.015***	0.038***
	(0.003)	(0.001)	(0.017)	(0.007)	(0.033)	(0.052)	(0.007)	(0.007)	(0.005)	(0.008)	(0.004)	(0.005)	(0.006)
imf_gdp_actual	0.103***	0.080***	0.118***	0.283***	0.245***	0.266***	0.368***	0.240***	0.082***	0.621***	0.140***	0.086***	0.058***
	(0.004)	(0.003)	(0.019)	(0.017)	(0.060)	(0.087)	(0.011)	(0.013)	(0.007)	(0.010)	(0.006)	(0.006)	(0.009)
log_empl	-0.429***	-1.081***	0.109	0.259	3.435***	4.008***	-0.431***	-0.604***	-1.564***	0.347***	-0.307***	-3.261***	-2.095***
	(0.054)	(0.032)	(0.266)	(0.186)	(0.862)	(0.814)	(0.096)	(0.139)	(0.068)	(0.113)	(0.063)	(0.070)	(0.104)
age	0.051***	0.225***	0.388***	0.794***	0.970***	0.603***	-0.016	-0.077*	0.338***	0.700***	-0.384***	0.129***	-0.027
	(0.014)	(0.009)	(0.061)	(0.073)	(0.213)	(0.215)	(0.038)	(0.041)	(0.022)	(0.036)	(0.023)	(0.021)	(0.034)
I(age2)	0.002***	0.0004	-0.003**	-0.002	-0.018***	0.0002	0.002*	0.0002	-0.002***	-0.005***	0.017***	0.005***	0.009***
	(0.0003)	(0.0003)	(0.001)	(0.002)	(0.006)	(0.004)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	1,365,387	3,170,033	67,596	566,623	47,009	24,557	474,639	385,719	756,251	532,654	1,074,521	1,361,170	516,163
F Statistic	292.581***	1,944.680***	45.114***	278.632***	27.625***	22.608***	262.445***	637.545***	467.662***	1,343.783***	265.300***	1,059.386***	236.086***
	ROE												
	C	G	E	L	D	B	N	A	H	I	F	M	J
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
imf_inf_actual	0.160***	0.218***	0.208***	0.045***	0.231**	0.024	0.261***	0.485***	-0.037**	0.415***	0.149***	0.066***	0.089***
	(0.007)	(0.007)	(0.046)	(0.005)	(0.096)	(0.040)	(0.023)	(0.010)	(0.018)	(0.022)	(0.015)	(0.017)	(0.022)
imf_gdp_actual	0.351***	0.386***	0.441***	0.309***	0.081	0.072	0.971***	0.581***	0.146***	1.953***	0.381***	0.130***	0.084***
	(0.012)	(0.010)	(0.056)	(0.015)	(0.095)	(0.091)	(0.035)	(0.022)	(0.028)	(0.039)	(0.024)	(0.017)	(0.031)
log_empl	2.917***	2.152***	3.418***	1.041***	4.943***	4.893***	6.594***	-0.033	3.214***	7.184***	7.443***	1.024***	2.558***
	(0.135)	(0.114)	(0.699)	(0.142)	(1.226)	(0.834)	(0.311)	(0.239)	(0.297)	(0.349)	(0.222)	(0.213)	(0.359)
age	-2.976***	-5.881***	-2.672***	-1.833***	-2.546***	-1.857***	-7.730***	-4.347***	-8.997***	-7.054***	-6.839***	-5.014***	-6.686***
	(0.068)	(0.046)	(0.219)	(0.071)	(0.298)	(0.303)	(0.150)	(0.098)	(0.141)	(0.163)	(0.111)	(0.071)	(0.141)
I(age2)	0.060***	0.138***	0.061***	0.046***	0.034***	0.040***	0.205***	0.088***	0.209***	0.157***	0.193***	0.138***	0.183***
	(0.002)	(0.001)	(0.005)	(0.002)	(0.008)	(0.007)	(0.005)	(0.003)	(0.005)	(0.005)	(0.004)	(0.002)	(0.005)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No	No	No	No	No	No	No	No	No
Observations	1,006,166	2,118,245	51,994	439,958	35,278	18,525	344,479	303,917	504,865	304,844	784,261	1,042,313	383,894
F Statistic	1,876.517***	9,546.816***	75.306***	388.954***	50.114***	23.607***	1,339.371***	1,330.170***	2,754.349***	1,435.320***	1,725.901***	1,786.809***	961.307***

Notes: The table shows the result of the baseline regressions with actual inflation as the dependent variable split by industries (NACE classification). The sample includes all countries of the region over the study period with firm fixed effects. The last lines report the number of firm-year observations used in estimation and F Statistics. ***, **, *, and **.** denote statistical significance at 0-0.1%, 0.1-1%, 1-5%, and 5-10% levels, respectively.