EKONOMIA I PRAWO. ECONOMICS AND LAW
Volume 24, Issue 3, 2025
p-ISSN 1898-2255, e-ISSN 2392-1625
www.apcz.umk.pl/EiP

Original article
received 16.02.2025; accepted 31.08.2025; published 30.09.2025
doi: 10.12775/ EiP.2025.12

Does macroeconomic stability matter for non-performing loans? The case of European Union countries

ALEKSANDRA OSTROWSKA

corresponding author
Department of Finance, Faculty of Economic Sciences, University of Warmia and Mazury in Olsztyn, ul. M. Oczapowskiego 2, 10-719 Olsztyn, Poland
aleksandra.ostrowska@uwm.edu.pl
ORCID: 0000-0001-5814-0530

Abstract

Motivation: The quality of a loan portfolio is a key determinant of banks' credit risk, profitability, and financial stability. It is influenced by both internal and external factors, with macroeconomic stability playing a crucial role. Macroeconomic stability affects both the demand for loans and the banks' ability to supply credit. Growing research interest in this area stems from the recurrence of economic crises and the importance of understanding these dynamics for economic policymakers, banking sector supervisors, bank managers, and borrowers.
Aim: This article aims to identify and assess the impact of selected macroeconomic stability indicators on non-performing loans (NPLs) in EU countries during the period 2014–2023, using panel data models.
Results: The results of the study showed that one-year lagged NPL values, economic growth, and the unemployment rate had a significant impact on NPL levels. GDP per capita exhibited a statistically significant negative effect, indicating that its growth is associated with an increase in NPLs. In contrast, the lagged NPL values and the unemployment rate had a significant positive effect, suggesting that increases in these variables are associated with a decrease in NPLs. The inflation rate, public debt, and current account balance were found to be statistically insignificant. These relationships were consistent across both the pre-crisis

period (2014–2019) and the crisis period (2020–2023). Based on these findings, recommendations were formulated for monetary and fiscal policy, as well as for the supervision of the banking sector.

Keywords: non-performing loans; NPL; macroeconomic stability, European Union countries
JEL: E32; E44; E30; G2

1. Introduction

One of the primary functions of banks is to provide credit. The efficiency of lending activities is reflected in the quality of the loan portfolio, which is the main factor shaping banks' credit risk, profitability, and financial stability. The quality of the loan portfolio is determined by both internal factors (dependent on banks' policies) and external factors (independent of banks). These are largely influenced by macroeconomic stability, which is considered a public good (Van Gunten, 2024, p. 149). Macroeconomic stability affects both the demand for loans and the supply of credit offered by banks. Banks formulate their credit policies in response to changes in the economic environment, which also influence the borrowing decisions, creditworthiness, and repayment ability of non-financial sector entities.

Since 2020, the global economy has faced a series of shocks, including the COVID-19 pandemic, the escalation of the Russia–Ukraine conflict, and surging inflation driven by rising energy prices. These events, often referred to as 'black swans' (Mic, 2024, p. 115; Gong et al., 2025, p. 6), have contributed to a deterioration in macroeconomic stability and a rise in non-performing loans (NPLs) in most EU countries.

The article aims is to identify and assess the impact of selected indicators of macroeconomic stability on the NPL in the EU countries between 2014––2023. This study contributes to the growing body of literature on the relationship between macroeconomic stability and NPLs by employing econometric panel models. Unlike previous studies, the research also included the period of the COVID-19 pandemic and the escalation of the Russian-Ukrainian conflict. To the author's knowledge, the research period in previous studies ended in 2022 or did not take into account all EU countries in this period (e.g. Тмава, К., & Спаxіу (2025), Fitriani et al. (2025). In addition, the basic conditions for macroeconomic stability were assessed, also taking into account the current account balance as an explanatory variable, which was not encountered in previous studies for EU. Unlike previous studies, the EU countries were also divided into old and new EU countries, which was not seen in other studies during the period indicated (Gallas et al. (2025)). The use of different research periods and country groups also ensured the robustness of the results. To ensure robustness, both static and dynamic

models were also applied. Static models were estimated using Ordinary Least Squares (OLS) with fixed effects (FE) and random effects (RE). The optimal model was selected based on the results of the Wald, Breusch–Pagan, and Hausman tests. After verifying the properties of the estimated models, robust standard errors (HAC) were used. Additionally, one-year lagged NPL values were included as an explanatory variable in the dynamic models. The practical contribution of the study is formulating recommendations for monetary and fiscal policy, as well as for banking sector supervision.

The article is structured as follows. Section 1 presents of literature review. Section 2 describes the variables and the research methodology. Section 3 presents the results of econometric modelling. Section 4 provides a discussion.

2. Literature review

The quality of a loan portfolio is commonly measured by the share of non-performing loans (NPLs) in a bank's total loan portfolio (Lepczyński & Penczar, 2016, p. 936). A loan is classified as non-performing when the repayment is overdue by more than 90 days (Khoirunisa et al., 2022, p. 66). NPLs represent one of the most significant risks for banks. The ability to effectively manage loan portfolio quality has a positive impact on the overall stability of the banking sector (Mileris, 2012, p. 496). Furthermore, the quality of the loan portfolio is one of the key determinants of a country's financial and macroeconomic stability (Anita et al., 2022, p. 1). According to Castro (2013), the 2008 financial crisis highlighted the severe economic consequences of deteriorating credit quality and spurred increased academic interest in identifying its determinants, including the role of macroeconomic stability. Interest in the relationship between macroeconomic conditions and credit risk has intensified in the wake of recurring crisis events. Such crises often contribute to a decline in macroeconomic stability and an increase in credit risk within the banking sector, thereby raising the likelihood of systemic risk (Bouvatier & El Ouardi, 2023). In recent years, the COVID-19 pandemic significantly worsened the financial position of borrowers–both households and businesses–by increasing their vulnerability (Acheampong et al., 2024, p. 4415). The pandemic led to widespread business failures, a rise in unemployment, declining household income, and a deterioration of many countries' foreign trade balances. The need to finance emergency public spending also resulted in rising public debt. In the EU, the impact of the pandemic was asymmetrical, exacerbating disparities between countries. This divergence stemmed partly from differences in economic growth models and institutional frameworks (Celi et al., 2020).

Additionally, the escalation of the Russia–Ukraine conflict accelerated inflation, primarily through higher energy prices. This inflationary pressure may have further worsened NPL levels by raising operating costs and reduc-

ing borrower incomes. As a response, central banks–first in non-eurozone countries and later the European Central Bank–began raising interest rates (Herr & Nettekoven, 2022, p. 21). Throughout the research period, banks also placed increasing emphasis on incorporating Environmental, Social, and Governance (ESG) criteria into their lending policies (Bruno et al., 2024, p. 4).

During the analyzed period, the secondary market for non-performing loans (NPLs) was further developed, having been initiated in 2017. This market allows banks to sell distressed loans to specialized entities that assume the associated recovery risk. The system remains under close regulatory oversight, as reflected in ongoing reforms. A key example is the action plan adopted by the European Commission on December 16, 2020, which aimed to prevent a rise in NPLs across EU countries in the wake of the COVID-19 pandemic. The plan included measures such as the further development of the secondary NPL market, reforms of EU rules on corporate insolvency and debt recovery, support for the creation and cooperation of national asset management companies (AMCs) at the EU level, and the implementation of prudential measures–including public support where necessary–to ensure continued financing of the real economy, in accordance with the EU Bank Recovery and Resolution Directive (BRRD) and the EU State Aid Framework. Another significant initiative is Directive (EU) 2021/2167 of the European Parliament and of the Council, adopted on November 24, 2021, on credit servicers and credit purchasers, which amends Directives 2008/48/EC and 2014/17/EU. This directive seeks to promote the development of the secondary market for NPLs within the EU by removing barriers to the transfer of NPLs from credit institutions to credit purchasers, while simultaneously safeguarding the rights of borrowers.

Macroeconomic stability is a broad concept, generally associated with the long-term internal and external equilibrium of an economy (Ocampo, 2008, p. 63). The configuration of macroeconomic indicators serves as the foundation for sustainable economic growth (Comporek et al., 2022, p. 133), which is the primary objective of macroeconomic policy in every country (Obidike & Nduka, 2022, p. 1; Kotliński, 2023, p. 602). The relationship between macroeconomic stability and non-performing loans (NPLs) can be examined from both theoretical and empirical perspectives.

For example, Hyman Minsky, in his Theory of Financial Instability, identified several stages in financial markets: disruption, overtrading, monetary expansion, revulsion, and discredit. Disruption refers to an external shock that alters expectations, such as wars, pandemics, or changes in government. Overtrading is characterized by speculative behavior, where market participants overestimate profit opportunities or the effects of leverage, resulting in a collective euphoria about the potential for quick profits. Monetary expansion occurs during periods of economic recovery and growing speculation,

leading to a sharp increase in the money supply. In the stage of revulsion, there is a buildup of debt, accompanied by the insolvency of individuals and businesses. This phase reflects a loss of confidence in the stability of the monetary system, which can lead to a collapse in asset prices, panic, a run on banks, and a flight from illiquid assets into money. The full cycle of a financial crisis concludes with discreditation, where the financial system collapses, triggering widespread panic (Surdej, 2000, pp. 190–191). Another theory that explains these relationships is the Financial Accelerator Theory, developed by Bernanke, Gertler, and Gilchrist (1998). This theory amplifies the boom-bust cycle by highlighting the impact of a company's financial situation on its access to external financing. A key element of this model is the asymmetry of information between banks and firms. Banks do not have complete knowledge of the risks and activities of companies, which creates issues characteristic of agency theory. As a result, banks incur costs to monitor debtors' actions, and borrowing costs rise when a firm has a weak financial position (low net worth). During a recession, declining profits and asset values reduce the firm's net worth, which increases the risk premium, leading to reduced investment and reinforcing the economic downturn. Loan defaults thus exacerbate macroeconomic shocks. In times of economic prosperity, banks face greater temptation to increase risk by expanding the supply of loans and engaging in speculative activities. This accumulated risk eventually materializes during economic downturns, leading to disruptions in loan repayments and triggering financial and macroeconomic crises.

The relationship between macroeconomic stability and non-performing loans (NPLs) in the context of EU countries has also been the subject of empirical research. Notable studies in this area include those by Makri et al. (2014), Tanasković & Jandrić (2015), Roman & Bilan (2015), Dimitrios et al. (2016), Rachuba (2018), Szarowska (2018), Ciukaj & Kil (2020), Kozarić & Dželihodžić (2020), Ofria & Mucciardi (2022), Ostrowska (2023), Zawadzki (2023), Filičková (2024), Artenisa & Hyrije (2023), and Christodoulou-Volos (2025). The results of these studies vary, depending on the group of countries analyzed, the research period, and the methodologies employed.

In conclusion, the growing interest in macroeconomic stability and its impact on non-performing loans (NPLs) remains highly relevant to the current developments affecting EU countries and is of particular concern to EU institutions. A review of the existing literature has highlighted a research gap in this area.

Based on the findings from the literature, the current study has formulated the following hypotheses:

H1: The growth in GDP per capita results in the decline of NPLs.
H2: The increase in unemployment rate results in the growth of NPLs.
H3: The increase in inflation rate results in the decline of NPLs.
H4: The increase in public debt results in the growth of NPLs.

H5: The increase in current account balance results in the decline of NPLs.
H6: The increase in one year lagged NPL results in the decline of NPLs.

The practical contribution is the formulation of recommendations for monetary policy, fiscal policy and supervision of the banking sector.

3. Methods

The research conducted was based on panel data. Annual data for 27 EU countries from 2014 to 2023 were obtained from the ECB Data Warehouse and Eurostat. The availability and completeness of statistical data limited the research period. The characteristics of the variables are presented in Table 1. NPL was used as the dependent variable, while indicators of macroeconomic stability, such as GDP per capita, unemployment rate, inflation rate, public debt (as a percentage of GDP), and current account balance (as a percentage of GDP) were used as independent variables. Descriptive statistics, including the mean, standard deviation, minimum, and maximum, are presented in Table 2.

Next, tests for the stationarity of the variables were conducted. The results of the Augmented Dickey-Fuller (ADF) test indicate that all variables were stationary at their levels, as shown in Table 3. The next step was to calculate the linear correlation coefficients between the variables, with the results displayed in Table 4. According to Schober et al. (2018), a strong correlation is considered when the correlation coefficient exceeds 0.70, while Khan et al. (2020) suggest that a value above 0.80 may indicate potential collinearity. None of the correlation coefficients exceeded these thresholds, allowing the variables to be included in a single model. Graphical correlations between the macroeconomic stability indicators and NPLs are shown in Charts 1-5, which also support the validity of the research hypotheses. Models were estimated using the OLS estimator, FE, and RE. The following model was adopted for the OLS approach (Kufel, 2011, pp. 173–178):

$$y_{it} = y_{it}\beta + \varepsilon_{it} \tag{1}$$

where:
y_{it} – dependent variable;
x_{it} – independent variable (in general, the vector of independent variables);
β – vector of the N dimension of the models' structural parameters;
v_{it} – total random error composed of the purely random part ε_{it} and individual effect u_{it} pertaining to the specific i-th unit of the panel ($v_{it} = \varepsilon_{it} + u_{it}$).

The model with FE assumed the form:

$$y_{it} = y_{it}\beta + u_i + \varepsilon_{it}, \tag{2}$$

The model with RE looked as follows:

$$\hat{\beta}_{RE} = (X^T \Omega^{-1} X)^{-1} X^T \Omega^{-1} y, \tag{3}$$

where:

$\hat{\beta}_{RE}$ – generalized estimator of the least square of structural parameters;

X –matrix of independent variables;

y – vector of dependent variables;

Ω – a reversible matrix of variance and covariance of the total random error.

The validity of the models was assessed with the Wald, Breusch-Pagan and Hausman tests (Kośko et al., 2007, pp. 416-418). Then robust HAC robust standard errors were imposed on the estimators and the models were reestimated.

Dynamic panel models were also estimated, taking into account the one-year lagged NPL. The following model was adopted for the dynamic approach (Arellano, Bond, 1991, p. 278):

$$y_{it} = \alpha y_{i(t-1)} + \eta_i + \nu_{it}, \tag{4}$$

where:

$y_{i(t-1)}$ – lagged dependent variable;

η_i – individual effect.

4. Results

The results of the static econometric models and relevant tests are presented in Tables 5-16. The results of the Wald test for each research period (p-value = 0.000<0.050) indicate that the hypothesis of the OLS model being correct should be rejected, supporting the alternative hypothesis that the fixed effects (FE) model is more appropriate. The results of the Breusch-Pagan test (p-value = 0.000 < 0.050) suggest that the hypothesis of the OLS panel model being correct should be rejected, in favor of the alternative hypothesis that the random effects (RE) model is more suitable. The decision was further supported by the Hausman test, which, with a p-value of 0.000<0.050, rejected the hypothesis that the RE models are correct, supporting the alternative hypothesis. The results of the Hausman test (p-value = 0.010 > 0.050 and 0.295 < 0.050) only in the model for 'new Union' countries in 2014–2019 and 2020–2023 showed the need to use the RE estimator.

After selecting the estimator, the models were diagnosed for cross-sectional dependence, autocorrelation, and heteroskedasticity. The results of the CD-Pesaran test (p-value = 0.000 <0.050) indicate the presence of cross-sectional dependence. The Wooldridge test results (p-value = 0.000<0.050) reveal the presence of autocorrelation in all static models. Additionally, the results of the Wald test (p-value = 0.000<0.050) indicate heteroskedasticity in

all static models. As a result, robust HAC standard errors were applied to the estimator, and the models were re-estimated. This approach was also utilized by Anita et al. (2022) and Claveria (2022) in their studies.

Following the estimation of the OLS models, the variance inflation factor (VIF) was analyzed. The VIF values, which were below 10, indicate the absence of collinearity among the variables (Salmerón et al., 2020, pp. 2–3). The FE model with robust HAC explains the variation in the response variable to a significant extent. The within R^2 coefficient explains the variance in the NPL evaluation, accounting for the lack of individual effects across countries, thus highlighting the relatively minor role of time effects in comparison to the individual effects of different countries.

Dynamic panel models with one-year lagged NPL were also estimated. The results for the dynamic models are presented in Table 8. The results of the AR(1) test for the model covering the entire study period, the years 2019–2023, and 'New Union' countries in years (p-value=0.049, 0.023, and 0.035 < 0.050) indicate the presence of autocorrelation, which is typical for macroeconomic panels. For the EU-27 in years 2014-2019, 'Old Union' countries in years 2014–2023, and 2014–2019 period, and 'New Union' countries in 2014–2019 (p-value = 0.236, 0.270, 0.072, 0.472 > 0.050), the absence of first-order autocorrelation was observed. Regarding the AR(2) test for the estimated dynamic models (p-value = 0.177, 0.258, 0.121, 0.227, 0.784, 0.147, and 0.133 > 0.050), the absence of second-order autocorrelation was not rejected. This suggests no correlation with the error term.

5. Discussion

The parameter estimates reveal a significant negative impact of GDP per capita, although the coefficients were low. These relationships were consistent in both static and dynamic models, regardless of the research period and country group considered. During the research period, the development of the COVID-19 pandemic and the escalation of the armed conflict led to a substantial decline in GDP and an increase in interest rates. These events likely contributed to an increase in credit risk. Despite this, a negative relationship was observed. GDP is a key macroeconomic indicator, and its positive dynamics, including GDP per capita, signal an improvement in the macroeconomic environment. This should, in turn, lead to a reduction in NPLs, as higher incomes for borrowers increase their ability to repay loan obligations (Kocisova & Pastyriková, 2020). A negative relationship between GDP per capita and NPLs was also found by Louzis et al. (2012), Ahmad & Bashir (2013), Castro (2013), Ghosh (2015), Idris & Nayan (2016), Mazreku et al. (2018), Ferreira (2022), Ostrowska (2023), Artenisa and Hyrije (2023), and Christodoulou-Volos (2025). Therefore, the first research hypothesis was not rejected.

In most of the estimated models, the parameter for the unemployment rate was significant and positive. The exception was the dynamic model for EU-27 in the period 2020-2023, where the parameter was insignificant and negative. This could be attributed to the limited number of observations and may represent a disturbance in the data. An increase in the unemployment rate results in a decrease in income and a reduction in the demand for goods and services, which diminishes borrowers' ability to repay loan debt. This finding aligns with the research of Louzis et al. (2012), Ahmad & Bashir (2013), Castro (2013), Wdowiński (2014), Ghosh (2015), Idris & Nayan (2016), Zhang et al. (2022), Ostrowska (2023), Zawadzki (2023), Filičková (2024), Artenisa and Hyrije (2023), and Christodoulou-Volos (2025). Thus, the second research hypothesis was not rejected.

The next indicator of macroeconomic stability is the inflation rate. In the static models for the entire study period and for the years 2020-2023, this parameter was negative and insignificant, while in 2014–2019, it was insignificant but positive, as was observed in the dynamic models. An acceleration of inflationary processes worsens the macroeconomic environment by increasing prices and thereby reducing the purchasing power of money. This directly affects the financial situation of borrowers, as it reduces the value of their disposable income, potentially hindering their ability to repay loans on time (Lekupanai & Makori, 2024). Additionally, inflation often leads to an increase in interest rates. A negative effect of the inflation rate was shown by Ahmad & Bashir (2013). However, the inflation rate was insignificant in the studies by Tanasković & Jandrić (2014), Idris & Nayan (2016), and Artenisa & Hyrije (2023). A positive effect of the inflation rate was observed by Mileris (2012), Abid et al. (2014), Mazreku et al. (2018), and Zhang et al. (2022). Therefore, the third research hypothesis was rejected.

Public debt reflects the condition of public finances. Its increase is primarily driven by a negative difference between state revenues and expenditures, as well as the need for budgetary borrowing. An increase in public debt raises the cost of servicing it and can lead to several negative consequences, including the potential for tax hikes on the population and a reduction in budget revenues. Public debt can also result from a trade or budget deficit (Koju et al., 2018, p. 121). If public debt rises excessively, the government may resort to measures such as reducing social spending. This increase can, in turn, lead to a deterioration in the quality of banks' loan portfolios. The parameter estimates from the models reveal an insignificant but positive impact of public debt for the entire study period. In the sub-periods, this impact was significant and positive in some cases, but insignificant and negative in dynamic models. A positive impact was also identified by Ofria & Mucciardi (2022) and Zawadzki (2023). An insignificant, positive effect in the short term was observed in the study by Karadima & Louri (2022). On the other hand, a negative impact of government debt on the share of non-performing

loans was reported by Anjom & Karim (2016), Dimitrios et al. (2016), and Anita et al. (2022). The fourth hypothesis is not rejected solely in the context of static models.

Another key condition for macroeconomic stability is external balance, particularly in foreign trade. A favorable external balance, where exports exceed imports, is positive for macroeconomic stability and indicates healthy trends in international trade. To enhance their competitive advantage, companies engage in foreign trade by exporting goods and services. Exports are a crucial component of national income in open economies, benefiting not only exporters but also the broader economy (Yahaya & Oni, 2016). A decline in exports can lead to a reduction in business revenues, which, in turn, diminishes the ability to repay loans, contributing to a higher share of non-performing loans (NPLs) in total loans (Clichici & Colesnicova, 2014, p. 1032). In most of the estimated models, the current account balance (as a percentage of GDP) proved to be an insignificant explanatory variable. It is worth noting that, in recent years, the current account balance has deteriorated in most EU countries, particularly in Central and Eastern European (CEE) countries, a trend that began with the closure of economies in 2020. The development of the COVID-19 pandemic and the escalation of the armed conflict may have disrupted the expected relationships in terms of external stability. The lack of a significant impact of export dynamics on NPLs was also supported by the study by Shonhadji (2020). Similarly, the insignificance of the current account balance (as a percentage of GDP) on NPLs was found by Kauko (2012) and Tiryaki (2014). Therefore, the fifth research hypothesis was rejected.

In all dynamic models, the one-year lagged NPL was a significant explanatory variable. This relationship was also observed in other studies, such as those by Gashi et al. (2022), Artenisa & Hyrije (2023), and Christodoulou-Volos (2025). Therefore, the sixth research hypothesis was not rejected.

The results of the conducted research allowed for the confirmation of three out of the six postulated hypotheses. The fourth hypothesis was only supported by static models. The panel analysis results show that the key determinants of the level of non-performing loans (NPL) in EU countries were the one-year lagged NPL, GDP per capita, and the unemployment rate. The impact of other macroeconomic variables, such as the inflation rate, public debt, and the current account balance, was statistically insignificant, which requires further explanation. The insignificance of the inflation rate may be attributed to the fact that it remained relatively low in EU countries for most of the period under review. It experienced a slight increase during the COVID-19 pandemic, but it was only the escalation of the armed conflict that caused a sharp rise, which was subsequently brought under control. Thus, the high inflation rate persisted for a relatively short period, which may explain why it did not have a statistically significant impact. The

increase in inflation, however, led to higher interest rates, which may have had a more direct impact on NPLs. The insignificance of public debt in the models may be due to the fact that NPLs primarily affect the private sector, not the public sector. Therefore, public debt may not have had a direct effect on the results of this study. Its indirect influence could be observed through fiscal policies, such as government spending on business aid or social support for households. Other factors could be related to the design of the panel models. The inclusion of one-year lagged NPLs may have explained most of the variability, causing less significant variables to lose their relevance. Additionally, public debt could be correlated with other variables already incorporated in the models, such as fiscal policies. The insignificance of the current account balance (CAB) may stem from the fact that it directly influences exports and imports but only indirectly affects the financial situation of enterprises, which in turn impacts their loan repayment capacity. It is also possible that the exchange rate could have played a role in influencing NPLs, and its exclusion from the model may have impacted the results. Finally, the lack of significance of certain variables could also be influenced by structural factors, such as the judicial system or banking regulations, which were not accounted for in this study.

The study conducted has certain limitations. Firstly, it focused exclusively on macroeconomic variables. As noted earlier, the insignificance of some of these variables may have been influenced by country-specific characteristics that were not captured in the estimated models. Another limitation is the research period. The division into sub-periods resulted in a relatively small number of observations in each panel, especially for the years 2020-2023. Additionally, the relatively short duration of the macroeconomic shocks during the study period could have influenced the results.

Future research should incorporate additional variables, including bank-specific, structural, institutional, regulatory, and microeconomic factors, which may influence the significance of macroeconomic variables. Another avenue for investigation would be to divide EU countries into 'old Union' and 'new Union' member states and examine the differences between them. It would also be beneficial to extend the research period by incorporating, for instance, quarterly data, which would increase the number of observations, particularly for the years 2020–2023. Additionally, alternative measures of loan portfolio quality, such as the ratio of non-performing loans covered by provisions, could be explored. Modifications to dynamic models, such as adding lags of explanatory variables, introducing other variables like interest rates or loan values, and excluding irrelevant ones, could provide further insights. Due to the scope limitations of this article, these aspects were not addressed in the current research.

Based on the results, recommendations for monetary policy, fiscal policy, and banking sector supervision have been formulated. Measures that affect

both the financial situation of potential and existing borrowers, as well as the situation of banks and their loan portfolios, are important. At the centre of monetary policy within the framework of macroeconomic stability remains inflation, which affects the real income of borrowers. In the context of inflation, it is important to properly set interest rates, which affect inflation and NPLs. Another area is the use of open market operations and reserve requirements. By buying securities and lowering the reserve requirement, the central bank increases liquidity and stimulates inflation, which can encourage loan restructuring or easier refinancing and lower NPLs. Selling them and raising the reserve requirement, on the other hand, leads to a decrease in liquidity and an increase in NPLs. The central bank's information policy is also important. Predictable central bank policy makes financial planning easier for borrowers and banks, which affects inflation expectations and lower NPLs. During economic downturns, reducing interest rates can help stimulate economic activity, benefiting both businesses and households. However, it is important to note that prolonged low interest rates can lead to excessive borrowing, which may overheat the economy and create repayment difficulties for borrowers.

Fiscal policy should focus on improving the labor market situation, particularly by supporting long-term employment. It is recommended to implement activation programs and invest in job creation. However, such measures require additional spending, which could lead to an increase in public debt. Nevertheless, as the research has shown, public debt appears to be an insignificant factor in this context. As part of fiscal policy, it is also important to support borrowers. These can include permanent or temporary tax breaks for both households and businesses. Provided they are properly utilized, they can contribute to improving NPLs. Another solution, particularly in crisis situations, is to provide support to borrowers in the form of installment subsidies, as exemplified by the Borrower Support Fund in Poland. Another solution is the so-called credit vacations, which should be applied only to borrowers in difficult financial situations, as they can generate losses for banks. Another measure could be contribution subsidies for housing loans.

Banking sector supervision should promote a more flexible, cyclical approach to credit risk assessment, such as creating incentives for banks to build up capital buffers during economic booms. Emphasizing stress tests that account for scenarios involving economic downturns and rising unemployment would also be beneficial. Supporting efforts to detect credit problems early, such as through modern scoring systems, could help reduce NPLs. Referring to existing solutions, further development of the secondary market for NPLs within the EU should be prioritized. Additionally, it would be valuable to introduce a unified system for monitoring overdue receivables across the EU. It is important to note that while macroeconomic stability impacts NPLs, NPLs themselves can weaken both the banking sector and

the broader economy due to the costs they generate. As part of banking sector supervision, regular monitoring of current NPL levels is crucial, as past values have also been identified as a significant variable.

6. Conclusion

The article aims is to identify and assess the impact of selected macroeconomic stability indicators on NPLs in EU countries from 2014 to 2023 using panel models. Both static and dynamic panel models were employed in the research. The study period was divided into two sub-periods: 2014–2019 and 2020–2023. The EU countries were also divided into 'old' and 'new' EU countries. In the static models, OLS, FE, RE and robust standard errors estimators were used. These solutions ensured the robustness of the results.

The results of the study showed that economic growth, one-year lagged NPL values, and the unemployment rate were significant determinants of NPLs. These relationships were observed both in the pre-crisis period (2014–2019) and the crisis period (2020–2023). This has also been observed in the 'old' and 'new' Union countries. Thus, the results showed that macroeconomic stability is an important factor shaping NPL in EU countries regardless of the research period adopted. Economic growth and labor market conditions represent key components of macroeconomic stability that significantly affect the level of non-performing loans, chiefly by influencing borrowers' income. The inflation rate, public debt, and the current account balance were found to be insignificant.

GDP per capita exhibited a significant negative impact, meaning that its growth leads to a decrease in NPLs. In a favorable economic climate, households and businesses have higher incomes, making it easier for them to service their obligations on time. As a result, the share of NPLs in banks' portfolios tends to decline. In contrast, during economic downturns or recessions, the risk of default increases, leading to an increase in the number of defaulted loans. The lagged values of NPLs and the unemployment rate showed a significant positive effect, indicating that their increase results in a rise in NPLs. Historically high levels of NPLs can limit banks' ability to make new loans and increase risks to the stability of the financial system. Also important is the unemployment rate, which correlates strongly with household solvency. Rising unemployment reduces the ability of borrowers to service their debt, especially for consumer loans and mortgages.

Therefore, effective economic policies and labor market measures are important for reducing credit risk. The main role in maintaining macroeconomic stability is played by central banks and governments of individual countries. An important role in managing existing NPLs is played by banking sector supervision. Banking sector supervision should adopt a more flexible,

cyclical approach to credit risk assessment, with increased focus on stress tests that consider scenarios of economic downturns and rising unemployment. Additionally, it is important to develop a secondary market for non-performing loans (NPLs) to help banks remove bad loans from their portfolios. Close coordination between monetary policy, fiscal policy, and banking sector supervision is essential to mitigate the risks posed by deteriorating macroeconomic stability on NPLs.

References

Abid, L., Ouertani, M.N., & Zouari-Ghorbel, S. (2014). Macroeconomic and bank-specific determinants of household's non-performing loans in Tunisia: A dynamic panel data. *Procedia Economics and Finance*, 13, 58–68. https://doi.org/10.1016/s2212-5671(14)00430-4.

Acheampong, A., Ibeji, N., & Danso, A. (2024). COVID-19 and credit risk variation across banks: International insights. *Managerial and Decision Economics*, 45(7), 4415–4431. https://doi.org/10.1002/mde.4271.

Ahmad, F., & Bashir, T. (2013). Explanatory power of macroeconomic variables as determinants of non-performing loans: Evidence form Pakistan. *World Applied Sciences Journal*, 22(2), 243–255. https://doi.org//10.5829/idosi.wasj.2013.22.02.1863.

Anita, S.S., Tasnova, N., & Nawar, N. (2022). Are non-performing loans sensitive to macroeconomic determinants? Empirical from banking sector of SAARC countries. *Future Business Journal*, 8(1), 7. https://doi.org/10.1186/s43093-022-00117-9.

Anjom, W., & Karim, A.M. (2016). Relationship between non-performing loans and macroeconomic factors with bank specifc factors: a case study on loan portfolios–SAARC countries perspective. *ELK Asia Pacifc Journal of Finance and Risk Management*, 7(2), 1–29. https://doi.org//10.16962/EAPJFRM/issn. 2349-2325/2015.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies, 58*(2), 277–297. https://doi.org/10.2307/2297968.

Artenisa, B., & Hyrije, A.A. (2023). The impact of economic growth on non-performing loans in Western Balkan countries. *Journal for the International and European Law, Economics and Market Integrations*, 10(2), 117–130. https://doi.org/10.22598/iele.2023.10.2.6.

Bernanke, B.S., Gertler, M., & Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. *Handbook of Macroeconomics*, 1, 1341–1393.

Bouvatier, V., & El Ouardi, S. (2023). Credit gaps as banking crisis predictors: A different tune for middle- and low-income countries. *Emerging Markets Review*, 54, 101001. https://doi.org/10.1016/j.ememar.2023.101001.

Bruno, E., Iacoviello, G., & Giannetti, C. (2024). Bank credit loss and ESG performance. *Finance Research Letters*, *59*, 104719. https://doi.org/10.1016/j.frl.2023.104719.

Castro, V. (2013). Macroeconomic determinants of the credit risk in the banking system: The case of the GIPSI. *Economic Modelling*, 31(1), 672––683. https://doi.org/10.1016/j.econmod.2013.01.027.

Christodoulou-Volos, C. (2025). Determinants of Non-Performing Loans in Cyprus: An Empirical Analysis of Macroeconomic and Borrower-Specific Factors. *International Journal of Economics and Financial Issues*, 15(1), 190–201. https://doi.org/10.32479/ijefi.17398.

Celi, G., Guarascio, D., & Simonazzi, A. (2020). A fragile and divided European Union meets COVID-19: further disintegration or 'Hamiltonian moment'?. *Journal of Industrial and Business Economics*, *47*(3), 411–424. https://doi.org/10.1007/s40812-020-00165-8.

Ciukaj, R., & Kil K. (2020). Determinants of the non-performing loan ratio in the European Union banking sectors with a high level of impaired loans. *Economics and Business Review*, 6(1), 22–45. https://doi.org/10.18559/ebr.2020.1.2.

Claveria, O. (2022). Global economic uncertainty and suicide: Worldwide evidence. *Social Science & Medicine*, 305, 115041. https://doi.org/10.1016/j.socscimed.2022.115041.

Clichici, D., & Colesnicova, T. (2014). The Impact Of Macroeconomic Factors On Non-Performing Loans In The Republic Of Moldova, *Journal of Financial and Monetary Economics*, 1(1), 73–8.

Comporek, M., Kowalska, M., & Misztal, A. (2022). Macroeconomic stability and transport companies' sustainable development in the Eastern European Union. *Journal of Business Economics and Management*, 23(1), 131–144. https://doi.org/10.3846/jbem.2021.15913.

Dimitrios, A., Helen, L., & Mike, T. (2016). Determinants of non-performing loans: Evidence from Euro-area countries. *Finance Research Letters*, 18, 116–119. https://doi.org/10.1016/j.frl.2016.04.008.

Directive (EU) 2021/2167 of the European Parliament and of the Council of 24 November 2021 on credit servicers and credit purchasers and amending Directives 2008/48/EC and 2014/17/EU.

Ferreira, C. (2022). Determinants of non-performing loans: A panel data approach. *International Advances in Economic Research*, 28(3), 133–153. https://doi.org/10.1007/s11294-022-09860-9.

Filičková, N. (2024). Key determinants of non-performing loans: evidence from European Union countries. *Scientia Iuventa*, 47, 47–58.

Fitriani, F., Yusuf, M., & Maksar, M.S. (2025). Evolution and Determinants

of Non-Performing Loan Burden in The Group of Seven (G7) Banking Sector. *Golden Ratio of Finance Management*, 5(2), 372–385. https://doi.org/10.52970/grfm.v5i2.1211.

Gallas, S., Bouzgarrou, H., & Zayati, M. (2025). Analyzing Macroeconomic Variables and Stress Testing Effects on Credit Risk: Comparative Analysis of European Banking Systems. *Journal of Central Banking Theory and Practice*, 2, 121–149. https://doi.org/10.2478/jcbtp-2025-0016.

Gashi, A., Tafa, S., & Bajrami, R. (2022). The impact of macroeconomic factors on non-performing loans in the Western Balkans. *Emerging Science Journal*, 6(5), 1032–1045. https://doi.org/10.28991/esj-2022-06-05-08.

Ghosh, A. (2015). Banking-industry specific and regional economic determinants of non-performing loans: evidence from US States. *Journal of Financial Stability*, 20, 93–104. https://doi.org/10.1016/j.jfs.2015.08.004

Gong, X.L., Ning, H.Y., & Xiong, X. (2025). Research on the cross-contagion between international stock markets and geopolitical risks: the two-layer network perspective. *Financial Innovation*, 11(1), 23. 1–23. https://doi.org/10.1186/s40854-024-00687-3.

Herr, H., & Nettekoven, Z.M. (2022). *Macroeconomic effects of the Covid-19 Pandemic in Germany and the European Monetary Union and economic policy reactions*, Working Paper, Institute for International Political Economy (IPE) Berlin, 185, 1–41.

https://finance.ec.europa.eu/publications/action-plan-tackling-non-performing-loans-npls-aftermath-covid-19-pandemic_en (18.04.2025).

Idris, I.T., & Nayan, S. (2016). The joint effects of oil price volatility and environmental risks on non-performing loans: evidence from panel data of organisation of the petroleum exporting countries. *International Journal of Energy Economics and Policy*, 6(3), 522–528.

Karadima, M., & Louri, H. (2022). Government debt accumulation and non-performing loans: An ARDL bounds testing approach. *Economics and Business Letters*, 11(4), 150-160. https://doi.org//10.17811/ebl.11.4.2022.150-160.

Kavkler, A., & Festić, M. (2010). The trade deficit and banking sector results in Romania and Bulgaria. *Economic Interferences*, 12(27), 199–213.

Khan, M.A., Siddique, A., & Sarwar, Z. (2020). Determinants of non-performing loans in the banking sector in developing state. *Asian Journal of Accounting Research*, 5(1), 135-145. https://doi.org/10.1108/ajar-10-2019-0080.

Khoirunisa, H., Hutauruk, C.M., & Muchtar, S. (2022). Factors affecting non-performing loans of conventional banking: Evidence in Indonesia stock exchange. *Jurnal Syntax Transformation*, 3(1), 65–78. https://doi.org/10.46799/jst.v3i1.494.

Koju, L., Koju, R., & Wang, S. (2018). Macroeconomic and bank-specific determinants of non-performing loans: Evidence from Nepalese banking

system. *Journal of Central Banking Theory and Practice*, 7(3), 111–138. https://doi.org/10.2478/jcbtp-2018-0026.
Kotliński, K. (2023). The macroeconomic stability of United Kingdom after Brexit. *Ekonomia i Prawo. Economics and Law*, 22(3), 599–611. https://doi.org/10.12775/EiP.2023.032.
Kocisova, K., & Pastyriková, M. (2020). Determinants of non-performing loans in European Union countries. In: Proceedings of Economics and Finance Conferences. International Institute of Social and Economic Sciences. https://doi.org/10.20472/EFC.2020.013.005.
Kośko M., Osińska M. and Stempińska J. (2007). Ekonometria współczesna. Wydawnictwo TNOiK, Toruń.
Kozarić, K., & Dželihodžić, E.Ž. (2020). Effects of macroeconomic environment on non-performing loans and financial stability: Case of Bosnia and Herzegovina. *Journal of Central Banking Theory and Practice*, 9(2), 5–17. https://doi.org//10.2478/jcbtp-2020-0011.
Kufel, T. (2011). Ekonometria. Rozwiązywanie problemów z wykorzystaniem programu GRETL, Wydawnictwo Naukowe PWN, Warszawa.
Lekupanai, L., & Makori, D. (2024). Effect of inflation on non-performing loans of non-liste dcommercial banks in Kenya. *The Strategic Journal of Business & Change Management*, 11 (4), 1007–1014. http://dx.doi.org/10.61426/sjbcm.v11i4.3135.
Lepczyński, B., & Penczar, M. (2016). Analiza porównawcza jakości kredytów sektorów bankowych krajów Europy Środkowo-Wschodniej. *Finanse, Rynki Finansowe, Ubezpieczenia*, 82, 931–943. https://doi.org//10.18276/frfu.2016.4.82/1-77.
Louzis, D.P., Vouldis, A.T., & Metaxas, V.L. (2012). Macroeconomic and bank-specific determinants of non-performing loans in Greece: A comparative study of mortgage, business and consumer loan portfolios. *Journal of Banking and Finance*, 36(4), 1012–1027. https://doi.org/10.1016/j.jbankfin.2011.10.012.
Makri, V., Tsagkanos, A., & Bellas, A. (2014). Determinants of non-performing loans: The case of Eurozone. *Panoeconomicus*, 61(2), 193–206. https://doi.org/10.2298/pan1402193m.
Mazreku, I., Morina, F., Misiri, V., Spiteri, J.V., & Grima, S. (2018). Determinants of the level of non-performing loans in commercial banks of transition countries. *European Research Studies Journal*, 21, 3–13. https://doi.org/10.35808/ersj/1040.
Mic, D.A. (2024). Theoretical Aspects of Black Swan Scenarios and Predictable Events Techniques. *Revista de Științe Politice. Revue des Sciences Politiques*, 82, 107–116.
Mileris, R. (2012). Macroeconomic determinants of loan portfolio credit risk in banks. *Engineering Economics*, 23(5), 496–504. https://doi.org/10.5755/j01.ee.23.5.1890.

Obidike, M.O., & Nduka, J.A. (2022). Effect of Selected Macroeconomic Variables on the Nigeria in Economy 1987–2020. *International Journal of Business & Law Research*, 10(3), 84–96.

Ocampo, J.A. (2008). A broad view of macroeconomic stability. The Washington consensus reconsidered, 63–94. https://doi.org/10.1093/acprof:oso/9780199534081.003.0006.

Ofria, F., & Mucciardi, M. (2022). Government failures and non-performing loans in European countries: a spatial approach. *Journal of Economic Studies*, 49(5), 876–887. https://doi.org//10.1108/JES-01-2021-0010.

Ostrowska, A. (2023). Makroekonomiczne determinanty jakości kredytów dla sektora niefinansowego w Polsce. *Bank i Kredyt*, 54(5), 541–556. https://doi.org/10.5604/01.3001.0054.5717.

Rachuba, J. (2018). Koniunktura gospodarcza a jakość portfeli kredytowych banków komercyjnych oraz banków spółdzielczych w Polsce. *Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu*, 521, 153–162. https://doi.org/10.15611/pn.2018.521.15.

Roman, A., & Bilan, I. (2015). An empirical analysis of the macroeconomic determinants of non-performing loans in EU28 banking sector. *Revista Economică*, 67(2), 108–127.

Schober, P., Boer, C., & Schwarte, L.A. (2018). Correlation coefficients: appropriate use and interpretation. *Anesthesia & analgesia*, 126(5), 1763––1768. https://doi.org/10.1213/ane.0000000000002864.

Shonhadji, N. (2020). What Most Influence on Non-Performing Loan in Indonesia? Bank Accounting Perspective with Mars Analysis. *Journal of Accounting and Strategic Finance*, 3(2), 136–153. https://doi.org/10.33005/jasf.v3i2.85.

Surdej A. (2000). Historia kryzysów finansowych. *Historyka. Studia Metodologiczne*, 30, 189-192.

Szarowska, I. (2018). Effect of macroeconomic determinants on non-performing loans in Central and Eastern European countries. *International Journal of Monetary Economics and Finance*, 11(1), 20-35. https://doi.org/10.1504/ijmef.2018.10008415.

Tanasković, S., & Jandrić, M. (2015). Macroeconomic and institutional determinants of non-performing loans. *Journal of Central Banking Theory and Practice*, 4(1), 47-62. https://doi.org/10.1515/jcbtp-2015-0004.

Tiryaki, G. (2014). Banking leverage, credit indicators, current account balance and economic growth with their implications in Turkey (1999-2013). *Finansal Araştırmalar ve Çalışmalar Dergisi*, 6(11), 99–118. https://doi.org/10.14784/jfrs.2014117330.

Тмава, К., & Спахіу, М. (2025). Banking and macroeconomic drivers effects on non-performing loans: insights from Western Balkan countries. *Financial and credit activity problems of theory and practice*, 2(61), 40–53. https://doi.org/10.55643/fcaptp.2.61.2025.4682.

Van Gunten, T. S. (2024). Elite politics and economic crisis: Hyperinflation in Argentina, 1989–1990. *Political Power and Social Theory*, 41, 141–173. https://doi.org/10.1108/S0198-871920240000041006.

Wdowiński, P. (2014). Makroekonomiczne czynniki ryzyka kredytowego w sektorze bankowym w Polsce. *Gospodarka Narodowa*, 272(4), 55–77. https://doi.org/10.33119/gn/100880.

Yahaya, K.A., & Oni, O. (2016). Impact of Macroeconomic Factors on Non-Performing Loan in the Nigerian Deposit Money Bank. *Amity Global Business Review*, 11(1), 68–78 .

Zawadzki, A. (2023). Macroeconomic determinants of credit risk on the example of non-performing loans. *Central European Economic Journal*, 10(57), 275–286. https://doi.org/10.2478/ceej-2023-0016.

Zhang, P., Zhang, M., Zhou, Q., & Zaidi, S.A.H. (2022). The Relationship Among Financial Inclusion, Non-Performing Loans, and Economic Growth: Insights From OECD Countries. *Frontiers in Psychology*, 13, 1–11. https://doi.org/10.3389/fpsyg.2022.939426.

Acknowledgements

Author contributions: author has given an approval to the final version of the article.

Funding: this research was fully funded by the University of Warmia and Mazury in Olsztyn.

Appendix

Table 1. Characteristics of variables

Variables	Unit	Source	Expected relation with NPL
Bank non-performing loans to total gross loans (NPL)	%	ECB Data Warehouse	
GDP per capita (GDP)	euro/unit; market prices	Eurostat	-
Unemployment rate (UR)	%	Eurostat	+
Inflation rate; Hamonised index of consumer prices (HICP)	%	Eurostat	-
Public debt (PD)	% of GDP	Eurostat	+
Current account balance (CAB)	% of GDP	Eurostat	-

Source: Own preparation.

Table 2. Descriptive statistics

Variable	Mean	Std. dev.	Min	Max
NPL	12.719	13.320	0.389	67.367
GDP	31663	21150	7760	107850
UR	7.596	4.087	2.000	26.600
HICP	2.627	3.744	-1.600	19.400
PD	71.109	40.589	8.200	206.300
CAB	1.451	4.799	-20.700	18.900

Source: Own preparation.

Table 3. Results of ADF stationarity tests for variable levels

Variable	Variable level	p-value
NPL	-6.024	0.000
GDP	-4.519	0.000
UR	-5.258	0.000
HICP	-9.649	0.000
PD	-3.488	0.040
CAB	-5.122	0.000

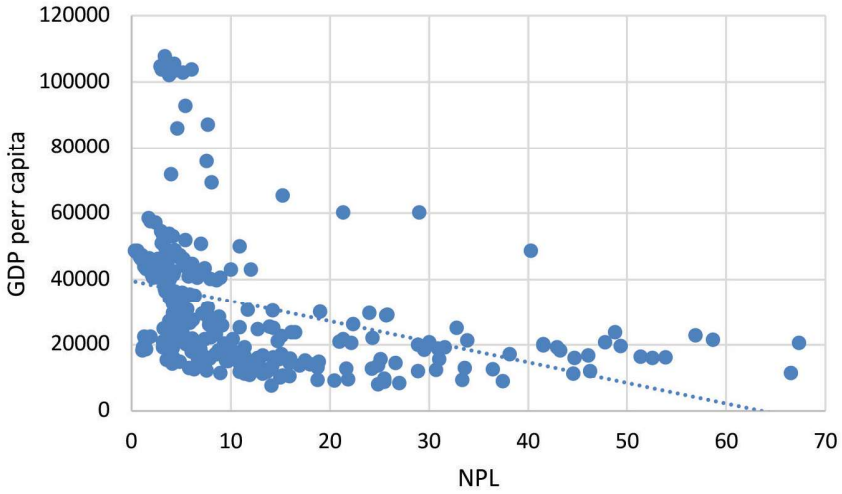
Source: Own preparation.

Table 4. Correlation matrix

Variable	NPL	GDP	UR	HICP	PD	CAB
NPL	1.000					
GDP	-0.392*	1.000				
UR	0.513*	-0.208*	1.000			
HICP	-0.323*	-0.039	-0.339*	1.000		
PD	0.303*	-0.202*	0.557*	-0.187*	1.000	
CAB	-0.157*	0.429*	-0.195*	-0.213*	-0.260*	1.000

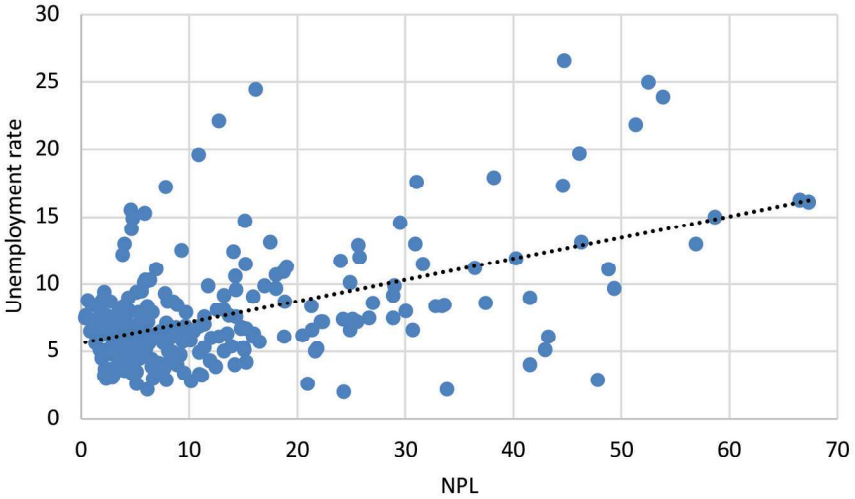
*means significance at the 0.10 level
Source: Own preparation.

Chart 1. Scatterplot–GDP per capita and NPL



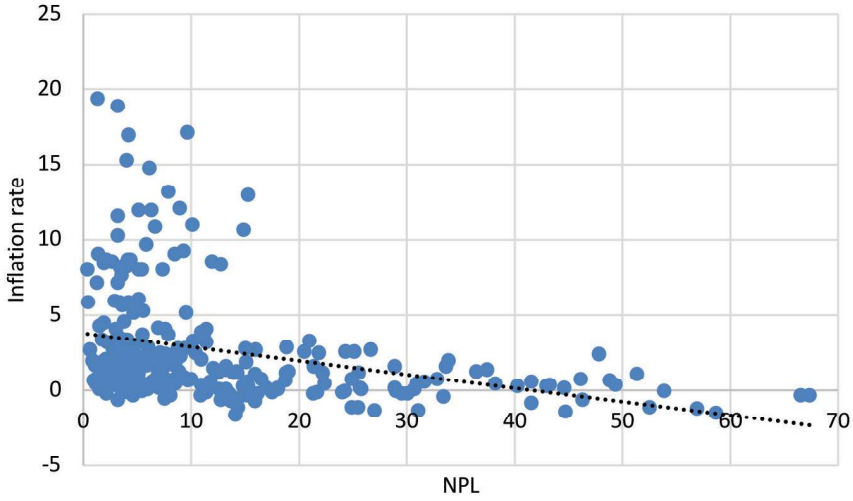
Source: Own preparation based on ECB Data Warehouse and Eurostat.

Chart 2. Scatterplot–unemployment rate and NPL



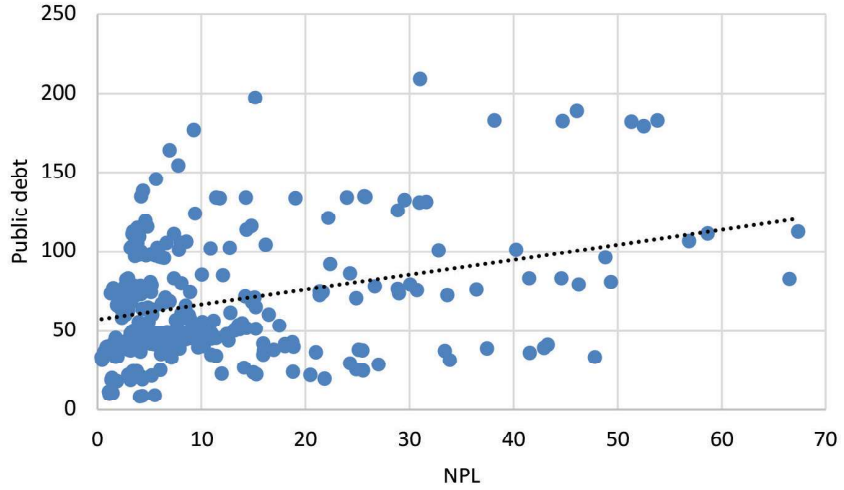
Source: Own preparation based on ECB Data Warehouse and Eurostat.

Chart 3. Scatterplot–inflation rate and NPL



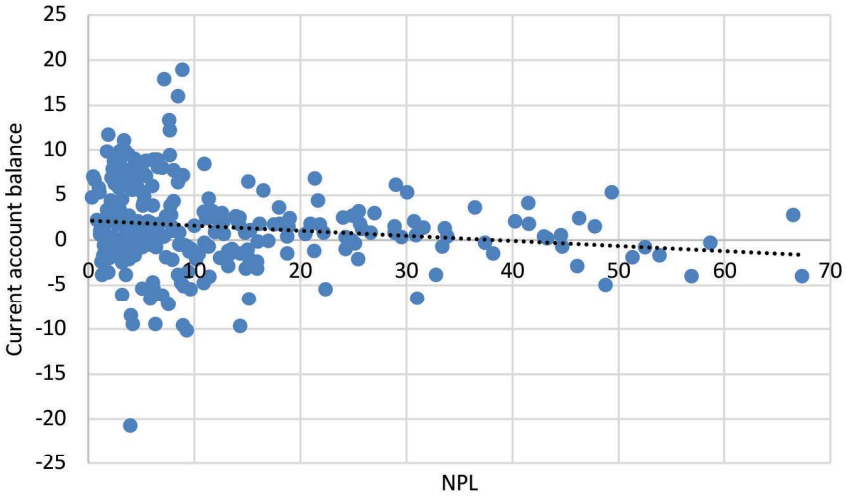
Source: Own preparation based on ECB Data Warehouse and Eurostat.

Chart 4. Scatterplot–public debt and NPL



Source: Own preparation based on ECB Data Warehouse and Eurostat.

Chart 4. Scatterplot–current account balance and NPL



Source: Own preparation based on ECB Data Warehouse and Eurostat.

Table 5. Model estimation, dependent variable: NPL, EU-27, years: 2014-2023, number of observations: 270

Variable	OLS	FE	RE	FE HAC)	VIF
Const.	11.783***	2.754	3.114	2.754	–
	(0.000)	(0.762)	(0.467)	(0.352)	
GDP	−0.002***	−0.001***	−0.002***	−0.001**	1.252
	(0.000)	(0.008)	(0.000)	(0.015)	
UR	1.239***	2.549***	2.465***	2.549***	1.869
	(0.000)	(0.000)	(0.000)	(0.000)	
HICP	−0.728***	−0.110	−0.237*	-0.110	1.244
	(0.000)	(0.383)	(0.055)	(0.532)	
PD	−0.001	0.075	−0.004	0.075	1.703
	(0.953)	(0.277)	(0.927)	(0.433)	
CAB	0.038	0.478***	0.418***	0.478**	1.390
	(0.811)	(0.001)	(0.002)	(0.013)	
F-Stat./LSDV F-Stat.	33.206 (0.000)	33.555 (0.000)	–	–	–
R2 / LSDV R2	0.386	0.815	–	0.815	–
Adj. R2 / Within R2	0.374	0.608	–	0.608	–
Wald test	–	21.164 (0.000)	–	–	–
Breusch-Pagan test	–	–	369.356 (0.000)	–	–
Hausman test	–	–	25.898 (0.000)	–	–
CD-Pesaran test	–	8.109 (0.000)	–	–	–
Wooldridge test	–	21.465 (0.000)	–	–	–
Wald test	–	16002.4 (0.000)	–	–	–

Source: Own preparation.

Table 6. Model estimation, dependent variable: NPL, EU-27, years: 2014-2019, number of observations: 162

Variable	OLS	FE	RE	FE (HAC)	VIF
Const.	17.156***	−34.656	2.937	−34.656	–
	(0.000)	(0.145)	(0.628)	(0.215)	
GDP	−0.002***	−0.001	−0.001***	−0.001***	1.148
	(0.000)	(0.932)	(0.002)	(0.927)	
UR	0.666**	1.631***	1.789***	1.631***	2.333
	(0.034)	(0.000)	(0.000)	(0.001)	
HICP	−2.773***	0.590	0.119	0.590	1.299
	(0.005)	(0.257)	(0.824)	(0.410)	
PD	0.070**	0.552***	0.122**	0.552**	1.889
	(0.036)	(0.001)	(0.039)	(0.013)	
CAB	−0.124	0.193	0.208	0.193**	1.160
	(0.604)	(0.224)	(0.193)	(0.024)	
F-Stat./LSDV	22.417	45.603	–	–	–
F-Stat.	(0.000)	(0.000)			
R2 / LSDV R2	0.418	0.916	–	0.916	–
Adj. R2 / Within R2	0.399	0.576	–	0.576	–
Wald test	–	29.549	–	–	–
		(0.000)			
Breusch-Pagan test	–	–	214.841	–	–
			(0.000)		
Hausman test	–	–	29.603	–	–
			(0.000)		
CD-Pesaran test	–	0.727	–	–	–
		(0.467)			
Wooldridge test	–	12.959	–	–	–
		(0.001)			
Wald test	–	16565.7	–	–	–
		(0.000)			

Source: Own preparation.

Table 7. Model estimation, dependent variable: NPL, EU-27, years: 2020-2023, number of observations: 108

Variable	OLS	FE	RE	FE (HAC)	VIF
Const.	10.352***	(0.024)	3.366	(0.048)	–
	(0.000)	0.001	(0.245)	0.001***	
GDP	−0.001***	(0.523)	−0.001**	(0.268)	1.518
	(0.001)	1.312**	(0.032)	1.312	
UR	0.173	(0.010)	0.889**	(0.131)	1.779
	(0.441)	−0.064	(0.011)	−0.064	
HICP	−2.271**	(0.390)	−0.156**	(0.485)	1.321
	(0.018)	0.183***	(0.025)	0.184***	
PD	−0.004	(0.001)	0.023	(0.003)	1.851
	(0.801)	0.058	(0.416)	0.058	
CAB	−0.099	(0.546)	0.059	(0.302)	1.837
	(0.388)	16.300	(0.529)	–	
F-Stat./LSDV	6.412	(0.000)	–		–
F-Stat.	(0.000)				
		0.869		0.869	
R2 / LSDV R2	0.239		–		–
		0.534		0.534	
Adj. R2 / Within R2	0.202		–		–
		14.115		–	
Wald test	–	(0.000)	–		–

Variable	OLS	FE	RE	FE (HAC)	VIF
Breusch-Pagan test	–	–	63.904 (0.000)	–	–
Hausman test	–	–	34.338 (0.000)	–	–
CD-Pesaran test	–	6.136 (0.000)	–	–	–
Wooldridge test	–	13.653 (0.001)	–	–	–
Wald test	–	7363.99 (0.000)	–	–	–

Source: Own preparation.

Table 8. Model estimation, dependent variable: NPL, EU-27, dynamic models

Variable	2014-2023	2014-2019	2020-2023
NPL_{-1}	0.714*** (0.000)	0.803** (0.041)	0.584*** (0.000)
GDP	–0.001 (0.780)	0.001** (0.029)	–0.001** (0.013)
UR	1.519*** (0.000)	1.649* (0.054)	–0.479 (0.379)
HICP	0.094* (0.053)	0.354 (0,173)	0.023 (0.446)
PD	–0.059 (0.301)	–0.021 (0.937)	–0.019 (0.758)
CAB	0.076 (0.242)	–0.075 (0.329)	0.112 (0.072)
AR(1)	–1.964 (0.049)	–1.185 (0.236)	–1.634 (0.023)
AR(2)	–1.351 (0.177)	–1,132 (0.258)	–1.321 (0.121)
Sargan test	22.684 (0.946)	11.011 (0.275)	0.242 (0.886)
Wald test	1278.1 (0.000)	974.797 (0.000)	44.814 (0.000)

Source: Own preparation.

Table 9. Model estimation, dependent variable: NPL, 'Old Union' countries, years: 2014––2023, number of observations: 140

Variable	OLS	FE	RE	FE (HAC)	VIF
Const.	–21.283*** (0.000)	–0.139 (0.989)	–13.297* (0.065)	–0.139 (0.991)	–
GDP	0.002*** (0.001)	–0.001*** (0.004)	–0.001 (0.602)	–0.001*** (0.005)	2.500
UR	0.977*** (0.000)	2.240*** (0.000)	2.113*** (0.000)	2.240*** (0.001)	2.111
HICP	–0.635*** (0.007)	–0.158 (0.297)	–0.109 (0.483)	–0.158 (0.160)	1.140
PD	0.018*** (0.000)	0.067 (0.231)	0.066 (0.121)	0.067 (0.427)	4.123
CAB	0.476*** (0.003)	0.400*** (0.002)	0.353*** (0.007)	0.400** (0.028)	1.607
F-Stat./LSDV F-Stat.	48.587 (0.000)	33.555 (0.000)	–	–	–
R2 / LSDV R2	0.64	0.897	–	0.897	–

Variable	OLS	FE	RE	FE (HAC)	VIF
Adj. R2 / Within R2	0.631	0.728	–	0.728	–
Wald test	–	23.012 (0.000)	–	–	–
Breusch-Pagan test	–	–	127.184 (0.000)	–	–
Hausman test	–	–	35.630 (0.000)	–	–
CD-Pesaran test	–	2.977 (0.003)	–	–	–
Wooldridge test	–	283.698 (0.000)	–	–	–
Wald test	–	3479.2 (0.000)	–	–	–

Source: Own preparation.

Table 10. Model estimation, dependent variable: NPL, 'Old Union' countries, years: 2014––2019, number of observations: 84

Variable	OLS	FE	RE	FE (HAC)	VIF
Const.	−27.712*** (0.000)	−38.772 (0.057)	−26.350** (0.015)	38.772 (0.170)	–
GDP	0.002*** (0.000)	−0.001*** (0.000)	0.001 (0.613)	−0.001*** (0.007)	2.632
UR	0.430* (0.059)	1.148*** (0.000)	1.307*** (0.000)	1.148*** (0.000)	2.852
HICP	−2.396** (0.023)	1.166** (0.023)	0.744 (0.206)	1.166 (0.130)	1.388
PD	0.309*** (0.000)	0.072 (0.493)	0.251*** (0.000)	0.072 (0.640)	4.394
CAB	0.403** (0.038)	0.133 (0.269)	0.407*** (0.002)	0.133* (0.063)	1.272
F-Stat./LSDV F-Stat.	52.852 (0.000)	53.852 (0.000)	–	–	–
R2 / LSDV R2	0.772	0.972	–	0.972	–
Adj. R2 / Within R2	0.757	0.770	–	0.770	–
Wald test	–	35.664 (0.000)	–	–	–
Breusch-Pagan test	–	–	90.340 (0.000)	–	–
Hausman test	–	–	46.985 (0.000)	–	–
CD-Pesaran test	–	0.289 (0.000)	–	–	–
Wooldridge test	–	51.822 (0.000)	–	–	–
Wald test	–	1389.8 (0.000)	–	–	–

Source: Own preparation.

Table 11. Model estimation, dependent variable: NPL, 'Old Union' countries, years: 2020––2023, number of observations: 56

Variable	OLS	FE	RE	FE (HAC)	VIF
Const.	−8.623***	−33.340***	−17.802***	−33.340***	–
	(0.005)	(0.004)	(0.001)	(0.000)	
GDP	0.001***	0.001	0.001***	0.001	2.442
	(0.002)	(0.391)	(0.004)	(0.103)	
UR	0.212	1.534***	0.826***	1.534***	2.005
	(0.247)	(0.002)	(0.009)	(0.132)	
HICP	−0.212	−0.127	−0.106	−0.127	1.117
	(0.117)	(0.338)	(0.281)	(0.110)	
PD	0.094***	0.208***	0.110***	0.208***	4.824
	(0.000)	(0.001)	(0.001)	(0.000)	
CAB	0.075	−0.038	0.025	−0.038	2.800
	(0.581)	(0.799)	(0.829)	(0.618)	
F-Stat./LSDV F-Stat.	13.309 (0.000)	33.555 (0.000)	–	–	–
R2 / LSDV R2	0.571	0.815	–	0.902	–
Adj. R2 / Within R2	0.528	0.608	–	0.725	–
Wald test	–	9.616 (0.000)	–	–	–
Breusch-Pagan test	–	–	12.101 (0.000)	–	–
Hausman test	–	–	33.985 (0.000)	–	–
CD-Pesaran test	–	8.298 (0.000)	–	–	–
Wooldridge test	–	26.699 (0.000)	–	–	–
Wald test	–	1954.21 (0.000)	–	–	–

Source: Own preparation.

Table 12. Model estimation, dependent variable: NPL, 'Old Union' countries, dynamic models

Variable	2014-2023	2014-2019	2020-2023
NPL_{-1}	0.739***	1.403***	0.222***
	(0.000)	(0.000)	(0.000)
GDP	0.001**	0.001	−0.001
	(0.017)	(0.206)	(0.288)
UR	1.375***	0.600	0.053
	(0.001)	(0.342)	(0.784)
HICP	0.009*	−1.243**	−0.023
	(0.849)	(0,046)	(0.564)
PD	−0.077	−0.348*	0.081**
	(0.198)	(0.081)	(0.022)
CAB	−0.100***	−0.192***	0.003
	(0.000)	(0.001)	(0.975)
AR(1)	−1.103	1.802	–
	(0.270)	(0.072)	
AR(2)	−1.209	−0.274	–
	(0.227)	(0.784)	
Sargan test	122.252	21.170	0.629
	(0.000)	(0.012)	(0.730)
Wald test	4312.36	965.904	1028.56
	(0.000)	(0.000)	(0.000)

Source: Own preparation.

Table 13. Model estimation, dependent variable: NPL, 'New Union' countries, years: 2014––2023, number of observations: 130

Variable	OLS	FE	RE	FE (HAC)	VIF
Const.	2.638	43.650**	7.620	43.650	–
	(0.569)	(0.010)	(0.397)	(0.148)	
GDP	−0.001**	−0.003***	−0.001**	−0.003*	1.329
	(0.047)	(0.000)	(0.010)	(0.077)	
UR	1.926***	2.136***	2.553***	2.136**	1.500
	(0.000)	(0.000)	(0.000)	(0.035)	
HICP	−0.516**	0.128	−0.128	0.128	1.428
	(0.037)	(0.530)	(0.498)	(0.687)	
PD	0.186***	0.064	0.198**	0.064	1.322
	(0.001)	(0.645)	(0.029)	(0.697)	
CAB	0.304	0.483**	0.539**	0.483*	1.309
	(0.186)	(0.041)	(0.017)	(0.058)	
F-Stat./LSDV F-Stat.	21.512 (0.000)	22.161 (0.000)	–	–	–
R2 / LSDV R2	0.465	0.771	–	0.771	–
Adj. R2 / Within R2	0.443	0.624	–	0.624	–
Wald test	–	12.477 (0.000)	–	–	–
Breusch-Pagan test	–	–	110.873 (0.000)	–	–
Hausman test	–	–	11.992 (0.035)	–	–
CD-Pesaran test	–	1.326 (0.000)	–	–	–
Wooldridge test	–	12.840 (0.004)	–	–	–
Wald test	–	134.212 (0.000)	–	–	–

Source: Own preparation.

Table 14. Model estimation, dependent variable: NPL, 'New Union' countries, years: 2014––2019, number of observations: 78

Variable	OLS	FE	RE	RE (HAC)	VIF
Const.	−1.270	−45.643	−2.574	−2.754	–
	(0.854)	(0.274)	(0.849)	(0.795)	
GDP	−0.001	−0.001***	−0.001	−0.001*	1.443
	(0.786)	(0.937)	(0.115)	(0.067)	
UR	1.494***	1.332**	1.795***	1.795***	1.823
	(0.009)	(0.042)	(0.001)	(0.007)	
HICP	−0.581	0.876	0.845*	0.846	1.539
	(0.641)	(0.275)	(0.273)	(0.371)	
PD	0.281***	1.143***	0.511***	0.511***	1.575
	(0.000)	(0.003)	(0.000)	(0.000)	
CAB	−0.098	0.556*	0.401	0.401***	1.206
	(0.784)	(0.077)	(0.171)	(0.000)	
F-Stat./LSDV F-Stat.	12.662 (0.000)	26.870 (0.000)	–	–	–
R2 / LSDV R2	0.468	0.884	–	–	–
Adj. R2 / Within R2	0.431	0.618	–	–	–
Wald test	–	17.916 (0.000)	–	–	–

Variable	OLS	FE	RE	RE (HAC)	VIF
Breusch-Pagan test	–	–	83.606 (0.000)	–	–
Hausman test	–	–	8.995 (0.110)	–	–
CD-Pesaran test	–	0.126 (0.009)	–	–	–
Wooldridge test	–	10.190 (0.008)	–	–	–
Wald test	–	147.681 (0.000)	–	–	–

Source: Own preparation.

Table 15. Model estimation, dependent variable: NPL, 'New Union' countries, years: 2020-2023, number of observations: 52

Variable	OLS	FE	RE	RE (HAC)	VIF
Const.	15.605***	22.630	13.222**	13.222	–
	(0.000)	(0.267)	(0.039)	(0.129)	
GDP	–0.001***	–0.001	–0.001***	–0.001***	1.164
	(0.000)	(0.131)	(0.005)	(0.008)	
UR	0.276	0.690	0.467	0.467	1.203
	(0.531)	(0.606)	(0.490)	(0.599)	
HICP	–0.229***	–1.000	0.149	–0.149	1.423
	(0.112)	(0.348)	(0.110)	(0.262)	
PD	0.049	0.079	0.090*	0.090	1.210
	(0.165)	(0.477)	(0.072)	(0.158)	
CAB	0.193	–0.028	0.082	0.082**	1.383
	(0.213)	(0.863)	(0.520)	(0.097)	
F-Stat./LSDV F-Stat.	4.843 (0.001)	10.657 (0.000)	–	–	–
R2 / LSDV R2	0.345	0.842	–	0.815	–
Adj. R2 / Within R2	0.274	0.470	–	0.608	–
Wald test	–	8.914 (0.000)	–	–	–
Breusch-Pagan test	–	–	29.951 (0.000)	–	–
Hausman test	–	–	6.120 (0.295)	–	–
CD-Pesaran test	–	–	3.041 (0.002)	–	–
Wooldridge test	–	–	4.393 (0.058)	–	–
Wald test	–	–	–	–	–

Source: Own preparation.

Table 16. Model estimation, dependent variable: NPL, 'New Union' countries, dynamic models

Variable	2014-2023	2014-2019	2020-2023
NPL_{-1}	0.697***	0.463**	0.919**
	(0.000)	(0.182)	(0.013)
GDP	–0.001	0.001	–0.002**
	(0.924)	(0.463)	(0.182)
UR	1.797***	2.880***	4.244
	(0.000)	(0.000)	(0.154)
HICP	0.113**	0.874**	–0.021
	(0.028)	(0.034)	(0.814)
PD	–0.012	0.373	–0.041*
	(0.887)	(0.254)	(0.082)
CAB	0.113	0.153	0.321
	(0.239)	(0.343)	(0.072)
AR(1)	–2.111	–0.719	–
	(0.035)	(0.472)	
AR(2)	–1.450	–0.150	–
	(0.147)	(0.133)	
Sargan test	46.747	23.514	1.288
	(0.089)	(0.005)	(0.525)
Wald test	561.532	286.129	39.804
	(0.000)	(0.000)	(0.000)

Source: Own preparation.