DETERMINANTS OF BANK PROFITABILITY IN UKRAINE

by

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LIST OF ABBREVIATIONS

CPI Consumer Price Index

FRED Federal Reserve Economic Data

GDP Gross Domestic Product

GMM Generalized Method of Moments

LDR Loans to Deposit Ratio

NBU National Bank of Ukraine

NIM Net Interest Margin

NPL Non-performing loans

OLS Ordinary least squares

ROA Return on Assets

ROE Return on Equity

SOB State-owned banks

UKRSTAT State Statistics Service of Ukraine

WAG Median Wages

CHAPTER 1. INTRODUCTION

The banking sector plays a crucial role in the economy's stable growth, particularly, in the mobilization of resources, providing critical financial services, and underpinning economic stability and growth. Banks not only play the role of financial intermediaries between savers and borrowers but are also critical in monetary policy implementation, the payment system, and financial stability.

Over the past decades, countries worldwide faced numerous crises that started from the financial sector, and Ukraine is not an exception. Ukraine presents a particularly interesting case for examining these determinants due to its transitional economy, recent economic challenges, and evolving banking sector. Since Ukraine's independence there have been numerous challenges the banking sector has undergone, including political revolutions, the 2007-2008 financial crisis, the COVID-19 pandemic, started in the 2022 war with Russia amid restructuring and regulatory reforms aimed at enhancing stability and performance. These transformations provide a unique backdrop for analyzing how traditional determinants of profitability operate in a period of high economic volatility and changing regulations.

Most importantly, there is a good number of reasons for understanding the drivers to bank profitability. Profitability is an indicator of soundness and efficiency of a bank; it reflects the ability of banks to generate earnings from their operations. If it is profitable, a bank will be able to continue supplying credit to the economy over time and promote financial stability at the same time.

Indeed, analysis of the factors contributing to profitability would have succeeded in better designing the regulatory frameworks for an efficient banking sector. Insights into these factors would help policymakers to balance their efforts in promoting financial stability and facilitating innovativeness and competition, fostering resilience and dynamism in the banking sector.

Also, knowledge of the key determinants of profitability in the banking industry would eventually arm investors and other stakeholders with needed information that would enable them to make discretionary investment and operations decisions. Such allows strategies for factors enhancing financial performance.

Therefore, this paper contributes to the existing body of literature with empirical evidence from Ukraine, a country that depicts both the similarities and unique features of the profitability determinants in this market. This paper aims to explore the specific factors that influence bank profitability in Ukraine, a country with a unique economic environment and banking sector dynamics. The knowledge of these factors will be of practical use to bank managers, regulators, and future researchers on transitional economies like Ukraine.

The paper is structured in the following way. The second chapter covers the industry overview and related studies, discussing previous research on the relationship between macroeconomic and bank-specific factors on profitability, as well as an overview of the Ukrainian banking sector. In the third chapter, the methodology for assessing bank profitability, focusing on variables such as ROA, ROE, and other financial metrics, is outlined. The fourth one is devoted to the data used in the analysis, including detailed descriptive statistics and sources. Finally, the fifth chapter presents the results, while the sixth chapter draws conclusions and offers recommendations.

CHAPTER 2. INDUSTRY OVERVIEW AND RELEVANT STUDIES

2.1. Previous studies on the relationship between macroeconomic and bank-specific factors on bank profitability.

Existing empirical literature on the determinants of bank profitability is rich and focuses on developed and developing countries, while research focused on Ukraine is still relatively sparse.

Yiyi Zhang and Huan Dai (2019) in their research analyzes the determinants of bank profitability using a sample of U.S. bank holding companies from 2002 to 2018. The study investigates both macroeconomic and bank-specific factors and performs a regression analysis to understand their influence on profitability.

They noted that an increased proportion of loans in total assets, GDP growth and higher capital levels boost profitability, especially for small and large banks, while bank size, unemployment rate and inflation are negatively correlated with profitability. Higher unemployment rate decreases purchasing power and increases the number of bad loans. Also, during inflationary periods banks usually face limited financial reserves and market access.

Laurynas Naruševičius (2017) investigates the relationship between the profitability of the Lithuanian banking sector and various internal and external determinants using a panel error correction model.

The author distinguished long-term and short-term determinants of bank profitability. Long-term determinants include bank size and real GDP. Larger banks tend to have higher net interest income and net fee and commission income. Bank size also positively impacts operating expenses due to economies of scale and scope. Also, there exists a long-term positive relationship between real GDP and both net interest income and operating expenses. Higher economic activities raise the demand for loans and banking services,

hence revenue. However, it also increases operating expenses, as banks scale up to meet demand. Short-term determinants of bank profitability in Lithuania include: credit losses, real export, compensation per employee. Higher credit losses negatively impact net interest income, reflecting the effect of deteriorating loan portfolio quality on bank profitability. Increased real export positively influences net fee and commission income, as more trade activities drive demand for currency exchange and other banking services. Also, higher compensation per employee significantly increases operating expenses, highlighting the importance of wage costs in banks' expense structures.

Fostyak V., Tanchak Y., Druhova V., Alieksieiev I., and Bondarchuk M. (2021) analyzed the deposit policy of Ukrainian banks under the conditions of economic instability resulting from the COVID-19 pandemic. It has been surprising to the authors that the pandemic did not influence the market of Ukrainian banks' deposits. Despite pessimistic forecasts, no essential outflow of Ukrainian deposits took place. Instead, banks successfully increased the amount of funds raised from both individuals and legal entities.

Another and most relevant research on determinants of bank profitability in Ukraine is made by Antonina Davydenko (2011). The results of the analysis reveal concerning findings on the quality of loans and risk monitoring practices within banks in Ukraine. The negative impact of loans on the percentage of total assets on profitability underlines the deficiencies in credit risk management.

On the positive side, the study confirmed a positive and significant association between capital and profitability, meaning that banks that increase their equity may enjoy a lower cost of capital and higher profitability.

The analysis further throws light on the influence of deposits; the negative correlation with performance is arguably based on market competition and the predominance of short-term deposits. However, the larger banks have more market powers that give them relatively more capacity to retain interest margins even in the face of competition.

Economic factors such as GDP growth, inflation, and exchange rate depreciation, also influence profitability, with foreign banks being found to have the capacity to exploit these factors more satisfactorily.

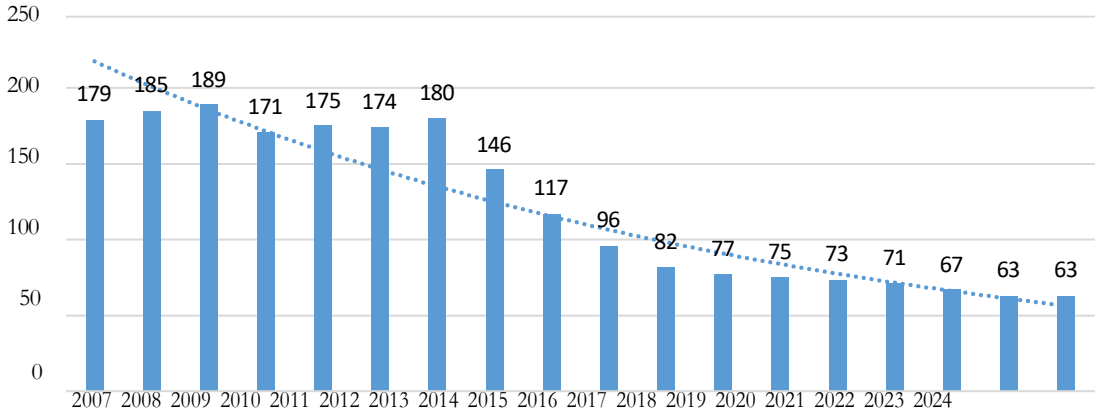
2.2. Ukrainian banking sector overview

The roots of Ukraine's banking system lie in the ineffective Soviet banking model. Prior to 1991, the few state-owned and controlled banks mostly engaged in subsidization of state-owned enterprises instead of providing loans. After Ukraine's declaration of independence, the banking sector has gone through a period of rapid growth: the number of banks has increased from 76 in 1991 to 230 in 1995 (National Bank of Ukraine. Statistics. Supervisory Data). This has been mainly due to the low entry barriers, especially the very low capital requirements. Although many banks were subsequently closed during the following years, even more new ones were opened. At the end of 2009, there were 189 licensed banks operating in Ukraine.

In 2005-2008, many international leading banks entered the Ukrainian market, promoting the development and growth of the banking sector.

Following the Russian invasion of Ukraine in 2014, Ukrainian banks incurred huge losses within that period, but from 2016 until 2021, they were in the process of recovering due to economic rejuvenation and new banking reforms that removed some of those restrictive rules. But, at the same time, new regulations were imposed that led to a significant reduction in banks quantity, thus, number of banks has reduced from more than 100 in 2016 to 63 at the beginning of 2024 (Figure 1), while the concentration of banks remains high, with the largest bank by assets being the state-owned PrivatBank. The top five banks together have more than 58% of net assets, while the top ten banks have over 78% of net assets within the banking sector (National Bank of Ukraine. Statistics. Supervisory Data).

Figure 1. Number of banks operating in Ukraine (2007-2024), number of banks

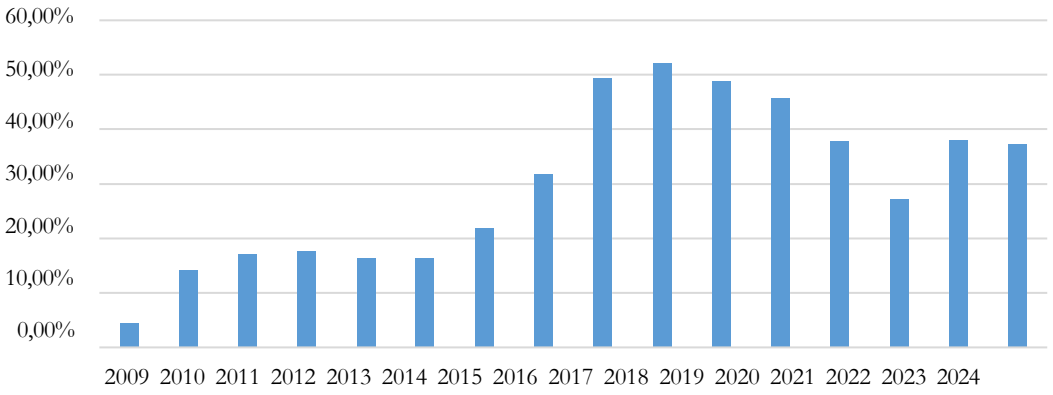


Source: National Bank of Ukraine. Statistics. https://bank.gov.ua/en/statistic/supervision-statist

The non-performing loan (NPL) ratio for the banking sector in Ukraine is 38.1%, which accounts for UAH 432 billion, with state-owned banks holding the largest proportion of NPLs, about 54% of their total assets. More than 90% of state-owned banks' (SOBs') NPLs come from the corporate segment.

Over the five years from 2010 to 2014, the NPL ratio was at approximately the same level at 14.1-17.6%. Since 2015, a sharp increase has been observed, which is mainly explained by economic instability and financial crises after Russia invades Ukraine. Also, there is a declining trend in the NPL ratio from 48.9% in 2019 to 37.8% in 2021, indicating better performance in loans and maybe the economic environment being more favorable for the banking sector's health. This can be pegged on the fact that the NPL ratio, as displayed in Figure 2, has generally been decreasing since 2018.

Figure 2. Non-performing loans (NPL) ratio of the Ukrainian banking sector (2009-2022), %



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

In summary, aside from challenges due to the conditions of the ongoing war, the banking industry in Ukraine is presently challenged by three significant factors:

1. Enormous concentration - state-owned banks control 53% of the total assets accounted for by four SOBs;

2. High NPL ratio: 38.1% in the sector, and around 54% in the state-owned banks.

3. High market concentration with a significant number of banks (63 in the first quarter of 2024) in a relatively small and distressed market.

2.3. Relevance of the study

The current literature reviewing the determinants of bank profitability is extensive, but with a notable gap about the Ukrainian banking sector. This paper bridges this gap and contributes to the general knowledge of the factors influencing bank profitability in Ukraine.

Antonina Davydenko (2011) found in her research that Ukrainian banks, apart from the negative impact of low-quality loans and the difficulty of extracting profits from deposits, had a significant effect by factors of capital and macroeconomic character, such as GDP growth and exchange rates.

This paper extends the recent analysis period up to 2022 to provide updated observations of the post-2008 financial crisis recovery and the impact of more recent economic events to identify long-run trends and the effects of sustained economic policies and reforms in Ukraine.

Based on Davydenko's work, a broader set of macroeconomic variables can be identified; they are recent real GDP, median wages, inflation rate, household income, and unemployment rate. It also includes new bank-specific variables, such as net income, size of the bank, operating expenses, total assets, deposit ratio, loan ratio, loan-to-deposit ratio and NPL ratio, which are in growing relevance. It is a thoughtful analysis of how Ukrainian banks managed their profitability throughout the crisis periods.

CHAPTER 3. METHODOLOGY

Bank profitability may be defined as the ability to gain revenue, in general, compared to the cost of running the bank and other financial responsibilities. Bank profitability can be assessed using various financial ratios and metrics among which Return on Assets (ROA) and Return on Equity (ROE) are the most widely used. These ratios discover how well banks use their assets and capital in income generation.

While both are critical profitability ratios, both are somewhat interrelated: ROA focuses on the efficient utilization of bank assets to generate income while ROE puts emphasis on the return generated on shareholders' equity.

Thus, higher banking income leads to higher ROA and ROE, indicating better asset utilization and equity efficiency, that's why they will be used as dependent variables for our models.

Many studies on bank profitability use the dynamic panel approach because of the persistency of profitability or income statement items over time. For our research, we also use this methodology. The information contains:

1. Bank-specific variables: net income, size of the bank, operating expenses, total assets, deposit ratio, loan ratio, loan-to-deposit ratio and NPL ratio, sourced from banks' income statements and balance sheets published by the National Bank of Ukraine. Data on many financial and operational performance variables in Ukrainian banks from January 2016 to 2022.

2. Macroeconomic variables: real GDP, median wages, inflation rate, household income, and unemployment rate, from the State Statistics Service of Ukraine (UKRSTAT) and Federal Reserve Economic Data (FRED).

Based on the research question and past studies, we state the following hypothesis:

1. Macroeconomic factors such as real GDP, median wages, household income, unemployment rates and inflation have a significant effect on bank profitability with expected adverse impact due to the creation of an unfavorable economic environment.

2. Financial-banking specific factors, including net income, size of the bank, operating expenses, total assets, deposit ratio, loan ratio, loan-to-deposit ratio and NPL ratio, have statistically significant effects on bank profitability.

This methodology provides a structured approach to identifying and analyzing the determinants of banking system profitability in Ukraine where the following variables are used:

Table 1. Variables and their definition

Variable	Measurement	Notation
1. Dependent variable		
Return on Assets	Pre-tax profit / Total assets (%)	ROA
Return on Equity	Pre-tax profit / Total equity (%)	ROE
2. Independent bank-specific variables		
Non-performing loans	Non-performing loans / Total loans (%)	NPL
Net Interest Margin	The difference between interest income earned and interest paid (in millions of hryvnias)	NIM
Size of the bank	log(Total assets)	SIZE
Total expenses	Total expenses (in millions of hryvnias)	TE
Loan-to-Deposit	The ratio of a bank's total loans to its total deposits	LDR
3. Independent macroeconomic variables		
Consumer price	Inflation rate (%)	CPI
Unemployment rate	Number of Unemployed People / Labor force	UE
GDP	Real GDP (in millions of hryvnias)	GDP
Median Wages	Median Wages (in hryvnias)	WAG

The empirical effects of bank-specific and macroeconomic variables on bank profitability can be estimated using an ordinary least squares method (OLS). OLS is one of the methods used to estimate the unknown parameters in a linear regression model. Since the observations are likely to be dependent for the same bank over time, standard errors are clustered at the bank level, and hence OLS would be an appropriate estimation. The equations of our estimation are given by (1) and (2), respectively:

1. $ROA_{i,t} = \beta_0 + \beta_1 NIM_{i,t} + \beta_2 NPL_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 TE_{i,t} + \beta_5 LDR_{i,t} + \beta_6 CPI_t + \beta_7 UE_t + \beta_8 GDP_t + \beta_9 WAG_t + \epsilon_b + \varepsilon b_t.$

2. $ROE_{i,t} = \beta_0 + \beta_1 NIM_{i,t} + \beta_2 NPL_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 TE_{i,t} + \beta_5 LDR_{i,t} + \beta_6 CPI_t + \beta_7 UE_t + \beta_8 GDP_t + \beta_9 WAG_t + \epsilon_b + \varepsilon b_t.$

Where ROA$_{i,t}$ and ROE$_{i,t}$ are Return on Assets and Return on Equity in period t, NPL$_{i,t}$ represents Non-performing loans ratio in period t, Net Interest Margin is the difference between interest income earned and interest paid, SIZE$_{i,t}$ is Size of the bank in period t, TE is Total Expenses in period t, LDR $_{i,t}$ is Loan-to-Deposit Ratio in period t, CPI$_t$, UE$_t$, GDP$_t$, WAG$_t$ are Consumer Price Index, Unemployment rate, Median Wages and GDP in period t.

Individual fixed effects (ϵb) control for bank-specific effects that influence the model. As usual, εbt is the error term.

Regression analysis of panel data will be performed using the OLS regression model. All these primal methods enable the finding of the best values of coefficients allowing one to receive an appropriate approximation to the observed data. Calculations were made in the EViews 12 environment.

Next, it is necessary to check the obtained model for the significance of autocorrelation of the first order using the Durbin-Watson test. The Durbin-Watson test is based on testing the autocorrelation of the residual terms based on their distributions. It allows you to determine whether there is a statistically significant autocorrelation between adjacent residual terms.

The Breusch-Godfrey LM test is a devised test to detect higher-order autocorrelation in a model. In other words, the test has been devised to check whether some form of autocorrelation can be said to be prevalent in residuals that come about due to regression analysis. This is an extension of a Durbin-Watson test in situations where there may be not only autocorrelation between consecutive residual terms but longer separations of time or space.

The Breusch-Godfrey test is based on an extended form of the regression model, which includes the lagged values of the residual terms as additional variables. Then the test statistic is calculated, which is expressed as the squared coefficient of determination (R-squared) in the extended model.

To test this model for homoscedasticity of random variables, we will apply White's test. In order to investigate the normality of the distribution of the residuals of this model, it is worth conducting the Jarque-Bera test, since the null hypothesis of this test means exactly the normality of the distribution of the residuals of the model. The main idea of the Jarque- Bera test is to assess the asymmetry and kurtosis of the residual members of the model, which are related to the normal distribution. A normal distribution has zero skewness and kurtosis. Thus, the Jarque-Bera test tests how much the skewness and kurtosis values differ from zero.

CHAPTER 4. DATA

The data set consists of 7 annual periods (covering the period from 2016 to 2023), in which financial and operational data of Ukrainian banks are presented in a section of 20 banks:

- JSC CB 'PRIVATBANK'
- JSC 'Oschadbank'
- JSC 'Ukreximbank'
- JSB 'UKRGASBANK'
- Raiffeisen Bank JSC
- JSC 'UKRSIBBANK'
- OTP BANK JSC
- JSC 'SENSE BANK'
- JSC 'CREDIT AGRICOLE BANK'
- JSC 'KREDOBANK'
- PRAVEX BANK' JSC
- JSC 'PIRAEUS BANK ICB'
- JSC 'SEB CORPORATE BANK'
- JSC Deutsche Bank DBU
- JSC 'BANK FORWARD'
- JSC 'CREDITWEST BANK'
- JSC 'CREDIT EUROPE BANK'
- JSC 'UNIVERSAL BANK'
- Pivdennyi Bank
- TASCOMBANK JSC

Thus, the data set used in the study consists of 140 observations. The data set includes 9 variables, as well as bank group identification and time period variables. National Bank of Ukraine, more specifically statistics and supervisory data, is the source of data for the conducted analysis.

Analyzing the descriptive statistics of the above-mentioned variables, we can conclude that many variables may not be normally distributed due to the large differences between the means and medians, wide ranges, and high standard deviations that indicate skewed distribution (Table 2). This can be because of economic instability that causes distortions in the major indicators.

Table 2. Descriptive statistics of bank-specific and macroeconomic factors

	Mean	Standard Deviation	Median	Minimum	Maximum
ROA, %	2.048	15.970	1.621	-61.735	7.481
ROE, %	3.441	107.488	13.082	-1072.511	409.730
NPL, %	22.914	23.103	14.100	0.000	100.000
NIM, million hryvnias	3,252,312.0	5,351,699.0	1,760,355.0	46,409.90	39,917,417.0
SIZE, million hryvnias	79,892,073.0	130,033,348.0	32,029,835.0	964,750.60	737,413,903.0
TE, million hryvnias	46,124.14	34,952.30	33,805.00	11,787.00	170,285.00
LDR, %	0.583	0.199	0.579	0.293	0.913
CPI, %	111.342	5.266	110.900	102.700	120.200
UE, %	139.671	321.859	9.900	8.600	909.000
GDP, %	115.224	11.106	119.420	95.230	129.110
WAG, hryvnias	11,438.570	2,851.094	12,264.000	64,75.000	14,859.000

Table 2 displays the summary statistics of the variables used in our regression analysis. On average, the banks in our sample have an ROA of 2.047% over the period from 2016 to 2022. The standard deviation for ROA is 15.97%, which is quite high, and we can conclude that the sample data for ROA tends to be distributed in a large range.

For ROE, the average return is 3.44%, the minimum return is -1072.5% and the maximum return is 409.73%. The significant difference in range, along with a standard deviation of 107.5%, confirms that the data points are spread over a large range of values.

On average, the ratio of non-performing loans of banks is 22.9%, but it differs between

banks. The highest value in our sample is 100%, and the lowest is only 0%.

For net interest margin, the observation numbers decrease from 1760355 to 46409 million hryvnias, and the average value is 3252312, indicating that most banks have a low value of this indicator. The range of total costs is also quite high with a minimum of 11787 and a maximum of 170285 million hryvnias.

On average, the ratio of loans to deposits is 58.26% with a standard deviation of 0.1999%, which is a low indicator and indicates that the ratio of loans in different banks does not differ much.

The consumer price index during 2016-2022 changes from 102.7% to 120.2% with an average value of 110.9%. The unemployment rate has a significant standard deviation of 321.9% and ranges from 8.6 to 909.

The GDP growth index averages 119.4% with a minimum value of 95.23% and a maximum value of 129.11.

Correlation analysis is crucial as we can observe if there are some factors that are highly correlated with the dependent variables and shall be reconsidered for future regression analysis to avoid multicollinearity.

Table 3. Correlation matrix (ROA)

Covariance Analysis: Ordinary
Date: 09/18/24 Time: 08:20
Sample: 2016 2022
Included observations: 140

Correlation	ROA	NPL	NIM	SIZE	LDR	TE	CPI	GDP	UE	WAG
ROA	1.000000									
NPL	-0.178603	1.000000								
NIM	0.033973	0.408849	1.000000							
SIZE	-0.034620	0.615231	0.870227	1.000000						
LDR	0.075429	-0.011111	-0.289989	-0.312245	1.000000					
TE	-0.318919	0.409369	0.385972	0.479438	-0.206662	1.000000				
CPI	-0.117065	0.184490	0.083285	-0.005245	-0.038484	0.109154	1.000000			
GDP	-0.003784	-0.030609	-0.152695	-0.065626	0.198420	-0.074145	-0.188655	1.000000		
UE	-0.018430	-0.113664	-0.000724	0.032580	-0.079665	-0.018203	-0.678650	-0.351136	1.000000	
WAG	0.080949	-0.203643	0.245609	0.129453	-0.296741	-0.038076	-0.127219	-0.496547	0.258640	1.000000

Table 3 displays the pairwise Pearson correlation coefficients between selected variables. The correlation coefficients between return on assets and other variables are statistically significant at the 5% significance level.

ROA has a statistically significant negative correlation with banks' total expenses (TE), which is intuitive. We also observe a negative correlation between the profitability of assets and the level of inflation, the ratio of non-performing assets and GDP growth rates.

ROA is positively correlated with average wages and net interest margin. We observe a weak positive correlation between other variables.

The study revealed the presence of multicollinearity between some variables. To avoid this phenomenon, bank size was excluded from the model. As a result, the following data were obtained (Table 4).

Table 4. Correlation matrix with excluded variables (ROA)

Covariance Analysis: Ordinary
Date: 09/18/24 Time: 08:22
Sample: 2016 2022
Included observations: 140

Correlation	ROA	NPL	NIM	LDR	TE	CPI	GDP	UE	WAG
ROA	1.000000								
NPL	-0.178603	1.000000							
NIM	0.033973	0.408849	1.000000						
LDR	0.075429	-0.011111	-0.289989	1.000000					
TE	-0.318919	0.409369	0.385972	-0.206662	1.000000				
CPI	-0.117065	0.184490	0.083285	-0.038484	0.109154	1.000000			
GDP	-0.003784	-0.030609	-0.152695	0.198420	-0.074145	-0.188655	1.000000		
UE	-0.018430	-0.113664	-0.000724	-0.079665	-0.018203	-0.678650	-0.351136	1.000000	
WAG	0.080949	-0.203643	0.245609	-0.296741	-0.038076	-0.127219	-0.496547	0.258640	1.000000

Next, we will consider the correlation matrix for the dependent variable ROE.

Table 5. Correlation matrix (ROE)

Covariance Analysis: Ordinary
Date: 09/18/24 Time: 08:25
Sample: 2016 2022
Included observations: 140

Correlation	ROE	NPL	NIM	LDR	TE	SIZE	GDP	CPI	UE	WAG
ROE	1.000000									
NPL	-0.20976	1.000000								
NIM	0.04849	0.408849	1.000000							
LDR	0.07311	-0.01111	-0.28998	1.000000						
TE	-0.78744	0.409369	0.385972	-0.20666	1.000000					
SIZE	-0.05646	0.615231	0.870227	-0.31224	0.479438	1.000000				
GDP	0.096937	-0.03060	-0.15269	0.198420	-0.07414	-0.06562	1.000000			
CPI	-0.12586	0.184490	0.083285	-0.03848	0.109154	-0.00524	-0.18865	1.000000		
UE	0.025381	-0.11366	-0.00072	-0.07966	-0.01820	0.032580	-0.35113	-0.67865	1.000000	
WAG	0.073161	-0.20364	0.245609	-0.29674	-0.03807	0.129453	-0.49654	-0.12721	0.258640	1.000000

The profitability of banks' assets is positively correlated with the level of net interest margin, wages, bank size, GDP growth rate and the ratio of loans and deposits. A negative correlation is observed with total costs, non-performing loan ratio and inflation index.

The study revealed the presence of multicollinearity between some variables. To avoid this phenomenon, the total costs and bank size were excluded from the model. As a result, the following data were obtained (Table 6).

Table 6. Correlation matrix with excluded variables (ROE)

Covariance Analysis: Ordinary
Date: 09/18/24 Time: 08:27
Sample: 2016 2022
Included observations: 140

Correlation	ROE	NPL	NIM	LDR	CPI	GDP	UE	WAG
ROE	1.000000							
NPL	-0.209763	1.000000						
NIM	0.048498	0.408849	1.000000					
LDR	0.073119	-0.011111	-0.289989	1.000000				
CPI	-0.125868	0.184490	0.083285	-0.038484	1.000000			
GDP	0.096937	-0.030609	-0.152695	0.198420	-0.188655	1.000000		
UE	0.025381	-0.113664	-0.000724	-0.079665	-0.678650	-0.351136	1.000000	
WAG	0.073161	-0.203643	0.245609	-0.296741	-0.127219	-0.496547	0.258640	1.000000

CHAPTER 5. RESULTS

5.1. Results of the ROA regression model.

To estimate the panel model, we will use the method of least squares. A generalized model was estimated that does not contain bank-specific effects where ROA is a dependent variable (Table 7).

Table 7. Results of the generalized panel model (ROA)

Dependent Variable: ROA
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient
NPL	-0.095***
	(0.067)
TE	-3.706***
	(0.0001)
LDR	2.183***
	(3.150)
CPI	-1.102***
	(0.447)
UE	-0.017***
	(0.007)
NIM	0.00001
	(0.0001)
WAG	-0.0004**
	(0.00006)
GDP	-0.337***
	(0.185)
C	171.33
	(68.815)
R-squared	0.686
Adjusted R-squared	0.471
F-statistic	3.759

Next, we will conduct diagnostics of the received model. The change in the profitability of bank assets is explained by 68.7% of the selected independent variables. The weighted coefficient of determination is 47.2%.

Also, it is necessary to check the obtained model significance of the first-order autocorrelation using the Durbin-Watson test. In the obtained model, the p-value is 2.27.

Our value is outside the uncertainty zone, so we can claim the absence of first-order autocorrelation. The model is significant because the F-statistic is 0.0.

Let's estimate the model with fixed individual effects (Table 8).

Table 8. Results of the panel model with fixed effects (ROA)

Dependent Variable: ROA
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient
NPL	-0.132*** (0.130)
TE	-4.593*** (0.0001)
LDR	2.411*** (4.404)
CPI	-0.964*** (0.465)
UE	-0.016*** (0.007)
NIM	1.946*** (0.0001)
WAG	-0.0002** (0.0006)
GDP	-0.350*** (0.187)
C	158.22 (70.822)
R-squared	0.722
Adjusted R-squared	0.522
F-statistic	1.975

The change in the profitability of bank assets in this model is explained by 72.3% of the selected independent variables. The weighted coefficient of determination is 52.2%.

It is necessary to check the obtained model significance of the first-order autocorrelation using the Durbin-Watson test. In the obtained model, the value is 2.71. Our value is outside the uncertainty zone, so we can claim the absence of first-order autocorrelation. The model is significant because the F-statistic is 0.0.

Let's build a model with random effects.

Table 9. Results of the panel model with random effects (ROA)

Dependent Variable: ROA
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient
NPL	-0.091*** (0.071)
TE	-3.725*** (0.0001)
LDR	2.067*** (3.294)
CPI	-1.099*** (0.442)
UE	-0.017*** (0.007)
NIM	7.064*** (0.0001)
WAG	-0.0004** (0.0006)
GDP	-0.336*** (0.183)
C	170.7150 (69.059)
Weighted Statistics	
R-squared	0.785
Adjusted R-squared	0.617
S.E. of regression	14.537
F-statistic	3.733
Prob(F-statistic)	0.0005
Unweighted Statistics	
R-squared	0.786
Sum squared resid	28834.46
Durbin-Watson stat	2.270

The change in the profitability of bank assets in this model is explained by 78.6% of the selected independent variables. The weighted coefficient of determination is 61,7%.

It is necessary to check the obtained model significance of the first-order autocorrelation using the Durbin-Watson test. In the obtained model, the value is 2.36. Our value is outside the uncertainty zone, so we can claim the absence of first-order autocorrelation. The model is significant because the F-statistic is 0.0 (Table 9).

Also, it is necessary to test the choice between the random-effects model and the fixed-effects model. We will use the Correlated Random effects-Hausman test (Table 10).

Table 10. Results of the panel model with fixed and random effects (ROA)

Correlated Random Effects - Hausman Test
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000000	8	1.0000

* Cross-section test variance is invalid. Hausman statistic set to zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
NPL	-0.132***	-0.091***	0.011***	0.713
TE	-0.000	-0.000	0.000	0.343
LDR	2.411***	2.067***	8.548***	0.906
CPI	-0.964***	-1.099***	0.021***	0.355
UE	-0.016***	-0.017***	0.000001	0.485
NIM	0.000	0.000001	0.000	0.245
WAG	-0.0002	-0.0004	0.000	0.619
GDP	-0.350	-0.336***	0.001**	0.707

Check the probability value and make decision based on the decision criterion. The probability value here is 1.0000 which is greater than 5% thereby we accept null hypothesis and conclude that the random effects model is appropriate.

The resulting equation makes it possible to draw conclusions about the influence of factors on the dependent variable.

1. An increase in the ratio of loans and deposits by 1% causes an increase in the profitability of banks by 2.07%. Thus, there is a direct relationship between the indicators.

2. An increase in total costs by 1% leads to a decrease in banks' profitability by 3.73%. The simulation results show the existence of an inverse relationship between the indicators.

3. An increase in the GDP growth rate by 1% leads to a decrease in the profitability of banks by 0.34%. Therefore, it is possible to assert their inverse dependence.

4. An increase in the level of inflation by 1% causes a decrease in the profitability of banks by 1.099%. The simulation results indicate the existence of an inverse relationship between the indicators.

5. An increase in the average salary by 1% leads to a decrease in the profitability of banks by 0.0004%. The simulation results indicate the presence of a feedback relationship between the indicators.

6. An increase in the level of non-performing loans by 1% causes a decrease in the profitability of banks by 0.09%, and the level of unemployment - by 0.017%. The modeling results indicate the presence of an inverse relationship between the indicators.

5.2. Results of the ROE regression model.

Let's build a generalized model that does not contain effects where ROE is a dependent variable (Table 11).

Table 11. Results of the generalized panel model (ROE)

Dependent Variable: ROE
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient
NPL	-1.236*** (0.457)
NIM	4.042*** (0.0001)
LDR	28.955** (21.973)
CPI	-1.968** (3.160)
GDP	0.859*** (1.312)
UE	-0.013*** (0.052)
WAG	0.001*** (0.004)
C	101.03** (493.302)
R-squared	0.896
Adjusted R-squared	0.804
F-statistic	2.021

Next, we will conduct diagnostics of the received model.

The change in the profitability of banks' capital is explained by 89.7% of the selected independent variables. The weighted coefficient of determination is 80.4%.

It is necessary to check the obtained model significance of the first-order autocorrelation using the Durbin-Watson test. In the obtained model, the value is 1.343385. Our value is outside the uncertainty zone, so we can claim the absence of first-order autocorrelation. The model is significant because the F-statistic is 0.0.

Let's estimate the model with fixed individual effects (Table 12).

Table 12. Results of the panel model with fixed effect (ROE)

Dependent Variable: ROE
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient
NPL	1.687*** (0.794)
NIM	2.028*** (0.0001)
LDR	-15.024** (27.492)
CPI	-6.370*** (2.831)
GDP	1.600*** (1.164)
UE	-0.024*** (0.045)
WAG	-0.002*** (0.004)
C	463.12 (439.145)
R-squared	0.912131
Adjusted R-squared	0.831983
F-statistic	3.046915
Prob(F-statistic)	0.000000

The change in the profitability of banks' capital in this model is explained by 91.2% of the selected independent variables. The weighted coefficient of determination is 83.2%.

It is necessary to check the obtained model significance of the first-order autocorrelation using the Durbin-Watson test. In the obtained model, the value is 1.93. Our value is outside the uncertainty zone, so we can claim the absence of first-order autocorrelation. The model is significant because the F-statistic is 0.0.

Let's build a model with random effects.

Table 13. Results of the panel model with random effects (ROE)

Dependent Variable: ROE
Periods included: 7
Cross-sections included: 20
Total panel (balanced) observations: 140

Variable	Coefficient
NPL	-1.236*** (0.398)
NIM	4.039*** (0.0001)
LDR	28.955** (19.160)
CPI	-1.968*** (2.755)
GDP	0.859*** (1.144)
UE	-0.013*** (0.045)
WAG	0.001*** (0.003)
C	101.039 (430.144)
Weighted Statistics	
R-squared	0.796
Adjusted R-squared	0.634
F-statistic	2.021
Unweighted Statistics	
R-squared	0.796
Sum squared resid	1450477.

The change in the profitability of bank assets in this model is explained by 79.7% of the selected independent variables. The weighted coefficient of determination is 63.5%. It is necessary to check the obtained model significance of the first-order autocorrelation using the Durbin-Watson test. In the obtained model, the value is 1.34. Our value is outside the uncertainty zone, so we can claim the absence of first-order autocorrelation. The model is significant because the F-statistic is 0.0 (Table 13).

Also, it is necessary to test the choice between the random-effects model and the fixed-effects model. We will use the Correlated Random effects-Hausman test (Table 14).

Table 14. Results of the panel model with fixed and random effects (ROE)

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	0.000	7	0.0205

* Cross-section test variance is invalid. Hausman statistic set to zero.
** WARNING: estimated cross-section random effects variance is zero.

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
NPL	1.687***	-1.236**	0.472**	0.000
NIM	0.00002	0.000004	0.000	0.000
LDR	-15.024***	28.955***	388.711***	0.025
CPI	-6.370***	-1.968**	0.420**	0.000
GDP	1.600***	0.859***	0.046***	0.000
UE	-0.024***	-0.013**	0.00001	0.012
WAG	-0.002***	0.001***	0.000005	0.058

The probability value is 0.0205, which is less than 5%. The fixed-effects model is preferable.

The resulting equation makes it possible to draw conclusions about the influence of factors on the dependent variable.

1. An increase in the ratio of loans and deposits by 1% leads to a decrease in the profitability of banks' capital by 15.02%. Thus, there is an inverse relationship between the indicators.

2. An increase in the net interest margin by 1% causes an increase in the profitability of banks by 2.03%. The simulation results show the existence of a direct relationship between the indicators.

3. An increase in GDP growth rates by 1% leads to an increase in banks' profitability by 1.6%. Therefore, it is possible to assert their direct dependence.

4. An increase in the level of inflation by 1% causes a decrease in the profitability of banks by 6.37%. The simulation results indicate the presence of an inverse relationship between the indicators.

5. An increase in the average salary by 1% leads to a decrease in the profitability of banks by 0.0022%. The simulation results indicate the existence of an inverse relationship between the indicators.

6. An increase in the amount of non-performing bank loans by 1% leads to an increase in the profitability of banks by 1.67%. The simulation results indicate the presence of a direct relationship between the indicators.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

1.1. Conclusions

Two key hypotheses were evaluated in this research to determine the factors influencing bank profitability in Ukraine.

The first hypothesis suggested that macroeconomic variables including unemployment rates, inflation, GDP growth and median wages have a significant effect on bank profitability with expected adverse impact due to the creation of an unfavorable economic environment. The regression results supported this hypothesis to an extent, showing that macroeconomic factors had mixed impacts on bank profitability. The positive influence that was exerted by GDP growth on profitability meant better performance of the bank in conditions of growing economy. Meanwhile, negative inflation meant that rising prices decrease profitability. Some other influences, less significant but present, were unemployment and wages.

The second hypothesis was that bank-specific factors such as net income, bank size, operating expenses, total assets, deposit ratio, loan ratio, loan-to-deposit ratio (LDR), and the ratio of non-performing loans (NPL) are significant determinants of bank profitability. This hypothesis is strongly supported by the results showing that bank-specific factors such as total expenses, LDR, and NPL ratios significantly affect profitability. The LDR had both positive and negative impacts, improving profitability in some respects and reducing it in others. Operating expenses continued to appear to be a weakening factor to the profitability, hence a reminder of the importance of cost control, relating to the performance of the banks. The NPL ratio is a mixed-variable indicator showing that robust credit risk management is important to have profitability prevail. Other major variable that also positively influenced profitability was net interest margin.

Conclusively, the paper has added considerably to the insights on the determinants of bank profitability in Ukrainian transitional economy with serious external and internal challenges. The results will be helpful in designing proper risk management and cost-control strategies for bank managers and policymakers who can ensure high profitability. The present study enlightens regarding the incorporation of macroeconomic and bank-specific elements which have to be considered in volatile economic environments with regard to bank performance evaluation.

1.2. Policy implications

Based on the findings from this research, it is evident that Ukrainian banks need to improve their credit risk management systems due to the substantial effect on profitability that NPL ratios have. This can involve using tougher criteria for borrowing as well as putting in place sophisticated means of monitoring so as to reduce the incidence of non-performing loans.

The mixed effects of the LDR on profitability indicate that banks should carefully manage the balance between loans and deposits. For instance, if banks are eliminating a part of the deposit in their lending hence increasing ROE but because there is a greater part of the loan relative to the deposit, there can be liquidity risks.

The last implication is addressed to the positive impact of inflation on bank profitability that highlights the need for banks to maintain flexible interest rate policies enough so as to respond instantly towards any inflationary pressures. On the other hand, regulators must ensure that excessive risk-taking or a decrease in lending towards productive sectors does not occur as a result of this.

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