

Determinants of Banking Profitability through ROA and ROE: A Panel Data Approach

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Abstract

Empirical review of literature on banks' profitability suggests many determinants of banking profitability (measured through ROA Return on Assets and Return on Equity ROE, the main popular indicators of bank performance), from which we focus on GDP growth, Inflation, Loans/deposits ratio and Bank capital/total assets ratio. This paper intends to find if there is any significant relationship between ROA or ROE and these mentioned independent variables. We use Ordinary Least Squares OLS method with robust standard errors, consistent with panel-specific autocorrelation and heteroskedasticity. Our study is based on a panel database including 13 European Union countries over the period of 18 years ranging from 2000 to 2017. The empirical results reveal that there is a positive and a significant relationship between ROA or ROE and GDP growth, while the rest of the independent variables have a lesser influence on ROA or ROE.

Key words: ROA, ROE, Banking profitability, European Union

J.E.L. classification: C23, G21, F62

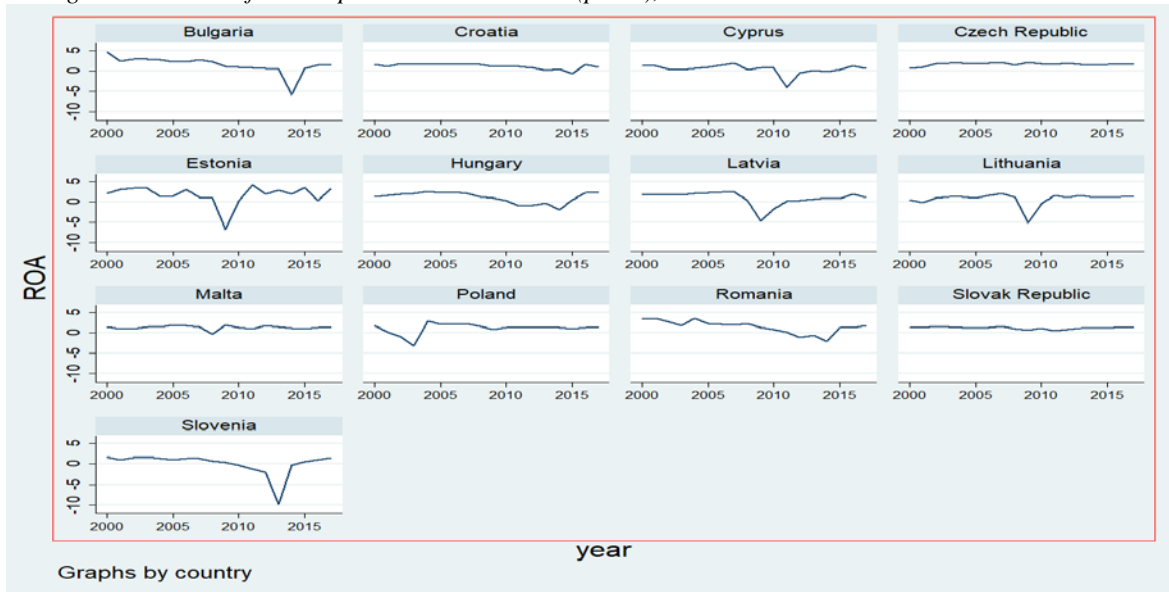
1. Introduction

There are some reasons why the banks' profitability became a major subject in the last few years in the context of the manifestations of the 2008 international financial crisis, which affected many banking systems. The crisis has catalysed an unprecedented phenomenon of worsening of the loans quality and the non-performing loans grew exponentially during the crisis. The required adequate level of banking capitalization (imposed by the Basel III Agreement and subsequently by the European Directives and national legislations) affects the banks' capacity to sustain increased volumes of credits that traditionally generate profit. Significant gaps between national economic conditions were exacerbated in the last years and the dependency of the banking systems on the macroeconomic drivers is wellknown. In this paper, we search for concrete evidence of such banks' behaviour, in order to find if macroeconomic conditions (GDP growth and inflation) influence a banks' profitability. Also, we have added in the research, the internal banking determinants, that can characterise capital adequacy and lending features of the banks (Loans/deposits ratio and Bank capital/total assets ratio).

Weak profitability has persisted in the European Union countries, in the last few years. The notable differences in profitability of the different countries exist and they can be explained by cyclical factors and specificity of each banking system or bank. Some of the banks have internal weaknesses in internal control and corporate governance or in their business model and these particularities generate diferencies in terms of profitability between countries.

The following figures capture the profitability of banking systems from the 13 European Union countries, between 2000 and 2017 and show an unequal evolution of banks' profitability.

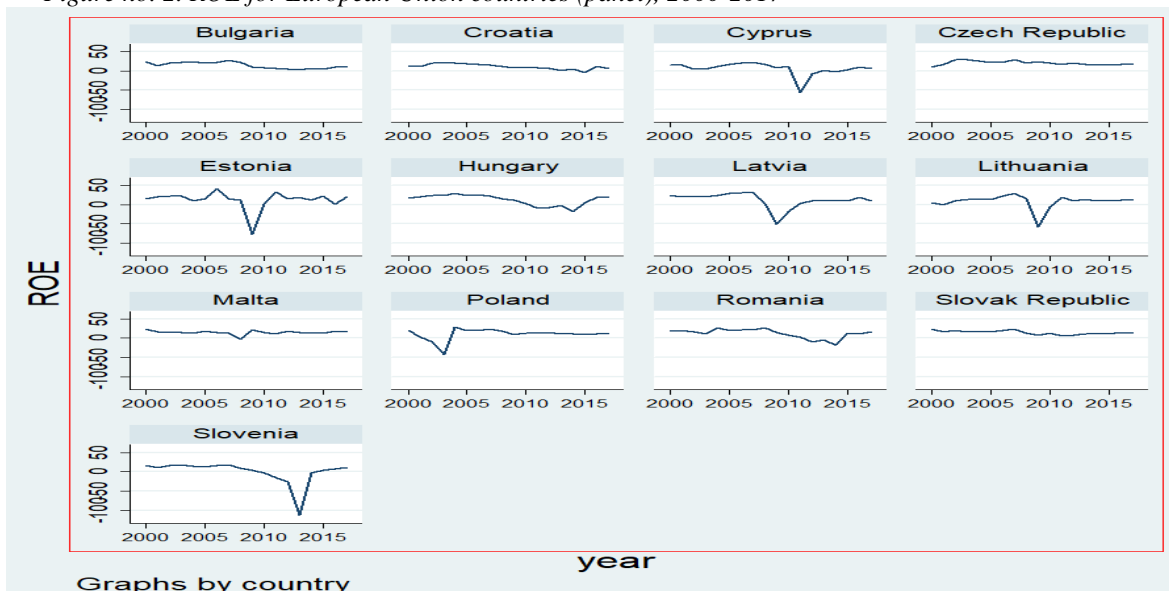
Figure no. 1. ROA for European Union countries (panel), 2000-2017



Source: Authors' calculations

In terms of ROA, surprising is the fact that in several countries (Czech Republic, Croatia, Poland and Slovak Republic) the 2008 financial crisis did not deteriorate their profitability and these banking systems have presented a linear evolution, without major oscillations that lead to a negative level of profitability. Unlike these states, the amplitude of the negative levels of profitability was significantly higher in Estonia, Latvia and Lithuania 2008-2010, Cyprus 2010-2012, Slovenia 2012-2014 and Bulgaria 2013-2015. Hungary and Romania had the atypical evolution and their banks' profitability decreased moderately starting to the year 2008 (year of debut of the financial crisis) and stayed in the negative territory until the year 2015, since then they have started to slowly recover.

Figure no. 2. ROE for European Union countries (panel), 2000-2017



Source: Authors' calculations

In terms of ROE, the banking profitability in the analysed countries has been slowly recovering after the 2008 financial crisis. After reaching the lowest values and results (Cyprus 2010-2012, Estonia, Latvia and Lithuania 2008-2010, Slovenia 2012-2014), ROE remained positive and recorded improvements in all other studied countries. Poland exhibited an atypical behavior, which

presents a short period of the profitability decreasing in the first part of the 2000s, when the banking system has recorded negative results, but after this period, the banks' profitability remained relatively stable.

The paper have the following structure: part 2 presents the literature review, part 3 contains the methodological aspects and data analysis, part 4 describes the findings and part 5 presents the conclusions.

2. Literature review

Our study is in line to previous research of Capraru and Ihnatov (Capraru and Ihnatov, 2014, pp. 587-591), who have used ROE/ROA as proxy for banks profitability and they have obtained statistical influences of macroeconomic factors (inflation and economic growth) on ROA and ROE. They have studied banks' profitability in five selected CEE countries (Romania, Hungary, Poland, Czech Republic and Bulgaria) for 143 commercial banks from 2004 to 2011 and they have studied some internal or external bank factors as independent variables (bank size, capital adequacy, credit risk, management efficiency, liquidity risk, market concentration). These independent variables have been studied by the authors in other papers (Petria et. al., 2015, pp. 518-524) in European Union 27 countries over the period 2004-2011 and the results reveal that the GDP growth has a positive effect on bank profitability, while the inflation seems not to influence the performance.

Previous research studied the banks' profitability in South Africa over the period 2006 to 2015 through generalised methods of Moments (GMM) and panel Two-Stage Least Squares (2SLS) or Pooled IV method as the estimation techniques (Nyoka, 2019, pp. 99-116). The author obtained evidence of a positive relationship between bank capital and profitability (between capital to assets ratio, return on equity ROE and return on assets ROA). Recent studies examined the predictors of ROA and ROE for banks listed on Vietnamese stock market, using a basic OLS regression model, which computed among others variables GDP growth as proxy (Pointer and Khoi, 2019, pp. 185-198). The results show none of macroeconomic variables (including GDP) were predictors of either ROA or ROE.

Different countries have been studied from a bank's profitability point of view. The microeconomic factors (size, capital, loan, deposits) and the external factors (GDP, inflation and stock market capitalization) have a significant impact on the profitability of the banks in Pakistan between 2005 and 2009 (Gul et al, 2011, pp. 61-87). In Central and Eastern Europe between 1993 and 2003 greenfield banks have performed better in terms of ROA than domestic and takeover (Havrylchyk and Jurzyk, 2011, pp. 443-472). The authors have been studied the independent variables regarding the macroeconomic conditions (GDP growth, inflation, real interest rate and change in real effective exchange rate).

Various factors affect bank profitability and a large set of empirical studies has analysed the determinants of bank profitability, that can be allocated specially into some categories regarding the macroeconomic factors or banking specific factors.

3. Research methodology

Our study presents an empirical analysis on some determinants of 13 European Union countries banks' profitability, focusing on relationship between ROE (Bank return on equity - %, before tax) and GDP growth (annual %), Inflation, consumer prices (annual %) and Loans to deposits (%). Also, we study profitability measured by ROA (Bank return on assets %, before tax) and few potential influencing factors: GDP growth (annual %), Inflation, consumer prices (annual %), Loans to deposits (%) and Bank capital to total assets (%).

The empirical analysis is based on a panel that contains 13 European Union countries: Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia. These countries are analysed between 2000 and 2017, based on data available at the World Bank database. ROA and ROE capture data calculated from underlying bank-by-bank unconsolidated data from Bankscope.

The regressors of the model, the explanatory variables used in our analysis are:

- GDP growth (annual %) [estimated effect: +]. This rate reflected the annual growth rate of GDP, in percentage. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.

- Inflation, consumer prices (annual %) [estimated effect: +]. Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.

- Loan_deposits represents the bank credit to bank deposits (%) [estimated effect: -].

- Capital_assets represents the bank capital to total assets (%) [estimated effect: +]. The indicator is calculated as total assets divided by bank capital and reserves.

Note that due to differences in national accounting, taxation, and supervisory regimes, these data are not strictly comparable across countries.

These indicators were determined using annual data extracted from the World Bank databases.

Table no. 1 Descriptive statistics for ROE model

	ROE	GDP_growth	Inflation	Loans_deposits
N - observations	234	234	234	230
Mean	11.34549	3.313966	3.54963	103.8453
Std. Dev.	16.30376	3.961991	4.735478	34.62069
Min	-112.194	-14.81416	-2.096998	36.9543
Max	41.1201	11.8881	45.6666	257.322

Source: Authors' calculations

Table no. 2 Descriptive statistics for ROA model

	ROA	GDP_growth	Inflation	Loans_deposits	Capital_assets
N - observations	234	234	234	230	195
Mean	1.144684	3.313966	3.54963	103.8453	9.200826
Std. Dev.	1.600079	3.961991	4.735478	34.62069	2.263662
Min	-9.98453	-14.81416	-2.096998	36.9543	4.6
Max	4.69987	11.8881	45.6666	257.322	15.3

Source: Authors' calculations

The first step in methodology was to check the stationarity of the variables in the Panel Regression Model with Fisher Test. The estimates are run through OLS panel data method with robust standard errors, consistent with panel-specific autocorrelation and heteroskedasticity. The impact of independent variables on ROE Return on equity or ROA Return on assets is examined on the annual basis through the following baseline models specification.

ROE model

$$ROE = \beta_0 + \beta_1 \times GDP_growth_{i,t} + \beta_2 \times Inflation_{i,t} + \beta_3 \times Loans_deposits_{i,t} + \varepsilon_{i,t} \quad (1)$$

ROA model

$$ROA = \beta_0 + \beta_1 \times GDP_growth_{i,t} + \beta_2 \times Inflation_{i,t} + \beta_3 \times Loans_deposits_{i,t} + \beta_4 \times Capital_assets_{i,t} + \varepsilon_{i,t} \quad (2)$$

where $GDP_growth_{i,t}$ is GDP growth (annual %), $Inflation_{i,t}$ denotes consumer prices (annual %), $Loan_deposits_{i,t}$ represents the bank credit to bank deposits (%), and $Capital_assets_{i,t}$ represents the bank capital to total assets (for country i in year t). $\varepsilon_{ij,t}$ is an iid error term specific to country i in year t .

We have performed the regression based on the variables which were included into the model and we have examined the results. In the ROE model, the sample is comprised of 230 observations and the explanatory index of the model, which consists in the R-squared, is at the medium level of 26,97%. The independent variables explains 26,97% of the variation of ROE.

Table no. 3 Empirical results for ROE model

Number of obs	=	230
F (3,226)	=	10.15
Prob > F	=	0.0000
R-squared	=	0.2697
Root MSE	=	13.079

ROE	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]	
GDP_growth	1.872256	0.3894322	4.81	0.000	1.104873	2.639638
Inflation	0.4349585	0.1639997	2.65	0.009	0.1117945	0.7581225
Loans_deposits	-0.0583938	0.0249947	-2.34	0.020	-0.1076462	-0.0091414
_cons	10.00094	2.502334	4.00	0.000	5.070054	14.93184

Source: Authors' calculations

In the ROA model, the sample is comprised of 191 observations and the explanatory index of the model, which consists in the R-squared, is at the medium level of 30,15%. The independent variables explains 30,15% of the variation of ROE.

Table no. 4 Empirical results for ROA model

Number of obs	=	191
F (4,186)	=	7.76
Prob > F	=	0.0000
R-squared	=	0.3015
Root MSE	=	1.1217

ROE	Coef.	Robust Std. Err.	t	P > t	[95% Conf. Interval]	
GDP_growth	0.1491147	0.0337115	4.42	0.000	0.0826086	0.2156208
Inflation	0.1132742	0.0274375	4.13	0.000	0.0591455	0.1674029
Loans_deposits	-0.0062575	0.0022025	-2.84	0.005	-0.0106026	-0.0019125
Capital_assets	0.0914541	0.0370667	2.47	0.015	0.0183289	0.1645794
_cons	0.1967393	0.4406902	0.45	0.656	-0.6726545	1.066133

Source: Authors' calculations

Tables no. 5 and 6 present the correlation matrix for the variables. There aren't correlations bigger than 0.5 between regressors and all variables used.

Table no. 5 Correlation matrix ROE model

	ROE	GDP_growth	Inflation	Loans_deposits
ROE	1			
GDP_growth	0.4817	1		
Inflation	0.1943	0.1077	1	
Loans_deposits	-0.2138	-0.1581	-0.0757	1

Source: Authors' calculations

Table no. 6 Correlation matrix ROA model

	ROE	GDP_growth	Inflation	Loans_deposits	Capital_assets
ROE	1				
GDP_growth	0.4673	1			
Inflation	0.2535	0.1375	1		
Loans_deposits	-0.1663	-0.1289	0.1894	1	
Capital_assets	0.0856	-0.0617	-0.1432	0.0570	1

Source: Authors' calculations

All variables used in our paper were stationary.

Table no. 7 Fisher-ADF unit root tests – ROE model

Fisher-ADF unit root tests				
	Inv. chi-squared	Inv.N	Inv.L	M.Inv chi-squared
ROE	109.9035 [0.000]	-7.7603 [0.000]	-8.4213 [0.000]	11.6353 [0.000]
GDP_growth	123.8182 [0.000]	-8.4324 [0.000]	-9.4964 [0.000]	13.5649 [0.000]
Inflation	123.9812 [0.000]	-8.2506 [0.000]	-9.4850 [0.000]	13.5875 [0.000]
Loans_deposits	65.6676 [0.000]	-4.5081 [0.000]	-4.6588 [0.000]	5.5009 [0.000]

Source: Authors' calculations

Table no. 8 Fisher-ADF unit root tests – ROA model

Fisher-ADF unit root tests				
	Inv. chi-squared	Inv.N	Inv.L	M.Inv chi-squared
ROA	107.6569 [0.000]	-7.6502 [0.000]	-8.2490 [0.000]	11.3238 [0.000]
GDP_growth	123.8182 [0.000]	-8.4324 [0.000]	-9.4964 [0.000]	13.5649 [0.000]
Inflation	123.9812 [0.000]	-8.2506 [0.000]	-9.4850 [0.000]	13.5875 [0.000]
Loans_deposits	65.6676 [0.000]	-4.5081 [0.000]	-4.6588 [0.000]	5.5009 [0.000]
Capital_assets	89.9586 [0.000]	-6.3493 [0.000]	-6.7670 [0.000]	8.8695 [0.000]

Source: Authors' calculations

Note: Fisher-ADF tests with drift, one lag and cross-sectional means removed. Its null hypothesis states that all panels contain unit roots, with the alternative that at least one panel is stationary. In table are reported the statistics and p-values for the following Fisher tests: inverse chi-squared, inverse normal, inverse logit and modified inverse chi-squared.

4. Results

All the variables are significant at the 5% level in the regression (ROE and ROA models) with the expected sign. The determination coefficient shows that an important variation of banks' profitability (measured by ROE and ROA) is explained by the analyzed variables.

Table no. 9 Determinants of ROE and ROA

Variables	(1) ROE
GDP_growth	1.872*** (0.389)
Inflation	0.435*** (0.164)
loan_deposits	-0.0584** (0.0250)
Constant	10.00*** (2.502)
Observations	230
R-squared	0.270

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(1) ROA_b
GDP_growth	0.149*** (0.0337)
Inflation	0.113*** (0.0274)
loan_deposits	-0.00626*** (0.00220)
Capital_assets	0.0915** (0.0371)
Constant	0.197 (0.441)
Observations	191
R-squared	0.302

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Source: Authors' calculations

The estimation results suggest that ROE and ROA is influenced not only by factors which were analyzed in these models and there are other variables that explain the variation of the dependent variables.

5. Conclusions

The purpose of this paper is to quantify how macroeconomic variables (GDP growth and Inflation) and internal banking factors (Loans to deposits and Capital to assets) contribute to the banks' profitability, measured by ROE Return on equity and ROA Return on assets. In order to present the correlation between these indicators we have used a panel, which present 13 European Union Countries (Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovak Republic and Slovenia) for a period of 18 years, respectively 2000–2017. GDP growth and Inflation have a positive impact on ROE and ROA while Loans to assets are inversly correlated with ROE and ROA as expected. In the ROA model, Capital to assets has a positive impact on ROA, as expected.

6. References

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