

## **The Impact of Macroeconomic Factors on the Performance of Commercial Banks: The Case of Lithuania**

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*In recent years, the stability and performance of commercial banks have become increasingly intertwined with macroeconomic conditions. This study explores the complex relationship between macroeconomic factors and the performance of Lithuanian commercial banks. By analyzing empirical data, we seek to understand how fluctuations in various economic indicators affect interest income, service and fee income and loan portfolio size in the Lithuanian banking sector. There is a lack of such research, as the efficiency of banks' operations and the sensitivity of loan portfolio quality to changes in macroeconomic indicators depend mostly on the structure and characteristics of the banking sector in each country. The results of the study show that the impact of macroeconomic fluctuations on the Lithuanian commercial banking sector is relatively limited. Understanding the impact of macroeconomic factors on commercial banks is crucial for policy makers, investors, and practitioners. Identifying these linkages can improve risk management practices, strengthen regulatory frameworks, and promote financial stability.*

**Keywords:** *Macroeconomic Factors; Banking Sector's Performance; Loan Portfolio; Interest Income; Services and Commission Income.*

### **Introduction**

In modern economies, commercial banks play a pivotal role in facilitating financial intermediation, resource allocation, and economic growth. The performance of these institutions is closely linked to the broader macroeconomic landscape. Therefore, policymakers, regulators, investors, and economists must understand the dynamic interplay between macroeconomic factors and commercial bank behavior. In their role as market intermediaries, banks provide an indication of the level of economic activity, but they are also influenced by market conditions, which determine the banks' performance and the benefits to investors.

Historical financial market experience, recent geopolitical events leading to higher commodity prices, as well as the COVID-19 pandemic, which led to the disruption of global supply chains and the imposition of movement restrictions, signal that economic shocks or a prolonged slowdown in economic development adversely affect households' financial capability and the performance of corporates, which is reflected in a contraction of the demand for credit or in the increased risk of banks' portfolio.

The assessment of the impact of actual macroeconomic indicators on banks' efficiency, asset quality indicators and forecasts of economic developments is a constant subject of study for each individual bank and, by extension, for the central bank responsible for the stability of the state financial system. The global financial crisis in 2007 revealed that lax regulatory frameworks, insufficient capital, and low credit standards can lead to economic downturns and, in the long term, make economic recovery more difficult.

The relationship between macroeconomic variables and commercial bank activity has been a subject of extensive scholarly inquiry, spurred by its significant implications for financial stability, monetary policy transmission mechanisms, and the broader economy. As the global financial landscape continually evolves, driven by technological advancements, regulatory reforms, and economic shocks, the need to comprehensively grasp these interconnections becomes ever more pressing.

Macroeconomic determinants significantly impact bank profitability according to multiple studies (Saif-Alyousfi., 2020; Rolle *et al.*, 2020; Yao *et al.*, 2018; Saeed, 2014). The performance of banks is sensitive to a range of macroeconomic factors, including GDP growth, inflation, interest rates, exchange rates, and others (Durguti *et al.*, 2020; Rolle *et al.*, 2020).

Impact assessment of macroeconomic variables, including economic growth (GDP) and inflation, often leads to contradictory conclusions. Several authors unanimously confirm that GDP has a significant impact on profitability (Rolle *et al.*, 2020; Lawal *et al.*, 2018; Panigrahi *et al.*, 2019). In terms of the overall effect of the price level, the work of Abreu & Mendes (2002) reveals a positive relationship between return on assets and inflation, while Rolle and al. (2020) finds that inflation has no impact on profitability of banks.

Most of these studies are performed by the example of a particular country, so it is possible to think that the efficiency of the banking portfolio and the quality of the quality of the macroeconomic indicators depend greatly on the structure and characteristics of the particular banking sector in the country. Andries & al. (2013) investigated the efficiency and productivity of Romanian banking industry

and its determinants in the face of European integration, during a five-year period, from 2004 to 2008. Their results suggest that during the period under study, the privately-owned banks in Romania have been significantly more efficient and have enjoyed a higher productivity growth compared with the state-owned banks. Racic & al. (2014) evaluated the effects of different balance sheet determinants on the interest rate risk exposure of banks operating in developed and developing financial markets. They conclude that growth of total assets in banks in the United States results in increases in exposure to interest rate risk, while in Serbia the relationship seems to be inverse. Furthermore, the results show that an increase in the share of deposits in total assets of the U.S. banks reduces exposure to interest rate risk, while banks in the Republic of Serbia experience an opposite effect. The coefficients also suggest that there are some empirical factors whose effects are universal. For instance, both an increase in return on average equity (ROAE) and a decrease in net interest income led to reductions of interest rate sensitivity, regardless of the level of development of the market where the banks operate.

For small economies such as Lithuania, it is very important to see how the complex interaction of macroeconomic factors influences commercial banks. Understanding macroeconomic factors is crucial for evaluating and improving Lithuania commercial banks' Performance. Lakstutiene (2008) analyzed the relationship between the development of the financial system and the growth of the economic growth in the European Union. The results obtained in Lithuanian conditions did not confirm the research on other authors examining the growth of the "old" European Union countries' financial sector and economic growth, that economic growth determines the formation of the structure of the market type financial system. In Lithuania, even with the rapid growth of the economy, the dominant strong banking sector and the small average GDP per capita do not allow the formation of markets oriented to the financial system structure. Although other studies (Lakstutiene & al., 2011) present the relationship between the Lithuanian economy activity and the synchronicity of the credits provided by the banks. The results of the study conducted by Miller (2015) revealed the dependence of the amount of the amount of Lithuanian bank loan portfolio on macroeconomic indicators.

No new empirical studies are available in the public domain to assess the dependence of the Lithuanian banking sector on macroeconomic factors. Our study addresses this research gap. The main contribution of this study to the existing knowledge base is a detailed empirical analysis, covering the entire gamut of independent macroeconomics to explain the results of Lithuanian banks.

**The aim of this article is** to conduct an in-depth analysis of how the macroeconomic factors of a country influence on the performance of Lithuanian commercial banks.

We delve into the multifaceted nature of this relationship, exploring how various macroeconomic indicators influence bank behavior across different economic environments. By synthesizing empirical evidence, theoretical frameworks, and practical insights, we aim to contribute to a deeper understanding of the mechanisms driving the interactions

between macroeconomic variables and commercial bank dynamics.

The macroeconomic factors considered range from variables such as interest rates and average wages, to inflation, public debt, and broader economic indicators such as GDP and unemployment rates. Each of these variables has a different and often interrelated impact on the performance of commercial banks.

In synthesizing empirical evidence and theoretical frameworks, this study aims to provide a holistic perspective on the intricate relationship between macroeconomic factors and the activity of commercial banks. By shedding light on these complex dynamics, we endeavor to contribute to the formulation of informed policies and strategies aimed at fostering financial stability, sustainable economic growth, and inclusive development.

The paper is structured as follows. Theoretical analysis provides a basis for identifying macroeconomic factors that may affect the activities of commercial banks and identifying their performance indicators. The data and methodology section presents the data and research methodology. The research methodology includes regression analysis to assess the magnitude and significance of the impact of macroeconomic factors on bank performance. The results, their interpretation in the discussion and the conclusions are presented in the final chapters.

## Literature Review

The link between macroeconomic variables and the performance of commercial banks has been the subject of extensive research, driven by its significant impact on financial stability, monetary transmission mechanisms and the wider economy. In this section, we will carry out a literature review to identify the economic factors and commercial bank performance indicators on which we can focus our research.

### *Impact of Gross Domestic Product on the Performance of Commercial Banks*

The response of the banking sector to boom and recessionary phases of economic conditions differs significantly. Barczyk (2018) points out that, at the beginning of the upturn phase of the business cycle, the growth rate of commercial banks' money demand may be quite rapid and start to slow down at the first signs of the end of the business cycle, which would be followed by a slowdown in the growth of the volume of consumer credit to households and a lower level of credit extended to businesses for investment purposes. According to Jesus and Gabriel (2006), during economic upturns, commercial banks tend to be liberal in their assessment of the solvency of potential customers and their ability to meet their obligations in full, with the financing of projects with negative net present values indicating an increased risk of default and future losses.

On the other hand, as the economy enters a slowdown phase, falling factor utilization is adversely affecting demand for investment and consumption products. Bohachova (2008) points out that as economic conditions

worsen during periods of stagnation and recession, the riskiness of intermediation tends to increase, making financial institutions more vulnerable to adverse borrower selection and moral hazard behavior.

Research on the relationship between gross domestic product and the performance of commercial banks can be divided into two parts: it is argued that a stable and shock-resilient financial sector may not only be a consequence of economic growth, but also a cause of economic growth, with important implications for the development of the economy itself, and that, therefore, GDP-banking-performance can be examined in terms of the mutual effects (Garbaravicius & Kuodis, 2002).

Tecles and Tabak (2008) use a vector error correction model to assess the relationship between the performance of Brazilian commercial banks and gross domestic product. The empirical study confirmed the assumption that rising economic activity increases consumer and investor optimism. Higher expectations of productivity, as measured by future GDP, are associated with rising profits and incomes, which stimulate consumption smoothing and, at the same time, increase the volume of borrowing. On the other hand, the study also confirmed the existence of an inverse relationship, with the results showing that a 1% increase in the supply of credit leads to an increase in GDP between 0.37 % and 0.56 %. According to Tecles and Tabak (2008), both results confirm the importance of monitoring aggregate economic activity and the financial sector and the reciprocal relationship.

Bohachova (2008) investigated the impact of gross domestic product on banking sector risk - the results showed that commercial banks' efforts to minimize risk in response to the dynamics of gross domestic product vary significantly across countries. In advanced economies, banks tend to increase their capital levels during upturns, by accumulating capital when it is easiest to do so, and to mitigate the build-up of losses during the expected downturn. In contrast, in developing economies, periods of faster growth are associated with lower capital ratios - a procyclical behavior where capital levels move in tandem with the economic phase.

Narusevicius (2018) analyzed data on Lithuanian banks covering the years 2004–2013, i.e. the pre-crisis and post-crisis period, and found that economic growth also has a strong impact on bank performance. In the long run, there is a statistically significant relationship between gross domestic product and commercial banks' interest income and operating costs. He also showed that during periods of economic growth, the evolution of a bank's net interest income tends to be faster than the growth of its funding costs.

Bonaccorsi di Patti and Palazzo (2020) investigated the impact of macroeconomic indicators on bank profitability depending on the bank's business model. The results showed that the sensitivity of bank profitability to GDP growth varies significantly depending on the bank's business model. Banks that are more lending-oriented, i.e. the "medium" and "high" loan share clusters, have a higher sensitivity to GDP growth than the remaining banks that are more heavily geared towards investment instruments. Moreover, GDP growth affects the profitability of lending-oriented banks through operating income and asset write-downs; loan

impairments in these banks are more sensitive to the business cycle than securities impairments.

According to Tham et al. (2022), a key identifier of a healthy and viable real estate finance system is the level of non-performing real estate loans, for which macroeconomic surveillance becomes a cornerstone to mitigate the impact of systemic shocks by identifying macroeconomic risks that can lead to a banking downturn, which then leads to economic collapse (Reinhart & Rogoff, 2011). A study by Tham et al. (2022) on the dynamic impact of key macroeconomic indicators on non-performing loans in the real estate segment confirmed a strong correlation between real estate non-performing loans and GDP. It was found that a 1 % increase in GDP between 2009 and 2017, i.e. during the post-crisis recovery period, reduced the level of NPLs by 7.2 %. According to the authors, this indicates that, in the long term, the country's economic development can significantly reduce the risk of real estate defaults in the country.

On the other hand, Andersen, Berg and Jansen (2012) observed a countercyclical pattern in banks' net interest margins. According to the authors, margins can be higher in recessions and start to decline in booms. A possible explanation for this countercyclical pattern of net interest margins is that banks may prioritize smoothing of total income during recessions and compensate for lower lending volumes by charging higher margins. In addition, loan markets may be less competitive during a recession, which may mean that incumbents who restrict pricing may maintain higher margins without encouraging potential new entrants. However, these assumptions depend on banks having sufficient market power to build resilience in a downturn, where counter-cyclical margin behavior acts as a financial accelerator, amplifying the impact of shocks on the wider economy.

To summarize the studies on the relationship between gross domestic product and commercial banks' performance indicators carried out by the authors discussed above, it can be argued that, normally, during an economic downturn, the quality of the banks' loan portfolio in terms of non-performing loans (NPLs) tends to deteriorate because of the financial difficulties faced by borrowers. In contrast, the upturn phase of an economy leads to increased demand for credit and rising levels of bank earnings, which tend to be more intense in the segment of banks that are more active in lending operations.

### ***The Impact of Interest Rates on the Performance of Commercial Banks***

Interbank interest rates are one of the most important monetary policy tools used to adjust the cost of capital and the demand for investment, which, in interaction with the interest margin, i.e. the difference between the final interest rate paid by the customer and the base rate, often has a significant impact on the performance of commercial banks.

When analyzing the impact of interest rates on the level of risk-taking by banks, we can find studies in the literature (Dell'ariccia, Laeven, & Suarez, 2017; Ioannidou, Ongena, & Peydro, 2015) suggesting that there is a risk-taking channel through which negative interest rates affect the degree of risk-taking by commercial banks. This channel is confirmed by the fact that when interest rates turn negative,

banks often resort to increasing their risk appetite in search of yield. Moreover, as this interest rate policy is designed to stimulate lending, financial institutions may relax lending standards by deteriorating the quality of their loan portfolios, increasing the likelihood that banks will lend to ex-ante identified riskier borrowers who have defaulted in the past or who have problem loans at the current moment.

In addition, the impact of interest rates is assessed by analyzing the extent to which a bank's risk-taking depends on specific bank characteristics. Dell'ariccia et al. (2017) provide evidence that low interest rates are a risk-increasing factor, with a weaker effect in thinly capitalized banks and typically occurring when interest rates are held steady for longer periods of time. Nucera, Lucas, Schaumburg and Schwaab (2017) confirm that the impact of negative interest rates on bank risk depends on the bank's business model: large banks with diversified income sources are considered less risky. In contrast, Heider, Saidi, and Schepens (2019) note that banks that rely on a larger share of deposits for their business may tend to increase risky lending when negative interest rates are imposed.

On the other hand, Carbo-Valverde, Cuadros-Solas and Rodríguez-Fernández (2021) point out that low or negative interest rates can reduce the probability of default on outstanding loans and thus reduce the provisions for non-performing loans. This effect is supported by the results of Urbschat (2018), who analyzed the German banking segment and found that the introduction of negative interest rates was not a significant cost-increasing element for German banks, or a factor that lowered credit standards. On the contrary, the negative interest rate policy served to reduce refinancing costs and loan portfolio provisions. Similar results were reported by Bongiovanni, Reghezza, Santamaria and Williams (2021) in a study of 33 OECD countries for the period 2012–2016: they found that banks' risky asset levels fell by about 10 percentage points in the member countries that adopted negative interest rates. Meanwhile, Bochanova (2008) points out that, in line with information theories between borrowers and lenders, higher interest rates reinforce the adverse selection problem: in the context of credit relationships, borrowers with a high probability of default are selected. In other words, for potentially solvent borrowers looking for additional financing alternatives for safe projects, high interest rates become a repellent.

Martirosianiene (2012) draws on the insights of Coeure (2012) to highlight the direct impact of the ECB's base rate setting on the efficiency performance of the banking sector: a negative interest rate environment can have a detrimental impact on the profitability of commercial banks. According to the author, in times of crisis, "commercial banks need to keep retail deposit rates unchanged in order to preserve the deposit base and reduce the scope for banknote substitution". Heider et al. (2019) confirm similar results by pointing out that banks' reluctance to pass on negative interest rates to depositors significantly increases funding costs. Moreover, the authors argue that large deposit banks are generally seen as traditional intermediaries, which are the most stable players in the market, providing the bulk of loans, and that negative interest rates may change the role of these banks in providing credit to the real economy.

Borio, Gambacorta and Hofmann (2017), using data from 109 large international banks for the period 1995–2012, confirmed a positive relationship between the level of short-term interest rates and the slope of the yield curve.

Boungou and Mawusi (2023) apply counterfactual analysis to about 10,000 banks operating between 2009 and 2018 and find that banks' net interest income tended to decline in countries with negative interest rate policies. The contraction in net interest income was found to be influenced by banks' reluctance to charge a negative interest rate on retail deposits, either due to legal constraints or the fear of losing their core funding base. On the other hand, the results showed that the pass-through of negative interest rates and the impact on interest income depend significantly on banks' specific characteristics, i.e. size, capital level, share of deposits - the implementation of the negative interest rate policy had a greater impact on small, less capital-constrained and deposit-dependent banks.

According to Molyneux, Reghezza and Xie (2019), who surveyed banks from 33 Organization for Economic Co-operation and Development (OECD) countries over the period 2012–2016, in countries where central banks introduced a negative interest rate, the net interest margin and the return on assets declined by 16.41 % and 3.06 %, respectively, compared to countries where central banks did not follow this policy. The findings also confirmed the impact of negative interest rate policies depending on bank- and country-specific factors. For example, large banks can mitigate the negative impact on profitability by hedging, diversifying loans and shifting from interest to non-interest-oriented business models. Among country-specific factors, negative interest rates have been observed to have a stronger impact on bank profitability in competitive banking sectors and in countries with a predominance of floating interest rates.

An even more intense impact of interest rate changes on bank profitability is revealed in Claessens, Coleman and Donnelly (2018): an analysis of banks between 2005 and 2013 shows that a one percentage point drop in the interest rate reduces net interest margins by 8 basis points, and that in each successive year of low rates, margins and profitability fall by an additional 9 basis points and 6 basis points respectively. In other words, the low-for-long effect indicates that the long-term impact of negative interest rates can be detrimental to bank efficiency or even financial stability.

Meanwhile, Brunnermeier and Koby (2018) have shown that keeping interest rates low or negative for a prolonged period prevents banks from obtaining better financing conditions and leads to a consistent reduction in bank margins. The authors also conclude that interest rate cuts can have different effects across regions, with expansionary effects in one region and contractionary effects (in terms of profitability) in another.

Mileris (2015) analysis of statistical data of Lithuanian banks in 2009–2010 confirmed that the decline in interbank interest rates had a significant negative impact on the profitability of Lithuanian banks' loan portfolios. Detailing the economic downturn, the author mentions that the main problem for banks at the time was a sharp increase in non-performing loans, which limited further lending and led to a decline in the quality and volume of the loan portfolio. As

the demand for money in banks began to contract, interbank interest rates were also reduced, contributing to the decline in the profitability of banks' loan portfolios.

Contrary to previous studies, Altavilla, Boucinha and Peydro (2018) show that low interbank interest rates are not detrimental to bank profitability. The authors find that the negative effect of monetary policy interest rates on bank profitability disappears when the endogeneity of monetary policy is considered by controlling for future economic conditions. However, the authors also point out that, although the results of their study do not confirm that monetary easing will reduce bank profits, the prolonged low interest rate environment may still have negative consequences for bank profitability, which may manifest themselves after a certain time. These effects tend to materialize only after a long period of time and are offset by improvements in macroeconomic conditions, as accommodative monetary conditions support real economic activity, which in turn has a positive impact on bank profitability. Moreover, looking at bank-specific characteristics, the authors summarize that monetary easing is relatively more beneficial for more efficient and lower asset quality banks.

The contradictory assessment of the impact of low interest rates is also revealed in Martinez-Pages (2017). Analyzing the dynamics of Spanish banks' net interest income, the author observed that net interest income had been increasing for a long time before the crisis, while the downward trend observed since 2008 coincided with a period of declining interbank interest rates. However, Martinez-Pages (2017) argues that there is no evidence of a correlation between these variables: after eliminating the effects of changes in the non-performing loan ratio and lending volumes, net interest income started to decline before the crisis.

Arce et al. (2019) studied 122 banks from 13-euro area countries, classified into two groups according to the degree of reduction in net interest income because of the ECB's introduction of a negative interest rate policy, and concluded that banks more strongly affected by the negative interest rate policy tightened their lending conditions in order to optimize their risk-weighted assets and capital ratios. However, the findings of Arce et al. (2019) revealed that there were no significant differences in lending volumes between banks affected and unaffected by the negative interbank lending rate.

Meanwhile, a study by Bounou and Mawusi (2023) found a positive effect of negative interest rates on bank lending activity: in countries where a negative interest rate was introduced, bank lending tended to increase by 0.338 percentage points more than in banks where no negative interest rate policy was implemented. Particularly significant credit supply growth was observed among banks heavily dependent on retail deposits. This result is in line with the results of Heider et al. (2019), which confirm that negative interest rates in the euro area have led to an increase in the credit supply of banks that are heavily deposit-dependent, suggesting that the adjustment of lending volumes is becoming a channel through which negative interest rates are transmitted to the real economy.

Meanwhile, Brunnermeier and Koby (2018) have shown that low interest rates can have the opposite effect on

lending. In explaining this relationship, the authors define the "inverse interest rate", i.e. the rate at which the expected effect of stimulative monetary policy becomes the opposite of the expected effect of increasing lending. The existence of this relationship is explained by the fact that banks' net interest income declines faster than the recapitalization gains on banks' initial fixed-income assets.

To summarize the impact of interest rates on commercial banks, changes in interest rates have an impact on commercial banks' lending volumes, risk-taking and profitability. It has been observed that a fall in interest rates can lead to increased risk appetite, liberalization of lending standards and reduced loan portfolio provisions, whereas the expected and usually fixed effect of a fall in interest rates is an increase in lending volumes. Most authors who have analyzed the impact of interest rates on bank profitability have found a direct relationship between these variables. However, it should be noted that the magnitude of the impact of interest rates on bank profitability depends not only on the magnitude of the change in the interest rate, but also on the specific characteristics of the individual bank and the economic situation of the country and is therefore often assessed in a complex manner.

#### ***The Impact of Labor Market Indicators and Inflation on Bank Performance***

Monitoring and analyzing national and regional unemployment, wage and inflation indicators is another avenue undertaken by commercial banks to assess the climate of the labor market and the purchasing power of consumers, which is reflected in the volume of services provided by banks and the quality of their portfolio.

Swanson and Zanzalari (2021) examine the impact of unemployment shocks on bank profitability and find that a 1 % increase in the local market unemployment rate reduces a bank's net operating profit by 3.2 % on average. Using a bank-specific measure of sensitivity to changes in the unemployment rate, the authors note that the effect of a fall in employment is stronger in banks that are large, operate in a larger number of markets, face high levels of competition and are more dependent on the provision of funding services, with net interest income being the component of profitability that is most significantly responsive to local labor market conditions.

Garcia and Guerreiro (2016) found that wage and disposable income growth allowed public banks to expand lending and increase profitability.

On the other hand, Narusevicius (2018), analyzing macroeconomic factors affecting the Lithuanian banking sector, links fluctuations in the unemployment rate to organizational costs, which are a significant profit-destroying factor for banks. Narusevicius (2018) points out that salaries and employee costs account for a large share of banks' operating costs, and the impact on banks' profitability is manifested in changes in wages and salaries. Higher unemployment rates allow banks to postpone or even reduce wage increases, while high employment levels favor the negotiation of higher pay for bank employees. The impact of price levels on the performance of commercial banks can also be seen through changes in costs and income from services and fees. According to Albertazzi and Gambacorta (2009), commercial banks tend to increase transaction and

transaction fees in response to the rising general price level. In addition, higher inflation rates may put pressure on bank service and commission costs due to the rising cost of the latter.

Jadah, Alghanimi, Al-Dahaan and Al-Husainy (2020) attributes the rise in the unemployment rate to the worsening financial situation of existing borrowers, which, according to the author, is transmitted to banks in three directions:

- increased unemployment negatively affects households' cash flows and disposable incomes, while at the same time limiting borrowing opportunities.
- the unemployment rate indicates the relationship between production and demand (the lower the production, the lower the effective demand and incomes).
- rising unemployment increases the default rate of existing customers.

The labor market and inflation impact on banks' activities, which have been identified, suggest that fluctuations in unemployment, wages and inflation are reflected in changes in customers' ability to pay, which undermine the quality of banks' assets and the demand for funding products.

#### ***The Impact of Public Debt and Exports on the Performance of Commercial Banks***

Much of world trade is dependent on access to efficient and reliable sources of finance provided by commercial banks - by providing access to finance, banks play an important role in stimulating and supporting international trade, which can also affect the performance of the banking sector. In addition, financial stability, and hence banking performance, is affected by the level of indebtedness of the public institutional sector, which is an indicator of a country's creditworthiness and shapes the confidence of its customer base in financial institutions.

Khan and Yeniceri (2016) analyzed the macroeconomic factors influencing the return on assets (ROA) of a Pakistani bank and found a significant relationship between export volume and ROA. The authors' analysis of quarterly data for the period 2005–2009, covering the crisis period when banks operating in the country faced an intense decline in deposits, confirmed that a decline in international trade has a negative impact on the profitability of banks in the country. Meanwhile, Narusevičius (2018) analysis of the performance of Lithuanian commercial banks revealed that the volume of products sold abroad has a significant impact on banks' revenues from services and commissions. This dependence is explained by the growing demand for services provided by banks in the context of export growth: as international trade intensifies; businesses are confronted with a growing need for foreign exchange and other banking transactions. Moreover, Rahman, Begum, Ashraf, and Masud (2020), in their analysis of the risk behavior of banks in the BRICS region over the period 2000–2017, find that increased international trade has a strong negative impact on banks' risk appetite, with a high level of international trade

activity allowing banks to increase portfolio diversification and reduce credit risk.

On the other hand, Chukwuogor, Anoruo and Ndu (2021)'s analysis of the determinants of the profitability of US commercial banks reveals a negative impact of economic openness, as measured by the ratio of the sum of exports and imports to GDP, on bank performance. The results indicate that a 1% increase in economic openness reduces bank profitability by around 28 %, a finding that is supported by the intensification of competition in a context of increasing international trade, which is reflected in a reduction in bank profitability.

Deghi, Natalucci and Qureshi (2022), in their analysis of the impact of sovereign debt on commercial banks, point out that sovereign financial pressures, followed by a decline in the value of sovereign debt securities, can have a negative impact on banks that have accumulated a large amount of sovereign debt and have little capital. This effect is manifested in banks' decision to restrict or reduce lending to households and businesses, which has a negative impact on bank profitability. Similar results are found in Horobet, Radulescu, Belascu and Dita (2021), who analyze the impact of government deficits on commercial banks in Central and Eastern Europe over the period 2009-2018. The results showed that government indebtedness is negatively correlated with the examined return on assets and return on equity. The authors attribute this relationship to the rise in debt levels during the period analyzed, followed by a rise in interest rates, which reduced lending and increased the level of non-performing loans (NPLs), which was negatively reflected in banks' operating results. Deltuvaite (2013) identifies the impact of the transfer of public debt to the banking sector in several dimensions: banks experiencing capital losses due to the impairment of securities tend to tighten lending standards and to reduce lending volumes, and imprudent management of public sector debt can reduce confidence in commercial banks and increase capital losses.

To summarize the impact of sovereign indebtedness and international trade on the banking sector, it should be noted that rising sovereign debt has a negative impact on the creditworthiness of the sovereign and on confidence in financial institutions, which becomes a drag on banks' earnings, while the impact of an increase in international trade may increase earnings through increased banking transactions, but also lead to the entry of new entrants into the market, with a negative effect on banks' performance in the longer run.

#### **Data and Research Methodology**

This study examines the impact of selected macroeconomic factors potentially affecting the performance of Lithuanian commercial banks in three ways: the impact of macroeconomic factors on interest income, service and commission income and loan portfolio size (Figure 1). These macroeconomic factors were chosen by analyzing scientific literature as factors most affecting the performance of banking.

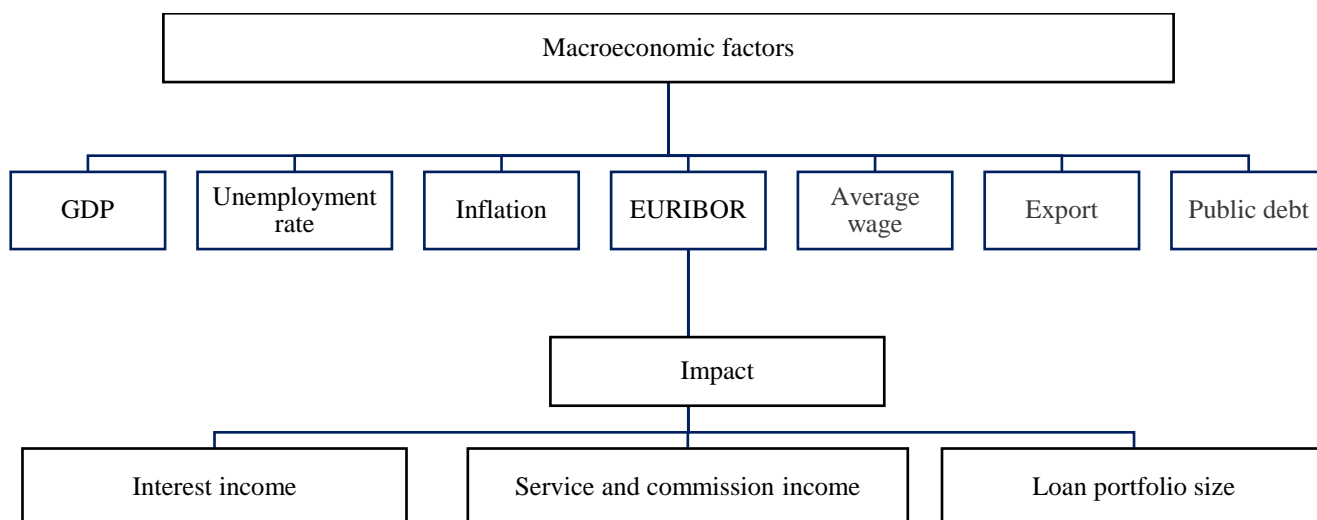


Figure 1. A Diagram of the Impact of Macroeconomic Factors on the Performance of Commercial Banks

The theoretical analysis of the literature has led to the establishment of the following research hypotheses:

1. GDP fluctuations, exports, changes in EURIBOR and changes in average wages directly influence the performance of Lithuanian banks.
2. The unemployment rate, inflation and the growth of public debt inversely influence the performance of Lithuanian banks.

Correlation and regression analysis are used for the study of these hypotheses. Correlation analysis was chosen for its ability to determine the linear relationship between two variables, and regression analysis was chosen for its ability to model and predict complex relationships between variables. These methods aim to evaluate the link between banks of Lithuanian banks to macroeconomic indicators, which are presented in Figure 1. These variables were chosen for their importance to the hypothesis of their importance.

The analysis uses data from the Official Statistics Portal of Lithuania and the Bank of Lithuania, covering the period 2008–2022. The dataset consisted of 15 observations.

Pearson correlation coefficient used to perform correlation analysis because the variables are permanent and correspond to the prerequisite of normality. The Shapiro-Wilk test was used to test the normalness of the variables.

The regression model equation is:

$$Y = \beta_0 + \beta_i X_i + \epsilon,$$

where  $Y$  is the dependent variable,  $\beta_0$  is the intercept,  $\beta_i$  is the coefficient,  $X_i$  is the independent variable,  $\epsilon$  is the error term.

Dependent variables are the results of Lithuanian banking activities – interest income, service and commission income, and loan portfolio size, while independent variables are macroeconomic factors – GDP, unemployment rate, inflation, EURIBOR, average wage, export and public debt. Markup assigned to variables:

- $X_1$  – GDP (million euros)
- $X_2$  – average wage (bruto, euros)
- $X_3$  – export (thousand euros).
- $X_4$  – EURIBOR 6 months (%).

- $X_5$  – inflation (%);
- $X_6$  – unemployment rate (%);
- $X_7$  – public debt (million euros).

The models were made using The EViews 12 software, consistently execution:

- assessment of the inpatient variables.
- assessment of the normality of the variables under investigation.
- modeling and evaluation of the model.
- model reliability assessment.
- the anticipation of the dependent variable.

The determination coefficient ( $R^2$ ) served to evaluate the accuracy of the models, showing how many observations dissemination is explained by the installed regression model, and the analysis of model residual errors allowed to evaluate the reliability of the model created, identify and eliminate the flaws that reduced the fitness of the model.

Using the designed models, the forecasting of the results of Lithuanian banks for one period was performed using real timelines values.

#### *Assessing the Impact of Macroeconomic Factors on the Interest Income of Lithuanian Banks*

Income from lending activities accounts for about 60-70 % of the total income of commercial banks operating in Lithuania and is the segment that generates the largest share of bank earnings. To detail the factors affecting this segment of income, this section develops a regression model between the selected macroeconomic indicators and the interest income of Lithuanian commercial banks.

Assessment of the stationarity of variables. The assessment of stationarity of the variables revealed that the stationary time series are the 6-month EURIBOR interest rate and the unemployment rate, while the remaining variables used in the study fulfilled the stationarity condition only after the use of the differencing procedure: interest income, GDP, exports – second-order integrated processes, average wages, inflation, public debt – first order (Table 1).



Table 1

**Results of the Stationarity Assessment of the Variables**

Variables	Time series differencing	p-value	Model for unit root testing	Level of integrability
Interest income	Differentiated (2)	0,0071	Without a shift and trend	I (2)
GDP	Differentiated (2)	0,0055	Without a shift and trend	I (2)
Average wage	Differentiated (1)	0,0495	With shift and trend	I (1)
Export	Differentiated (2)	0,0018	Without a shift and trend	I (2)
EURIBOR 6 months	Undifferentiated	0,0066	Without a shift and trend	I (0)
Inflation	Differentiated (1)	0,0493	Without a shift and trend	I (1)
Unemployment rate	Undifferentiated	0,0074	With shift and trend	I (0)
Public debt	Differentiated (1)	0,0395	Without a shift and trend	I (1)

**Estimating the normality of variables.** After assessing the stationarity of the variables, the distribution of the variables was analyzed according to a normal distribution by calculating the Jargue-Berra criterion and testing the hypotheses:

- $H_0$  – the values of the variable follow a normal distribution (p-value >0,05).
- $H_1$  – the values of the variable are not normally distributed (p-value <0,05).

The results of the normality assessment of the variables analyzed (Table 2) show that all the variables, except for the differenced average wage (X2), are normally distributed, i.e. the p-value obtained exceeds the 0.05 level. The average wage not satisfying the normality condition is transformed using time series logarithm. The functional transformation of the average wage revealed that the logarithmised variable was a second-order stationary process with a probability value of p above 0,05, i.e. the variable was normally distributed.

Table 2

**Results of the Estimation of the Normal Distribution of Variables**

Variable	Interest income	GDP	Average wage		Export	EURIBOR 6 months	Inflation	Unemployment rate	Public debt
Transformation of a variable	d(Y,2)	d(X1,2)	d(X2)	d(log X2,2)	d(X3, 2)	X4	d(X5)	X6	d(X7)
Jarque - Bera	1,3943	1,3478	7,5975	5,8763	1,9105	3,6415	4,366	1,742	3,901
p value	0,4980	0,5097	0,0224	0,0530	0,3847	0,1619	0,1127	0,4185	0,1422

Once the condition of a normal distribution of the regressors was met, a correlation analysis of the observations was carried out to investigate whether the selected variables were significantly correlated with the interest income of commercial banks. The aim of this step is to identify and include in the model only the independent variables with a significant correlation with interest income. Hypotheses are defined to assess the correlation:

- $H_0$  – there is a nonsignificant correlation between interest income and the macroeconomic factors analyzed.
- $H_1$  - there is a significant correlation between interest income and the macroeconomic variables analyzed.

According to Table 3, it should be noted that GDP, wages, exports, inflation, unemployment, and public debt did not have a significant impact on the interest income of Lithuanian commercial banks over the period 2008-2022 (hypothesis  $H_0$ ). The only macroeconomic indicator with a statistically significant correlation with banks' lending income is the 6-month EURIBOR interest rate.  $H_0$  is rejected with 95 % probability, suggesting that the correlation coefficient between bank interest income and 6-month EURIBOR is 0. The correlation coefficient defining the strength of the relationship between commercial banks operating in Lithuania and the EURIBOR interest rate is 0.7753, indicating that there is a statistically significant direct strong relationship between the variables.

Table 3

**Results of Correlation Analysis between Interest Income and Macroeconomic Indicators**

Variable	GDP	Average wage	Export	EURIBOR 6 months	Inflation	Unemployment rate	Public debt
Transformation of a variable	d(X1,2)	d(log(X2),2)	d(X3,2)	X4	d(X5)	X6	d(X7)
Correlation coefficient (r)	0,3369	0,1209	0,13363	0,7753	0,3364	0,0536	-0,2597
p value	0,2603	0,6939	0,6634	0,0018	0,2610	0,8619	0,3915

**Model building and evaluation.** After identifying the significant impact of the 6-month EURIBOR on the interest income of commercial banks, a pairwise linear regression model of these variables was developed using the least

squares method. The significance of the model is assessed using Fisher's likelihood ratio to test the hypotheses:



- $H_0$  – the regression model between interest income of commercial banks operating in Lithuania and 6-month EURIBOR is not statistically significant.
- $H_1$  – the regression model between interest income of commercial banks operating in Lithuania and 6-month EURIBOR is statistically significant.

The results of the model for bank interest income confirm that the model is significant (Fisher's probability of 0.0018, i.e. hypothesis  $H_1$  is accepted). The accuracy of the model is 56% - the 6-month EURIBOR rate explains 56% of the variation in interest income of commercial banks operating in Lithuania. The equation of the regression model is as follows (3):

$$\Delta\Delta\text{Interest income}=25.04+80.40*\text{EURIBOR 6 months} \quad (3)$$

It should be noted that to ensure the robustness of the model of interest income of commercial banks operating in Lithuania, the dependent variable (interest income) is double-differenced, which is why equation (3) of the regression model defines a positive impact of the 6-month EURIBOR interest rate on the acceleration of the change in the earnings of commercial banks operating in Lithuania.

**Estimation of residual errors in the regression model.** To assess the robustness of the regression model, a residual error analysis is performed. The zero-mean, constant, independent and normality conditions of the errors are checked.

Based on results, it can be assumed that the mean error of the developed model is close to 0 and the values are normally distributed ( $p>0.05$ ). The stability of the variance of the errors, assessed according to the Breush-Pagan

criterion, revealed that the errors are homoscedastic, i.e. they vary according to a defined constant (prob. Chi Square  $> 0.05$ ), and that the errors are uncorrelated with each other. Satisfying all the conditions for the residual errors of the regression model between the interest income of Lithuanian commercial banks and the EURIBOR interest rate shows that the regression model developed is robust and suitable for use.

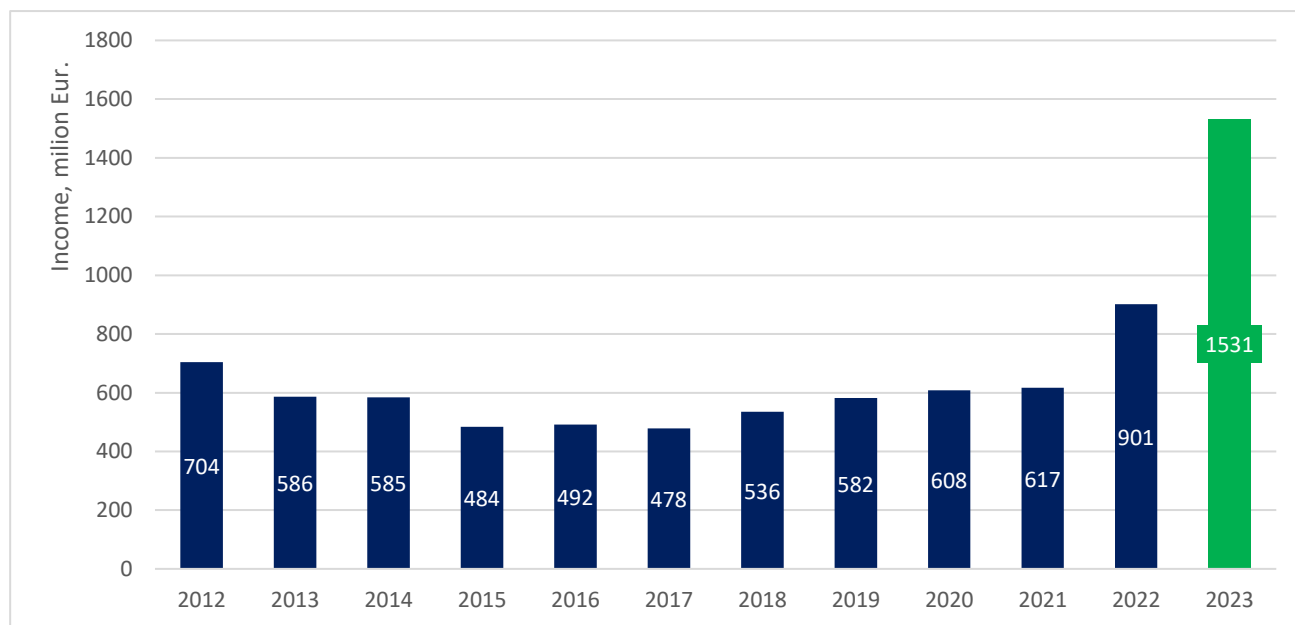
**Forecasting.** A regression model of interest income of commercial banks operating in Lithuania is used to forecast interest income for 2023. This step requires defining the value of the independent variable - the 6-month EURIBOR interest rate - for 2023. Based on the ECB projections (2023), it is expected that the base rate could reach 4% in 2023. The regression model developed shows that this increase in the EURIBOR rate would increase the lending income of Lithuanian banks to EUR 1 531 million (4), or by 70% compared to 2022, when projected using the static approach (Figure 2).

$$\Delta\Delta\text{Interest income} = 25,04 + 80,40*4$$

$$(\text{Interest Income}_{2023}-\text{Interest Income}_{2022})-(\text{Interest Income}_{2022}-\text{Interest Income}_{2021})= 346,64$$

$$\text{Interest Income}_{2023}=346,64+2*\text{Interest Income}_{2022}-\text{Interest Income}_{2021} \quad (4)$$

$$\text{Interest Income}_{2023}=346,64+2*901,0-617,3=1531,34 \text{ million Eur.}$$



**Figure 2.** Dynamics of Interest Income of Lithuanian Commercial Banks in the Period 2012–2022 and Forecast for 2023, Million EUR.

Summarizing the dependence of Lithuanian commercial banks' income on macroeconomic indicators, it should be noted that the EURIBOR interest rate has a significant impact on lending income. However, the main limitation of this regression model and the forecast based on it is that the study uses a year-end fixation of the EURIBOR interest rate, while the actual interest rate may fluctuate

within a certain range during the year and may differentially affect banks' interest income in shorter periods (months or quarters), the analysis of which is not possible due to the unavailability of data.

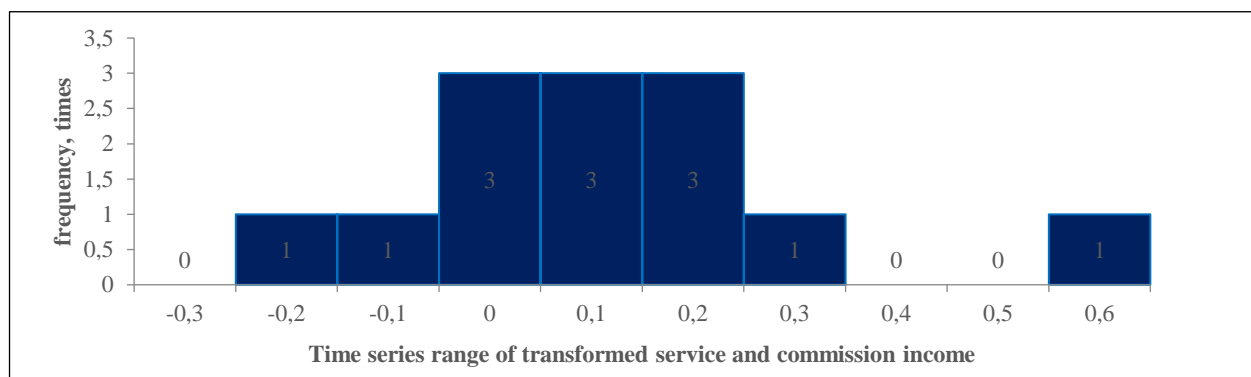
**Assessing the Impact of Macroeconomic Factors on Service and Fee Income of Lithuanian Banks**

Another important segment of banks' revenues is service and fee income, which highlights the importance of banks as money intermediaries. A linear regression model is developed to establish the relationship between this revenue segment and the identified macroeconomic factors.

**Assessing the stationarity of variables.** The stationarity assessment of the time series of service revenues and commissions of Lithuanian commercial banks showed that the dependent variable became stationary after applying a second-order logarithm difference transformation. This

modification of the time series of the variable ensures the plausibility of the regression model to be built.

**Assessment of the normality of the variables.** If the macroeconomic indicators are normally distributed, a preliminary analysis of the observations, including an assessment of normality and correlation, is also carried out for the transformed time series of services and commission income. The distribution of the observations in the time series of revenue and service commission income resembles a bell shape, i.e. the data are normally distributed (Figure 3). The normality condition is also confirmed by the Jarque-Bera criterion and by accepting the  $H_0$  hypothesis, which states that the data follow a normal distribution.



**Figure 3.** Histogram of the Transformed Time Series of Services and Commission Income of Lithuanian Commercial Banks

After confirming that all the variables used in the model satisfy the normality condition, a correlation analysis of service and commission income and macroeconomic indicators was carried out (Table 4), which revealed that service and commission income are statistically significantly correlated with inflation (p-value <0.05). The

correlation coefficient between the variables is 0.6799, indicating that there is a moderately strong direct relationship between inflation and service and commission income. The correlation analysis revealed that there is no statistically significant relationship (p-value above 0.05).

Table 4

**Results of the Correlation Analysis between Service and Commission Income and Macroeconomic Indicators**

Variable	GDP	Average wage	Export	EURIBOR 6 months	Inflation	Unemployment rate	Public debt
Transformation of a variable	d(X <sub>1,2</sub> )	d(log(X <sub>2</sub> ),2)	d(X <sub>3,2</sub> )	X <sub>4</sub>	d(X <sub>5</sub> )	X <sub>6</sub>	d(X <sub>7</sub> )
Correlation coefficient	0,5329	-0,0206	0,5378	0,5005	0,6799	-0,1222	-0,1095
p value	0,0608	0,9467	0,058	0,0815	0,0106	0,6910	0,7219

**Model building and evaluation.** Having established that service and commission income of banks operating in Lithuania is significantly affected by the price level of these variables, the least squares method was used to construct a paired linear regression model, the significance of which was estimated using the likelihood of Fisher's statistic:

- $H_0$  – the regression model between the services of commercial banks operating in Lithuania and commission income and inflation is not statistically significant.
- $H_1$  – the regression model between the services of commercial banks operating in Lithuania and commission income and inflation is statistically significant.

The Fisher statistical probability of the fitted model is 0.01, i.e. it does not exceed the 0.05 level, so it can be said that the pairwise linear regression model between the services and commission income of Lithuanian commercial banks and annual inflation is statistically significant and explains about 41% of the variation in the services and commission income. Equation of the regression model:

$$\Delta \ln(\text{Service and commission income}) = 0,018 + 0,031 * \Delta \text{Inflation} \tag{5}$$

The transformed variables included in the equation of the regression model for service and commission income are the time series of service and commission income is logarithmic and twice-differenced, inflation is once-differenced. This ensures the robustness of the regression

model and reduces the possibility of erroneous conclusions about the existence of a causal relationship.

**Estimation of residual errors in the regression model.** The residual error analysis of the regression model between the services of Lithuanian commercial banks and the commission income and price level confirms the reliability of the model. The conditions for the residual errors of the model are met:

- The Jarque-Bera test probability value exceeds 0.05, so we can say that the model errors follow a normal distribution.
- the mean of the estimated residual errors is 0.
- the variance of the residual errors is constant - homoskedasticity exists.
- the residual errors are independent of each other.

**Forecasting.** The regression model for services and commission income of Lithuanian commercial banks is used to forecast the dependent variable for 2023. This requires a forecast of a given significant independent variable, in this case inflation, for 2023. Based on the March 2023 inflation forecast. According to the Bank of Lithuania's estimates

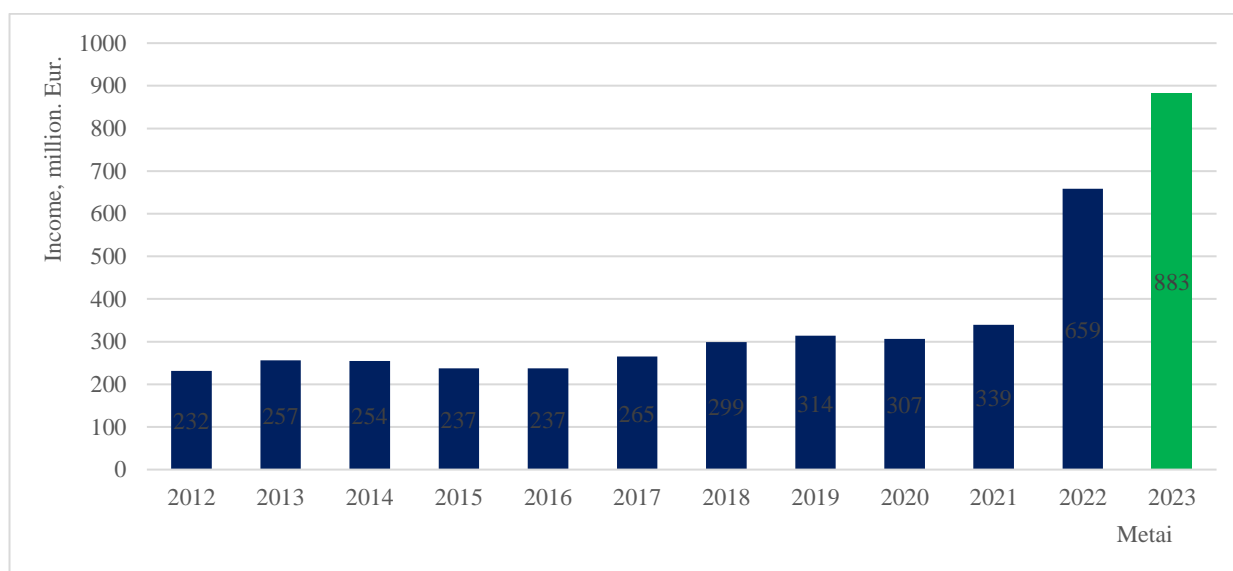
(2023), annual inflation could reach 9% at the end of 2023, i.e. it would be more than twice as low as in 2022. Using this inflation projection and a paired linear regression model (6), the service and fee income of Lithuanian commercial banks in 2023 would amount to 883 million Eur (Figure 4).

$$\Delta \ln(\text{Service income}) = 0,018 + 0,031 * (\text{Inflation}_{2023} - \text{Inflation}_{2022})$$

$$(\ln(\text{Service income}_{2023}) - \ln(\text{Service income}_{2022})) - (\ln(\text{Service income}_{2022}) - \ln(\text{Service income}_{2021})) = 0,018 + 0,031 * (\text{Inflation}_{2023} - \text{Inflation}_{2022})$$

$$\text{Service income}_{2023} = e^{0,018 + 0,031 * (\text{Inflation}_{2023} - \text{Inflation}_{2022}) + 2 * \ln(\text{Service income}_{2022}) - \ln(\text{Service income}_{2021})} \quad (6)$$

$$\text{Service income}_{2023} = e^{0,018 + 0,031 * (9,0 - 21,7) + 2 * \ln 659 - \ln 339} = 883 \text{ million Eur.}$$



**Figure 4.** Dynamics of Services and Commission Income of Lithuanian Commercial Banks in the Period 2012–2022 and Forecast for 2023, Million Eur.

Summarizing the impact of macroeconomic factors on the service and commission income of Lithuanian commercial banks, it should be noted that this income segment is significantly affected by the prevailing price level in the country. The results of the regression analysis of service and commission income in Lithuania are consistent with the findings of Albertazzi and Gambacorta (2009) on the correlation between inflation and service and commission income: as the price level in Lithuania rises, banks tend to raise service fees, increase the taxation of banking transactions.

**Assessing the Impact of Macroeconomic Factors on the Size of Lithuanian Banks' Loan Portfolios**

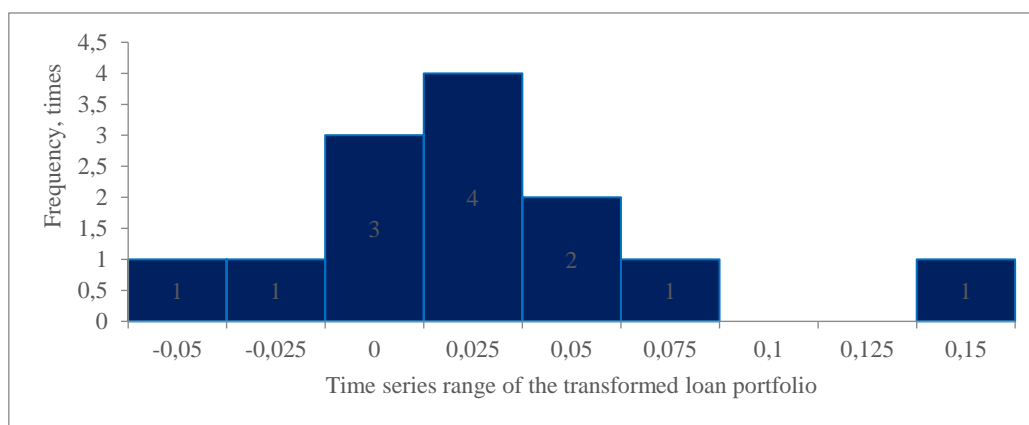
The size of the loan portfolio is one of the key indicators of the banking sector, reflecting not only the scale of banks'

activities, but also the dynamics of consumers' propensity to use credit services. In this part, a regression model is developed between the macroeconomic indicators identified in the theoretical part and the size of the loan portfolio of Lithuanian commercial banks.

**Assessment of the stationarity of the variables.** Once the stationarity condition is met for the macroeconomic indicators under study, the stationarity of the third variable analyzed in the study, i.e. the volume of loans, is additionally assessed. Based on the unit root criterion, it was found that the undifferentiated time series of the loan portfolio is not a stationary process; therefore, the stationarity condition, which is necessary to ensure the certainty of the model to be developed, was satisfied by logarithmic and double-differencing the time series of the loan portfolio.

**Assessment of the normality of the variables.** To proceed with the assessment of the impact of macroeconomic indicators on the size of the loan portfolio of Lithuanian commercial banks, a prerequisite is that the variables follow a normal distribution. Based on the histogram of the transformed time series of the bank loan

portfolio in Figure 5, we can say that the data are tentatively distributed according to a normal distribution - the histogram is in the shape of a "bell". The assumption is also confirmed by the Jarque-Bera test, with a p-value of 0.096, i.e. above the 0.05 level, and therefore  $H_0$  is accepted, which implies that the data follows a normal distribution.



**Figure 5.** Histogram of the Transformed Time Series of the Loan Portfolio of Lithuanian Commercial Banks

If the conditions of stationarity and normality are satisfied for the variables analyzed, a correlation analysis of the loan portfolio of Lithuanian commercial banks and macroeconomic indicators was performed. However, the results obtained (Table 5) indicate that there is no statistically significant relationship between the size of the loan portfolio and the macroeconomic factors analyzed: in

all cases the p-value exceeds the level of 0.05, and therefore  $H_0$  is accepted, which means that the correlation coefficient of the variables is not significantly different from 0. In the absence of any macroeconomic variables significantly correlated with the loan portfolio size, no regression model with the selected dependent variable is developed.

Table 5

**Results of the Correlation Analysis between loan portfolio Size and Macroeconomic Indicators**

Variable	GDP	Average wage	Export	EURIBOR 6 months	Inflation	Unemployment rate	Public debt
Transformation of a variable	$d(X_{1,2})$	$d(\log(X_{2,2}))$	$d(X_{3,2})$	$X_4$	$d(X_5)$	$X_6$	$d(X_7)$
Correlation coefficient	0,3582	0,1667	0,3056	-0,0983	0,5132	-0,0527	-0,3472
p value	0,2294	0,5863	0,3100	0,7492	0,0728	0,8642	0,2451

Summarizing the impact of macroeconomic indicators on the size of the loan portfolio of Lithuanian banks, it should be noted that no statistically significant correlation of the loan portfolio with the analyzed macroeconomic indicators was found. These results show that over the last decade, the volume of lending by banks operating in Lithuania has not been sensitive to fluctuations in macroeconomic indicators defining the labor market situation, productivity, and price level. This suggests that Lithuanian commercial banks are sufficiently resilient to changes in macroeconomic indicators due to relatively low competition, favorable market conditions over the last decade, and their accumulated client base.

**Discussion**

The banking sector plays a key role in the economic development and stability of any nation. In Lithuania, commercial banks are essential intermediaries, channeling funds from savers to borrowers and stimulating economic growth. However, the performance of these banks is closely

linked to the wider macroeconomic environment in which they operate. Fluctuations in key macroeconomic indicators can have a significant impact on the profitability, risk and overall health of commercial banks. Understanding the relationship between macroeconomic factors and bank performance is therefore a key issue for policymakers, regulators and industry participants.

An analysis of the literature on the impact of macroeconomic factors on the performance of commercial banks has revealed that the main macroeconomic indicators that affect banks include GDP, inflation, unemployment, interest rate, wages, exports, and public debt. Despite the expected positive performance of banks in boom periods and the negative impact in recessionary periods, the impact of macroeconomic fluctuations can vary significantly depending on a country's level of economic development, the structure of the banking sector and the business models used. Historical analysis of the impact of macroeconomic indicators on the banking sector and periodic forecasts are one of the tools to prepare for economic shocks, to achieve sustainable growth at the level of the individual bank, and

to ensure the stability of the financial system of the country and the region, which is the responsibility of the European Central Bank to maintain.

The theoretical analysis of the literature (Deghi, Natalucci & Qureshi, 2022; Horobet *et al.*, 2021; Bonaccorsi di Patti & Palazzo, 2020; Narusevicius, 2018; Altavilla, Boucinha & Peydro, 2018; Lakstutiene *et al.*, 2011 and others) suggested that fluctuations in GDP, exports, changes in EURIBOR and changes in average wages have a direct impact on bank performance, such as interest income, service and commission income and loan portfolio size. Our results show that GDP, wages and exports are analyzed in 2008–2022. During the period 2000–2006, there was no significant impact on Lithuanian commercial banks on interest income, services and commission income and service portfolio size. The only macroeconomic indicator is 6 months old with a statistically significant correlation of bank credit income. EURIBOR interest rate. Among these variables among the variables are a statistically significant direct strong connection, which confirms the results obtained by other authors under the conditions of other countries.

Conversely, the theoretical analysis of the literature (Swanson & Zanzalari, 2021; Garcia & Guerreiro, 2016; Jadah, Alghanimi, Al-Dahaan & Al-Husainy, 2020; Deghi, Natalucci & Qureshi, 2022, and others) have indicated that there is a negative correlation between unemployment rates, inflation and the growth of public debt and the performance of banks, including interest income, service and commission income and loan portfolio size.

Our results show that the unemployment rate and the growth of public debt are analyzed during the period 2008–2022 and has no significant impact on Lithuanian commercial banks on interest income, services and commission income and service portfolio size. The only macroeconomic indicator is the only statistically significant correlation of bank services and commission income is inflation. There is a moderate direct relationship between inflation and services and commission income, which does not confirm the results of other authors in the conditions of other countries.

The findings of this study have important implications for policy makers, financial institutions, and stakeholders, revealing strategies to enhance the resilience and sustainability of the banking sector in the face of macroeconomic volatility. Policy makers need to formulate proactive measures to maintain macroeconomic stability, as

fluctuations in key indicators can significantly affect the banking sector. Strengthening regulatory frameworks, improving risk management practices, and fostering financial resilience should be prioritized to mitigate the negative impact of macroeconomic volatility on banks. In addition, the creation of an enabling environment for sustainable economic growth is essential to strengthen the long-term viability of Lithuanian commercial banks.

## Conclusions

The findings of the study indicate that only a few macroeconomic variables have a significant impact on the performance of Lithuanian commercial banks. It is found that inflation and the EURIBOR interest rate have a significant impact on the earnings of Lithuanian commercial banks. Based on a paired linear regression model, which was developed after finding a positive significant relationship between the 6-month EURIBOR rate and the interest income of Lithuanian commercial banks, the forecast for 2023 showed that banks' interest income is expected to increase to EUR 1 531 million per year, or 70 %, by 2023 compared to 2022. The study on the dependence of services and commissions on macroeconomic indicators indicates that the income of this segment is significantly influenced by the price level, with the forecast calculations indicating that services and commissions income will increase by 34 % in 2023. The study did not confirm the impact of the macroeconomic factors identified on the size of the loan portfolio of Lithuanian commercial banks, as no significant correlation was found between gross domestic product, interest rate inflation, unemployment rate, wages, exports, public debt, and the size of the loan portfolio. The weak sensitivity of banking sector income and portfolio size to macroeconomic developments is partly due to high concentration and excess liquidity.

In summary, this study provides valuable insights into the complex relationship between macroeconomic factors and the performance of Lithuanian commercial banks. By elucidating the mechanisms through which economic variables influence bank performance, this study contributes to a deeper understanding of the dynamics of the Lithuanian banking sector. Moving forward, sustained efforts are needed to promote a stable macroeconomic environment conducive to the growth and stability of commercial banks, thereby fostering overall economic growth.

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