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THE IMPACT OF INTERNAL AND MACROECONOMIC FACTORS ON THE PROFITABILITY OF THE BANKING SECTOR. A CASE STUDY OF THE WESTERN BALKAN COUNTRIES

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Abstract. The banking sector in the Western Balkan countries has changed dramatically in recent years. A variety of factors have contributed to these changes, such as economic growth, increased competition, and the implementation of new regulations. As a result, the profitability of the banking sector varies greatly between countries. The purpose of this research is to look into the impact of internal and macroeconomic factors on the profitability of the banking sector in the Western Balkan countries. The research used 85 observations from unbalanced panel data from five countries from 2005 to 2021. Data were gathered from the International Monetary Fund's World Economic Outlook Database, which contains information on the trend and progress of banking in the Western Balkans. The variables used included macroeconomic variables, internal bank variables, and industry variables, with return on assets and return on equity used to measure bank profitability. Panel regression with pooled least squares, fixed effects, and random effects was used to analyze these variables. Internal factors such as bank Z-score, 3-bank asset concentration, bank net interest margin, bank overhead costs to total assets, bank credit to deposits, and bank capital to total assets have a positive impact on profitability, according to the findings. GDP and inflation, for example, have a mixed impact on profitability. The impact of industry factors such as liquid assets, deposits, and short-term funding, as well as bank Z-score, on profitability is mixed. The study's findings have significant implications for policy experts and bank managers in Western Balkan countries. The findings can be used by policymakers to create policies that promote the profitability of the banking sector. The findings can be used by bank managers to improve their banks' profitability by making strategic decisions about asset allocation, capital structure, and risk management.

Keywords: internal factors, macroeconomic factors, profitability, Western Balkans.

JEL Classification: E4, E5, G2.

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1. Introduction

Banks are financial intermediary institutions between economic stakeholders who have shortages and surpluses of monetary funds, as well as optimal distributors of resources in the economy. As a result, banks play an important role in both financial stability and long-term economic development in industrialized and emerging economies. Because of the importance of banks in the economy, recognizing the determinants of their earnings is critical. Banks continue to play an important role in providing economic growth in general and in various segments of the market in particular (Athanasoglou et al., 2008). Bank profitability aids in the prediction of financial crises because a profitable banking sector is better able to withstand negative trends. Furthermore, fluctuations in bank profitability have a negative impact on their ability to issue new capital due to the presence of agency costs and tax hindrances (Cornett & Tehranian, 1994). Some of the authors who addressed this topic, such as Petria et al. (2015), Saeed (2014), Kosmidou et al. (2005), Kosmidou (2008), Obamuyi (2013), Tan and Floros (2012), concluded that bank capital, operational efficiency, interest rate, bank size, loans, and deposits have a positive impact on bank profitability, while liquidity and GDP have a mixed impact. According to the aforementioned authors, inflation and the effective tax rate have a negative impact on bank profitability. Based on these studies and other empirical articles, this study sought to assess the impact of internal and macroeconomic factors affecting bank profitability in Western Balkan states from 2005 to 2021. Based on the literature review, we will divide the factors that will affect bank profitability (ROA and ROE) into three large groups in this paper, such as: I. Bank internal factors (3-bank asset concentration, bank net interest margin, bank overhead costs to total assets, bank credit to bank deposits, bank capital to total assets) II. External macroeconomic factors (GDP per capita and inflation) III. Specific industry factors (liquid assets to deposits, short-term funding, and Z-score coefficient) Furthermore, this paper will help fiscal policy stakeholders understand how GDP and inflation affect the profitability of banks; it will help monetary policy stakeholders understand how liquidity and financial stability will affect the profitability of banks; and it will help bank management understand how bank concentration, net interest rate, operational efficiency, loans and deposits, and bank capital and bank assets will affect the profitability of banks.

2. Literature review

The empirical literature focuses on various categories of determinants that affect bank profitability. Some studies link individual bank profitability to various macro-indicators (Demirgüç-Kunt & Huizinga, 1999; Pasiouras & Kosmidou, 2007; Athanasoglou et al., 2008; Kanwal & Nadeem, 2013). Other authors, on the other hand, link bank profitability to internal factors such as non-performing loans (Salas & Saurina, 2002; Louzis et al., 2012), loan loss provisioning (Bikker & Metzemakers, 2005; Bouvatier & Lepetit, 2008), capital (Pasiouras & Kosmidou, 2007; Berger, 1995; Jacques & Nigro, 1997), the impact of liquidity risk (Hmweck & Kilcollin, 1984).

Another area of study is the role of various factors in bank profitability, such as macroeconomic indicators, banking industry indicators, or internal financial health indicators (e.g. Pasiouras & Kosmidou, 2007; Athanasoglou et al., 2008; Riaz & Mehar, 2013).

The study "What Determines the Profitability of Commercial Banks? New Evidence from Switzerland" analyzes data from 453 Swiss banks (1999–2006) and finds that better-capitalized, privately-owned, Swiss-owned banks with diversified income streams are more profitable, while larger banks face inefficiencies. GDP growth boosts profitability, whereas high taxes and market concentration reduce it. Cost efficiency is crucial, while factors like bank age and deposit growth have limited impact. The findings highlight the importance of strong capital, income diversification, and efficient management for bank profitability (Dietrich & Wanzenried, 2009).

In their 2020 study, "Liquidity Creation and Bank Profitability," Duan and Niu investigate the impact of liquidity creation on bank profitability using panel data regression analysis of U.S. banks. They find that higher levels of liquidity creation generally enhance profitability, with liability-side and off-balance-sheet liquidity creation positively contributing, while asset-side liquidity creation has a negative impact. By decomposing liquidity creation into its components, the study provides a detailed understanding of how different aspects of liquidity creation influence profitability, highlighting its importance in banking operations (Duan & Niu, 2020).

In their research titled "Breaking the Bank? A Probabilistic Analysis of Euro Area Bank Profitability" Elekdag et al. (2020) study the factors influencing the profitability of banks in the euro area using an innovative method involving conditional profitability distributions and quantile regressions to examine the impact of different variables at various levels of profitability distribution. Their results show that the real GDP growth and nonperforming loan (NPL) ratio play roles, in determining bank profitability. According to the findings of the analysis study shows that although higher economic growth typically boosts profits levels for banks can still encounter difficulties even in times of robust economic upturns. Therefore the research recommends that some banks need to prioritize reducing performing loans cutting costs and making targeted changes to their business approaches in order to consistently improve profitability, over time (Elekdag et al., 2020).

Petria's paper on "Determinants of Bank Profitability" analyzed banks from 27 EU countries and categorized them into two groups: bank-specific internal variables and macroeconomic factors specific to the industry. The study found that credit risk, liquidity, management efficiency, business diversification, market concentration/competition, and economic growth all impact bank profitability. The significant impact of competition on bank profitability in the 27 countries of the European Union is noteworthy. ROA and ROE ratios are the most commonly used profit indicators in organizations, showing how well a bank uses managerial efficiency and investment funds to increase profitability (Petria et al., 2015). Capital ratio, credit, deposits, liquidity, and interest rate have positive impacts on ROA and ROE, while GDP and inflation rate have negative impacts (Saeed, 2014).

Golubeva et al. (2019) analyzed 45 European banks (2014–2018) using OLS and WLS regressions to assess the impact of liquidity risk on profitability (ROA, ROE, NPM, EBTDA). They found mixed results: some liquidity measures influenced profitability significantly, but the Basel III Liquidity Coverage Ratio (LCR) had no significant effect. Bank size and loan loss provisions negatively impacted profitability, while other factors showed variable effects.

Bank profitability is positively related to asset management, bank size, and capital ratio (Sahyouni & Wang, 2018). Banks with more liquidity tend to be less profitable, while GDP growth has a positive impact on profitability. Capital strength, efficiency with cost management, and bank size are important factors (Kosmidou et al., 2005). Commercial bank profitability in Kosovo is primarily determined by internal determinants such as capital adequacy, asset quality, and management efficiency (Nuhiu et al., 2017). GDP growth has a significant positive impact on the return on assets average (ROAA), while inflation has a negative impact. A high return on assets average (ROAA) is linked to well-capitalized banks and lower cost-to-income ratios (Kosmidou, 2008). In Nigeria, improvements in bank capital, interest income, efficient expense management, and favorable economic conditions contribute to improved bank performance (Obamuyi, 2013). Inflation negatively impacts bank profitability when banks are net monetary creditors but positively when banks accept call deposits (Perry, 1992). Bankers have learned to better manage interest rates. GDP growth rate, inflation rate, and market concentration all have a positive effect on profitability, while EU membership has a negative effect (Karadi & Nakov, 2021). Higher asset returns are associated with bank size, activity diversification, and private ownership, in addition to credit risk (Flamini et al., 2009). Bank returns are influenced by macroeconomic variables, and policies that promote low inflation and stable output growth encourage credit expansion. Significant investment and credit-to-asset ratios, as well as favorable macroeconomic conditions, all have a positive impact on profitability (Hassan & Bashir, 2003). Holding liquid assets has a positive effect on bank profitability up to a point, but there is a point at which holding other liquid assets reduces a bank's profitability (Bordeleau & Graham, 2010).

Monetary policy significantly impacts bank profitability. A study from 1995–2012 found a positive relationship between short-term interest rate levels and the yield curve slope and ROA (Borio et al., 2017). Banks face crises when the macroeconomic environment is weak, especially when economic growth is low and inflation is high. High real interest rates are linked to systemic problems in the banking sector, including vulnerability to balance of payments crises and lax law enforcement. Low interest rates harm bank performance and eat away at net interest margins (Demirgüç-Kunt & Detragiache, 1998).

Karadžić and Đalović (2021) analyzed profitability determinants in 47 large European banks (2013–2018) using panel data models and GMM. They found that macroeconomic factors like GDP growth, inflation, and market concentration positively impacted profitability, while EU membership had a negative effect. Internal factors such as size and capital adequacy were not significant.

Parrado-Martínez et al. (2019) used the SYMBOL methodology and dynamic panel data models to analyze factors influencing European banks' probability of default (PD) from 2011 to 2016. They found that both bank-specific factors, such as capital adequacy and liquidity, and macroeconomic variables significantly impact PD, highlighting the methodology's effectiveness in assessing bank stability under Basel regulations.

Deposits and profitability indicators have a strong relationship, with savings deposits contributing the most to bank profitability (Haddaweea & Flayyihb, 2020). In China, there is a negative relationship between GDP growth and bank profitability. Cost management efficiency is positively related to bank profitability, while higher taxes negatively impact Chinese bank profitability (Tan & Floros, 2012). Countercyclical fiscal policies that boost aggregate demand help shorten the duration of crises. Foreign banks have higher profits in developing countries, but the opposite is true in developed countries (Baldacci et al., 2009). An increase in foreign banks is associated with a decrease in profitability and profits for domestic banks (Claessens et al., 2001).

According to recent studies, both internal and external macroeconomic factors have a significant impact on bank profitability. According to Veríssimo et al. (2021), loan loss provision costs have a three-fold greater effect on peripheral banks' profitability than they do on core banks. According to Joaqui-Barandica et al. (2022), the most significant macroeconomic factors affecting bank profitability are household financial burden, economic activity, household income, net worth, and financial market stress. Profitability is impacted positively by asset-side liquidity creation and negatively by asset-side liquidity creation. According to other studies, industry stability and macroeconomic factors have an impact on bank NLPs and profitability. Gashi et al. (2022) analyzed the impact of macroeconomic factors on non-performing loans (NPLs) in the Western Balkans (2000–2019) using GMM, Fixed Effects, and Random Effects models. They found that GDP growth, government consumption, real interest rates, savings, and unemployment significantly affect NPL levels, highlighting the need for targeted policies to reduce credit risk.

The hypotheses to tested are:

H1: Banks' internal factors have a positive impact on the profitability of banks.

H2: Macroeconomic factors have a positive impact on the profitability of banks.

H3: Industry factors have a positive impact on the profitability of banks.

H4: Financial stability has a positive linear relationship with the profitability of banks.

3. Methodology

The Western Balkan countries are used in this study to examine how internal and macroeconomic factors affect the profitability of the banking sector. These are the bank Z-score, three-bank asset concentration, net interest margin, overhead costs to total assets, credit to deposits, and capital to total assets. Liquid assets to deposits, short-term funding, and bank Z-score are all industry factors. GDP and inflation are examples of macroeconomic factors.

We used unbalanced panel data from five countries from 2005 to 2021 for this study. Albania is included on the list. Serbia, Montenegro, North Macedonia, and Bosnia and Herzegovina are the other countries on the list, each with 85 observations. Data were gathered from the International Monetary Fund's World Economic Outlook Database, which contains information on the Trend and Progress of Banking in the Western Balkans. We chose a few significant variables that were expected to have a significant impact on profitability based on the literature. The variables are briefly listed in Table 1 below.

Table 1. Summary of variables

Type of Variables	Variables	Description of Variables
Dependent Variables	ROA	Bank return on assets (%, before tax) ROA
	ROE	Bank return on equity (%, before tax) ROE
Macro-economic variables	GDP per capita	Gross domestic product, constant prices %
	INFLA	Inflation, average consumer prices %
Sector variables	LIQ	Liquid assets to deposits and short-term funding (%)
	Z-score	Bank Z-score
Internal Variables (Controller)	3-BAC	3-bank asset concentration (%)
	BNIM	Bank net interest margin (%)
	OE (BOCTTA)	Bank overhead costs to total assets (%)
	BCTBD	Bank credit to bank deposits (%)
	BCTTA	Bank capital to total assets (%)

The current study looks at balanced panel data from Western Balkan countries between 2005 and 2021. (Summary statistics for the variables used are shown in Table 2). We used fixed effect and random effect estimations on the model under consideration. Fixed effects are typically preferred over random effect estimates because they produce more reliable results. Fixed effect estimates are more reliable than random effect estimates because they do not rely on the assumption that each individual error term (ε_{it}) is unrelated to the regressors (β_s). The Hausman test was also used to distinguish between fixed and random effect estimates.

The Panel Data Regression Model can be written as:

$$Y_{it} = \alpha_i + \beta X'_{it} + \varepsilon_{it}, \quad \forall i, j, \tag{1}$$

where: i is the individual dimension and t is the time dimension Y_{it} is the response of individual i at time t; α_i are the unobserved individual-specific, time-invariant intercepts X_{it} is the explanatory variable i at time t; β is a vector of regression coefficients, and ε_{it} is the error term of individual i at time t.

They are also known as idiosyncratic errors because they change across i as well as across t.

The T observations for individual i can be summarized as:

$$y_i = X_i\beta + \alpha_i i_T + \varepsilon_i, \tag{2}$$

for i = 1, 2, ... N, where y_i and ε_i are T-vectors and X_i is a $T \times K$ matrix,

$$\underset{(T\times 1)}{y_i} = \begin{bmatrix} y_{i1} \\ y_{i2} \\ \vdots \\ y_{iT} \end{bmatrix}, \quad \underset{(T\times k)}{X_i} = \begin{bmatrix} x'_{i1} \\ x'_{i2} \\ \vdots \\ x'_{iT} \end{bmatrix} = \begin{bmatrix} x_{1i1} & x_{2i1} & \cdots & x_{ki1} \\ x_{1i2} & x_{2i2} & \cdots & x_{ki2} \\ \vdots & \vdots & \ddots & \vdots \\ x_{1iT} & x_{2iT} & \cdots & x_{iT} \end{bmatrix},$$

$$\underset{(T\times 1)}{i} = \begin{bmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{bmatrix}, \quad \underset{(T\times 1)}{\varepsilon_i} = \begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \vdots \\ \varepsilon_{iT} \end{bmatrix} \tag{3}$$

and $\alpha_i = \alpha_i i_T$. Then, stacking the entire data set by individuals,

$$\underset{(NT\times 1)}{Y} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix} = \begin{bmatrix} y_{i1} \\ \vdots \\ y_{iT} \\ \vdots \\ y_{N1} \\ \vdots \\ y_{NT} \end{bmatrix},$$

$$\underset{(NT\times K)}{X} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_N \end{bmatrix} \underset{(NT\times 1)}{\varepsilon} = \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_N \end{bmatrix}, \tag{4}$$

$$\underset{(N\times 1)}{\alpha} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \vdots \\ \alpha_N \end{bmatrix}, \quad \underset{(K\times 1)}{\beta} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_N \end{bmatrix}.$$

Then we can write this as:

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix} = \begin{bmatrix} i \\ 0 \\ \vdots \\ 0 \end{bmatrix}\alpha_1 + \begin{bmatrix} 0 \\ i \\ \vdots \\ 0 \end{bmatrix}\alpha_2 + \ldots$$
$$+ \begin{bmatrix} 0 \\ 0 \\ \vdots \\ i \end{bmatrix}\alpha_N + \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_N \end{bmatrix}\beta + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_N \end{bmatrix}. \tag{5}$$

Then the data can be represented by the single (relatively simple) equation by pilling over all observations on top as

$$Y = X\beta + \alpha + \varepsilon. \tag{6}$$

The specification of determinants of profitability to be estimated has been formulated in the following equation:

Model 1: $ROA_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 INFLA_{it} + \varepsilon_{it};$

Model 2: $ROA_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 ZScore_{it} + \varepsilon_{it};$

Model 3: $ROA_{it} = \beta_0 + \beta_1 BAC_{it} + \beta_2 BNIM_{it} + \beta_3 BOCTTA_{it} + \beta_4 BCTBD_{it} + \beta_5 BCTTA_{it} + \varepsilon_{it};$

Model 4: $ROE_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 INFLA_{it} + \varepsilon_{it};$

Model 5: $ROE_{it} = \beta_0 + \beta_1 LIQ_{it} + \beta_2 ZScore_{it} + \varepsilon_{it};$

Model 6: $ROE_{it} = \beta_0 + \beta_1 BAC_{it} + \beta_2 BNIM_{it} + \beta_3 BOCTTA_{it} + \beta_4 BCTBD_{it} + \beta_5 BCTTA_{it} + \varepsilon_{it},$

where: *ROA* is Bank return on assets (%, before tax), *ROE* is Bank return on equity (%, before tax), *GDP* per capita is Gross domestic product, constant prices %, *INFLA* is Inflation, average consumer prices %, *LIQ* is Liquid assets to deposits and short-term funding (%), Z-score is Bank Z-score, 3-BAC is 3-bank asset concentration (%), BNIM is Bank net interest margin (%), OE (*BOCTTA*) is Bank overhead costs to total assets (%), *BCTBD* is Bank credit to bank deposits (%), *BCTTA* is Bank capital to total assets (%), $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$, are the coefficients of determinant variables and ε_{it} is the error term.

We created a panel with the indices '*i*' and '*t*' representing country and year, respectively. The data set included five countries and spanned 17 years (2005–2021). There were 85 total observations.

4. Results

Data analyses are divided into descriptive analysis, correlation analysis, and empirical analysis.

This section investigates the data distribution's normality. Descriptive statistics are shown in Table 2. The mean-median ratio is close to one, indicating that the data are normally distributed. Low error numbers indicate a small coefficient of variation when compared to the mean and standard deviation. The Jarque-Bera normality test was used to determine whether the data were normal. The results are shown in Table 2.

Table 2 shows the descriptive statistics for the variables. According to the table, the average profitability as determined by ROA and ROE was 0.86 percent and 6.8 percent, respectively. On average, the annual rate of inflation is 2.82 percent. Furthermore, the table figures show that the data has been standardized using Jarque-Bera statistics and is ready for further investigation.

The correlation matrix table shows the coefficients of correlation between the dependent and independent variables. A high level of independent variable collinearity is unacceptable. In addition, if there is a strong correlation between variables, those variables are excluded and treated separately. There is no multicollinearity between macroeconomic, sectoral, and internal variables and profitability measures, according to the table below (ROA and ROE).

Table 2. Descriptive statistics (2005–2021)

	ROA	ROE	GDP	INFLA	LIQ	ZScore	BAC	BNIM	OE(BOCTTA)	BCTBD	BCTTA
Mean	0.864	6.802	2.922	2.82	33.07	13.654	58.57	4.492	3.903	93.17	8.849
Median	0.916	6.711	3.315	2.053	30.48	13.235	56.58	4.309	3.267	95.58	10.167
Maximum	–4.342	–41.22	–15.307	–1.584	15.01	4.102	35.53	2.047	1.333	29.12	0
Minimum	2.431	29.021	13.043	16.253	60.83	23.781	97.39	8.385	14.601	168.84	23.6
Std. Dev.	0.931	8.476	3.784	3.146	10.3	4.628	14.42	1.057	2.717	27.53	6.853
Skewness	–2.36	–2.01	–1.4	1.84	0.74	0.35	0.41	1.54	2.76	0.08	0.05
Kurtosis	11.45	12.81	6.09	4.31	0.08	–0.64	–0.52	3.85	7.4	0.22	–0.91
Jarque-Bera	482.457	564.708	140.465	102.531	7.4771	3.2468	3.3464	77.1415	272.52	0.16011	3.0795
Prob.	1.72063e-105	2.37257e-123	3.15086e-031	5.44097e-023	0.02378	0.1972	0.18764	1.77391e-017	6.65291e-060	0.9230	0.2144

Note: ROA is Bank Return On Assets (%, before tax), ROE is Bank Return On Equity (%, before tax), GDP per capita is Gross Domestic Product, constant prices %, INFLA is Inflation, average consumer prices %, LIQ is Liquid assets to deposits and short term funding (%), Z-score is Bank Z-score, 3-BAC is 3-Bank Asset Concentration (%), BNIM is Bank Net Interest Margin (%), OE (BOCTTA) is Bank Overhead Costs To Total Assets (%), BCTBD is Bank Credit To Bank Deposits (%), BCTTA is Bank Capital To Total Assets (%).

Table 3. Correlation matrix

	ROA	ROE	GDP	INFLA	LIQ	Z-score	3-BAC	BNIM	OE (BOCTTA)	BCTBD
ROE	0.928									
GDP	0.208	0.227								
INFLA	0.065	–0.021	0.258							
LIQ	0.296	0.323	0.279	0.127						
Z-score	0.291	0.325	–0.022	–0.083	–0.073					
3-BAC	0.027	0.187	0.090	–0.178	0.206	–0.226				
BNIM	0.133	0.023	0.130	0.617	0.249	–0.056	–0.329			
OE (BOCTTA)	–0.032	–0.146	–0.025	0.634	0.096	–0.108	–0.454	0.669		
BCTBD	–0.364	–0.470	–0.129	0.316	–0.225	–0.568	–0.277	0.245	0.339	
BCTTA	0.200	0.136	–0.113	0.323	0.022	0.394	–0.371	0.525	0.471	0.108

Note: ROA is Bank Return On Assets (%, before tax), ROE is Bank Return On Equity (%, before tax), GDP per capita is Gross Domestic Product, constant prices %, INFLA is Inflation, average consumer prices %, LIQ is Liquid assets to deposits and short term funding (%), Z-score is Bank Z-score, 3-BAC is 3-Bank Asset Concentration (%), BNIM is Bank Net Interest Margin (%), OE (BOCTTA) is Bank Overhead Costs To Total Assets (%), BCTBD is Bank Credit To Bank Deposits (%), BCTTA is Bank Capital To Total Assets (%).

ROA and GDP have a correlation of 0.208, while BNIM and OE have a correlation of 0.669. (BOCTTA). Obviously, the latter has a stronger correlation. All of the variable coefficient values are less than 0.669, indicating that there is no multicollinearity problem for these variables (Table 3).

The pool regression model is currently being run. Because the considered model rejects data heterogeneity and individuality, we also used the fixed effect method, which allows for country heterogeneity or individuality.

To choose the best specification, the Hausman test, as well as fixed and random effect regressions, were used. According to random effect estimates, GDP had a significant effect on profitability. In contrast, the GDP had a positive effect, whereas the INFLA had a negative effect. According to the findings, INFLA has no effect on profitability. Fixed effect estimates yield the same results as random effect estimates. According to fixed effect analyses, GDP has a positive impact on bank profitability while INFLA has a negative impact (ROA). R-square was found to be 0.329 in the fixed effect test, indicating model fitness. Furthermore, the Durbin Watson stat value of 1.56 for this model indicates that the variables have no autocorrelations (Table 4).

The Hausman test was used to determine which test should be used between fixed and random effect estimates. The use of fixed effect estimates over random effect estimates was confirmed because the p value was less than 0.05. The Hausman test results are shown in Table 5.

According to random effect estimates, LIQ and Z-Score had a significant influence on profitability. LIQ and Z-Score, on the other hand, had a positive effect. Fixed effect estimates produce the same results as random effect estimates. Fixed effect calculations show that LIQ and Z-Score have a positive relationship with bank profitability (ROA). The fixed effect test revealed that the model was fit, as evidenced by the R-square value of 0.417. This model's Durbin Watson stat value is also 1.44, indicating that there is no autocorrelation among the variables (Table 6).

Between fixed and random effect estimates, the Hausman test was used to determine which test should be used. Because the p value was less than 0.05, the use of fixed effect estimates over random effect estimates was confirmed. Table 7 displays the Hausman test results.

BNIM and BCTBDP had a significant impact on profitability, according to random effect estimations. While

Table 4. Regression equation for effect of macroeconomic variables on profitability (ROA)

Variables	Pooled Least Square		Fixed Effect Estimates		Random Effect Estimates	
	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
GDP	0.0503	1.83	0.0517	2.16	0.0515	2.18
INFLA	0.0035	0.11	–0.0139	–0.41	–0.0123	–0.38
C	0.7065	4.84	0.7517	5.70	0.7478	2.15
R-Squared	0.0432		0.3290		0.0404	
Adjusted R-Squared	0.0199					
Prob(F-statistic)	0.1634		0.0000		0.0898	
Durbin-Watson stat	1.0904		1.5628		1.5628	

Table 5. Hausman test

Test Summary	Chi-Sq Statistic	Df	Prob.
Cross-section random	43.2658	1	4.77861e-011

Table 6. Regression Equation for Effect of Industry Variables on Profitability (ROA)

Variables	Pooled Least Square		Fixed Effect Estimates		Random Effect Estimates	
	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
LIQ	0.0287	3.19	0.0306	3.73	0.0284	3.26
Z-Score	0.0633	3.15	0.1259	2.87	0.0669	3.03
C	–0.9521	–2.21	–1.8702	–2.55	–0.9914	–2.20
R-Squared	0.1857		0.4170		0.1854	
Adjusted R-Squared	0.1658					
Prob(F-statistic)	0.0002		0.0000		0.0001	
Durbin-Watson stat	1.1315		1.4397		1.4397	

Table 7. Hausman test

Test Summary	Chi-Sq Statistic	Df	Prob.
Cross-section random	22.1387	2	1.55827e-005

BCTBD and BCTTA had negative effects, BAC, BNIM, and OE (BOCTTA) had positive effects. The findings show that IBAC, OE (BOCTTA), and BCTTA have no effect on profitability. Fixed effect estimates produce different results than random effect estimates. Fixed effect estimates show that BAC, BNIM, and OE (BOCTTA) have a positive impact on bank profitability, whereas BCTBD and BCTTA have a negative impact (ROA). The model is fit with an R-square value of 0.429, according to the results of the fixed effect test. The Durbin Watson stat value for this model is also 1.65, indicating that there is no autocorrelation between the variables (Table 8).

Between fixed and random effect estimates, the Hausman test was used to determine which test should be used. Because the p value was less than 0.05, the use of fixed effect estimates over random effect estimates was confirmed. Table 9 displays the Hausman test results.

GDP had a significant impact on profitability, according to random effect estimates (ROE). The GDP, on the other hand, had a positive effect, whereas the INFLA had a negative effect. According to the findings, INFLA has a negligible impact on profitability. Fixed effect estimates produce different results than random effect estimates. Fixed effect estimates show that GDP has a positive impact on bank profitability (ROE), whereas INFLA has a negative impact (ROE). The R-square value of 0.335 demonstrated the model's fitness in the fixed effect test. Furthermore, the Durbin Watson stat value of 1.53 for this model indicates that there are no autocorrelations among the variables (Table 10).

Between fixed and random effect estimates, the Hausman test was used to determine which test should be used. Because the p value was less than 0.05, the use of fixed effect estimates over random effect estimates was confirmed. Table 11 displays the Hausman test results.

LIQ and Z-Score have a significant impact on profitability, according to random effect estimates (ROE). LIQ and Z-Score, on the other hand, had a positive effect.

Table 8. Regression equation for effect of internal variables on profitability (ROA)

Variables	Pooled Least Square		Fixed Effect Estimates		Random Effect Estimates	
	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
BAC	–0.0000337	–0.00	0.0033	0.33	0.0025	0.26
BNIM	0.1937	1.55	0.2634	2.30	0.2515	2.23
OE(BOCTTA)	–0.0468	–0.94	0.0121	0.24	0.0039	0.08
BCTBD	–0.0132	–3.64	–0.0160	–3.18	–0.0159	–3.37
BCTTA	0.0259	1.56	–0.0421	–1.84	–0.0334	–1.558
C	1.1830	1.55	1.3039	1.65	1.3521	1.62
R-Squared	0.2144		0.4294		0.2144	
Adjusted R-Squared	0.1647					
Prob(F-statistic)	0.0016		0.0000		0.0006	
Durbin-Watson stat	1.2129		1.6549		1.6549	

Table 9. Hausman test

Test Summary	Chi-Sq Statistic	Df	Prob.
Cross-section random	3.5221	4	0.474518

Table 10. Regression equation for effect of macroeconomic variables on profitability (ROE)

Variables	Pooled Least Square		Fixed Effect Estimates		Random Effect Estimates	
	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
GDP	0.5581	2.24	0.4876	2.25	0.4941	2.30
INFLA	–0.2288	–0.77	–0.0979	–0.32	–0.1124	–0.38
C	5.8160	4.41	5.6528	4.73	5.6747	1.99
R-Squared	0.0584		0.3358		0.0569	
Adjusted R-Squared	0.0354					
Prob(F-statistic)	0.0850		0.0000		0.0680	
Durbin-Watson stat	1.1169		1.5368		1.5368	

Table 11. Hausman test

Test Summary	Chi-Sq Statistic	Df	Prob.
Cross-section random	0.717734	2	0.698467

Fixed effect estimates produce different results than random effect estimates. Fixed effect calculations show a positive relationship between LIQ and Z-Score and bank profitability (ROE). LIQ has a significant impact on revenue (ROE). The fixed effect test revealed that the model was fit, as evidenced by the R-square value of 0.377. This model's Durbin Watson stat value is also 1.50, indicating that there is no autocorrelation among the variables (Table 12).

Between fixed and random effect estimates, the Hausman test was used to determine which test should be used. Because the p value was less than 0.05, the use of fixed effect estimates over random effect estimates was confirmed. Table 13 displays the Hausman test results.

BNIM and BCTBD had a significant impact on profitability, according to random effect estimates (ROE). While BCTBD and BCTTA had negative effects, BAC, BNIM, and OE (BOCTTA) had positive effects. According to the findings, the effects of BAC, OE (BOCTTA), and BCTTA on profitability are negligible. Fixed effect estimates produce the same results as random effect estimates. Fixed effect estimates show that BAC, BNIM, and OE (BOCTTA) have a positive impact on bank profitability, whereas IBCTBD and BCTTA have a negative impact (ROE). The model is fit, according to the results of the fixed effect test, with an R-square value of 0.437. This model's Durbin Watson stat value is also 1.64, indicating that there is no autocorrelation among the variables (Table 14).

Between fixed and random effect estimates, the Hausman test was used to determine which test should be used. Because the p value was less than 0.05, the use of fixed effect estimates over random effect estimates was confirmed. Table 15 displays the results of the Hausman test.

We attempted to investigate how macroeconomic (GDP and INFLA) and internal (3-BAC, BNIM, OE (BOCTTA), BCTBD, and BCTTA) factors affect bank profitability in this study. Numerous studies have been conducted to investigate bank profitability and how it relates to external,

Table 12. Regression equation for effect of industry variables on profitability (ROE)

Variables	Pooled Least Square		Fixed Effect Estimates		Random Effect Estimates	
	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
LIQ	0.2867	3.58	0.2521	3.26	0.2719	3.59
Z-Score	0.6425	3.60	0.2822	0.68	0.5437	2.08
C	–11.4512	–3.00	–5.3913	–0.78	–9.6139	–1.96
R-Squared	0.2266		0.3772		0.2257	
Adjusted R-Squared	0.2077					
Prob(F-statistic)	0.0000		0.0000		0.0005	
Durbin-Watson stat	1.1582		1.5020		1.5020	

Table 13. Hausman test

Test Summary	Chi-Sq Statistic	Df	Prob.
Cross-section random	4.15848	2	0.125025

Table 14. Regression equation for effect of internal variables on profitability (ROE)

`	Pooled Least Square		Fixed Effect Estimates		Random Effect Estimates	
	Coefficients	t-statistic	Coefficients	t-statistic	Coefficients	t-statistic
BAC	0.0773	1.19	0.1411	1.53	0.1302	1.53
BNIM	1.2449	1.15	2.2262	2.15	2.0660	2.02
OE(BOCTTA)	–0.4368	–1.01	0.2409	0.52	0.1372	0.31
BCTBD	–0.1379	–4.37	–0.1522	–3.33	–0.1524	–3.60
BCTTA	0.2694	1.87	–0.3315	–1.60	–0.2364	–1.22
C	8.8521	1.34	4.7188	0.66	5.6553	0.76
R-Squared	0.2889		0.4367		0.2889	
Adjusted R-Squared	0.2449					
Prob(F-statistic)	0.0000		0.0000		0.0000	
Durbin-Watson stat	1.3200		1.6404		1.6404	

Table 15. Hausman test

Test Summary	Chi-Sq Statistic	Df	Prob.
Cross-section random	3.37919	4	0.49684

internal, and macroeconomic issues. The research provided the foundation for developing the study hypotheses.

At a 5% level of significance, evidence suggests that GDP has a negative relationship with bank profitability (ROA and ROE). While BAC, BNIM, and OE (BOCTTA) have a positive impact on profitability (ROA and ROE), BAC, OE (BOCTTA), and BCTTA have little influence on bank profitability. This implies that LIQ has a significant impact on bank profitability. According to Kiganda (2014), macroeconomic factors (real GDP, inflation, and exchange rate) have a negligible impact on bank profitability in Kenya, with Bank Equity being the focus at the 5% relevance threshold. The Amman Stock Exchange Index, construction licensed square meters, and money supply growth, according to Al-Qudah and Jaradat (2013), are reliable indicators of Islamic bank profitability. Profitability is significantly influenced positively by the GDP growth rate, inflation, currency rate, oil prices, and money supply, according to Ali et al. (2018) research. The findings also revealed that GDP, inflation, and oil prices were the most important predictors of profitability, while the exchange rate and money supply had the least impact. GDP and inflation rates, according to Saeed (2014), have a negative impact. According to Kanwal and Nadeem (2013), real GDP has a negligibly negative impact on ROE and EM but a negligibly positive impact on ROA.

5. Conclusions

Bank profitability in Western Balkan countries is influenced by a variety of internal and external factors, but this study only considers three of them: macroeconomic, industry, and internal factors. The inclusion of two major macroeconomic variables (GDP and Inflation), three internal variables (3-BAC, BNIM, OE (BOCTTA)), BCTBD, and BCTTA, two industry variables (LIQ and Z-Score), and two internal variables (3-BAC, BNIM, OE (BOCTTA)) was made possible by the ease with which quantified data for these variables can be obtained from secondary resources and the frequency with which these variables have previously been studied. ROA and ROE will be used as stand-ins for profitability in the cumulative analysis. The analysis of 17 years of data from 5 countries (2005–2021) with a total of 85 observations using POLS regression, Fixed Effect, and Random Effect confirmed that, in general, the selected macroeconomic factors contributed noticeably to the profits of sampled countries. As a result, banks must focus more on other external factors or develop policies to improve internal factors in order to maximize risk-adjusted returns.

The Western Balkan banking sector is facing a number of challenges, including low profitability, high non-performing loans, and a lack of competition. This study investigates the impact of internal and macroeconomic factors on banking sector profitability in Western Balkan countries. Internal factors such as bank Z-score, 3-bank asset concentration, bank net interest margin, bank overhead costs to total assets, bank credit to deposits, and bank capital to total assets are found to have a significant impact on profitability, according to the study. Profitability is also influenced by macroeconomic factors such as GDP growth and inflation.

The findings of the study have a number of theoretical and managerial implications. First, the study confirms the importance of internal factors for profitability, such as bank Z-score, 3-bank asset concentration, bank net interest margin, bank overhead costs to total assets, bank credit to deposits, and bank capital to total assets. This implies that banks should prioritize these factors in order to increase their profitability. Second, the study confirms the importance of macroeconomic factors for profitability, such as GDP growth and inflation. This implies that banks should keep an eye on these variables and adjust their strategies accordingly.

The study's findings can be used to improve the profitability of banks in Western Balkan countries. Banks can improve their profitability and remain competitive in the market by focusing on improving internal factors and monitoring macroeconomic factors.

The study's specific managerial implications include the following: larger banks are typically more profitable than smaller banks. This is due to economies of scale and the ability to spread costs across a larger number of customers; banks with higher capital adequacy are typically more profitable because they are less likely to fail; A healthy loan portfolio is critical to profitability. Banks should carefully screen borrowers and make loans only to those who are likely to repay them, and macroeconomic factors such as GDP growth and inflation can have a significant impact on profitability. Banks should keep an eye on these variables and adjust their strategies accordingly.

The study's findings provide valuable insights for banks in the Western Balkan countries. By focusing on improving internal factors and monitoring macroeconomic factors, banks can improve their profitability and remain competitive in the market.

The recommended that in order to maintain their profitability, banks in the WBCs need to focus on improving their internal efficiency and risk management. They should also closely monitor macroeconomic conditions and take steps to mitigate the risks associated with economic slowdowns, rising inflation.

In addition, banks in the WBCs should continue to invest in financial integration and regulatory reforms. These measures will help to create a more stable and competitive banking sector, which will ultimately benefit businesses and consumers in the region.

The following are some areas for future research on the impact of internal and macroeconomic factors on the profitability of the banking sector in the Western Balkan countries:

- Digitalization significantly impacts the banking sector, as banks shift operations online, altering customer interactions, costs, and revenue. Future research should explore Western Balkan banks' profitability.
- The COVID-19 pandemic significantly impacted the global economy, impacting the banking sector. Eco-

nomic activity decreased, loan demand decreased, and unemployment increased. Future research could explore Western Balkan bank profitability.
- Regulating changes significantly impact the banking sector's profitability, with new capital requirements increasing costs. Future research should explore Western Balkan countries' banks' profitability.
- Competition in the banking sector impacts profitability, as new and existing banks expand, putting pressure on margins. Future research should explore Western Balkan countries' impact.

Below are some of the limitations:
- The study is limited to the countries of the Western Balkans. The results may not be applicable to other regions or countries.
- The study only takes a few factors into account. Many other factors, such as regulatory changes, technological advancements, and competition, could have an impact on the banking sector's profitability.
- The research relies on secondary data. This means that the information was gathered by other researchers and may be inaccurate or incomplete.
- The study could be expanded to cover a longer time span. This would enable a more thorough examination of the impact of macroeconomic factors on bank profitability.
- The study could be expanded to include more countries. This would allow for a broader view of the issue of bank profitability.
- A more rigorous methodology could be used for the study. The findings would be more reliable as a result.

Author contributions

To the research approach, all writers contribute equally.

Arsim Hoxha is responsible for drafting the conceptual ideas of manuscript, writing development of the hypothesis, the literature review, limitations of the study, future research and conclusions.

Roberta Bajrami is responsible for data collections, processing statistical data, methods, use STATA software for analyses, discussions and managing online submissions of articles.

Ylber Prekazi is responsible for writing introduction and part of literature review.

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APPENDIX

Model 16: Pooled OLS, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	0.706572	0.145911	4.842	<0.0001	***
GDP	0.0503158	0.0275134	1.829	0.0711	*
INFLA	0.00355066	0.0330923	0.1073	0.9148	

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	69.66470	S.E. of regression	0.921721
R-squared	0.043225	Adjusted R-squared	0.019889
F(2, 82)	1.852305	P-value(F)	0.163379
Log-likelihood	−112.1541	Akaike criterion	230.3082
Schwarz criterion	237.6361	Hannan-Quinn	233.2557
rho	0.437098	Durbin-Watson	1.090492

Model 17: Pooled OLS, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	−0.952119	0.430127	−2.214	0.0296	**
LIQ	0.0287898	0.00903374	3.187	0.0020	***
ZScore	0.0632635	0.0201016	3.147	0.0023	***

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	59.29167	S.E. of regression	0.850335
R-squared	0.185688	Adjusted R-squared	0.165827
F(2, 82)	9.349281	P-value(F)	0.000220
Log-likelihood	−105.3020	Akaike criterion	216.6040
Schwarz criterion	223.9320	Hannan-Quinn	219.5516
rho	0.419539	Durbin-Watson	1.131555

Model 18: Pooled OLS, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	1.18308	0.762652	1.551	0.1248	
BAC	−3.36786e-05	0.00747881	−0.004503	0.9964	
BNIM	0.193715	0.124944	1.550	0.1250	
OEBOCTTA	−0.0468624	0.0500942	−0.9355	0.3524	
BCTBD	−0.0132520	0.00364558	−3.635	0.0005	***
BCTTA	0.0259867	0.0166358	1.562	0.1223	

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	57.20187	S.E. of regression	0.850926
R-squared	0.214390	Adjusted R-squared	0.164668
F(5, 79)	4.311756	P-value(F)	0.001609
Log-likelihood	−103.7770	Akaike criterion	219.5540
Schwarz criterion	234.2100	Hannan-Quinn	225.4491
rho	0.383372	Durbin-Watson	1.212971

Model 19: Pooled OLS, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	5.81602	1.31789	4.413	<0.0001	***
GDP	0.558142	0.248505	2.246	0.0274	**
INFLA	−0.228804	0.298894	−0.7655	0.4462	

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	5683.224	S.E. of regression	8.325119
R-squared	0.058351	Adjusted R-squared	0.035384
F(2, 82)	2.540632	P-value(F)	0.085007
Log-likelihood	−299.2212	Akaike criterion	604.4425
Schwarz criterion	611.7704	Hannan-Quinn	607.3900
rho	0.397630	Durbin-Watson	1.116912

Model 20: Pooled OLS, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	−11.4512	3.81650	−3.000	0.0036	***
LIQ	0.286711	0.0801559	3.577	0.0006	***
ZScore	0.642513	0.178361	3.602	0.0005	***

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	4667.989	S.E. of regression	7.544978
R-squared	0.226564	Adjusted R-squared	0.207700
F(2, 82)	12.01023	P-value(F)	0.000027
Log-likelihood	−290.8577	Akaike criterion	587.7153
Schwarz criterion	595.0433	Hannan-Quinn	590.6628
rho	0.389422	Durbin-Watson	1.158215

Model 21: Pooled OLS, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	8.85212	6.60586	1.340	0.1841	
BAC	0.0773626	0.0647793	1.194	0.2360	
BNIM	1.24491	1.08223	1.150	0.2535	
OEBOCTTA	−0.436878	0.433901	−1.007	0.3171	
BCTBD	−0.137949	0.0315769	−4.369	<0.0001	***
BCTTA	0.269473	0.144094	1.870	0.0652	*

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	4291.577	S.E. of regression	7.370466
R-squared	0.288932	Adjusted R-squared	0.243927
F(5, 79)	6.420089	P-value(F)	0.000047
Log-likelihood	−287.2845	Akaike criterion	586.5690
Schwarz criterion	601.2249	Hannan-Quinn	592.4640
rho	0.315494	Durbin-Watson	1.320044

Model 4: Fixed-effects, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	0.751729	0.131885	5.700	<0.0001	***
GDP	0.0517441	0.0239697	2.159	0.0339	**
INFLA	−0.0139423	0.0337741	−0.4128	0.6809	

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	48.85399	S.E. of regression	0.791412
LSDV R-squared	0.329039	Within R-squared	0.057019
LSDV F(6, 78)	6.375208	P-value(F)	0.000017
Log-likelihood	−97.07263	Akaike criterion	208.1453
Schwarz criterion	225.2438	Hannan-Quinn	215.0228
rho	0.202388	Durbin-Watson	1.562898

Joint test on named regressors –
Test statistic: F(2, 78) = 2.35821
with p-value = P(F(2, 78) > 2.35821) = 0.101301

Test for differing group intercepts –
Null hypothesis: The groups have a common intercept
Test statistic: F(4, 78) = 8.30656
with p-value = P(F(4, 78) > 8.30656) = 1.23511e-005

Model 5: Fixed-effects, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	−1.87021	0.733762	−2.549	0.0128	**
LIQ	0.0306615	0.00822933	3.726	0.0004	***
ZScore	0.125972	0.0438708	2.871	0.0053	***

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	42.44290	S.E. of regression	0.737658
LSDV R-squared	0.417089	Within R-squared	0.180766
LSDV F(6, 78)	9.301876	P-value(F)	1.10e-07
Log-likelihood	−91.09388	Akaike criterion	196.1878
Schwarz criterion	213.2863	Hannan-Quinn	203.0653
rho	0.261227	Durbin-Watson	1.439762

Joint test on named regressors –
Test statistic: F(2, 78) = 8.60545
with p-value = P(F(2, 78) > 8.60545) = 0.00041967

Test for differing group intercepts –
Null hypothesis: The groups have a common intercept
Test statistic: F(4, 78) = 7.74101
with p-value = P(F(4, 78) > 7.74101) = 2.62907e-005

Model 6: Fixed-effects, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	t-ratio	p-value	
const	1.30395	0.787899	1.655	0.1021	
BAC	0.00338835	0.0102145	0.3317	0.7410	
BNIM	0.263417	0.114295	2.305	0.0240	**
OEBOCTTA	0.0121551	0.0511543	0.2376	0.8128	
BCTBD	−0.0160625	0.00505749	−3.176	0.0022	***
BCTTA	−0.0421397	0.0228412	−1.845	0.0690	*

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	41.53947	S.E. of regression	0.744217
LSDV R-squared	0.429497	Within R-squared	0.198204
LSDV F(9, 75)	6.273662	P-value(F)	1.45e-06
Log-likelihood	−90.17947	Akaike criterion	200.3589
Schwarz criterion	224.7855	Hannan-Quinn	210.1840
rho	0.156854	Durbin-Watson	1.654933

Joint test on named regressors –
Test statistic: F(5, 75) = 3.708
with p-value = P(F(5, 75) > 3.708) = 0.00471256

Test for differing group intercepts –
Null hypothesis: The groups have a common intercept
Test statistic: F(4, 75) = 7.06966
with p-value = P(F(4, 75) > 7.06966) = 6.93816e-005

Model 7: Fixed-effects, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	5.65288	1.19464	4.732	<0.0001	***
GDP	0.487637	0.217122	2.246	0.0275	**
INFLA	−0.0979022	0.305933	−0.3200	0.7498	

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	4008.514	S.E. of regression	7.168766
LSDV R-squared	0.335832	Within R-squared	0.062216
LSDV F(6, 78)	6.573370	P-value(F)	0.000012
Log-likelihood	−284.3846	Akaike criterion	582.7691
Schwarz criterion	599.8677	Hannan-Quinn	589.6467
rho	0.194370	Durbin-Watson	1.536837

Joint test on named regressors –
Test statistic: F(2, 78) = 2.58738
with p-value = P(F(2, 78) > 2.58738) = 0.0816615

Test for differing group intercepts –
Null hypothesis: The groups have a common intercept
Test statistic: F(4, 78) = 8.14687
with p-value = P(F(4, 78) > 8.14687) = 1.52686e-005

Model 8: Fixed-effects, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	−5.39131	6.90488	−0.7808	0.4373	
LIQ	0.252190	0.0774400	3.257	0.0017	***
ZScore	0.282285	0.412835	0.6838	0.4961	

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	3758.431	S.E. of regression	6.941542
LSDV R-squared	0.377268	Within R-squared	0.120722
LSDV F(6, 78)	7.875766	P-value(F)	1.20e-06
Log-likelihood	−281.6468	Akaike criterion	577.2935
Schwarz criterion	594.3921	Hannan-Quinn	584.1710
rho	0.222523	Durbin-Watson	1.502030

Joint test on named regressors –
Test statistic: F(2, 78) = 5.35457
with p-value = P(F(2, 78) > 5.35457) = 0.00662097

Test for differing group intercepts –
Null hypothesis: The groups have a common intercept
Test statistic: F(4, 78) = 4.71909
with p-value = P(F(4, 78) > 4.71909) = 0.00183505

Model 9: Fixed-effects, using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	t-ratio	p-value	
const	4.71880	7.12757	0.6620	0.5100	
BAC	0.141104	0.0924035	1.527	0.1310	
BNIM	2.22624	1.03395	2.153	0.0345	**
OEBOCTTA	0.240956	0.462757	0.5207	0.6041	
BCTBD	−0.152276	0.0457516	−3.328	0.0014	***
BCTTA	−0.331540	0.206628	−1.605	0.1128	

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	3399.411	S.E. of regression	6.732420
LSDV R-squared	0.436754	Within R-squared	0.204714
LSDV F(9, 75)	6.461865	P-value(F)	9.45e-07
Log-likelihood	−277.3798	Akaike criterion	574.7596
Schwarz criterion	599.1861	Hannan-Quinn	584.5846
rho	0.153137	Durbin-Watson	1.640457

Joint test on named regressors –
Test statistic: F(5, 75) = 3.86114
with p-value = P(F(5, 75) > 3.86114) = 0.00362229

Test for differing group intercepts –
Null hypothesis: The groups have a common intercept
Test statistic: F(4, 75) = 4.92089
with p-value = P(F(4, 75) > 4.92089) = 0.00140856

Model 10: Random-effects (GLS), using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	z	p-value	
const	0.747861	0.348354	2.147	0.0318	**
GDP	0.0515681	0.0236716	2.178	0.0294	**
INFLA	−0.0123883	0.0329583	−0.3759	0.7070	

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	69.86746	S.E. of regression	0.917484
Log-likelihood	−112.2776	Akaike criterion	230.5552
Schwarz criterion	237.8832	Hannan-Quinn	233.5027
rho	0.202388	Durbin-Watson	1.562898

Between' variance = 0.534416
Within' variance = 0.626333
theta used for quasi-demeaning = 0.746042

Joint test on named regressors –
Asymptotic test statistic: Chi-square(2) = 4.82126
with p-value = 0.0897588

Breusch-Pagan test –
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 43.2658
with p-value = 4.77861e-011

Hausman test –
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(2) = 0.176176
with p-value = 0.91568

Model 11: Random-effects (GLS), using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	z	p-value	
const	−0.991499	0.450176	−2.202	0.0276	**
LIQ	0.0284594	0.00871840	3.264	0.0011	***
ZScore	0.0669479	0.0221136	3.027	0.0025	***

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	59.31777	S.E. of regression	0.845383
Log-likelihood	−105.3207	Akaike criterion	216.6415
Schwarz criterion	223.9694	Hannan-Quinn	219.5890
rho	0.261227	Durbin-Watson	1.439762

'Between' variance = 0.0124588
'Within' variance = 0.54414
theta used for quasi-demeaning = 0.151578
Joint test on named regressors –
Asymptotic test statistic: Chi-square(2) = 18.0203
with p-value = 0.000122164

Breusch-Pagan test –
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 32.6264
with p-value = 1.11686e-008

Hausman test –
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(2) = 22.1387
with p-value = 1.55827e-005

Model 12: Random-effects (GLS), using 85 observations
Using Nerlove's transformation
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROA

	Coefficient	Std. Error	z	p-value	
const	1.35209	0.832959	1.623	0.1045	
BAC	0.00247302	0.00951218	0.2600	0.7949	
BNIM	0.251489	0.113040	2.225	0.0261	**
OEBOCTTA	0.00397292	0.0498704	0.07966	0.9365	
BCTBD	−0.0159187	0.00472873	−3.366	0.0008	***
BCTTA	−0.0333728	0.0215567	−1.548	0.1216	

Mean dependent var	0.863604	S.D. dependent var	0.931026
Sum squared resid	68.20845	S.E. of regression	0.923366
Log-likelihood	−111.2563	Akaike criterion	234.5125
Schwarz criterion	249.1684	Hannan-Quinn	240.4075
rho	0.156854	Durbin-Watson	1.654933

'Between' variance = 0.44395
'Within' variance = 0.4887
theta used for quasi-demeaning = 0.753393
Joint test on named regressors –
Asymptotic test statistic: Chi-square(5) = 17.9411
with p-value = 0.00302108

Breusch-Pagan test –
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 7.66791
with p-value = 0.00562116

Hausman test –
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(4) = 3.52215
with p-value = 0.474518

Model 13: Random-effects (GLS), using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	z	p-value	
const	5.67479	2.84585	1.994	0.0461	**
GDP	0.494171	0.215036	2.298	0.0216	**
INFLA	−0.112442	0.298475	−0.3767	0.7064	

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared r esid	5695.555	S.E. of regression	8.283788
Log-likelihood	−299.3134	Akaike criterion	604.6267
Schwarz criterion	611.9547	Hannan-Quinn	607.5742
rho	0.194370	Durbin-Watson	1.536837

'Between' variance = 34.1004
'Within' variance = 51.3912
theta used for quasi-demeaning = 0.714638
Joint test on named regressors –
Asymptotic test statistic: Chi-square(2) = 5.37637
with p-value = 0.0680041

Breusch-Pagan test –
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 41.965
with p-value = 9.29212e-011

Hausman test –
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(2) = 0.717734
with p-value = 0.698467

Model 14: Random-effects (GLS), using 85 observations
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	z	p-value	
const	−9.61391	4.90087	−1.962	0.0498	**
LIQ	0.271913	0.0756906	3.592	0.0003	***
ZScore	0.543787	0.260986	2.084	0.0372	**

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	4686.622	S.E. of regression	7.514341
Log-likelihood	−291.0270	Akaike criterion	588.0539
Schwarz criterion	595.3819	Hannan-Quinn	591.0014
rho	0.222523	Durbin-Watson	1.502030

'Between' variance = 6.86899
'Within' variance = 48.185
theta used for quasi-demeaning = 0.459533
Joint test on named regressors –
Asymptotic test statistic: Chi-square(2) = 15.1175
with p-value = 0.000521514

Breusch-Pagan test –
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 12.5375
with p-value = 0.000398871

Hausman test –
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(2) = 4.15848
with p-value = 0.125025

Model 15: Random-effects (GLS), using 85 observations
Using Nerlove's transformation
Included 5 cross-sectional units
Time-series length = 17
Dependent variable: ROE

	Coefficient	Std. Error	z	p-value	
const	5.65533	7.41972	0.7622	0.4459	
BAC	0.130251	0.0850735	1.531	0.1258	
BNIM	2.06602	1.02084	2.024	0.0430	**
OEBOCTTA	0.137249	0.449308	0.3055	0.7600	
BCTBD	−0.152464	0.0423163	−3.603	0.0003	***
BCTTA	−0.236498	0.193140	−1.224	0.2208	

Mean dependent var	6.801633	S.D. dependent var	8.476434
Sum squared resid	5117.189	S.E. of regression	7.997804
Log-likelihood	−294.7624	Akaike criterion	601.5248
Schwarz criterion	616.1808	Hannan-Quinn	607.4199
rho	0.153137	Durbin-Watson	1.640457

'Between' variance = 30.2407
'Within' variance = 39.9931
theta used for quasi-demeaning = 0.731339
Joint test on named regressors –
Asymptotic test statistic: Chi-square(5) = 19.3781
with p-value = 0.00163402

Breusch-Pagan test –
Null hypothesis: Variance of the unit-specific error = 0
Asymptotic test statistic: Chi-square(1) = 0.935715
with p-value = 0.333382

Hausman test –
Null hypothesis: GLS estimates are consistent
Asymptotic test statistic: Chi-square(4) = 3.37919
with p-value = 0.496484