ECONOMETRIC ANALYSIS OF THE DETERMINANTS OF NON-PERFORMING LOANS IN UKRAINIAN BANKS

by

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A thesis submitted in partial fulfillment of the
requirements for the degree of

MA in Business and Financial Economics

Kyiv School of Economics

2025

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ACKNOWLEDGMENTS

The author wishes to

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LIST OF ABBREVIATIONS

CAR – Capital Adequacy Ratio

CPI – Consumer Price Index

EU – European Union

GDP – Gross Domestic Product

HAC – Heteroskedasticity and Autocorrelation Consistent

FE – Fixed Effects

FX – Foreign Exchange

RE – Random Effects

IFRS – International Financial Reporting Standards

IMF – International Monetary Fund

NBU – National Bank of Ukraine

NPL – Non-Performing Loans

OLS – Ordinary Least Squares

ROA – Return on Assets

ROE – Return on Equity

Size – Bank Size (logarithm of total assets)

Cost/Income – Cost-to-Income Ratio

SSSU – State Statistics Service of Ukraine

WB – World Bank

CHAPTER 1. INTRODUCTION

The stability of the banking industry is one of the key pillars for sustainable economic growth. The ratio of non-performing loans (NPLs) is an important parameter of credit quality and risk management efficiency of the financial system. High NPLs are detrimental to the profitability of the banks, affect the liquidity, reduce credit to the real economy and are a systemic risk to the national financial stability. Hence, controlling and understanding the drivers of NPLs is still one of the main priorities of central banks and regulators around the world.

International experience indicates that non-performing loans dynamics are the result of the interaction of external and internal factors that are affected by macroeconomic conditions and the banking system conditions. The economic environment, which is characterized by economic downturns, high inflation or exchange rate volatility, is associated with an increase in credit risk while bank-specific factors, such as low capitalization, poor cost management, and low profitability, are associated with an increase in bad assets. Several studies (Louzis et al., 2012; Makri et al., 2014; Klein, 2013; Ciukaj & Kil, 2020) confirm the fact that the stability of the banking sector is jointly affected by the external as well as endogenous factors.

The Ukrainian banking system has faced the most significant structural changes since 2014. The 2014-2015 crisis, the currency devaluation and the liquidation of more than half of the Ukrainian banks resulted in one of the highest amounts of NPLs in Europe - more than 55% in 2017 (NBU, 2018). Although confidence was gradually restored by large scale regulatory reforms, the introduction of IFRS 9 and the recapitalisation of solvent institutions, the ratio of non-performing loans still continues at a stubbornly high level. As of 2024, it was about 30%, which is almost three times the EU average (NBU, 2024).

The recent shocks have further complicated the situation. The COVID-19 pandemic wreck havoc on both corporate and household incomes and the full scale Russian invasion in 2022 placed an unparalleled burden both on borrowers and banks. The economic contraction, asset losses, migration and logistical disruptions have resulted in a worsening of the repayment capacity and an increase in credit risk. Therefore, it has turned into a crucial issue to one's attention to tackle the problem of NPLs for a successful post-war financial recovery and sustainable growth.

Although the factors of non-performing loans are widely examined in international literature (Beck et al., 2015; Messai & Jouini, 2013; Al-Khazali & Mirzaei, 2020), the Ukrainian example is insufficiently covered, especially in the context of the current war and macroeconomical instability. Most of the current literature addresses pre-2020 time horizons or focuses on single bank-level data, which overlooks the systemic aspects of the whole sector. In addition, there is little empirical evidence on the joint impact of structural and macro-financial factors on credit quality in transition economies subject to long-stance geopolitical stress.

The goal of the research is to reveal and empirically investigate the main factors which determine the level of non-performing loans in the Ukrainian banking sector in 2017-2024. The aim of the research is to offer a comprehensive insight into the credit risk formation, which is regulated by the macroeconomic environment of Ukraine and the performance of the banking sector. The results are expected to inform evidence-based recommendations for building financial resilience, improving regulatory supervision and improving credit risk during times of crisis and recovery.

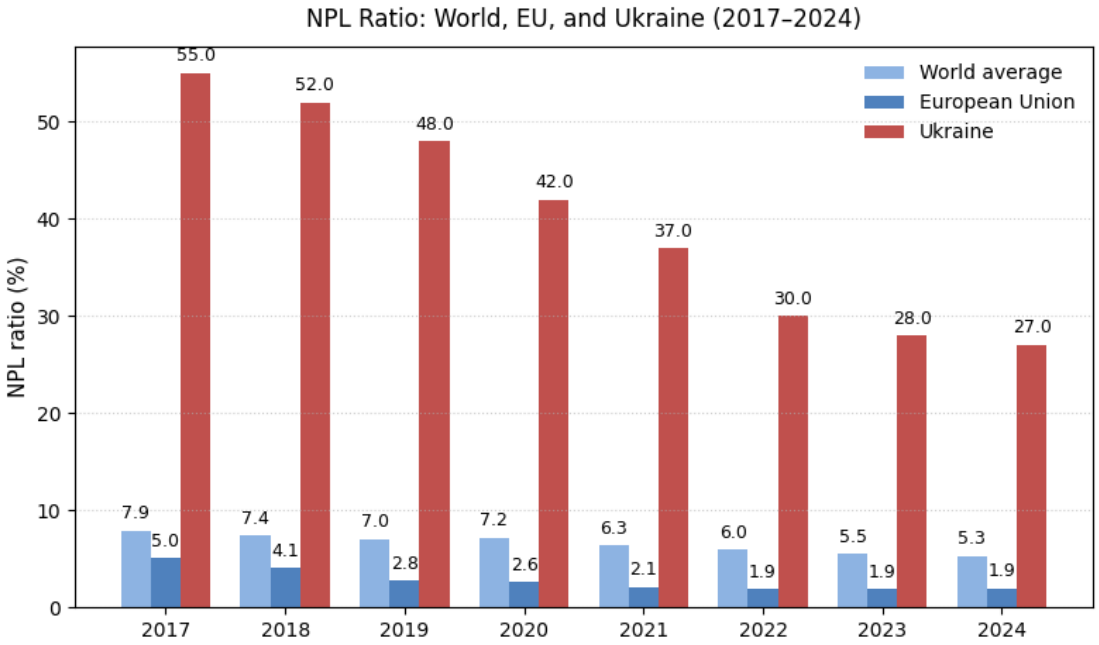
CHAPTER 2. INDUSTRY OVERVIEW AND RELATED STUDIES

Non-performing loan (NPL) ratio is one of the most significant drivers of financial stability in the entire global banking system. NPLs are now widely used as a measure of resilience of banks to macroeconomic shocks and the effectiveness of risk -management practices since the 2008 global financial crisis. According to international studies, the levels of NPL are cyclical, which generally increases during recession and decreases as the economies rise (Ozili, 2025; Beck et al., 2015).

As a countermeasure to the crisis of 2008-2009, most jurisdictions implemented even stricter regulatory regimes, such as increased capital requirements, more restrictive conditions regarding risk assessment of credit under Basel III, or the creation of so-called bad banks to specify the toxic assets. These reforms have helped in the reduction of systematic weaknesses. The mean of the NPLs ratio was over 7 percent of total assets in 2017, which is expected to drop down to not less than 5 percent in 2024, indicating a slow stabilization in the post-pandemic period (Beck et al., 2015; Ozili, 2025).

However, this has not been evenly spread. Developed economies, like the United States, Canada, and Northern European countries have been recovering more quickly; this can be explained by the strong legal norm and the efficient restructuring systems. By contrast, most developing economies continue to grapple with structural flaws, such as poor enforcement of credit contracts and financial literacy as well as over-exposure to foreign-currency lending. The studies conducted by Klein (2013) and Louzis et al. (2012) highlight that the three factors, including exchange-rate volatility, inflationary shocks, and macroeconomic instability, are major causes of NPL inflations in emerging markets.

Figure 1. *NPL ratio for the World, European Union, and Ukraine, 2017–2024 (%).*



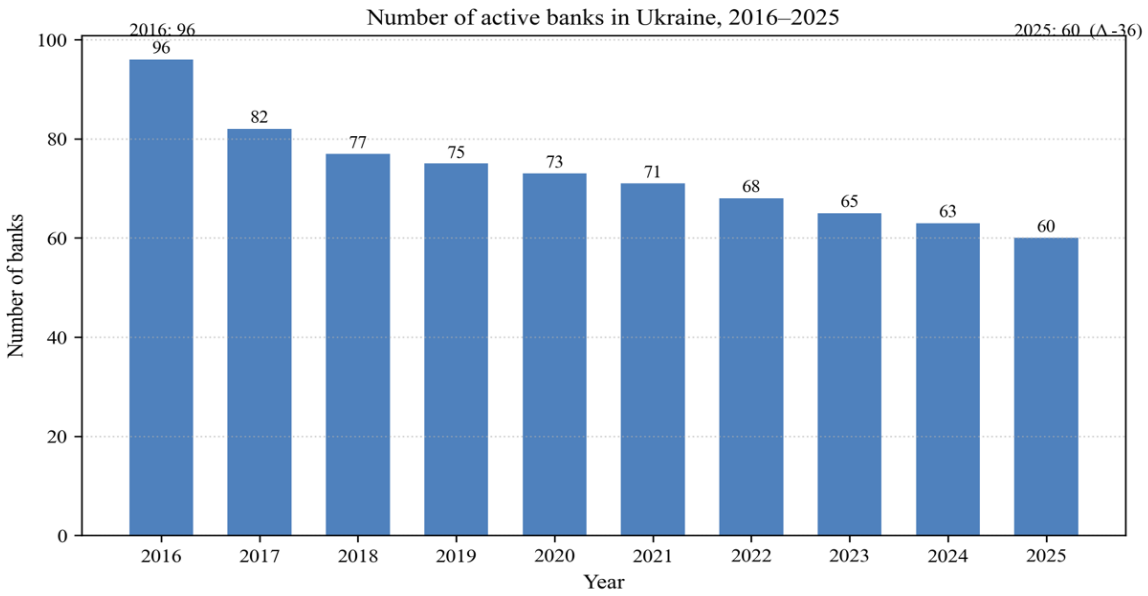
Source: World Bank (2024); European Central Bank; National Bank of Ukraine; author's ccalculations.

The regional banking systems are also affected by the developments in the global environment. Though the rate of non-top performing assets have been going down gradually in most of the countries, the overall scenario still seems to be uneven. In transition economies, the process takes longer, and a bunch of external factors - like military conflicts, swings in exchange rates and energy crises - directly mess with the stability of the banking sector. In this regard, Ukraine really shows the mix of macro - financial instability and the slow march of institutionalizing its bank system.

Following the financial crisis of 2014-2015 Ukrainian banking sector has undergone a radical transformation. The National Bank of Ukraine launched a massive system clean - up and as a result, the number of banks have shrunk of more than three times - from over 180 banks in 2014 to less than 60 banks by 2025. This concentration

proved to be an inevitable step to strengthen the resilience and gain back confidence on the system

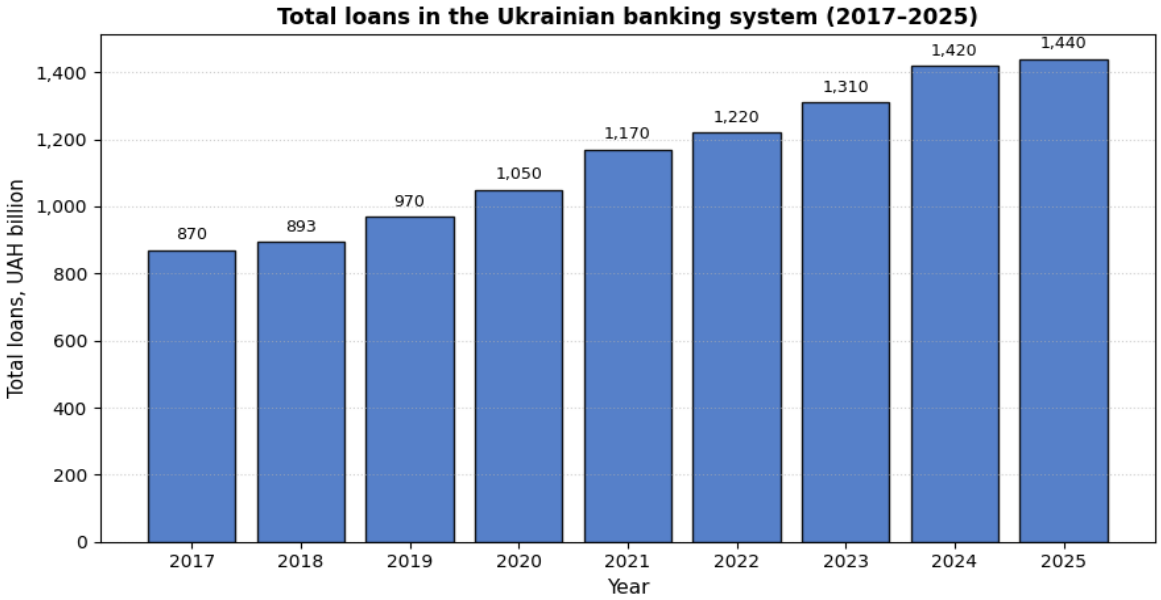
Figure 2. Number of active banks in Ukraine (2016–2025), number of banks



Source: National Bank of Ukraine. Statistics. https://bank.gov.ua/en/statistic/supervision-statist

The decrease in the number of institutions was accompanied by market consolidation and a rising role of state-owned banks, which now hold more than half of total banking assets. Despite this, lending activity gradually recovered. The total volume of loans in Ukrainian banks grew from about 900 billion UAH in 2017 to over 1.4 trillion UAH in 2025.

Figure 3. Total loans in the Ukrainian banking system, 2017–2025 (million UAH)

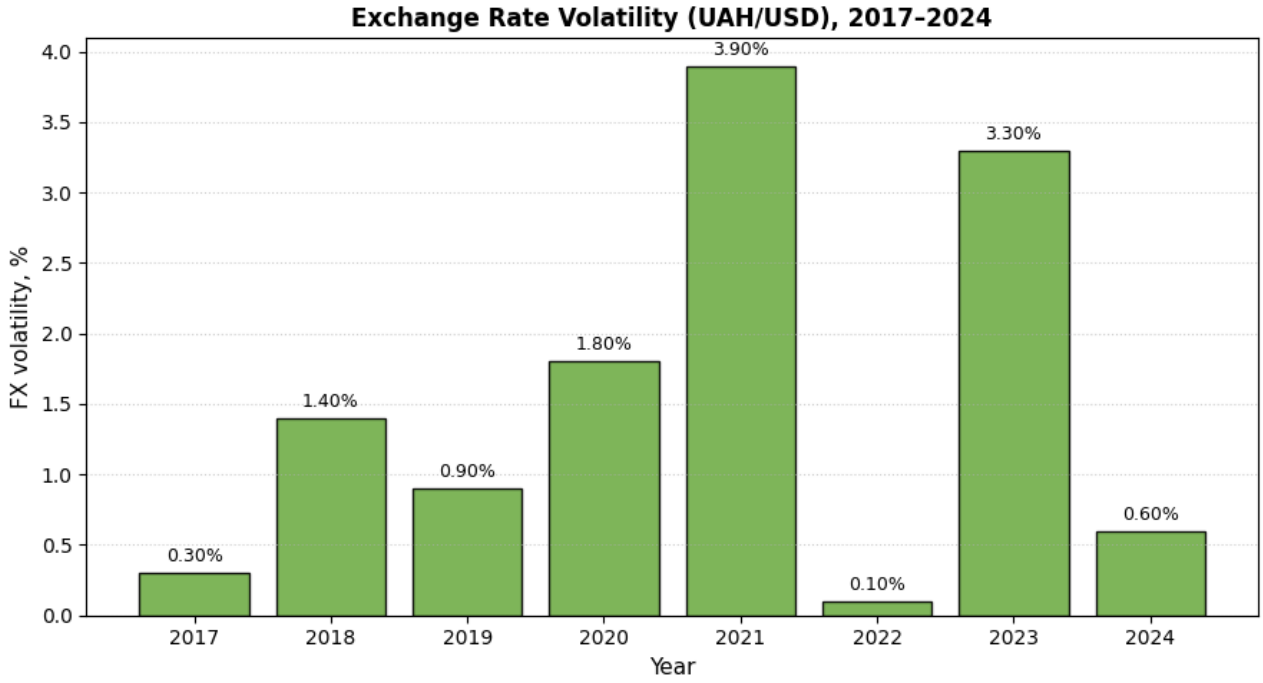


Source: Author's estimation based on NBU data.

Although the share of non-performing loans has been gradually decreasing, the Ukrainian banking system continued to be exposed to currency risks. The proportion of loans denominated in foreign currency was always around 30–40%, and the system was therefore vulnerable to devaluation shocks. At the same time, the official exchange rate policy of the NBU, postoperatively to the commencement of the full-scale invasion in 2022, had a smoothing effect: the regulator established a fixed exchange rate, which restrained short-term turbulence and did not provoke panic movements in the foreign exchange market. Therefore, the observed decrease in measured currency volatility in

2022–2023 can be seen not as the real picture in the market, but as a consequence of administrative decisions in monetary policy.

Figure 4. FX volatility in Ukraine, 2017–2024 (percent)



Source: Author's estimation based on National Bank of Ukraine data.

In the international literature, these trends are explained both in terms of macroeconomic as well as bank-specific factors. For instance, Makri and others (2014) found that GDP growth has a negative correlation with the share of non-performing loans; on the contrary, an increase in unemployment, inflation, and exchange rate volatility is associated with their growth. These patterns were confirmed by Louzis et al. (2012) for the case of Greece, and Klein (2013) and Skarica (2014) for Central and Eastern European countries.

From the bank-specific point of view, according to the study of Ozili (2025), it was concluded that the profitability indicators (ROA, ROE), capital adequacy (CAR), and the quality of risk management are the factors of credit quality. It was found that banks with

lower ROA and a higher proportion of foreign currency loans tend to have higher NPL formation. The same patterns are found in Ukraine: decline in profitability in times of crisis is accompanied by an increase in overdue loans, and during the periods of economic recovery the reverse is true.

Thus, the Ukrainian banking system has characteristics common to transition countries. Its analysis demonstrates the fact that financial stability is primarily determined by macroeconomic conditions, the stability of the exchange rate, and the efficiency of banks' asset management. Not only does the issue of NPAs continue to be a financial issue, it is also considered a barometer for the economic health of the nation and is very susceptible to external shocks, political risk, and war disruptions.

CHAPTER 3. METHODOLOGY

3.1. Econometric Model of the Study

To achieve the research objective, i.e. identification of key determinants of non performing loans (NPLs) in Ukrainian banks, the methodology of panel data analysis is used. This approach is the most suitable for this study as it provides the possibility to consider simultaneously both the time dynamics of indicators (changing in the macroeconomic environment and banking strategies in the period 2017-2024) and the cross-sectional heterogeneity of the sample (unique characteristics of each individual bank). The use of panel data greatly enhances the statistical power of the analysis compared to modeling separate time series or cross sectional samples. It allows control over unobservable individual features of financial institutions, such as the quality of corporate governance, approach to risk management, or business model, which are relatively constant over time, but substantially different from bank to bank. Thus, this model provides the possibility to obtain more reliable and unbiased estimates of the effect of the studied factors on the quality of credit portfolio.

The baseline econometric model to be estimated within this study is specified as follows:

$$NPL_{it} = \beta_0 + \sum_{k=1}^{K} \beta_k X_{kit} + \alpha_i + \varepsilon_{it}$$

where:

NPL_{it} – is the dependent variable, representing the level of non-performing loans (NPL Ratio) for bank i at time period t.

β_0 – is the constant term (the overall average NPL level not explained by other factors).

X_{kit} – is a vector of K independent variables, including bank-specific indicators for bank i at time t (e.g., ROA, capitalization level) and macroeconomic variables for time period t.

β_k – are the regression coefficients to be estimated, which interpret the strength and direction of the influence of each independent variable on the NPL level.

α_i – is the individual effect, reflecting the unobservable, time-invariant unique characteristics of bank i (e.g., a stable business strategy, management quality).

ε_{it} – is the idiosyncratic error term, which captures all other unobserved factors affecting the NPL of bank i at time period t.

3.2. Research Variables and Hypotheses

A key set of variables that reflects both the internal characteristics and the external macroeconomic environment was chosen for depicting the econometric model. Such a calculated approach makes it possible to avoid over-complexity and the risks of multicollinearity of the model. It also points to the factors whose impact on the quality of the credit portfolio is best explained in financial theory. All variables used in the analysis are presented in the table below.

Table 1. Description of Research Variables

Variable	Notation	Definition
Dependent Variable		
Non-Performing Loan Ratio	NPL	Gross non-performing loans to total loan portfolio, %

Independent Variables (Bank-Specific)		
Return on Assets	ROA	Net income to average total assets, %
Capital Adequacy Ratio	CAR	Regulatory capital to risk-weighted assets, %
Bank Size	Size	Natural logarithm of total bank assets
Operational Efficiency	Cost/Income	Operating expenses to operating income, %
Independent Variables (Macroeconomic)		
Real GDP Growth	GDP_Growth	Annual change in real gross domestic product, %
NBU Policy Rate	Policy_Rate	Policy rate at the end of the period, %

The first group of hypotheses concerns the impact of a bank's fundamental characteristics on its NPL level. Return on Assets (ROA) is expected to have a negative effect on the share of non-performing loans. More profitable banks typically have superior risk management systems and fewer incentives to issue excessively risky loans, which aligns with the "bad management hypothesis", according to which poor management efficiency translates into a deterioration of asset quality. Similarly, the Capital Adequacy Ratio (CAR) is also expected to negatively influence NPLs. Having a large capital buffer reduces the incentives for excessive risk taking , and the bank can absorb losses and be more conservative on its policy. Regarding Bank Size (Size), its impact is theoretically mixed as large institutions may gain from diversification, while at the same time their complexity may be a potential impediment for effective monitoring.

The second group of hypotheses focuses on the operational aspects of the activities of a bank. The Operational Efficiency (Cost/Income) ratio is likely to be positively correlated with the NPL level. High operating costs in relation to income is often an indication of general management weaknesses, which are likely to spill over to credit policy, leading to mistakes in borrower selection as well as monitoring. Thus, an inefficient bank is more likely to have non-performing debt. This indicator is an important proxy of the quality of internal processes and manager discipline, which directly influences the ability of a bank to maintain a healthy loan portfolio in the long term.

The third category of hypotheses concerns the effect of the macroeconomic environment. There should be a strong negative correlation between Real GDP Growth (GDP Growth) and the level of NPL. In times of economic growth, the financial status of businesses and households is better, which increases their capacity to service debts. Conversely, borrowers' ability to carry their obligations drops drastically in recessions. On the other hand, the NBU Policy Rate (Policy Rate) is likely to have a positive effect on NPLs. A rise in the main policy rate causes an increase in the cost of borrowing throughout the economy, putting greater strain on the borrowing side and making refinancing difficult, so it leads to an increase in the number of defaults.

3.3. Justification of the Estimation Method

For the empirical analysis for the determinants of non-performing loans, a regression analysis with the available panel data is adopted. This method is optimal for the present study since it permits the good handling of the data with both a temporal dimension (observations of banks from year 2017 to 2024) and a spatial dimension (multiple banks into the sample). The chief advantage of panel data is the control for unobserved heterogeneity, i.e., those factors that are specific to individual banks over time, such as business model specifics, corporate culture, or the quality of top management. Accounting for these individual effects enables accurate and unbiased estimates of the effects of the

independent variables, which is critically important for the correct identification of factors determining the quality of the credit portfolio.

Within the framework of panel analysis, three main estimation approaches will be considered, differing in their assumptions about the nature of the individual effects (α_i).

Table 2. Comparative Characteristics of Panel Data Models

Model	Main Assumption Regarding Individual Effects (α_i)	Advantages	Disadvantages
Pooled OLS	Individual effects are absent (α_i=0). All banks are homogeneous.	Simplicity of calculation and interpretation.	High risk of biased estimates due to ignoring the unique characteristics of banks.
Fixed Effects (FE) Model	α_i are constant, bank-specific intercepts. They may be correlated with the independent variables.	Provides unbiased estimates even if individual effects are correlated with regressors.	Does not allow for the estimation of the impact of time-invariant variables.
Random Effects (RE) Model	α_i are random variables that are not correlated with the independent variables.	More efficient (smaller standard errors) if the non-correlation assumption holds.	Estimates become biased and inconsistent if αi are in fact correlated with regressors.

The first and simplest method of dealing with the data is the Pooled OLS regression. It simply uses the observations in the panel to treat all the data that is there like it is one big observation - and totally neglects that the data is actually tracked over

time for each bank. That seems a bit too restrictive, as the problem is that it assumes that banks are identical, but in practice that probably isn't the case. So we advance to models which include individual effects. The Fixed Effects (FE) model retains the specific characteristics of each bank that will remain unchanged across time; this neutralizes bias that can result from these characteristics, even if they are correlated with other independent variables. An alternative is the Random Effects (RE) model, where we treat those individual differences as a random effect and, as importantly, corrupt. i.e. not correlated with the regressors.

Choosing between Fixed Effects model and Random Effects model is the important methodological decision and that is commonly done using formal Hausman test. This test is done to check the null hypothesis that there's no correlation between the individual bank effects and the independent variables.

CHAPTER 4. DATA

4.1. Data Sources and Sample Formation

The basis of the empirical analysis of this study is represented by a balanced panel data set that covers the key performance metrics of 15 leading Ukrainian banks. The sample was formed according to the criterion of asset volume. This factor made it possible to include systemically important financial entities that collectively represent the majority of the country's banking sector. A critical condition for including a bank in the sample was its continuous activity through the entire study period of 32 quarters – from the first quarter of 2017 to the fourth quarter of 2024. Such an approach guaranteed the formation of a balanced panel dataset covering 480 unique observations. These data are sufficient for conducting a reliable econometric analysis and obtaining statistically robust results.

The information base for the research is only based on official and verified sources. Data on bank-specific indicators, such as level of non-performing loans (NPL), return on assets (ROA), capital adequacy ratio (CAR), volume of assets and cost-to-income ratio, were taken from the quarterly data on financial statements of banks and supervisory statistics files published by National Bank of Ukraine. The use of the data of the regulator ensures their uniformity and compliance with the financial reporting standards. Macroeconomic indicators, as the growth rate of real Gross Domestic Product (GDP) and the level of the policy rate, were taken from official publications of the State Statistics Service of Ukraine and the National Bank of Ukraine respectively, which guarantees their reliability and relevance.

4.2. Descriptive Statistics and Visual Analysis

An initial analysis of the collected data is made based on descriptive statistics, the main indicators of which are presented in Table 3. This data makes it possible to establish the general trends, variability and range of values of the studied variables. The results of the table analysis allow to form an idea of the operation of the banking system in the conditions of high macroeconomic and political uncertainty, which was observed in the period 2017-2024. A detailed examination of these statistical indicators is a critically important stage preceding the construction of regression models, as it allows for the formation of justified expectations regarding potential relationships and the identification of specific data features that must be considered during subsequent modeling.

Table 3. Descriptive Statistics of Variables

Statistic	N	Mean	St. Dev.	Min	Max
NPL	480	25.57	21.92	3.30	87.30
ROA	480	1.63	1.58	-8.50	5.50
CAR	480	19.08	3.35	12.10	27.80
Cost_Income	480	0.53	0.10	0.31	0.78
GDP_Growth	480	-1.29	11.84	-37.20	19.50
Policy_Rate	480	14.75	5.82	6.00	25.00
Size	480	11.68	0.85	10.00	13.72

So, the main thing we're looking at - the Non - Performing Loan (NPL) ratio - does show an extreme spread across banks. The average comes in at 25.57% which is pretty high compared to the international benchmarks. What's even more eye - opening is the range, the lowest amount recorded is 3.3 per cent for the most conservative banks and the highest goes to a massive 87.3 per cent for institutions that were still tidying up their balance sheets, following crises. With standard deviation amounting to 21.92, it's clear that asset quality is one of the most heterogeneous features of Ukrainian banks. That kind of variation is exactly what we can use to test what causes the differences because we can then identify important factors that account for such a large difference in NPL levels across banks and over time.

Bank - specific metrics give us the feel for the resilience of the sector overall even when individual banks are experiencing shocks. The average Return on Assets (ROA) is positive at 1.63%, which indicates that banks are still able to make a profit. However, the lower end of the spectrum is at -8.50 percent, indicating the effect of crises such as the Covid-19 pandemic and the full-scale invasion when banks were left setting aside large levels of allowances for anticipated credit losses. The Capital Adequacy Ratio (CAR) is 19.08 have been on average with a minimum value of 12.1, it means that all financial institutions of our sample had a significant margin above the regulatory requirements of the National Bank of Ukraine, which shows their readiness to tolerate possible losses and preserve financial stability even in the most difficult times.

Macroeconomic figures show how volatile the Ukrainian economy has been. GDP growth averages -1.29 per cent, which is largely the result of the catastrophic collapse in 2022, when the indicator fell to -37.2 per cent. That shock is unprecedented and has had a profound effect on the ability of the borrowers to service their debt which in turn affects the NPL ratios.

On the other hand, recovery periods, such as in 2023 (with 19.5% growth in the second quarter), created opposite conditions. The NBU's Policy Rate also shows significant

fluctuations, from 6% to 25%, reflecting the changing cycles of monetary policy–from stimulating the economy during the pandemic to a harsh response to inflationary and devaluation risks following the full-scale invasion.

4.3. Correlation Analysis

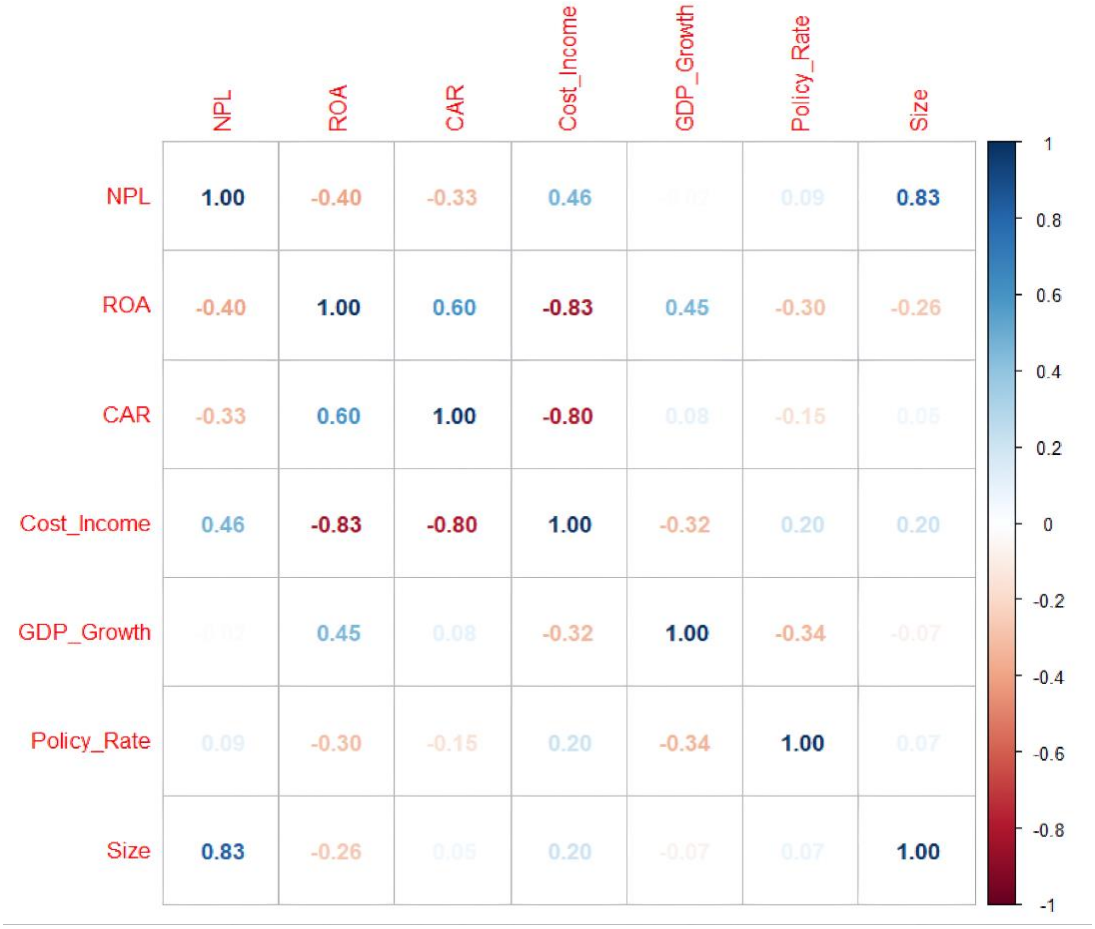
To identify initial linear relationships between the variables and to diagnose the potential problem of multicollinearity, a matrix of Pearson's pairwise correlation coefficients was calculated. The results are presented in Table 4 and visualized in Figure 5. This analysis allows for checking whether the directions of the relationships correspond to the a priori hypotheses formulated in the methodology section, as well as identifying variables that might pose problems for the correct interpretation of regression analysis results due to a high degree of interconnection.

Table 4. Correlation Matrix

	NPL	ROA	CAR	Cost_Income	GDP_Growth	Policy_Rate	Size
NPL	1.00	-0.40	-0.33	0.46	-0.02	0.09	0.83
ROA	-0.40	1.00	0.60	-0.83	0.45	-0.30	-0.26
CAR	-0.33	0.60	1.00	-0.80	0.08	-0.15	0.05
Cost_Income	0.46	-0.83	-0.80	1.00	-0.32	0.20	0.20
GDP_Growth	-0.02	0.45	0.08	-0.32	1.00	-0.34	-0.07

Policy_Rate	0.09	-0.30	-0.15	0.20	-0.34	1.00	0.07
Size	0.83	-0.26	0.05	0.20	-0.07	0.07	1.00

Figure 5. Visualization of the Correlation Matrix



Source: Author's calculation based on bank-level data (2017–2024)

The results of the correlation analysis confirm a number of the initial hypotheses. A reasonable negative relationship is found between the NPL level and the indicators of

Return on Assets (ROA, -0.40) and Capital Adequacy Ratio (CAR, -0.33). This means that more profitable and better capitalized banks have a smaller average share of non-performing loans. Also expected is the positive correlation with the Operational Efficiency (Cost/Income, 0.46) indicator, which reflects the fact that less efficient banks (with a higher cost-to-income ratio) tend to accumulate more bad loans. The strongest relationship is between NPL and Bank Size (Size, 0.83) that can be explained by the existence of large state-owned banks in the sample with historically burthened loan portfolio that needs a more in-depth analysis within the regression model.

At the same time, the analysis of the matrix identifies a potential problem of multicollinearity, which might cause a problem in interpreting the regression coefficients. Specifically, a very high negative correlation is found between Return on Assets (ROA) and Operational Efficiency (Cost/Income) at the level of -0.83. This is perfectly logical and the less an operation's cost relative to income, the more profitable it is. A similar relationship of -0.80 is found between Capital Adequacy Ratio (CAR) and Cost/Income.Though multicollinearity does not cause bias in the coefficient estimates themselves, it does cause them to have inflated standard errors, which may produce erroneous conclusions about the statistical significance of individual factors. This aspect will be considered during the interpretation of the results of econometric modeling.

CHAPTER 5. RESULTS

5.1. Results of Regression Model Estimation

The key stage of this research is the econometric modeling, which allows for a quantitative assessment of the impact of the selected bank-specific and macroeconomic factors on the level of non-performing loans. For this purpose, three panel data regression models were successively estimated: a Pooled OLS regression, which ignores individual differences between banks; a Fixed Effects (FE) model, which controls for the time-invariant unique characteristics of each bank; and a Random Effects (RE) model, which treats these characteristics as random variables. Detailed results of the estimation of all three models are presented in the summary Table 5.1, which allows for their comparative analysis and the selection of the most appropriate specification for further interpretation.

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Table 5. Results of Regression Analysis of NPL Determinants

	Pooled OLS	Fixed Effects	Random Effects
ROA	1.395***	1.149***	1.197***
	(0.515)	(0.148)	(0.151)
CAR	-2.134***	-0.755***	-0.832***
	(0.233)	(0.105)	(0.106)
Size	21.916***	8.502***	8.926***

	(0.544)	(0.500)	(0.503)
Cost_Income	29.602***	45.555***	45.641***
	(10.625)	(3.922)	(4.004)
GDP_Growth	0.124***	0.114***	0.114***
	(0.043)	(0.009)	(0.009)
Policy_Rate	0.042	0.216***	0.208***
	(0.077)	(0.017)	(0.018)
Constant	-208.076***		-91.805***
	(10.035)		(5.367)
Observations	480	480	480
R2	0.832	0.754	0.746
Adjusted R2	0.830	0.743	0.743

Note: *p<0.1; **p<0.05; ***p<0.01

The choice between the Fixed Effects and Random Effects models is a key methodological decision based on a formal statistical procedure. For this purpose, the Hausman test was conducted, which tests the null hypothesis of no correlation between the unobserved individual effects and the model's regressors. The obtained results of the test are clear: the p-value (< 2.2e-16) is significantly lower than the

threshold (0.05). These facts make it possible to reject the null hypothesis that indicates endogeneity in the Random Effect model – it makes its estimates biased and inconsistent. As a consequence, the Fixed Effects model (FE) is the only appropriate and reliable specification for this study. Future interpretation and discussion of the results will be based exclusively on the estimates obtained from this model (column 2 of Table 5).

5.2. Interpretation and Discussion of Results

The analysis of the results of the chosen Fixed Effects model makes it possible to conclude concerning the factors that influence the quality of the credit portfolio of Ukrainian banks. The coefficient estimates demonstrate that almost all variables included in the model are statistically significant. However, the direction of their influence is not always correlated with the previous theoretical expectations. This fact reflects the complexity and composite structure of the problem of non-performing loans, especially in volatile economic conditions. A detailed interpretation of each coefficient helps to reveal the economic meaning of the observed relationships and to propose a possible explanation of analogical results. This is the key contribution of this study.

The first unexpected result is positive and statistically significant (at the 1% level) influence of Return on Assets on the NPL level. The coefficient of 1.149 demonstrates that a one percentage point increase of ROA is associated with a 1.15 p.p. increase of the share of non-performing loans. This result directly contradicts the hypothesis that more profitable banks manage the risks more effectively. One of possible explanations is the risk-return trade-off compromise: in an attempt to gain higher profitability, banks may consciously operate in more risky types of lending. These types of risky lending generate a higher interest income in short term, but they also have a higher potential of default in the future.

At the same time, the influence of the Capital Adequacy Ratio (CAR) fully corresponds with theoretical expectation. The coefficient for this variable is negative (-0.755) and statistically significant at the 1% level. This fact means that a one percentage point increase in the CAR leads to an average decrease in the NPL level of 0.76 p.p., ceteris paribus. This conclusion proves "moral hazard hypothesis". Banks with a solid buffer of capital are less prone to over-risk because their owners have more «skin in the game». Sufficient capital acts as a safety pillow by absorbing unexpected losses and by stimulating management to adopt more prudent and more conservative lending policies. The above picture shows the correlation between the higher the capitalization and the lower the share of non-performing loans. Well-capitalized banks give greater opportunities to absorb unexpected losses and to carry through periods of financial crisis in a stable manner. A good capital currents make it possible for entities to apply more pragmatic approach to lending because the potential cost extensive risk has a direct influence on their resources. This is sufficient capital that serves as not only a method of financial protection, but a mechanism that contributes towards management and confidence in the banking system.

Bank Size (Size), measured as a natural logarithm of assets, also considered to be a significant factor with a positive coefficient. This fact proves the results of the correlation analysis: larger Ukrainian banks have the higher level of NPL. This result seems to be paradoxical because larger banks have more opportunities for risk diversification. But in Ukrainian context it can be explained by the presence of large state banks in the sample that historically collected solid portfolios of non-performing debt, especially from lending to state enterprises and the consequence of previous crisis. Thus, this coefficient likely reflects the institutional peculiarities of the market's largest players rather than just an economy of scale effect.

The strongest influence among the bank-specific factors is demonstrated by Operational Efficiency (Cost/Income). The obtained coefficient is positive (45.555) and highly significant, which fully confirms the initial hypothesis. A one percentage point increase in the cost-to-income ratio (i.e., a decline in efficiency) is associated with a 0.46

p.p. increase in the NPL level. This result supports the "bad management hypothesis", according to which inefficiency in managing operational processes is a marker of general deficiencies in bank management, which inevitably extends to the quality of credit underwriting, borrower monitoring, and debt collection efforts, directly leading to the accumulation of non-performing assets.

Among the macroeconomic factors, GDP Growth (GDP_Growth) shows a positive (0.114) and statistically significant impact, which is another counter-intuitive result. According to the model, an acceleration in economic growth is associated with a small but statistically significant increase in NPLs. Classical theory predicts the opposite relationship. However, such a result could be explained by the pro-cyclicality of banks' risk-taking behavior: during periods of economic expansion, banks may become overly optimistic, relax lending standards, and issue loans to less reliable clients, whose servicing problems emerge with a time lag, thus appearing in the statistics against the backdrop of a stable economic situation. This can be a reason of servicing problems that emerge with a time lag and are reflected in the statistics aimed stable economy conditions.

Finally, the impact of the Policy Rate (Policy Rate) fully satisfies the theoretical expectations. The coefficient is positive (0.216) and statistically significant at 1% level. This fact means that a one percentage point increase in the National Bank of Ukraine's discount rate leads to an average increase in the NPL level of 0.22. This is a clear illustration of the direct source of monetary policy transmission, when tighter monetary conditions increase the cost of financial resources. This output increases the debt burden for borrowers, especially the ones who have floating rate loans, and make the refinancing of existing debts more complicated. Such actions lead inevitably to a rising level of defaults and degradation of banks' loan portfolio quality.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

The current research is a full evaluation of the factors that determine the degree of non-performing loans (NPLs) in the Ukrainian banking sector in the period 2017-2024. Empirical evidence also emerged from the econometric analysis to show that the credit risk is determined by the interaction of the macro-economic situation and the internal efficiency of the banks. Consequently, the NPL ratio should not be seen as just a measure of the quality of the portfolio but as a more comprehensive indicator of the financial stability of the country. Nonetheless, the directional effects of the individual determinants show a number of counter-intuitive patterns that are typical of emerging banking systems.

Findings support the hypothesis according to which micro - economic variables, i.e., profitability, cost efficiency and bank size, are the main determinants of credit risk. The analysis shows the presence of a positive relationship between the profitability measured by return on assets (ROA) and the incidence of non-performing loans. This relationship represents a risk-return trade-off, which suggests that riskier lending patterns are pursued by more profitable institutions, and therefore increase default rates. Concurrently, over concentration of markets may be conducive to systemic risks, which may lead us to conclude that the regulatory policy has to balance financial stability and competition.

At the macro level, the empirical results show a positive relationship between non-performing loans (NPLs) and the GDP growth. Although this is surprising of itself, this finding puts into perspective the procyclical nature of Ukrainian banks: During economic expansion, the volume of lendings increases, the standards are lowered, which in the case of economic contraction, also increases the number of defaults.At the same time, non-performing loans are set to rise further as the policy rate is expected to rise further, worsening the debt servicing capacity and fueling the ongoing rise in non-performing loans. This gives an importance of coordination between monetary and banking regulation: too tight monetary policy may contribute to exchange rate stability, but can also contribute to

the weakening of credit quality. For the National Bank of Ukraine, there are a number of policy implications derived from these findings. First, monitoring of banks should not only be on capital adequacy but should also be on operational performance along with ROA and cost to income ratio. Second, the framework of the macroprudential supervision should incorporate the impact of the dynamics of the GDP and the policy rate on the formation of NPLs. It is also necessary to extend stress testing to situations of long-term war-related risk and currency instability.

For commercial banks, enhancing operational resilience should be a strategic priority. There are also several ways in which credit risk can be mitigated considerably during macroeconomic turbulence, such as optimization of cost structures, the movement of portfolios toward smaller and more diversified portfolios of retail loans, and the use of early warning systems for stressed assets. In addition, risk modelling systems (PD, LGD) should also be recalibrated, in order to better reflect the impact of uncertainty related to war and foreign exchange.

In summary, the level of non-performing loans in Ukraine is a combination of internal and external factors. Reducing credit risk is a central issue to which efficiency, profitability and disciplined use of resources are central, with the macroeconomic environment setting its wider context. These relationships are important to understand for creating efficient regulatory and managerial approaches for the improvement of the resilience of the Ukrainian financial system after the war.

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