PERFORMANCE IN EUROPEAN BANKING SECTOR BASED ON A COMPARATIVE ANALYSIS OF NON-PERFORMING LOANS AND NET INTEREST INCOME

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Abstract: *After the financial crisis of 2008, bank profitability became a crucial subject for investors, whose expectations were particularly affected by banks' asset quality and various legal and regulatory issues. In the context of the 2020–2021 COVID-19 pandemic, aspects of bank profitability worsened. For example, data from the European Central Bank indicates euro area banks' ROE fell from 5.3% in 2019 to 1.3% in 2020. We developed a study based on a panel database for 19 European Union countries over the period 2008–2020. The ordinary least squares method using stationarity was employed to determine whether return on equity is influenced by asset quality, operational costs or level of interest. The variables used in our analysis are non-performing loans, loan loss provision ratio and net interest income. Results demonstrate the impact of the variables on banking performance measured through return on equity.*

Keywords: *banking performance, ROE, non-performing loans, loan loss provision ratio, net interest income*

JEL Classification: C23, G21, F62

Introduction

The banking sector is highly affected by the general economic situation, generated by the COVID-19 pandemic, which started in March 2020 and influences numerous sectors of the economy for over a year and a half. At the beginning of the pandemic crisis, the banking industry was already influenced by the technological progress, which has transformed banking practices and products over the last decade. Banks sought to implement digital practices, along with the ever more aggressive migration in the online space, followed by the reduction in price of the products and services offered by banks, especially on an operational level. Despite the aforementioned benefits, the digitalisation came together with threats towards banking and with related risks, which can potentially generate new costs, some unforeseen and hard to estimate. Either way, the financial crisis that debuted in 2007 brought with it a series of challenges in the banking sector, referring to the type of investments that a

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bank can undergo an intense regulation of the domain, especially in the sector of operations with derived financial instruments. Influenced by the 2007 crisis, banks find themselves during the pandemic part of ample processes that aim to modify the paradigm regarding the profile of services and products that are being moved online. In addition, banks have been required to comply with regulatory processes imposed by supervisors as a reaction to the last financial crisis. The Basel III Agreement is a prime example of this development, as it was created in reaction to the 2007 global financial crisis with the goal of strengthening the regulation, supervision and risk management of banks. The implementation of Basel III represents a sensitive issue for supervisory authorities (Basel Committee, 2020). The new calendar of implementation demonstrates a major concern for the management of the economic impact of COVID-19. An essential point of view specific to this subject comes from Andreea Enria, Chair of the Supervisory Board of the European Central Bank, who mentioned the following aspects on May 3, 2021, (Enria A., 2021):

> In fact, the date for implementation was first scheduled for January 2022 with an additional five years of transitional period, so a fully-fledged implementation only at the beginning of 2027 – almost 20 years after the technical work began following the Lehman crisis. And, in the midst of all this, the COVID-19 pandemic struck. At the beginning of this exogenous crisis, the Basel Committee decided to push back the implementation date to the beginning of 2023 in order not to disrupt the business cycle even more. And this brings us at least to 2028 for the final deadline. Since in Europe there is still no legislative proposal from the European Commission, and the legislative process, for legislative initiatives of comparable complexity, takes on average between two and a half and four and a half years to conclude, we already risk missing the 2023 deadline for implementation, not to mention the ensuing transitional period, before the finish line is actually reached.

Standard	Original implementation date	Revised implementation date
Revised leverage ratio framework and G-SIB buffer	1 January 2022	1 January 2023
Revised standardised approach for credit risk	1 January 2022	1 January 2023
Revised IRB approach for credit risk	1 January 2022	1 January 2023
Revised operational risk framework	1 January 2022	1 January 2023
Revised CVA framework	1 January 2022	1 January 2023
Revised market risk framework	1 January 2022	1 January 2023
Output floor	1 January 2022; transitional arrangements to 1 January 2027	1 January 2023; transitional arrangements to 1 January 2028
Revised Pillar 3 disclosure framework	1 January 2022	1 January 2023

IRB = internal ratings-based approach; CVA = credit valuation adjustment.

Figure 1. Implementation of Basel III Agreement
Source: Basel Committee on Banking Supervisors, 2020 (Basel Committee, 2020)
https://www.bis.org/press/p200327.htm

Thus, the erosion of profitability represents in the current economic context a subject of major significance in the context of increased costs of operation during the pandemic, of investing in digitalisation, of enhancing competition among banks, associated to new regulatory proceedings

(including Basel III) and of the decrease in assets quality (non-performing loans). Also, pandemic COVID-19 crisis strongly highlights the importance of a balance between long-term profitability and the harmonisation of interests between the organisation and its stakeholders (Baicu C.G. et al., 2020). By the way, profitability represents a special issue for socially responsible investments, along with environmental, social and governance issues (Fülöp M.T., 2020).

It is well known that the concept of bank 'performance' cannot be associated with a single method of measurement as the term has a number of different connotations, which in time have been refined and completed in the specialty literature. Both in the literature and in banking practice, a number of measures or proxies of performance are often used. A holistic approach towards bank performance is sought after, but difficult to obtain. Also, performance is a subject of debate in other economic fields (e.g., agriculture) (Burja C., 2020). The popularity of the term in the banking industry has increased in recent years due to its use by supervisory bodies, central banks or the Basel Committee on Banking Supervision. The wide range of the performance term allows its use in contexts synonymous with efficiency, efficacity, productivity, profitability, results, meeting of objectives, achievement of value and more.

This paper presents a performance concept regarding profitability – an essential expectation in the banking industry – particularly for shareholders, who are interested in profit maximisation. The method is a particular way to focus on a type of explanation for bank performance based on maximising the return on investment for shareholders. Challenges imply the mastery with which bank management put into practice the adequate mix of inputs and outputs that lead to a maximisation of profit. The basic model of bank performance shows us the return on equity (ROE) as a measure of shareholder satisfaction towards the investments they advanced in the banks that they own. Meanwhile, banks in the marketplace choose suboptimal combinations of output prices and inputs, which could lead to inefficiency and to a loss of profitability, respectively. Also, well-known examples of profitability indicators are return on assets (ROA) or net interest rate margin, which allows comparison over time and across countries.

We aim to identify the factors which can affect the bank performance, measured by ROE, and we examine essential aspects that could influence the profitability. For this purpose, we developed a set of common explanatory variables, which we expected to impact ROE: non-performing loans (NPLs), loan loss provision ratio (LLPR) and net interest income (NII). The analysis was carried out through an ordinary least squares (OLS) regression model for 19 countries from the EU, in the period 2008–2020. The paper was developed through the literature review, the initial presentation of the used concepts, regarding bank profitability and explanatory variables, followed by the case study, findings and conclusions.

Literature review

Surveys on bank profitability are widespread in the economic literature. The authors usually prefer to study the two base indicators of this phenomenon, respectively ROE and return on assets, and from the point of view of econometrical models, mainly utilise NPLs, liquidity, capital adequacy or elements of corporate governance as microeconomic variables, while out of the macroeconomic variables Gross Development Products or inflation rate have been chosen. Numerous other explanatory variables are used in the literature to explain the dynamic of the bank profitability phenomenon, regarding the preferences and the vision of the authors, the availability of data and, not least the validity of the used statistical models.

Our research is in line with recent studies (Rastogi S. et al., 2021), which consider NPLs as a proxy for bank profitability. In the first-mentioned study, the degree of bank profitability is given by ROA, as well as by the net interest margin. In our case, we have utilised the NII index to show a link between income and ROE, regarded by us as the independent variable of the econometric model. One of the explanatory variables of our model, NPLs, represents a milestone for the banking industry, preoccupied with the establishment of a harmonised approach to NPL recognition, which is

particularly desirable in a cross-border scheme (Bholat D. et al., 2018). The authors mentioned divergences in defining NPLs across regulatory jurisdictions, accounting practices and the importance of the new IFRS9 and provisioning. Also, NPLs represent a variable used in the analysis of bank efficiency through methods other than regression models, such as stochastic frontier analysis (Ferreira C., 2019). Stochastic frontier analysis and data envelopment analysis allow researchers to study panel data regarding bank efficiency using variables covering a wide range of banking input and output indicators (Ruinan L., 2019).

The problem of NPLs and their implications in the bank medium is not a recent one. For example, countries in southeastern Europe experienced high growth in NPLs as early as the financial crisis that started in 2007 (Ćurak M. et al., 2013). Asset quality can harm banking profitability, which calls for prudential measures from the central banks (Tomuleasa I.I. and Cocriș V., 2014). The authors investigated 20 European financial groups during the period 2004–2012 and found proof of a relationship between bank performance (return on average assets, return on average equity and net interest margin) and bank-specific factors: capital adequacy ratio, ratio of impaired loans to total loans, ratio of loans to total assets, bank size, GDP growth rate and inflation rate. Their results reveal that the analysed variables had a moderately heterogenous impact on bank profitability due to the particularities of each country.

Data and Methodology

A consistent part of the literature has examined the impact of variables that characterise banks' asset quality on banking profitability. The most commonly used indicator is NPLs, which at a high level pose problems for both banks and supervisors. We intend to determine whether ROE is influenced by NPLs, LLPR or NII. We develop a linear regression model with ROE as the dependent variable and NPLs, LLPR or NII as regressors. We used annual data for the period 2008–2020 for a sample that includes 19 European Union countries: Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, France, Germany, Greece, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia and Spain. The panel data set is formed of both domestic banks and foreign banks, which are active in a country *i* in year *t*. The data of the banks was gathered from the European Central Bank database (ECB, 2021b), and the econometric processing was carried out with the use of STATA13. Table 1 provides a list of variables used in our analysis and the definition of each variable used in the study, while Figure 2 presents the evolution of ROE for each studied country during 2008–2020. Table 2 details the descriptive statistics for the variables of the model.

Figure 2. Return on Equity ROE by country, for the panel 2008–2020
Source: Authors' processing, based on data available at European Central Bank (ECB, 2021b) https://sdw.ecb.europa.eu/

The variables used in our model are graphically presented in the following figure.
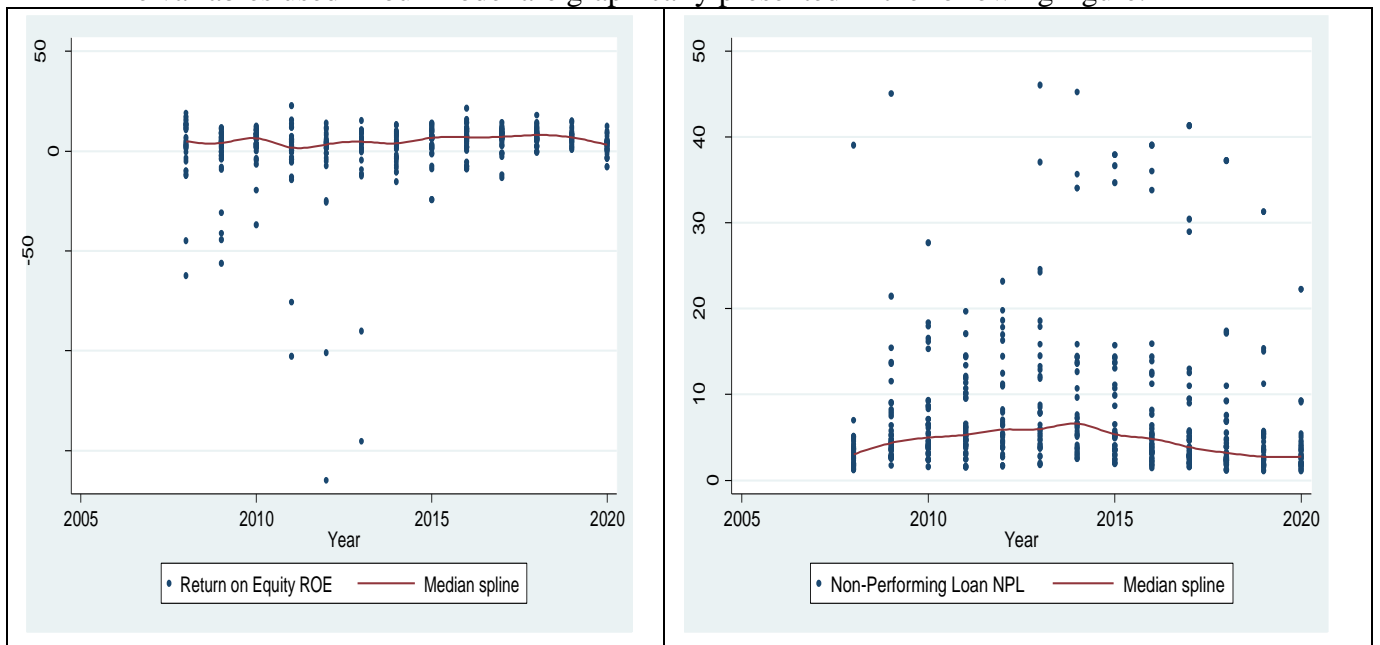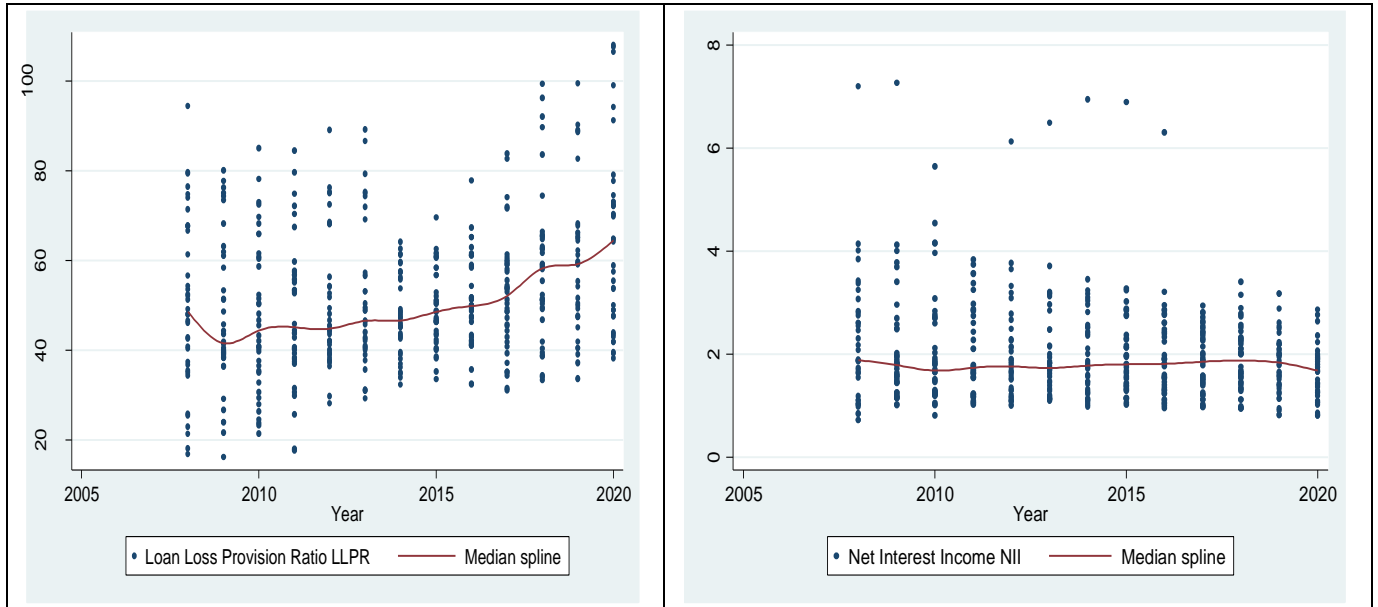
Figure 3. ROE, NPL, LLPR and NII evolution, panel, 2008–2020
Source: Authors' processing, based on data available at European Central Bank (ECB, 2021b) https://sdw.ecb.europa.eu/

Table 1. Definitions of simple proxies of bank profitability

Symbol	Name	Definition
ROE	Return on Equity	Net income after tax to average equity (%)
NPL	Non-Performing Loans	Gross non-performing debt instruments (% of total gross debt instruments)
LLPR	Loan Loss Provision Ratio	Total accumulated impairment (% of total gross non-performing debt instruments)
NII	Net Interest Income	Net interest income (% of total assets)

Table 2. Descriptive statistics for ROE model (winsorised data), 2008-2020

Variables	Obs	Mean	Std. Dev.	Min	Max
Return on Equity	488	4.098948	6.561885	−12.1197	13.57622
Non-Performing Loans	492	6.959818	6.548109	1.64512	27.704
Loan Loss Provision Ratio	492	51.84273	14.31142	29.76085	82.56879
Net Interest Income	494	1.924842	0.7394524	0.9920949	3.569837

Source: Authors' processing, based on data available at European Central Bank (ECB, 2021b) https://sdw.ecb.europa.eu/

We remove the outliers from the data sample, through the winsorisation process, according to studies which consider that in business surveys, the distribution of variables is often highly skewed, resulting in sample observations that differ from the majority of observations in the data set (the literature refers to these units as outliers) (European Commission, 2014). We remove and modify the extreme value of the sample, considering a 95% confidence interval. It is a conservative approach as the coverage probability is at least 95% for any of the distributions under study (Ruppert D., 2014). The author considers that the extreme values should be removed because they are simply 'bad' data or, for example, in regression with an aberrant *x* value because they are outside the scope of the study. According to this approach, we consider 5% the extreme values of the data sample in the winsorisation process, so all the data below 5% and above 95% was replaced with the largest or smallest value from the sample.

The OLS equation was applied, and we included robust standard errors to remove heteroskedasticity from the panel data. An important drawback of many statistical tests is that they are not robust against time-dependent heteroscedasticity. This is because the implicit or explicit bias correction of the autocovariances depends on the error variances (Born B. and Breitung J., 2010). None of the pairs of exogenous variables had a significant correlation, which ensures that the data is free from multicollinearity aspects.

Table 3. Correlation matrix for variables

Variables (winsorised data)	Return on Equity (ROE)	Non-Performing Loans (NPLs)	Loan Loss Provision Ratio (LLPR)	Net Interest Income (NII)
ROE	1.0000			
NPL	−0.4649	1.0000		
LLPR	0.0982	−0.1812	1.0000	
NII	0.1981	0.3529	0.2038	1.0000

Source: Authors' processing, based on data available at European Central Bank (ECB, 2021b) https://sdw.ecb.europa.eu/

From the beginning of the 1990s, statistical findings have shown the popularity of the use of panel data unit root tests, which in time became generally accepted (for example, based on augmented Dickey–Fuller [AFD] or Phillips–Perron [PP]) (Maddala G.S. and Wu S., 1999). We tested the stationarity of the variables with the ADF test, with one and two lags and obtain that all the variables seem to be stationary across all countries. The null hypothesis is that the data is non-stationary. If the null hypothesis is rejected, then the data is stationary.

Table 4. Fisher–ADF unit root tests (winsorised data)

Fisher–ADF unit root tests				
Fisher–ADF tests with drift, one lag and cross-sectional means removed				
Variables (winsorised data)	**Inverse chi-squared**	**Inverse normal**	**Inverse logit *t***	**Modified inv. chi-squared**
Return on Equity (ROE)	287.9891 [0.000]	−11.8281 [0.000]	−12.7115 [0.000]	17.1946 [0.000]
Non-Performing Loan (NPL)	242.4174 [0.000]	−9.8212 [0.000]	−10.4116 [0.000]	13.4982 [0.000]
Loan Loss Provision Ratio (LLPR)	202.4660 [0.000]	−8.6144 [0.000]	−8.6333 [0.000]	10.2577 [0.000]
Net Interest Income (NII)	235.4862 [0.0000]	−9.4572 [0.0000]	−10.0275 [0.0000]	12.9360 [0.0000]
Fisher–ADF tests with drift, two lags and cross-sectional means removed				
Variables (winsorised data)	**Inverse chi-squared**	**Inverse normal**	**Inverse logit *t***	**Modified inv. chi-squared**
Return on Equity (ROE)	231.0932 [0.000]	−9.4814 [0.000]	−10.1010 [0.000]	13.2578 [0.000]
Non-Performing Loan (NPL)	223.8394 [0.000]	−8.8679 [0.000]	−9.3779 [0.000]	11.9914 [0.000]
Loan Loss Provision Ratio (LLPR)	171.8284 [0.000]	−7.1422 [0.000]	−7.0375 [0.000]	7.7727 [0.000]
Net Interest Income (NII)	167.4076 [0.000]	−6.2499 [0.000]	−6.2960 [0.000]	7.4141 [0.000]

Source: Authors' processing, based on data available at European Central Bank (ECB, 2021b) https://sdw.ecb.europa.eu/

Results

The impact of explanatory variables on ROE is examined on an annual basis through the following model regression, which is also synthetically presented in Table 5.

$$ROE_{i,t} = \beta_0 + \beta_1 \times NPL_{i,t} + \beta_2 \times LLPR_{i,t} + \beta_3 \times NII_{i,t} + \varepsilon_{i,t} \qquad (1)$$

$$ROE_{i,t} = 3.550 - 0.653 \times NPL_{i,t} - 0.0498 \times LLPR_{i,t} + 3.981 \times NII_{i,t} + \varepsilon_{i,t} \qquad (2)$$

where:

$ROE_{i,t}$ is Return on Equity for country *i* in year *t*
$NPL_{i,t}$ is Non-Performing Loans for country *i* in year *t*
$LLPR_{i,t}$ is Loan Loss Provision Ratio for country *i* in year *t*
$NII_{i,t}$ is Net Interest Income for country *i* in year *t*

Table 5. Regressors for ROE

Variables	ROE Model
Non-Performing Loans (NPL)	−0.653***
	(0.0454)
Loan Loss Provision Ratio (LLPR)	−0.0498***
	(0.0166)
Net Interest Income (NII)	3.981***
	(0.346)
Constant	3.550***
	(1.116)
Observations	486
R-squared	0.3765

Robust standard errors in parentheses
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

The results obtained allow us to conclude that during the period 2008–2020, there is clear evidence of a correlation between ROE and the explanatory variables (NPL, LLPR or NII) for the panel data that comprises domestic and foreign banks from Austria, Belgium, Bulgaria, Cyprus, Denmark, Estonia, France, Germany, Greece, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovakia and Spain. The biggest influence is exerted by NII, which has a positive link with ROE (an increase of NII generates a positive impact on ROE), while the increase of NPLs and LLPR leads to a decrease of ROE.

Conclusion

In this study, we used an OLS regression panel model to examine the determinants of return on equity (ROE) for 19 European Union countries during the period 2008–2020. Results allow us to conclude that for bank performance – in particular profitability – measured through ROE, some microeconomic indicators influence the independent variable. It was found that NPLs, LLPR or NII affect the level of ROE. Our research has implications for banks' quality assets regulations and policies, which require special attention. Also, the findings hint towards the necessity of an improvement in the risk management processes in banks, especially for NPL recognition and mitigation.

Further research in the domain is still necessary considering that the explanatory model developed in this paper accounts for only 37.65% of the evolution of the analysed variable, namely ROE, in the banking industry. Other variables and econometric methods could offer a greater degree of certainty regarding bank profitability across different countries and time periods.

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