Sensitivity of bank profitability to changing in certain internal and external variables: the case of Bosnia and Herzegovina

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Abstract

Banking profit plays a very crucial role in terms of providing a base for internal growth as well as a signal for additional borrowing. Profit is also a source for dividend payments to shareholders and expectations for future dividend payments. This research includes all banks in Bosnia and Herzegovina and testing endogenous and exogenous variables on bank profitability indicators. In addition to credit risk, the profitability of banks in B&H is also influenced by the financial result of operations, which is determined by price and interest rate risk. The primary goal of this paper is to attempt to identifying and recognizing the factors affecting the profitability of banks operating in Bosnia and Herzegovina. Therefore, this research focuses on the determinants of banking sector profitability that can be divided into two groups, namely: internal and external factors. The research period covered the years from 2007q1-2019q4 on a quarterly database. The total number of observations was 52. The paper included the OLS regression model (FE model) and the random-effects GLS model. Both models were appropriate for the obtained results through the Hausman test. The results showed that the significant influence on the dependent variables were the return on asset (ROA) and return on equity (ROE), which has been achieved by the following independent variables, such as the growth rate of net profit/loss, cost to income ratio and the growth rate of gross domestic product.

Keywords: profitability, non-performing loans, cost-to-income ratio, bank sector

Introduction

Profit for banks is necessary to attract new capital and enable the expansion and improvement of the performance of the banking sector. Also, profits can perform multiple functions, one of them is the creation of provisions for possible losses that may occur due to the poor performance of banks. Profit encourages bank

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management to expand and refine corporate strategy, reduce costs and improve service delivery. Bank profitability can be measured using different techniques and methods. Each of the methods has its advantages and disadvantages. One significant method is to compare profitability with the total assets of the bank, which will be discussed in the research data section. Thus, return on assets is a useful measure when comparing the profitability of a bank with the profitability of the entire banking system. If savings accounts for a large proportion of total deposits, interest expense may be above average. In these circumstances, banks will seek to reverse in terms of more aggressive lending and investment policies to generate more revenue (Reed and Gill, 1989). Many studies in the economic literature have explored the issue of banks because banks play a very significant role in the economic activity of a country. In this regard, various economic terms have been introduced to better explain the performance of banks, such as competition, concentration, efficiency, productivity and profitability (Bikker and Bos, 2008). In addition to credit risk, the profitability of banks in Bosnia and Herzegovina is also influenced by the financial result of operations, which is determined by price and interest rate risk.

This research attempts to identify the internal and external factors that determine banks' profitability in Bosnia and Herzegovina, by investigating the effect of each one of them on profitability, mainly (the growth rate of non-performing loans, the growth rate of profit/loss, GDP growth rate, the growth rate of loan-todeposit ratio, cost-to-income ratio and capital adequacy ratio).

The paper consists of five parts. The first part provides an overview of empirical evidence in terms of the results of the influence of internal and external factors on the profitability of bank operations. The second part analyzes a selected group of bank health indicators in B&H in terms of returns and risks. The thirds parts describe the chosen model and estimation technique, namely the Random effect model and the Fixed effect model through the application of the Hausman test. The forth part deals with the data necessary for the analysis. The five parts elaborates on the results of the research with recommendations.

1. Empirical evidence

A number of studies have argued that cost control is a key determinant of bank profitability management. According to Bourke (1989) the level of staff expenses has a negative impact on the ROA indicator. On the other hand, Molyneux (1993) concluded that there is a positive causality between staff expenses and total profits. Shen (2003) investigated the impact of concentration on bank performance using 52 countries between 1993 and 2000. His findings support the view that higher market concentration leads to higher bank earnings. Also, he has proved that concentration was adversely affected by low risk, corruption, confiscation and accounting standards. The three main reasons why state banks perform worse than private banks are in the first place because state banks are burdened with many goals in terms of

economic and social development. In this regard, profit maximization is often overlooked, as it often happens that government-controlled banks have to sacrifice their profits to fulfill the role of an economic development agent. The second reason is that state-owned banks are vulnerable to political intervention. For example, a certain portion of a bank's asset may be allocated for the achievement of certain goals, such as obtaining votes, bribing officeholders, etc. (Sapienza, 2004). The realization of these goals certainly has the effect of slowing down the performance of the bank. The third reason for the poor performance of domestic banks over other banks relates to the appointment process of management and other staff, where priority is given to people who have political influence rather than people who can perform such functions.

According to Boubakri *et al*. (2005), bank privatization to strategic investors plays a significant role in business performance. The authors that newly privatized banks controlled by local industry groups became more exposed to credit and interest rate risk after privatization. On the other hand, privatized banks controlled by foreign investors have become more cost-effective. In many transition countries, control of a large number of privatized banks has shifted from state ownership to foreign ownership. The entry of foreign banks after privatization had a positive impact on the way that domestic banks became much more efficient in terms of overhead costs and interest spread, although it did not always have a positive effect on profitability. Micco *et al*. (2007) investigated the relationship between bank ownership and bank performance in 119 countries. They concluded that state-owned banks in developing countries had lower profitability, higher costs, higher employment rates, and lower asset quality than all domestic counterparts.

The loan-to-deposit ratio is used as a measure of the liquidity of bank operations. Certain studies have shown a positive relationship between LDR indicator and bank profitability indicators (Athanasoglou *et al*., 2006; Gul *et al*., 2011). Pasiouras and Kosmidou (2007) found that there is an inverse relationship between bank profitability and liquidity.

Sayilgan and Yildirim (2009) investigated the factors determining return on assets (ROA) and return on equity (ROE) in Turkish banks for the 2002-2007 period using the multivariable singe-equation regression method. They came to the conclusion that the ratio of capital and total assets has a positive effect on profitability indicators in a statistically significant manner.

Dietrich and Wanzenried (2011) found that bank profitability was determined by bank-specific, then industry-specific and explanatory variables. The variables used in studies that affect profitability differs as the datasets vary across studies. According to Trujillo-Ponce (2013) concentration as a significant indicator of banking business had a positive and significant impact on the efficiency of bank operations in Spain. However, the concentration of banks on the example of banks in China did not have a significant impact but a negative impact.

According to a study by Borio *et al*. (2015), high short-term interest rates can have the effect of reducing bank's profitability. The results of their research show that the effects of short-term interest rates on bank profitability depend on the elasticity of supply and demand for loans. In conditions where the demand for loans is resilient, and when interest rates on deposits are higher, this may have the effect of reducing bank's profitability. According to the results of Căpraru and Ihnatov (2015), bank profitability is negatively affected by the cost / income ratio, bank size, credit risk and market concentration.

Knežević and Dobromirov (2016) investigated the impact of specific factors for banks in Serbia, market and macroeconomic on the profitability of the banking sector of the Republic of Serbia. The sample referred to a total of 29 banks that operated in Serbia in the period from 2004 to 2011. As a dependent variable, they used the average return on assets, and as independent variables, the following were used: size, cost-to-income ratio, capitalization of a bank , liquidity of a bank, market concentration, total asset of commercial banks divided by GDP, market capitalization to total assets of the commercial banks, market capitalization to GDP, the annual inflation rate, and gross domestic product growth.The results of the regression analysis showed that the profitability of banks in Serbia is influenced by factors which depend on the banks operation, such as the size of the bank, cost-to-income ratio, liquidity of a bank, then specific factors while macroeconomic factors do not have a significant impact.

Ibrahimov (2016) analyzed the impact of banking and macroeconomic variables on the profitability of 41 banks for the period: 2012 - 2015. Based on the results of the statistical panel, he came to conclude that bank size and bank capital have a positive impact on the return on assets, while liquidity risk is negative associated with the return on assets. In the context of macroeconomic variables, such as: the devaluation of the exchange rate and the price of oil, he came to conclude that they have both a positive and a negative impact on profitability.

Satria *et al*. (2018) conducted a survey on a sample of the 10 largest commercial banks in ASEAN over the period from 2012 to 2016. They concluded that equity to asset had a positive impact on profitability, while the following factors had a negative impact on profitability: loan to deposit, investment to asset and GDP.

2. The Bosnian banking system in light of the analysis of risk and profitability indicators

Today, the banking sector of Bosnia and Herzegovina is the largest sector in the financial services industry. At the end of 2019, the share of banking sector assets in total GDP was around about 10%. In addition, the banking sector of Bosnia and Herzegovina performs numerous functions in the country, such as business financing functions and facilitating the payment process. Also, all forms of lending have been developed, ie the forms of traditional banking are dominant, while investment

banking operations are underdeveloped due to the lack of domestic institutions that would rate domestic companies. Table 1 shows a set of the most important indicators of risk assets and liquidity of the banking sector in Bosnia and Herzegovina.

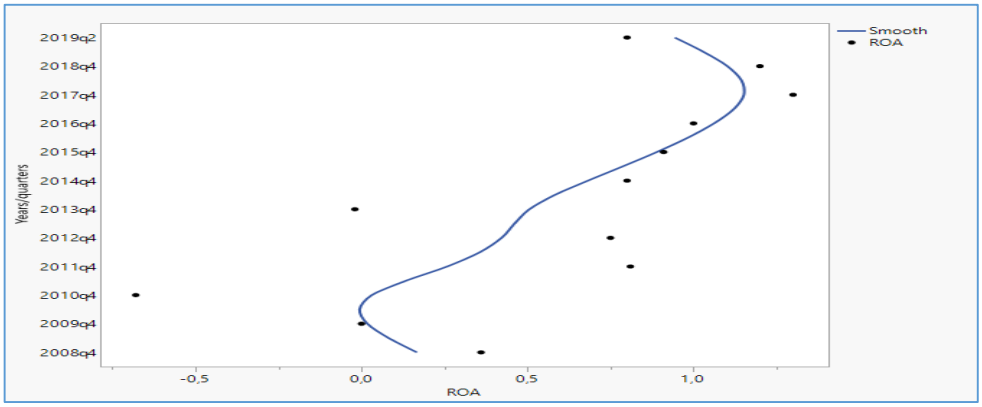
Table 1. Evaluation of some indicators of the Bosnian banking sector during 2010 – 2019 (in %)

Indicators	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average
Regulatory Capital to Risk-Weighted Assets	16.2	17.1	17.8	16.3	16.3	14.9	15.8	15.7	17.5	18.0	**16.56**
Non-performing Loans to Total Gross Loans	11.4	11.8	13.5	15.1	14.2	13.7	11.8	10.0	8.8	7.4	**11.77**
Interest Margin to Gross Income	60.1	63.9	63.7	62.3	61.6	62.0	60.4	58.3	58.8	56.8	**60.79**
Liquid Asset Ratio	29.0	27.2	25.4	26.4	26.8	26.5	27.2	28.4	29.7	29.6	**27.62**

Source: author's representation based on IMF data

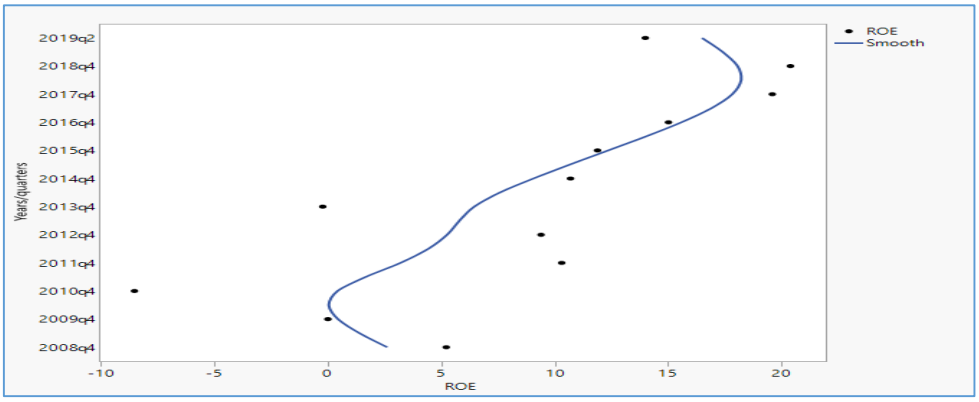
The banking sector of Bosnia and Herzegovina during the observed period was adequately capitalized, where the rate of regulatory capital in relation to risk assets ranged from a minimum of 14.9% in 2015 to a maximum of 18% in 2019, which is significantly above the statutory minimum of 12 %. The average capital adequacy ratio was 16.56%. Toxic loans had a very volatile trend as a result of increased credit risk, risk aversion, saturation of the economy with loans, rising unemployment rates and the limited inflow of money from abroad. The largest share of non-performing loans in total gross loans was recorded in 2013 (15.1%), while on the other hand the smallest share was recorded in 2019 (7.4%). The average amount of toxic loans in total loans was about 12%. The reduction in credit risk and non-performing loans arose as a result of the permanent write-off of non-performing loans, mild economic growth achieved in 2019, and more favorable financing conditions in terms of falling interest rates.

Figure 1. Trend of return on assets of banks in Bosnia and Herzegovina in the period 2008q4-2019q2 (in%)



Source: author's representation based on based on data from the Banking Agency of the Federation of Bosnia and Herzegovina[1] and Banking Agency of Republika Srpska

Figure 2. Trend of return on equity of banks in Bosnia and Herzegovina in the period: 2008q4 - 2019q2 (in%)



Source: author's representation based on data from the Banking Agency of the Federation of Bosnia and Herzegovina[2] and Banking Agency of Republika Srpska

[1] Banking Agency of the Federation of Bosnia and Herzegovina (2018), Information on the Banking System Entities of the Federation of Bosnia and Herzegovina (retrieved from https://www.fba.ba/bs/informacija-o-subjektima-bankarskog-sistema-federacije-bih-sa-stanjem-na-dan-31122018).

[2] Banking Agency of the Federation of Bosnia and Herzegovina (2019), Information on the Banking System Entities of the Federation of Bosnia and Herzegovina (retrieved from www.fba.ba/upload/docs/informacija_o_bankarskom_sistemu_30092019_eng_fra.pdf).

The first analyzed indicator of banks in Bosnia and Herzegovina return on asset (ROA) which had a volatile trend with a decline in value in 2010, as a result of increased costs of loan loss provisions and poor quality of the loan portfolio. In the later period, due to the recovery of economic activity and falling interest rates and write-offs of toxic loans, the ROA was increased slightly to 1% in the last quarter of 2016. In the fourth quarter of 2018, the ROA was recorded a value of 1.2%, and the average value of the observed period it was about 0.48%.

The second analyzed indicator is, return on equity (ROE), followed an identical pattern in moving to higher values. The negative ROE of banks in Bosnia and Herzegovina in 2010 was a direct result of increased costs and increased deductions from current revenues to cover loan losses. After 2010, profits were positive and reach a level of 10%. The highest levels of earnings were recorded in the third quarter of 2018 (19.90%) and the fourth quarter of 2018 (20.40%) respectively. Retention of expansionary monetary policy and low-interest rates by ECB had positive implications for boosting economic growth not only in EU countries but also in Southeast Europe (Banking Agency of the Federation Bosnia and Herzegovina, 2018).

2.1. Model and estimation technique

The Hausman test provides a simple way to choose between a random effect and a fixed-effects model. Of course, panel analysis is likely to be applicable compared to OLS, since the panel allows for control of individual unnoticed heterogeneity. Therefore, the Hausman test[3], provides a way to test between models to select a specific estimate between these two options. Following this approach, neither hypothesis has an association between individual-specific effects and independent variables, and cannot be rejected for both measures of profitability.

Estimating random effects models is a consequential strategy, distinguishing random and fixed effects by defining the target of inference (Wooldridge, 2002). According to Snijders (2005) and Mueller and Uhde (2011), a random effect model is better served if the interest of inference relates to the population average, that is if the banks are viewed as a sampling of the total population. On the other hand, fixed effects are more suitable if the data are not sampled but cover the entire population. Therefore, the models in this study use the fixed effect model (FE) and the Random effects model (RE).

In order to assess the impact of banking-specific, market and macroeconomic variables on the profitability of banks in Bosnia and Herzegovina, we used the following general model:

[3] For instance, random effect versus fixed effect as well as a random effect versus pooled OLS.

$$Y_{it} = \alpha + \beta' X_{it} + \mu_{it} \quad (1)$$

where Y_{it} is the dependent variable , α is the intercept term, β – is a kx1 vector of parameters to be estimated on the explanatory variables and μ is an error term (Brooks, 2008). By including all independent and dependent variables (ROA) in equation 1, model I is formulated as follows:

$$ROA_{i,t} = \alpha + \beta_{it}\left(GRNPL_{i,t} + GRPL_{i,t} + GDPGR_{i,t} + GRLDR_{i,t} + COINC_{i,t} + CAR_{i,t}\right) + \mu_{it} \text{ (Model I)}$$

By including all independent and dependent variables (ROE) in equation 1, model II is formulated as follows:

$$ROE_{i,t} = \alpha + \beta_{it}\left(GRNPL_{i,t} + GRPL_{i,t} + GDPGR_{i,t} + GRLDR_{i,t} + COINC_{i,t} + CAR_{i,t}\right) + \mu_{it} \text{ (Model II)}$$

The zero hypothesis supports the random-effects model. The alternative hypothesis supports the fixed effects model. The following hypotheses were tested:

- *The zero hypothesis supports the random-effects model.*
- *The alternative hypothesis supports the fixed effects model.*

If a p-value is statistically significant, the fixed-effect model should be used. On the other hand, if a p-value is not statistically significant, the random effect model should be used. The significance test was performed for all variables by using a t-test at a significance level of 95% (Chmelarova, 2007). The zero and the first hypotheses were tested by using the Hausman test.

2.2. Data and variables

The sample of this research consists of 30 commercial banks (15 banks in the Federation of Bosnia and Herzegovina and 15 banks in the Republika Srpska) which operated in Bosnia and Herzegovina in the period from the first quarter of 2007 to the fourth quarter of 2019. The bank-specific data were collected from individual financial reports of banks as well as the Banking Agency of the Federation of the B&H and the Banking Agency of Republika Srpska, while data on the country and market were obtained from statistical publications of Bosnia and Herzegovina and The Central Bank of Bosnia and Herzegovina. This empirical study uses quarterly data for the entire banking system of Bosnia and Herzegovina. The survey period covers the period from the first quarter of 2007 to the fourth quarter of 2019. The dependent variables the return on asset (ROA) and the return on equity (ROE) were used. Six independent variables as the growth rate of non-performing loans (GRNPL), the growth rate of the profit / loan (GRPL), the growth rate of the gross domestic product (GRGDP), loan-deposit ratio (GRLDR), cost-to-income ratio

(COINC) and capital adequacy ratio (CAR) were used. As in most of the previous studies, ROA and ROE is a dependent variable and it is used as a measure of individual bank profitability. In table 2 the explanatory variables and anticipated effects of dependent and independent variables are given:

Table 2. A brief description of the dependent and independent variables in the model

Variable	Measured by	Anticipated signs
ROA	The ratio of profit to total assets	-
ROE	This ratio is obtained by dividing the bank's net income with equity	-
GRNPL	The growth rate of non-performing loans (payment of interest and principal past due date by 90 days or more) to total gross loans	Negative (-)
GRPL	The growth rate of profit/loss	Positive (+)
GRGDP	The growth rate of the gross domestic product	Positive (+)
GRLDR	The loan-to-deposit ratio and comparing a bank's total loans To its total deposits for the same period.	Negative (-)
COINC	Cost-to-income ratio	Negative (-)
CAR	Capital adequacy ratio	Negative (-)

Source: author's representation

Return on assets (ROA) - is considered to be the most appropriate measure to evaluate the performance of a bank's business. The ROA is obtained by dividing the bank's income before the interest payable on its assets. Thus, ROA measures the effectiveness of management in using the resources of a bank to make a profit. It also evaluates the efficiency of the bank in using its financial and real investments to earn interest and other fees. This measure of bank profitability is particularly significant when comparing operational efficiency between banks (Sinkey, 1988).

Return on equity – (ROE) - expresses how much a bank earns on the book value of its investments. This ratio is obtained by dividing the bank's net income with equity, which reflects the revenue generation, operational efficiency, financial leverage, and tax planning. For some banks, ROE may be high because banks do not have an adequate capital ratio. The capital adequacy ratio in Bosnia and Herzegovina is 12%, which is the legal minimum so that almost all banks maintain a capital adequacy ratio. ROE can also be obtained as a product of ROA and leverage multiplier, where a bank can use this ratio between two ratios to improve ROE ratios. For example, banks with low ROA, can increase their ROE by using additional leverage, that is, by increasing their asset-equity ratio (Koch and MacDonald, 2009).

The growth rate of non-performing loans (NPLs) - represents the sum of borrowed money by banks to debtors, where debtors have not made the payment of interest and principal at least 90 days for commercial bank loans and 180 for consumer loans (Đukić, 2011).

The growth rate of profit/loss (GRPL) - for banks whose shares are not listed on stock exchanges, which is typical for countries where the capital market is underdeveloped, the use of profitability indicators is the only way to measure business performance. The bank operates profitably when interest income is greater than interest expense and other credit loss expenses. Conversely, a bank incurs an operating loss when interest income is less than interest expense and other credit loss expenses (Đukić, 2011). I expect a positive relationship between indicators of profitability and net profit.

The growth rate of the gross domestic product (GRGDP) - is a measure of economic growth as it relates to gross domestic product from one period to another, adjusted for inflation, and presented in real terms as opposed to nominal. Vong and Chan (2009) argue that there is a general perception where the default values of bank loans are usually lower at a time of favorable economic growth, while they are higher during adverse economic growth, and these situations do affect the profit of banks. According to Ongore and Kusa (2013), the trend of gross domestic product influences bank's assets in the context that as trends move towards a declining GDP, demand for loans decreases, which negatively affects bank's profitability. Conversely, when economic trends move toward increasing magnitude or have positive GDP growth, then such a cycle leads to a high demand for credit.

The growth rate of loans to deposits ratio (LDRGR) is calculated as the ratio of net loans to bank customers and total customer deposits. As noted in the literature review according to Pasiouras and Kosmidou (2007) this ratio shows how liquid the assets of the banks are, given the fact that liquid assets are associated with lower profitability rates. In this research, I expect a negative relationship between profitability indicators and LDRGR.

Cost to income ratio (COINC) is usually used as a measure of the efficiency of bank operations in terms of cost efficiency. This ratio is obtained by dividing the overhead costs with a sum of net interest income and other operating income. According to Kosak and Cok (2008), there is an inverse causality between the cost to income ratio and profitability indicators.

The capital adequacy ratio (CAR) is the ratio determined by the regulatory body for supervising banking operations and serves to test the health of the banking system, that is, it represents a safety pill for the absorption of a certain amount of losses (Bokhari and Ali, 2009).

3. Results

Before the hypothesis was tested, correlations and regression were shown in tables 3-8. The total number of observations is 52 which represents a representative sample both in terms of the bank sector of Bosnia and Herzegovina and the view of the timeframe.

Table 3. Correlation matrix (Pearson Correlation) between dependent and independent variables of banks in Bosnia and Herzegovina in the period: 2007q1 – 2019q4

Correlations								
		ROA	**GRNPL**	**GRPL**	**GDPGR**	**LDRGR**	**COINC**	**CAR**
ROA	Pearson Correlation	1.000	-0.046	0.835**	0.308*	-0.238	-0.613**	0.195
	Sig. (2-tailed)		0.747	0.000	0.026	0.089	0.000	0.166
	N	52	52	52	52	52	52	52
GRNPL	Pearson Correlation	-0.046	1.000	0.041	0.259	0.840**	0.065	0.098
	Sig. (2-tailed)	0.747		0.775	0.064	0.000	0.647	0.490
	N	52	52	52	52	52	52	52
GRPL	Pearson Correlation	0.835**	0.041	1.000	0.555**	-0.065	-0.500**	0.165
	Sig. (2-tailed)	0.000	0.775		0.000	0.645	0.000	0.242
	N	52	52	52	52	52	52	52
GDPGR	Pearson Correlation	0.308*	0.259	0.555**	1.000	0.203	-0.412**	-0.141
	Sig. (2-tailed)	0.026	0.064	0.000		0.150	0.002	0.320
	N	52	52	52	52	52	52	52
LDRGR	Pearson Correlation	-0.238	0.840**	-0.065	0.203	1.000	0.265	-0.003
	Sig. (2-tailed)	0.089	0.000	0.645	0.150		0.058	0.981
	N	52	52	52	52	52	52	52
COINC	Pearson Correlation	-0.613**	0.065	-0.500**	-0.412**	0.265	1.000	-0.126
	Sig. (2-tailed)	0.000	0.647	0.000	0.002	0.058		0.375
	N	52	52	52	52	52	52	52
CAR	Pearson Correlation	0.195	0.098	0.165	-0.141	-0.003	-0.126	1.000
	Sig. (2-tailed)	0.166	0.490	0.242	0.320	0.981	0.375	
	N	52	52	52	52	52	52	52

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: author's representation

The strongest negative correlation of the dependent variable return on asset (ROA) at the level of significance of 5% was recorded with the following independent variables: cost-to-income ratio (-0,613), the growth rate of loan to deposit ratio (-0,238) and the growth rate of non-performing loans (-0,046).

Non-performing loans increased the cost of provisioning, have the effect of reducing the bank's capital, making the bank unable to grow and expand its operations, and the result may be bank insolvency or liquidation (Babouček and Jančar, 2005). Also, banks with a high amount of non-performing loans in their investment portfolio are sure to achieve a reduction in their earnings (Bessis, 2006). In the banking sector of B&H at the end of 2018, the share of non-performing loans

in total loans was amounted to only 6.5%, as a result of permanent write-offs by individual banks. Also, reprogramming and better monitoring, as well as interest rate reductions, had a greater impact on reducing toxic loans (The Central Bank of Bosnia and Herzegovina, 2018, p. 35). On the other hand, the strongest positive causality with return on assets was achieved by the following independent variables: the growth rate of profit/loss (0,835) than the GDP growth rate (0,308) and capital adequacy ratio (0,195). Therefore, with an increase in business activity measured by the GDP growth rate, it creates a favorable economic climate for foreign bank migration, which increases banking assets and lending placement, and thus influences the successful conversion of assets into bank earnings.

The preceding VIF cutoffs were considered to be multi collinear, which were set at industry level. Each variable that has a higher VIF than 3 was considered as multi collinear and was dropped from the model. In case of multi-collinearity, the coefficients of the variables became unstable and standard errors were inflated.

Table 4. Multi-collinear analysis via variance inflation factor for all observed countries (VIF)

Variable	VIF	1/VIF
GRNPL	**2.85**	**0.3508**
GRPL	1.79	0.55847
GDPGR	1.93	0.51726
LDRGR	2.94	0.34014
COINC	1.68	0.59506
CAR	1.19	0.84202
Mean VIF 2.063		

Source: author's representation

As it can be seen in the previous table, each individual independent variable for all observed countries have a VIF coefficient value less than 3 or 3, but not more than 3. It is clear that there is no multi-collinearity between the variables, so the set model is valid.

Table 5 shows the results of the fixed effects regression (FE) between the selected variables in the model. The total number of observations is 52 which makes the models relatively representative. The empirical value of the F test for 10 degrees of freedom in the numeration and 42 in the denomination was 28,70. The probability based on the fixed effects regression is 0.000, which means that the model is very significant. In the table 5, it can be seen that independent variables (p-value < 5%) mostly affect the dependent variable return on asset (ROA) such as the growth rate of profit/loss (0.000), the cost-to-income ratio (0.003) and the growth rate of gross domestic product (0,004).

Table 5. Fixed effects regression between dependent (ROA) and independent variables of banks in Bosnia and Herzegovina in the period: 2007q1 – 2019q4 – Model I

Fixed-effects (within) regression					**Number of obs = 52**	
R-sq: within = 0.8039					Number of groups = 4	
between = 0.9893						
overall = 0.8160					Obs per group: min =13	
avg = 13.0 max = 13 F(10,42) = 28.70 Prob > F = 0.000						
ROA (dependent)	**Coef.**	**Std. Err.**	**t**	**P>[t]**	**[95% Conf . Interval]**	
GRNPL	-0.0141	0.01020	1.39	0.172	-0.00640	0.03478
GRPL	0.00459	0.00049	9.19	0.000	0.00358	0.00559
GDPGR	1.41e-07	4.68e-08	3.02	0.004	2.36e-07	4.67e-08
LDRGR	-0.01252	0.008497	-1.47	0.148	-0.02966	0.004623
COINC	-0.00616	0.001965	-3.14	0.003	-0.01013	-0.002197
CAR	-0.02349	0.043839	-0.54	0.595	-0.11196	0.064997
_cons	2.973516	1.055588	2.82	0.007	0.8432545	5.103778
sigma_u	0.023437					
sigma_e	0.22856					
rho	0.01040					

Source: author's representation with STATA 13.0

There is a negative link between the cost to income ratio and the return on asset (ROA) (-0,006). Increase the cost to income ratio of one unit, ceteris paribus, leads to a decrease of return on asset (ROA) by 0,006 units. The results of a number of studies have shown that there is an inverse relationship between the cost-to-income ratio and ROE. The very high value of the cost-to-income ratio shows that the profitability of banks largely depends on the management of operating costs, primarily the personnel expenses. In order for bank managers maintain higher profits, they need to reduce operating costs or take on higher credit risk. Given that there is increasing competition in credit markets (saturation of the economy with loans) which affects the reduction of net interest margins, as well as increased share of bad assets, bank management in Bosnia and Herzegovina should, in addition to reducing operating costs, introduce new products based on non-interest income. On the other hand, the most significant positive correlation with p-value below 5%, i.e. 0.000, respectively, was achieved between the growth rate of gross domestic product and return to the asset. Also, a positive

correlation was observed between the growth rate of profit/loss and return on asset (0,004).

Table 6. Random effects (GLS) regression between dependent and independent variables of bank's in Bosnia and Herzegovina for the period: 2007q1 – 2019q4 – Model I

Random-effects GLS regression					**Number of obs = 52**	
R-sq: within = 0.8038					Number of groups = 4	
between = 0.9907						
overall = 0.8161					Obs per group: min = 13	
avg = 13.0 max = 13 Wald chi2 (6) =199.76 Prob > chi2 = 0.0000						
ROA (dependent)	**Coef.**	**Std. Err.**	**z**	**P>[z]**	**[95% Conf . Interval]**	
GRNPL	-0.0155	0.00946	-1.65	0.100	-0.002970	0.03412
GRPL	0.0046	0.00471	9.83	0.000	0.003709	0.00555
GDPGR	1.40e-07	4.42e-08	3.17	0.002	2.27e-07	5.34e-08
LDRGR	-0.0138	0.00789-	-1.76	0.079	-0.02931	0.001612
COINC	-0.0060	0.00187	-3.21	0.001	-0.00968	-0.00234
CAR	-0.0230	0.0422	-0.55	0.585	-0.1057	0.05961
_cons	3.0377	1.002	3.03	0.002	1.0741	5.0013
sigma_u	0					
sigma_e	0.2285					
rho	0					

Source: author's representation with STATA 13.0

The results of the correlated random effects were investigated to decide which model best represents the significance between the dependent and independent variables. The results showed that GLS regression better describes the impact of independent variables on return on asset (ROA). The results of the Hausman test showed that Pro>chi2 = 0.998, that is, the random effect GLS model gives higher significance than fixed effects regression (Tables 6 and Appendix I). The most significant positive effect on the dependent variable (ROA) were recorded by the following independent variables: the growth rate of profit/loss (0.000) and the growth rate of gross domestic product (0,002). Economic growth as a measure of GDP has a significant impact on financial development as well as on the need to use financial services. In this regard, the economy develops, the demand for the use of financial services increases, which greatly affects the performance of banks (Patrick, 1996). GDP growth in the reporting period was recorded in 2007 (6%) so that in 2009 the real GDP growth recorded a negative value of 2.7%. In the period after 2009, there was a tendency of further decline in GDP until 2013, as a result of weak

economic activity and weak domestic and[4] foreign demand. Over 2014, there was a period of mild economic expansion and recovery, where the real GPD in 2015 recorded a growth of about 4.1%, so four years later (i.e., in 2019) economic growth would record a value of about 3.2%.

On the other hand, the most significant negative correlation with p-value below 5%, i.e. 0.000, respectively, was achieved between the cost to income ratio and return to the asset (-0,006). Also, a negative correlation was observed between the growth rate of loan to deposit ratio and return on asset with p-value slightly above 5%. This negative causality means that an increased loan to deposit ratio can consequently lead to an increase in bank liquidity risk. Miller and Noulas (1997) identified based on research that there is a negative correlation between the lands to deposit ratio and the profitability of banks in the United States. In 2007, banks in Bosnia and Herzegovina held about 41% of their assets in cash, which, together with the intervention of the Central Bank, which reduced the reserve requirement rate, helped them to overcome the liquidity problem. The share of liquid assets in the total assets of banks in B&H in 2019 was reduced to only 26% (Banking Agency of the FB&H, 2019 & Banking Agency of Republika Srpska, 2019). Banks in B&H have high liquidity and do not approve loans to their free reserves allow. The essential reasons for the slowdown in lending are primarily bad debtors, the lack of quality programs by the private sector and the growth of credit risk.

An inverse correlation with p - value above 5% was recorded between capital adequacy ratio and return on asset (-0,02), which indicates to the conclusion that regulatory capital in B&H banks does not have a significant impact on ROA. For the observed period, the banking sector had a much higher rate of regulatory capital than the legal minimum of 12%.

Table 7 shows the results of the fixed effects regression (FE) between the selected variables in the model. The empirical value of the F test for 10 degrees of freedom in the numeration 42 in the denomination was 30.37. The probability based on the fixed effects regression is 0.000, which means that the model is very significant. The same table shows that independent variables (p-value < 5%) mostly affect the dependent variable return on equity (ROE) such as the growth rate of profit/loss (0.000).

[4] B&H Directorate for Economic Planning (2019). Bosnia and Herzegovina – Economic trends, Annual report, (2019), Retrieved from: http://www.dep.gov.ba/dep_publikacije/ekonomski_trendovi/Archive.aspx?pageIndex=1&langTag=bs-BA.

Table 7. Fixed effects regression between dependent (ROE) and independent variables of banks in Bosnia and Herzegovina for the period: 2007q1 – 2019q4 – Model II

Fixed-effects (within) regression					**Number of obs = 52**	
R-sq: within = 0.8127					Number of groups = 4	
between = 0.9049						
overall =0.8133					Obs per group: min =13	
avg = 13.0 max = 13 F(10,42) = 30.37 Prob > F = 0.000						
ROE (dependent)	**Coef.**	**Std. Err.**	**t**	**P>[t]**	**[95% Conf . Interval]**	
GRNPL	-0.0546	0.132	-0.41	0.681	-0.2120	0.32124
GRPL	0.0568	0.006	8.79	0.000	0.0438	0.06992
GDPGR	4.84e-07	6.06e-07	0.80	0.429	-7.39e-07	1.71e-06
LDRGR	-0.0713	-0.110	-0.65	0.520	-0.29334	0.15073
COINC	-0.0499	0.025	-1.96	0.056	-0.10131	0.00137
CAR	-0.6865	0.567	-1.21	0.233	-1.8322	0.45909
_cons	20.0634	13.669	1.47	0.150	-7.52216	47.6489
sigma_u	0.7707					
sigma_e	2.95970					
rho	0.06351					

Source: author's representation with STATA 13.0

Table 8 shows the results of random effects (GLS) regression between the dependent variables, i.e., return on equity (ROE) and the independent variables in the model. The probability based on the fixed effects regression is 0.000, which means that the model is very significant.

Table 8. Random effects (GLS) regression between dependent and independent variables of banks in Bosnia and Herzegovina for the period: 2007q1 – 2019q4 – Model II

Random-effects GLS regression					**Number of obs = 52**	
R-sq: within = 0.8117					Number of groups = 4	
between = 0.9192						
overall =0.8142					Obs per group: min = 13	
avg = 13.0 max = 13 Wald chi2 (6) = 197.25 Prob > chi2 = 0.0000						
ROE (dependent)	**Coef.**	**Std. Err.**	**z**	**P>[z]**	**[95% Conf . Interval]**	
GRNPL	-0.0866	0.1253	-0.69	0.489	-0.15886	0.33221
GRPL	0.0554	0.0062	8.89	0.000	0.04320	0.06765

GDPGR	3.05e-07	5.85e-07	0.52	0.602	-8.42e-07	1.45e-06
LDRGR	-0.0894	0.1044	-0.86	0.391	-0.29418	0.115195
COINC	-0.0538	0.0247	-2.17	0.030	-0.10241	-0.00523
CAR	-0.6462	0.5583	-1.16	0.247	-1.74054	0.44811
_cons	2.3398	13.262	1.68	0.092	-3.65378	48.3334
sigma_u	0					
sigma_e	2.9597					
rho	0					

Source: author's representation with STATA 13.0

The results of the Hausman test show that Pro>chi2 = 0.873, that is, the random effect GLS model gives higher significance than Fixed effect regression (Tables 8 and Appendix I and II). The most significant positive effects on the dependent variable (ROE) were recorded by the following independent variable: the growth rate of profit/loss (0.000). With the increase in net profit, the market price of shares will increase if the bank management decides to regularly pay dividends to its owners, which will consequently lead to an increase in the ROE indicator. Conversely, if the shares do not gain in value in accordance with the expectations of shareholders, they can sell shares and bring down the market price, which can cause great difficulties for the bank to raise additional capital for further growth and development (Plakalović and Alihodžić, 2015). According to the results of the Hausman test (p-value > 5%) and the zero hypothesis cannot be rejected, which means that the random effect model is more appropriate in terms of the explanation of the influence of certain independent variables on a dependent variable (ROE) than the fixed effect model (Appendix II).

Conclusions

Bank's profitability is a major determinant of a bank's stability and its ability to continue lending. A stable banking sector can withstand future economic shocks. In this regard, it is very important to understand the bank's income and all the risks that come from the macroeconomic environment, especially the credit risk, which is still a threat to the profitability of banks in B&H.

In this study, endogenous and exogenous factors those affect the profitability of banks in Bosnia and Herzegovina were tested. For this purpose, in this study investigated took place for Bosnia Herzegovina on period of 2007: q1 -2019: q4. One of the most important variables of a bank is the efficient management of costs and revenues based on credit placements. Therefore, efficiency, cost management primarily increases the efficiency of bank operations, as the frequency of bank failure is reduced by reducing costs and controlling loan placements.

The effect of the independent variables on the dependent variable using the pooled OLS regression model (FE) model and the random-effects GLS regression model by using the Hausman test were used. The most significant impact through

the OLS regression model and GLS regression model had the following variables: the growth rate of profit/loss, the cost to income ratio and the growth rate of gross domestic product In terms of testing hypotheses through the Hausman test, we came to the conclusion that the null hypothesis was accepted and the alternative was rejected, because the GLS regression model best describes the influence of the independent variables on the dependent variable.

Improving the performance of banks in Bosnia and Herzegovina over the next few years will be a major challenge due to the influence of external factors such as slower economic growth, competitiveness, saturation of economy and population with credit, slow growth of employment and income, etc. In order to maintain and make higher profits, managers and supervisors of banks in Bosnia and Herzegovina will have to reduce operating costs in the coming period, primarily personnel expenses as compensation for increased competition, poor assets and net interest margins. In this regard, a successful response to a turbulent environment is certainly to forecast the bank's performance. Therefore, a larger data set of B&H banks could help to incorporate more determinants into the model and better understand the long-term and short-term relationships to the bank's profitability. This issue should be further explored.

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Appendix I. Results obtained using Hausman test for return on asset (ROA)

Variables	b(Fixed)	B(Random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
GRNPL	0.0141866	0.0155778	-0.0013912	0.003813
GRPL	0.0045912	0.004633	-0.0000418	0.0001667
GDPGR	1.41e-07	1.40e-07	1.01e-09	1.53e-08
LDRGR	-0.012517	-0.0138508	0.001334	0.0031546
COINC	-0.00616	-0.00602	-0.000144	0.0005942
CAR	-0.02349	-0.023057	-0.0004343	0.011953

Note: chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B) = 0.22
Prob>chi2 = 0.9988
Source: authors' representation (STATA 13.0)

Appendix II. Results obtained using Hausman test for return on equity (ROE)

Variables	b(Fixed)	B(Random)	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
GRNPL	0.054609	0.08667	-0.0320	0.0419
GRPL	0.056863	0.05543	0.00143	0.0017
GDPGR	4.84e-07	3.05e-07	1.79e-07	1.56e-07
LDRGR	-0.071303	-0.08949	0.01819	0.03462
COINC	-0.04996	-0.05382	0.00385	0.00572
CAR	-0.68654	-0.64621	-0.04033	0.10259

Note: chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)=1.82
Prob>chi2 = 0.8732
Source: authors' representation (STATA 13.0)