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# Factors affecting the profitability of banks - Evidence from Serbia's banking sector

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## Abstract:

**Research Question:** In the research, the authors investigate the effect of certain bank-specific, industry-specific, and macroeconomic factors on the profitability indicators of banks in the Republic of Serbia. The main question of the study is what factors have a relationship with profitability indicators and which of them has the most statistically significant impact. **Motivation:** Based on the research of (Fidasoski et al., 2018; Katusiime, 2021; Horobet et al., 2021), the authors intend to investigate the effects of certain factors on the profitability of the banking sector of the Republic of Serbia. The research should serve as a good indicator for banks to understand exactly which factors have the greatest impact on profitability. **Idea:** The essence of the research is precisely the discovery of the factors that have the most significant statistical effect on profitability indicators of banks, namely ROA (Return on assets), ROE (Return on equity), and NIM (Net interest margin). **Data:** The data includes a sample of 22 banks currently operating in the banking market of the Republic of Serbia. The research covers the period from 2014 to 2021 and includes a total of 174 observations. The dependent variables used are ROA, ROE, and NIM as representatives of bank profitability, while the independent variables are divided into three main units, bank-specific, industry-specific and macroeconomic factors. **Tools:** The research was carried out using the statistical software Eviews. The research includes the application of descriptive statistics and correlation methods. Further analysis includes the unit root test and the variance inflation factor analysis to check for stationarity and multicollinearity of the data. After testing, the authors establish a panel regression model using random and fixed effects, applying the Hausman test to establish a more valid model. **Findings:** Based on the performed analysis, we conclude that in the case of ROA and ROE, the variables that have the most significant influence on these indicators are liquidity indicator, the level of operating profit, capital adequacy, and loans. While liquidity, loans, and bank sector indicator such as HHI have the most significant effect on NIM. The study also showed that GDP annual growth does not have a statistically significant effect on profitability in the case of banks in the Republic of Serbia. **Contribution:** The paper contributes to the literature by empirically testing how certain factors affect the profitability of banks in the banking sector of the Republic of Serbia.

**Keywords:** ROA, ROE, net interest margin, profitability, banking sector

**JEL Classification:** C23, G21

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## 1. Introduction

The success, value, and size of a bank's business are all reflected in its performance. As a result, banks must work to enhance bank indicators to function and thrive in the financial market under competitive market conditions. Bank indicators are a reflection of their business activities. Exactly in this way, the banks will have the chance to generate positive business outcomes, i.e. profit, and so provide the framework for their long-term expansion and development. One of the most crucial elements in their operation is the imposition of the concept of profitability. Banks seek to provide an adequate level of security in light of the evolving market environment in global frameworks (Kalas & Rakita, 2017). The period of the previous decade of the Serbian banking system was mostly marked by the increased effect of market consolidation and the concentration of financial strength on certain selected banks. Also before that, the key factor in the preceding

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ten years that contributed to the restructuring of the ownership structure of the Serbian banking sector was the admission of international banks. Most frequently, foreign competition entered the local market by acquiring domestic private or state banks (Marinkovic & Ljumovic, 2012). The authors are motivated to gain a deeper understanding of the variables that affect bank profitability to more easily manage future changes as a result of the banking sector's high degree of variability. Profit is the lowest source of capital and a necessary condition for a competitive banking organization at the micro level. It is not only a byproduct of the increased competitiveness of the financial markets, but it is also a requirement for effective banking. Therefore, as a fundamental prerequisite for conducting business, the primary goal of any bank management is to maximize profit. At the macro level, a healthy and successful banking industry is better able to resist adverse shocks and support the stability of the financial system. Bank profits are a significant source of equity, particularly when reinvested back into the bank. This should result in more bank safety and overall financial stability. However, excessive profitability is not always good from the perspective of the main functions of the banks and the wider roles of the banks in the financial system. High levels of profitability, especially from big banks, maybe a sign of market dominance. Because banks with significant market power may offer lower returns on deposits while charging higher interest rates on loans, this could hinder financial intermediation. In turn, excessively poor profitability could deter private agents (depositors and stockholders) from conducting banking activities, which would prevent banks from attracting enough capital.

## 2. Literature review

There are many recent as well as older studies of profitability indicators of both companies and banks. Profitability is one of the most important principles of the company's business, and its indicators are one of the most important indicators of both the company's success and information for managers to establish a long-term bank business strategy. In the literature, there are various studies of profitability factors and indicators that have an impact on profitability. Some studies focused more on the research of only one country while other studies include a panel analysis of countries.

Research undertaken by Petria et al. (2015), dealt with the analysis of return on average assets (ROAA) and return on average equity (ROAE) indicators and the impact of microeconomic, bank-sector, and macroeconomic factors on them in selected countries of Central and Eastern Europe. Also, a more recent study by Horobet et al. (2021), included the influence of factors in the case of Eastern and Central European countries but using the Generalized Method of Moments (GMM). Also using the same method, research by Yuksel et al. (2018), analyzed the influence of various factors on the profitability of the banks in 13 post-Soviet countries.

A study undertaken by Djalilov and Piesse (2016), researched factors that had an effect on bank profitability in the former Soviet Union and CEE's late-transition countries as well as in early-transition CEE (Central and Eastern Europe). Another research by Petria et al. (2015), included an analysis of factors in 27 banking systems of the European Union. One of the studies covered 39 OECD countries and examined whether the implementation of increased capital requirements helps banking institutions to operate more profitably and efficiently while reducing risk (Bitar et al., 2018). The findings indicated that risk-based capital ratios do not reduce bank risk, even though both risk-based and risk-free capital ratios increase bank productivity and profitability. The research undertaken by Singhal et al. (2022), included an analysis of the ratio of capitalization and profitability in the example of banking sectors in BRICS countries. Other research that included multiple countries such as a study by Le and Ngo (2020), investigated the impact of the number of automated teller machines and point-of-sale terminals on profitability. Another research analyzed the impact of bank-specific indicators on the profitability of the European banking sector, the research included 28 European banks (Menicucci & Paolucci, 2016).

A study undertaken by Adelopo et al. (2018), investigated the association between macroeconomic conditions that are special to banks and bank profitability in the ECOWAS member countries of Africa before (1999-2006), (2007-2009), and after (2010-2013) the financial crisis. Islam and Nishiyama (2016), studied the influence of bank-specific, industry-specific, and macroeconomic factors on 259 banks in South Asian countries such as Bangladesh, India, Nepal, and Pakistan. Lopez-Penabad et al. (2022) came to the conclusion that when interest rates are already negative, a short-term fall in rates lowers the net interest margin. It was discovered that European banks take on greater risk in an environment of negative interest rates, and it was concluded that the impacts of enacting a negative interest rate policy vary depending on the accepted business model of banks.

As mentioned before, in addition to research covering several countries, there are many studies related to the analysis of profitability in one country. Research by Imani and Pracoyo (2018), dealt with the analysis of the impact of capital, liquidity, and loans on profitability in the Indonesian banking market, while more recent research undertaken by Sihotang et al. (2022) dealt with the impact of the same independent variables but for Islamic commercial banks operating on the Indonesian market. Alaagam (2019), researched the factors affecting the profitability of banks in Saudi Arabia. The study by Madugu et al. (2020), focused on the banking sector of Ghana. There are many researchers (Narwal & Pathneja, 2016; Kiran & Jones, 2016; Brahmaiah, 2018; Bansal et al., 2018), focused on the Indian market and considered public and private banks profitability. Research undertaken by Acaravci and Calim (2013), focused on the Turkish banking sector and the impact of microeconomic and macroeconomic factors on profitability. One of the studies excluded macroeconomic factors from the analysis and investigated only microeconomic factors on the profitability of the banking sector in Pakistan, while another study investigated the effects of macroeconomic factors, also on the banking sector in Pakistan (Ali & Puah, 2018; Lutf & Omarkhil, 2018). A more recent study by Katusiime (2021), included an analysis of the effect of the COVID-19 virus on the profitability of the banking sector in Uganda. Hirindu and Panditharathna (2017), investigated the impact of bank-specific factors on the profitability of banks in Sri Lanka. Similar to other research papers Batten and Vo (2019), investigated the determinants of bank profitability, using evidence from the banking sector of Vietnam. One of the recent studies by Xu et al. (2022) investigated the effect of intellectual capital on bank profitability during the period of the COVID-19 pandemic in China and Pakistan. The results indicated that the influence of intellectual capital remained positive even during the pandemic. Another recent study investigated the impact of internal and external factors on the banking profitability of Islamic banks. The results indicated a significant influence of internal factors such as non-performing loans, operating income, and financial-to-deposit ratio on profitability, while inflation did not prove to be statistically significant from external factors (Sihotang et al., 2022). Also, one similar research on Islamic banking and its profitability, a study conducted by Fajri et al. (2022), analyzed the negative effect of the COVID-19 pandemic on the profitability of Islamic banks in Indonesia. According to the findings of Grubisic et al. (2022), changes in the concentration coefficient may have been responsible for changes in the return on assets of Serbia and the return on capital. Other research such as Tomic (2015), which included the 15 largest banks in Serbia by assets, dealt with the research of audited financial statements of banks and produced information on profitability both before and during the global financial crisis. Also, the study (Miljkovic et al., 2013) included an analysis of the market concentration of the banking sector as well as a comparison of the banking sector of Serbia with the countries of Central, Eastern, and Southern Europe. On the other hand, research (Vesic et al., 2019) included an overview of the profitability and liquidity of the largest banks operating in the banking sector of Serbia. The research (Fidanoski et al., 2018) included an analysis of the influence of factors on the profitability of banks in the market of the Republic of Croatia. Bucevska and Hadzi Misheva (2017), researched the determinants of profitability in selected Balkan countries such as Slovenia, Croatia, Serbia, Bosnia and Herzegovina, Montenegro, and Macedonia.

### 3. Methodology and data

In this paper, the authors conduct research in several parts. The first part of the research includes the analysis of descriptive statistics of dependent and independent variables. The second part of the study deals with diagnostic tests, such as the Augmented Dickey-Fuller unit root test and the use of variance inflation factors to test for multicollinearity of independent variables. The third part of the study deals with panel regression using fixed and random effects models along with Hausman's test to check the adequacy of the model. The research includes 22 banks that operate in the banking sector of the Republic of Serbia, and the analysis covers the period from 2014 to 2021. The figure below provides an overview of all the banks included in the study as well as the trends in their profitability indicators during the study period.



**Figure 1:** Banks used in the analysis and their profitability indicators

In the study, the authors use ROA (return on assets), ROE (return on equity), and NIM (net interest margin) as dependent variables as a proxy for profitability. The independent variables are divided into three groups similar to the research of Petria et al. (2015), namely, bank-specific, industry-specific, and macroeconomic factors. Table 1 provides a summary of all variables and their calculation methods, as well as the expected effects of the factors on profitability in this study.

Based on the previous studies the authors define the following hypotheses:

- H0: None of the indicators affect profitability
- H1: Indicators affect profitability
- H3: Bank-specific have the most effect on profitability
- H4: Industry-specific factors have the greatest effect on profitability
- H5: Macroeconomic factors have the most effect on profitability

The table below serves to explain the variables used in the research. The authors separate the variables into three groups, microeconomic, bank-specific, and macroeconomic variables. Also, the table below authors explains the method of calculation of every used variable. Liquidity, Operating profit, Loans, Capital adequacy, Structural changes, and Size represent the Bank-specific variables. Market concentration uses the Herfindal Hirschman inflation factor for calculation and represents the Industry-specific variable while the annual GDP growth is used as the only macroeconomic variable. In the table below, the authors also present the expected effects of every used variable in the study. Expected effects were presented according to previous studies mentioned in the Literature review section.

**Table 1:** Variables description

Symbol	Variable	Proxy	Expected	Source
<b>Dependent variables</b>				
ROA	Return on assets	Net profit / Assets		Banks financial statements
ROE	Return on equity	Net profit / Equity		Banks financial statements
NIM	Net interest margin	Net interest profit / Assets		Banks financial statements
<b>Independent variables</b>				
<b>Bank-specific factors</b>				
Liq	Liquidity	Loans/Deposits	-	Banks financial statements
Op	Operating profit	Net operating income	+	Banks financial statements
Loan	Loans	Loans/Assets	+	Banks financial statements
Cap	Capital adequacy	Equity/Assets	+	Banks financial statements
Dummy	Structural changes	Mergers and acquisitions	+/-	Banks financial statements
Size	Size	Logarithm of assets	+	Banks financial statements
<b>Industry-specific factors</b>				
Hhi	Market concentration	Herfindal - Hirschman inflation	+/-	National bank of Serbia (2022)
<b>Macroeconomic factors</b>				
Gdp	Economic growth	GDP annual growth %	+	World Bank (2022)

Source: author`s interpretation

In the table above, in addition to the classification of variables into three groups, the authors also indicate the expected impact of independent variables on dependent variables of bank profitability. Many previous studies point to different influences of the variables used. As presented, the expected impact of the Size of banks factor is supported by studies such as (Alarussi & Alhaderi, 2018; Ali & Puah, 2018). The negative impact of Loans studies (Alarussi & Alhaderi, 2018; Yuksel, et al., 2018). The positive influence of Operative income and Capital adequacy ratio is supported by studies like (Sihotang et al., 2022; Imani & Pracoyo, 2018; Capraru & Ihnatov, 2014). The expected positive impact of GDP is supported by studies from (Yuksel et al., 2018; Brahmaiah, 2018). The influence of market concentration, which in practice is mostly measured using the Herfindahl-Hirschman coefficient, has been shown in certain studies to be positive, while in other studies it has a negative effect on profitability (Horobet et al., 2018; Miljkovic et al., 2018). Looking at previous studies, the effect of the factors largely depends on the market in which the study is conducted.

After reviewing the variables used, the authors derive the following regression model formula:

$$y = \alpha + \beta_1Liq_{it} + \beta_2Op_{it} + \beta_3Loan_{it} + \beta_4Cap_{it} + \beta_5Dummy_{it} + \beta_6Size_{it} + \beta_7Hhi_t + \beta_8Gdp_t + \varepsilon \quad (1)$$

Where:

- y stands for the dependent variables ROA, ROE, and NIM
- $Liq_{it}$  stands for liquidity of bank *i* at time *t*
- $Op_{it}$  stands for operating profit of bank *i* at time *t*
- $Loan_{it}$  stands for Loan/assets indicator of bank *i* at time *t*
- $Cap_{it}$  stands for Capital adequacy of bank *i* at time *t*
- $Dummy_{it}$  stands for structural changes of bank *i* at time *t*
- $Size_{it}$  stands for size log changes of bank *i* at time *t*
- $Hhi_t$  stands for Herfindahl-Hirschman inflation at time *t*
- $Gdp_t$  stands for GDP annual growth at time *t*

Panel data are widely used in econometric research because they enable the integration of spatial and temporal dimensions. In particular, panel data consist of many separate instances of the same observation unit. The most important need for an econometric approach, stationary data, is one of the prerequisites underlying the econometric analysis of time series (Musdaq, 2011). It refers to the constant values of the mean and variance of the time series. In this analysis, the authors use the Augmented Dickey-Fuller test to determine the stationarity of the data. This test includes the following hypotheses:

H0: Data is not stationary (has a unit root)

H1: Data is stationary

If the data has a p-value over 0.05, it means that the data has a unit root and is not stationary. The unit root test is performed to remove non-stationary data because the use of non-stationary data can result in an undesirable regression model (spurious regression).

Also, one of the necessary tests to check the validity of the data is the multicollinearity test, which tells us whether there is a high level of correlation between the independent variables. Based on Lin et al. (2011), the VIF test was used for the analysis, which after the calculated regression is calculated as follows:

$$VIF = 1/(1 - R_j^2) \quad (2)$$

Where:

- $VIF$  – Variance inflation factor
- $R_j^2$  – R square of the regression model

This test includes the following hypotheses:

H0: Multicollinearity exists

H1: There is no multicollinearity

If the variance inflation factor exceeds the threshold value of 10, multicollinearity is present among the data and the data must be excluded from the regression model. The Hausman test is one of the most important tests in panel analysis, which enables the selection of a more adequate model between fixed and working effects models. The Hausman test in the form of a formula can be presented as follows (Hahn et al., 2011):

$$H = (\beta^{FE} - \beta^{RE})' [Var(\beta^{FE}) - Var(\beta^{RE})]^{-1} (\beta^{FE} - \beta^{RE}) \quad (3)$$

- $\beta^{FE}$  – Fixed effects model estimates
- $\beta^{RE}$  – Random effects model estimates

The Hausman test includes the following hypotheses:

H0: Random effects model is adequate

H1: Fixed effects model is adequate

If the p-value of the Hausman test exceeds the limit of 0.05, the null hypothesis is accepted, and if it is below the limit value, the fixed effects model is more adequate.

#### 4. Results and analysis

As mentioned in the earlier part of the study, this study includes 22 banks that operate in the banking sector of the Republic of Serbia. The analysis covers the period from 2014 to 2021 and includes 172 observations. In the analysis, the authors use panel regression as well as the necessary diagnostic tests to perform a correct and statistically significant regression model. The following table presents the descriptive statistics of the user-dependent and independent variables.



**Table 2:** Descriptive statistics

Variable	Mean	Median	Maximum	Minimum	Standard dev.	Observations
ROA	-0.0093	0.0063	0.1205	-1.4215	0.1146	172
ROE	-0.0474	0.0408	0.4766	-8.3329	0.6584	172
Net interest	0.0357	0.0326	0.1267	0.0002	0.0206	172
Liquidity	2.4139	2.0600	11.2000	1.1100	1.3743	172
Operating profit	5728796	3738134	30182035	-9716930	6756551	172
Loans	0.6323	0.6621	0.9201	0.0118	0.1523	172
Capital adequacy	0.2054	0.1828	0.9879	0.0695	0.1124	172
Dummy	0.1628	0.0000	1.0000	0.0000	0.3703	172
Size	17.8712	18.2353	20.3162	14.4381	1.3424	172
Hhi	961.26	932.95	1045.82	867.41	70.71	172
Gdp annual	2.615979	2.719875	7.3892709	-1.58951	2.953601	172

Source: author`s calculation

Observing the dependent variables, the authors first note the highest amount of ROA indicator of 12.053% achieved by Expo Bank in 2017. In the same year, Expo Bank achieved the highest ROE indicator of 47.66%. The minimum amounts of ROA and ROE indicators, which amount to -142.14% and -833.28% respectively, were achieved by Srpska bank in 2014. Regarding the Net Interest Margin (NIM) indicator, we note that the maximum amount is 12.67% achieved by 3Banka in 2017, while the minimum amount of 0.205% was achieved by the Bank of China, also in 2017. In the case of dependent variables, we notice that the ROA indicator has the largest amount of standard deviation, which leads us to the conclusion that this indicator has the largest oscillation between minimum and maximum.

In the case of independent variables, operating profit indicators and the Hershman-Herfendahl indicator (Hhi) show the highest amount of standard deviation, which also indicates a large range between the maximum and minimum amount of these indicators. Mobi Bank achieved the highest liquidity ratio of 11.2 in 2015, while Uni Credit Bank achieved the lowest liquidity ratio of 1.11 in 2014. In terms of debt-to-asset ratio (Loans), we note that the minimum amount is 1.100% achieved by the Bank of China in 2017, while the maximum amount of 92.00% was achieved by Bank Intesa in 2018. Observing the dummy variable (structural changes), the authors observed that the largest number of structural changes in the period from 2014 to 2021 was achieved by OTP bank. OTP bank also represents the largest bank in the market of the Republic of Serbia, because looking at the size indicator (logarithmically derived from the number of assets) we notice the maximum amount of the indicator of 20.31, while the smallest bank on the market is represented by Bank of China with an indicator of 14.44.

**Table 3:** Correlation matrix

Variable	1	2	3	4	5	6	7	8	9	10	11
ROA	1	0.9889	0.1181	-0.2683	0.2895	0.3211	-0.0418	-0.1864	0.2358	-0.1420	0.0022
ROE	0.9889	1	0.1040	-0.2456	2.2742	0.3013	0.0057	-0.1633	0.2008	-0.1400	-0.0102
NIM	0.1181	0.1040	1	0.1614	0.0186	0.3308	-0.0752	-0.1341	-0.0124	0.2731	0.1242
Liq	-0.2683	-0.2456	0.1614	1	-0.1998	-0.1947	-0.0345	0.0881	-0.3024	0.0424	-0.0116
Op profit	0.2895	2.2742	0.0186	-0.1998	1	0.0909	-0.0908	-0.1446	0.5695	-0.0713	-0.0320
Loans	0.3211	0.3013	0.3308	-0.1947	0.0909	1	-0.2765	-0.1384	0.2188	-0.0972	-0.0019
Cap adeq	-0.0418	0.0057	-0.0752	-0.0345	-0.0908	-0.2765	1	0.1672	-0.3182	0.2651	0.1399
Dummy	-0.1864	-0.1633	-0.1341	0.0881	-0.1446	-0.1384	0.1672	1	-0.0985	-0.1316	-0.2776
Size	0.2358	0.2008	-0.0124	-0.3024	0.5695	0.2188	-0.3182	-0.0985	1	-0.1073	-0.0601
Hhi	-0.1420	-0.1400	0.2731	0.0424	-0.0713	-0.0972	0.2651	-0.1316	-0.1073	1	0.4151
Gdp	0.0022	-0.0102	0.1242	-0.0116	-0.0320	-0.0019	0.1399	-0.2776	-0.0601	0.4151	1

Source: author`s calculation

To perform a valid regression model, it is necessary to establish the amount of correlation between variables, as well as a multicollinearity test between descriptive variables. With the correlation matrix, we notice the most common and statistically significant correlation between ROA and ROE indicators in the amount of 0.98, but since these are dependent variables, it does not represent a problem when performing the regression model. In the case of the relationship between the dependent and independent variables, we notice a significant positive relationship between the indicators ROA and Loans (debts concerning assets) as well as ROE, and NIM concerning Loans which is in line with the research of (Fidanoski et al., 2018) that suggested that because loans have such a big positive impact on profitability, banks may be able to increase their profitability by enhancing their risk management procedures. Observing only the independent variables, a positive and significant relationship between Operating profit and the size of the bank (size) is noticeable, which is 0.5695, as well as a positive relationship between the Hhi indicator and Gdp growth. There is also a negative and significant relationship between the capital adequacy ratio and bank size, which is -0.3182.

**Table 4:** Multicollinearity test

Variable	Centered VIF
Liquidity	1.1726
Operating profit	1.5350
Loans	1.1514
Capital adequacy	1.3597
Dummy	1.1857
Size	1.8010
Hhi	1.2938
Gdp annual	1.3009
<b>Average VIF</b>	<b>1.3500</b>

Source: author`s calculation

The authors performed a multicollinearity test with the help of the Variance inflation factor to determine after the correlation matrix whether there is multicollinearity between the independent variables. The presence of multicollinearity is one of the main causes of incorrect panel regression models. Based on the results of the analysis, we observe that the average VIF (Variance inflation factor) is 1.3500, we conclude that there is no multicollinearity between the independent variables because the limit value is 10, so the authors can reject the null hypothesis of multicollinearity existing. Since there is no multicollinearity between the descriptive variables, the authors in the continuation of the study perform the rest of the necessary tests before performing the regression model.

**Table 5:** Augmented Dickey-Fuller unit root test

Variable	ADF t statistic	Level Prob**	ADF t statistic	1st difference Prob*
ROA	-12,9925	<b>0.0000**</b>	-3,95609	0,0000*
ROE	-13,0664	<b>0.0000**</b>	-4,19015	0,0000*
Net interest	-5,0785	<b>0.0069**</b>	-1,85915	0,0315*
Liquidity	-5,0022	<b>0.0069**</b>	-3,29215	0,0005*
Operating profit	-13,0002	<b>0.0069**</b>	-2,62197	0,0044*
Loans	-6,4563	<b>0.0069**</b>	-2,64539	0,0041*
Capital adequacy	-12,7715	<b>0.0069**</b>	-2,00052	0,0227*
Size	-10,2036	<b>0.0069**</b>	-1,58957	0,0278*
Hhi	-3,0306	<b>0.0069**</b>	-8,49007	0,0000*
Gdp annual	5,40545	1,0000	-6,1603	<b>0.0342**</b>

Source: author`s calculation

In the table above, the authors have indicated the level of significance using an asterisk above, but the accepted level of stationarity is marked with two asterisks. Also one of the conditions of a correct regression model is the presence of stationarity. To establish the presence of stationarity of the used variables, the authors used the ADF (Augmented Dickey-Fuller) unit root test in the analysis. In the Methodology section,



we explained the null hypothesis of the presence of a unit root. Based on the analysis, the authors established that all variables, except for GDP indicators, do not have a unit root, i.e. stationarity of data at the level, while in the case of GDP, stationarity was established after differentiation so the authors can reject the null hypothesis of non-stationarity. As, after numerous tests, all the conditions for performing a proper regression model have been met, in the table below the authors present the results of the panel regression analysis using fixed and random effects models.

**Table 6:** Fixed and Random effects model

Variable	ROA		ROE		NIM	
	RE Model	FE model	RE Model	FE model	RE Model	FE model
Liquidity	<b>-0.012133</b> (0.0383*)	<b>-0.041861</b> (0.0001*)	-0.060599 (0.0776)	<b>-0.208010</b> (0.0007*)	<b>-0.001365</b> (0.0457*)	<b>-0.001608</b> (0.0210*)
Operating profit	<b>0.0005</b> (0.0126*)	<b>0.0004</b> (0.0001*)	<b>0.0004</b> (0.0134*)	<b>0.0008</b> (0.0001*)	0.0002 (0.2117)	0.00002 (0.2609)
Loans	<b>0.200520</b> (0.0002*)	<b>0.193978</b> (0.0582*)	<b>1.154270</b> (0.0002*)	1.126448 (0.0611)	<b>0.015565</b> (0.0220*)	<b>0.013703</b> (0.0485*)
Capital adequacy	0.115995 (0.1317)	<b>0.238137</b> (0.0181*)	<b>0.931458</b> (0.0399*)	<b>1.1597815</b> (0.0071*)	-0.000409 (0.9513)	-0.000271 (0.96810)
Dummy	<b>-0.043050</b> (0.0490*)	-0.036391 (0.1151)	-0.233485 (0.0689)	-0.187026 (0.1676)	-0.001589 (0.3078)	-0.001509 (0.3335)
Size	0.002264 (0.7593)	0.023014 (0.1628)	0.004526 (0.9170)	0.120077 (0.2147)	-0.001841 (0.0796)	-0.001911 (0.0877)
Hhi	<b>-0.000240</b> (0.0453*)	-0.000116 (0.3809)	<b>-0.001423</b> (0.0430*)	-0.000696 (0.3713)	<b>0.0007</b> (0.0000*)	<b>0.0006</b> (0.0000*)
Gdp annual	0.000606 (0.8294)	0.000271 (0.9239)	0.000147 (0.99290)	-0.001314 (0.9371)	0.0004 (0.8200)	0.0004 (0.7962)
Constant	0.047521 (0.7903)	-0.455910 (0.2114)	0.388752 (0.7111)	-2.522991 (0.2389)	-0.007247 (0.7573)	-0.00269 (0.9128)
<b>R<sup>2</sup></b>	<b>0.33</b>	<b>0.51</b>	<b>0.31</b>	<b>0.48</b>	<b>0.52</b>	<b>0.91</b>
<b>Prob*</b>	0.000001	0.000001	0.000004	0.000006	0.000000	0.000000
<b>Observations</b>	172		172		172	

Source: author`s calculation

Using the model of fixed and random effects the authors noticed that in the case of ROA and ROA-dependent indicators the largest and most statistically significant effect is indicators of liquidity, loans, operating profit, and capital adequacy. The model shows that Liquidity harms ROA and ROE indicators, which can be represented as each increase in liquidity indicators by 1% contributing to a decrease in ROA and ROE indicators by 0.0418% and 0.2080%. respectively. These findings coincide with Milosevic (2014), who stated that banks typically ensure and maintain the necessary level of liquidity every day to be able to satisfy their due commitments. The analysis also shows indicators of operating profit, loans, and capital adequacy have a positive and statistically significant effect on profitability. These results contradict the findings of Imani and Pracoyo (2018), who stated that liquidity and capital adequacy do not have any impact on profitability. Dummy, size, Hhi, and Gdp indicators did not show a statistically significant relationship between those variables and bank profitability. In the case of Net Interest Income (NIM), a negative and statistically significant influence of the liquidity indicator was observed, as well as positive and statistically significant effects of the loans and Hhi indicators, while the other independent variables did not show a statistically significant relationship. The adequacy of the model is shown with the help of the R<sup>2</sup> indicator, which in all models exceeds 0.30 with an F test of a maximum of 0.000006. To select an adequate model at the end of the study, the authors applied Hausman's test, which showed the following results.

Table 7: Hausman test

Variable		Result	
ROA	Random effects vs Fixed effects model	Chi-square statistic = 33.0261	<b>The fixed effects model is more suitable</b>
		<b>Probability = 0.00001</b>	
ROE	Random effects vs Fixed effects model	Chi-square statistic = 29.7344	<b>The fixed effects model is more suitable</b>
		<b>Probability = 0.00002</b>	
NIM	Random effects vs Fixed effects model	Chi-square statistic = 7.081592	<b>The random effects model is more suitable</b>
		<b>Probability = 0.5279</b>	

Source: author`s calculation

The results of the Hausman test showed that in the case of ROA and ROE indicators, the fixed effects model is more adequate because the probability is 0.00001 and 0.00002 so the authors can reject the null hypothesis but in the case of the NIM indicator, the random effects model proved to be more adequate because the probability is 0.5279. Based on these results, the authors derive adequate models of predictability at the end of the chapter.

$$\text{Model NIM} = -0,007247 - 0,001365x_1 + 0,0002x_2 + 0,015565x_3 - 0,000409x_4 - 0,001589x_5 \\ - 0,001841x_6 + 0,0007x_7 + 0,0004x_8$$

$$\text{Model ROA} = -0,455910 - 0,041861x_1 + 0,00004x_2 + 0,193978x_3 - 0,238137x_4 - 0,036391x_5 \\ - 0,023014x_6 + 0,000116x_7 + 0,000271x_8$$

$$\text{Model ROE} = -2,522991 - 0,208010x_1 + 0,0008x_2 + 1,126448x_3 + 1,1597815x_4 - 0,187026x_5 \\ - 0,120077x_6 + 0,000696x_7 + 0,001314x_8$$

After the analysis, we can conclude that in the case of all three indicators of profitability, bank-specific factors have the greatest effect on profitability which is in line with the research of Acaravci and Calim (2013), who after they researched the Turkish banking sector, indicated that bank-specific (micro) characteristics had a greater impact on bank profitability than macroeconomic factors. This also coincides with the findings of Bucevska and Hadzi Misheva (2017), who discovered that in the case of banking sectors of selected Balkan countries (including Serbia), micro factors had an expected effect while macro factors such as inflation and GDP growth did not have a significant effect. Also, after diagnostic tests, it is established that the regression model is valid and that the factors used in the analysis have an effect on profitability. In addition to the impact of liquidity, which is statistically significant, the impact of operating profit on ROA and ROE is also noticeable. The change of 1% causes an increase in these indicators by 0.0004% and 0.0008%. On the other hand, a change in debt level of 1% causes an increase in ROA, ROE, and NIM indicators by 0.1939%, 1.1264%, and 0.013%. A change in the capital adequacy level of 1% has an impact on the increase of ROA and ROE indicators by 0.238% and 1.1597%. The only indicator of profitability in this study on which one of the industry-specific indicators had a statistically significant impact is NIM, whose change of 0.0006% was caused by a change of the HHI indicator by 1%. After these results and the set hypotheses in the work methodology section, the authors can conclude that hypotheses H0, H4, and H5 are rejected, while hypotheses H0 and H3 can be accepted.

## Conclusion

This study included 22 banks currently operating in the banking market of the Republic of Serbia. The study included an analysis of the impact of various factors on the profitability of banks in the period from 2014 to 2021. The analysis included dependent variables ROA (return on assets), ROE (return on equity), and NIM (net interest margin) as indicators of profitability, while independent variables were divided into bank-specific, industry-specific, and macroeconomic factors. The results themselves showed the expected results. In the case of ROA and ROE indicators, the fixed effects model proved to be more adequate while this is not the case with NIM, where the random effect model proved to be better. The results of the analysis showed a statistically significant influence on indicators of liquidity and operating profit. Loans and capital adequacy on ROA and ROE, where liquidity reduces the level of profitability while the increase in other indicators has a positive impact on profitability, which was to be expected. The results also showed a statistically significant influence on liquidity, debts, and the Herfindahl-Hirschman indicator (HHI) of market concentration on the NIM (net interest margin) indicator. An increase in liquidity harms profitability, while loans and HHI have a positive impact on profitability in the case of net interest margin. The shortcomings of this research can be found mostly in the use of a period of eight years and not including certain other indicators, mostly industry-specific and macroeconomic factors. As a proposal for future research, the authors suggest the use of more variables in the analysis itself, but also the analysis of a similar banking market for comparative analysis with the banking market of the Republic of Serbia. This study provides a better and more precise insight into certain factors and their effect on bank profitability and provides managers with a basis for understanding the trend of bank profitability indicators.

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