

Elman Nadžaković¹

Senada Dupovac²

Bedrija Hromić³

SENSITIVITY OF BANKS' CAPITAL IN THE FEDERATION OF BOSNIA AND HERZEGOVINA TO CHANGES IN EXOGENOUS AND ENDOGENOUS FACTORS

ABSTRACT

In order to ensure that risky assets are covered by the bank's capital, the regulator has prescribed a minimum capital adequacy ratio (CAR). The prescribed CAR, which in the Federation of Bosnia and Herzegovina is 12%, represents the ability of banks to absorb losses caused by bad placements, expressed as the ratio of capital and risk assets of the bank. The sample of this research was performed at the level of the whole banking system of the Federation of Bosnia and Herzegovina. The primary goal of this paper is to try to identify exogenous and endogenous factors that affect the capital sensitivity of banks operating in the Federation of Bosnia and Herzegovina. The research is focused on the period from 2014-2020, every quarter, and the research will explain descriptive statistics, correlation analysis and regression analysis. The research estimated two regression models, assumptions were checked and the obtained results were interpreted. The results of the first model showed that there is a statistically significant positive correlation between the leverage rate and the capital adequacy ratio, and a statistically significant negative correlation between the GDP growth rate and the capital adequacy ratio. The second model confirmed that there is a negative statistically significant correlation between the variables return on average assets (ROAA), total income / average assets (UPPA), net interest income / average assets (NIM) with the capital adequacy ratio.

Keywords: capital adequacy ratio, GDP, leverage, banks, non - performing loans

JEL: G22, D24, E58

1 PhD Student, Faculty of Economics University of Zenica, e-mail: elman.nadzakovic@gmail.com

2 PhD Student, Faculty of Economics University of Zenica, e-mail: s.dupovac@gmail.com

3 MBA in Executive Management, Victoria, BC, Canada, hurija83@gmail.com

1. INTRODUCTION

As one of the significant market players, banks conduct their business within the regulatory terms and conditions. The capital adequacy requirement represents one of the most important themes for bank governance and financial regulators. Accordingly, the Capital Adequacy Ratio (CAR), as a recommended measurement of a bank's available capital, indicates banks' ability to absorb losses. The higher CAR implies higher absorption of losses due to non-performing loans. The CAR is used to protect the bank depositors while minimizing risk exposures.

The most important regulator is the Basel Committee on Bank Supervision (BCBS) that provides a baseline for a stronger structure of the bank capital so to minimize the risk of non-payments. The BCBS sets a framework for banks to calculate their capital via CAR as the minimum requirement. The corresponding bank agencies set the minimal CAR for Bosnia and Herzegovina.

This undertaking is structured via sections. After introductions, the authors researched and elaborated on the relevant literature. The influence of non-performing loans on CAR is presented as a separate section and describes the relationship between non-performing loans and CAR. The goal of this research, research questions, hypothesis, data and methodology are provided in the fourth section as well as the analysis and discussion about the findings and results of the research. The last section provides a summary and final research notes.

2. Literature review

The sensitivity of the capital, as the main theme of this research, is demonstrated through the observations of capital adequacy. The structure of the capital as the pillar of capital adequacy represents a combination of different sources of funding. This influential area of economic theory attracted numerous scientists so the Modigliani-Miller theorem 1958 formed the basis on the structure of the capital. Following this theorem, numerous studies appeared and provided views on the optimal structure of the capital. However, it is important to note, that the majority of scientists focused on the non-financial sector while a few scientists focused on the banking sector exclusively.

Hewaidy and Alyousef (2018) researched the influence of seven (7) different bank-specific and two (2) macroeconomic determinants on the adequacy of bank's capital based on the evidence from Kuwaiti banks. The findings pointed at a significant negative relationship between the CAR and the bank size, profitability, asset quality and liquidity. On the other hand, the quality of banks' governance is in a positive correlation with the CAR. The type of bank has no significant link with the

CAR. The interesting finding in this study is that liquidity has a negative correlation with the CAR measurement. In addition, it is found that there is no influence on profitability when using the Return on Asset and the Return on Equity (ROA & ROE) measurements. With respect to macroeconomic determinants, the authors found that the inflation rate is negatively correlated with the CAR, but other macroeconomic variables do not have a significant influence on the CAR.

Dao and Nguyen (2020) found out that CAR and indicators of the banks' performance have, statistically significant and positive linkage with credit growth, GDP growth, equity-to-deposit ratio and cost-to-income ratio in relation to CAR and ROE variables. The findings suggest that commercial banks should control the credit growth, GDP growth, equity-to-deposit ratio and cost-to-income ratio if they want to maintain an adequate level of capital.

Giesecke, Dixon and Rimmer (2017) researched the effects of an increase in CAR on an increase of potential expenditures related to the unanticipated macroeconomic impacts as commercial banks reduce leverage. In that context, the authors believe that study disclosed very small macroeconomic consequences due to an increase in CAR.

El-Ansary, El-Masry and Yousry (2019) research encompassing 37 Islamic banks and 75 conventional banks concludes the following: there is a significant correlation between CAR and the size of the bank, operational efficiency and the growth rate of GDP resulting in a retroactive impact on CAR. While study findings with respect to the Islamic banks indicate a significant linkage between CAR and deposit-to-asset ratio, the conventional banks indicate a linkage between CAR and profitability, credit and portfolio risks.

Aktas and others (2015) estimated the impact of banks variables and external factors on banks' coefficient of the adequacy of capital in the South Eastern European region. The banks' size, profitability (ROA), leverage, liquidity, net interest margin (NIM), and risk are used as independent variables in the model, while an economic growth rate, inflation, real interest rate, the stock market volatility index within Eurozone, coverage of deposit insurance and banks' governance indicators are added to the original model for control of external factors.

For this study, during the 2007-2012 period, authors used annual data coming from 71 commercial banks from 10 different countries within the region. The study findings indicate that dimensional exploratory variables such as size, ROA, leverage, liquidity, net interest margin, and risk have a statistically significant correlation with CAR. At the same time, external factors such as economic growth rate, the stock market volatility index within the eurozone, coverage of deposit insurance and governance have a statistically significant impact in determining CAR for the regional banks.

Dreca (2013) explored the impact of capital structure, bank size, profitability indicators, the portion of deposits and loans in total assets, and leverage on the CAR. The study encompassed 10 banks with data collected over the 2005-2010 period. According to the findings, SIZE, DEP, LOA, ROA, ROE and LEV have a significant impact on the CAR. On the other hand, it appears that LLR and NIM do not have a significant effect. The variables such as SIZE, DEP, LOA and ROA negatively impact CAR; while variables such as LLR, ROE, NIM and LEV are positively linked with CAR. Except for LOA and ROA, all variables have expected signs.

Eldomiaty, Eldin and Azzam (2016) aimed to demonstrate empirical evidence explaining the internal financial indicators of banks with influence on CAR and the stress test of the capital adequacy requirement on Egyptian banks. The results indicate that return on assets, return on equity and asset-based market share have a significant impact on CAR. The ratio of loans-to-deposits and non-performing loans have a positive significant effect on CAR. The coefficient of liquidity expressed in US dollars has a trivial effect on CAR. The coefficient of liquidity in Egyptian pounds has an insignificant effect on CAR. The coefficient of loans-to-deposits, non-performing loans and liquidity in US dollars are robust and significant determinants on CAR.

Benazic and Masic (2016) pointed out an existence of a stable co-integrative linkage between macroeconomic variables and CAR. In the long run, the forecasted increase in the GDP growth rate leads towards a decline of CAR of Croatian banks, while an increase of the interest rate on credits in kuna with the currency clause and depreciative real-effective currency index of kuna leads towards an increase in CAR of the Croatian banks. On the other hand and short-term positive changes in the GDP growth rate and interest rate on credits in kuna with a currency clause have a positive effect on the Croatian banks CAR while a positive change in a real effective currency value of kuna has a negative impact on the Croatian banks' CAR.

3. The influence of non-performing loans on car

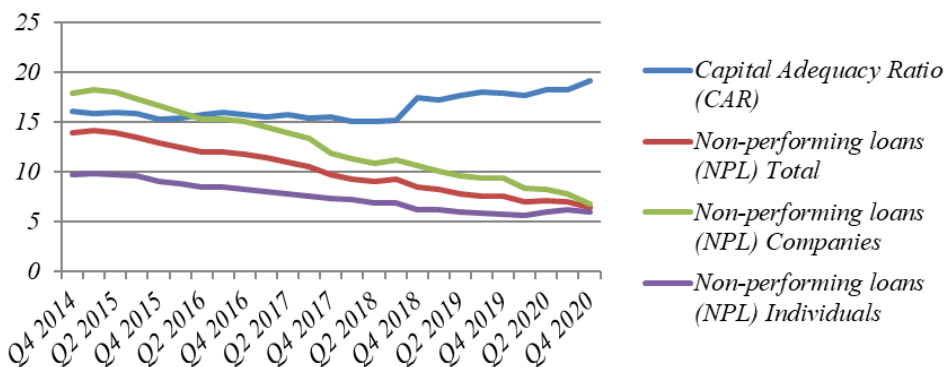
life, today is unimaginable without loans to the extent that an individual's growth is assessed via credit rating. The societies, the nations, are assessed via credit rating. Accordingly, the term credit presents an open field for further research. There are numerous definitions of the term credit so Vuckovic defined it as 'temporary lending of determined buying power so the consumer of credit would act or perform on the market with borrowed resources while stating the time-limited ownership. (Vuckovic, 1958)

Based on this definition, Bjelica believes that the buying power is a manifestation of the economic power and therefore, the term credit implies a temporary service of the lender to the borrower by providing access to a pre-determined amount of money with implied duties of the borrower to return the monetary resources within a given timeframe almost the same amount of the borrower's buying power. (Bjelica, 2001, p. 227)

Simply stated, credit is a way of lending resources, mostly financial, which a creditor or lender extend to a debtor or borrower, subject to fulfilling specific requirements, while a debtor or borrower undertakes the duty of returning the same resources in accordance with the pre-determined terms and conditions. Banks approve loans to individuals and corporations. This makes lending a core activity in most banks. Loans represent the main revenue stream for banks as well as the main source of risk(s). For that reason, it is of great importance to have adequate bank governance related to the management of the lending risks. In the end, the stability of commercial banks and the strengthening of the safety and the certainty of the banking sector as a whole are the main dependencies for a successful lending business. (Agic & Dusanic Gacic, 2019)

The non-performing loans, as one of the main risks, imply financial assets that do not provide interest or scheduled payments for a specific period and as such become the problem known as economic stagnation. Therefore, the minimization of non-performing loans represents also the main requirement for the economic growth. (Islam & Islam, 2018) researched and introduced empirical evidence of non-performing loans influencing, significantly, the capital adequacy of Bangladesh banks. The results point out that there is a significant negative correlation between non-performing loans and CAR as per the data of this research. Figure 1 depicts trends NPL rate and CAR of the banks that are conducting their business within the Federation of Bosnia and Herzegovina.

Figure 1: Trends NPL and CAR



Source: Data created and prepared by authors

Figure 1 depicts the timeline for the 4Q 2014 to the 4Q 2020 where is a noticeable trend in the CAR increase while the NPL (total, corporations and individuals) declines. The same trend shows a negative correlation between CAR and NPL, indicating a weakening of the credit risk. Continuous improvement in the quality of the credit portfolio within a given timeframe is due to the banks' efforts to write off non-performing loans and to the increased frequency in re-programming of credits. In addition, an increase in efficiency of the credit risk management by banks as well as opportunities to pay out credits via re-programs and imposed moratorium of credit duties from clients who face difficulties in repaying credit dues, greatly contributed to preventing further weakening of the quality of the credit portfolio. Despite a positive trend, it is important to emphasize that the NPL rate of the European Union at the end of Q4 2020 recorded 2.63%, which represents the aim of the analyzed banking sector within the Federation of Bosnia and Herzegovina.

4. Data and variables

The research was conducted on the whole population meaning the Federation of Bosnia and Herzegovina banking system as a whole. Data are based on the sample of 15 banks operating within the Federation of Bosnia and Herzegovina. At the end of 2020, the banking system operated with 531 organizational units, which employed a total of 6522 workers. The total net asset at the level of the banking sector is 24.4 billion, and the total capital is 3.1 billion BAM.

All data are collected from the reports coming from the Banking Agency of the Federation of Bosnia and Herzegovina, reports from the Central Bank of Bosnia and Herzegovina, and Federal Office of Statistics for the Entity of Federation of Bosnia and Herzegovina. The research was performed during the 2014-2020 period. The dependent variable for the research model is CAR representing the relationship of the bank's capital and risk-weighted assets. Independent variables, with their influence on the dependent variable as part of this research, are Leverage Rate (LR), GDP Growth Rate, Return on Average Assets (ROAA), Total Revenue/Average asset (UPPA) and Net Interest Margin (NIM). The following table shows the expected effects of independent variables on a dependent variable (CAR).

Table 1: Influencing factors on CAR

Short Name of Variable	Factor	Trend
LR	Leverage Rate	+
GDP	GDP Growth Rate	-
ROAA	Return on Average Assets	-
UPPA	Total Revenue / Average Asset	-
NIM	Net Interest Margin	-

Source: *Authors*

DESCRIPTIVE STATISTICS:

For the purpose of calculating the influence of exogenous factors on a dependent variable CAR, the model included variables such as LR rate and GDP growth rate. In order to establish the influence of endogenous factors, the model included ROAA, UPPA and NIM. All calculations are done while using STATA 12 software.

Table 2: Descriptive statistics of variables

Variable	Obs	Mean	Std.Dev	Min	Max
CAR	25	16.44	1.221338	15.1	19.1
LR	25	9.858	.419305	9.2	10.54
GDP Growth	25	2.036	3.058987	-9.3	4.5
ROAA	25	.8028	.3177331	.3	1.3
UPPA	25	2.8836	1.82234	.5	5.6
NIM	25	1.9372	.9350914	.6	3.5

Source: Data created and prepared by authors

Within an observable period the CAR increased from 15.1% to 19.1%, which is greater than the legal requirement minimum of 12%. In addition, the LV rate increased from 9.2% to 10.54% while the GDP Growth rate increased from -9.3% to 4.5%. The standard deviation as the indicator of variation or dispersion of a set of values, indicate the different performance of variables so the GDP Growth rate and UPPA recorded a significant downfall at the end of 2020, resulting in a high standard deviation. Unlike GDP Growth and UPPA, the other variables didn't display high oscillations in a given period with the exception of the continual gentle growth of CAR, as supported by the standard deviation of the CAR trend.

5. The influence of exogenous factors on car

For the purpose of estimating the influence of exogenous factors on the CAR, the linear regression model, according to which the parameters of the linear function were selected as they explain the variables based on the principle of the smallest quadrants. In order to establish the best influence of exogenous factors on CAR, the researchers used the following regression model:

$$Y_i = (b_0 + b_1 X_i) + \varepsilon_i \quad (1)$$

Where Y_i = i-th dependent variable, X_i = i-th the value of independent variable, b_0 = constant (free member), b_1 = ascent, a ε_i = random error. Including all independent and dependent variables in the formula, the following model was created:

$$CAR = b_0 + b_1 LR + b_2 GDP Growth + \varepsilon \quad (2)$$

where the CAR represents the dependent variable, b_0 , represents a constant or free member, $b_1 LR$ and $b_2 GDP Growth$ represent the ascent parameter of independent variables, and ε represents a random error.

The LR rate, as the first independent variable indicates concerns such as: is it worth using NPL in financing the banking business model as long as the lending activity results in the higher lending rate from the lending interest rate. The sensitivity indicator of profitability is especially useful in changing performance between the capital structure and financial debt. The GDP Growth rate, as the second independent variable, represents the measure of the total product on the accounts of national revenue. It is used as the measure of the total economic power of one state or country and represents the most frequently used macroeconomic variable for the purpose of researching the influence on a dependent variable.

The forecasting model is shown via the following formula:

$$CAR = -5.195802 + 2.215603_{LV} - 0.1009896_{GDP\ Growth}$$

Table 3: Results of regression

Independent Variable	Coef.	t-value	p-value
LR	2.215603	7.41	0.000
GDP Growth	-.1009896	-2.46	0.022
_cons	-5.195802	-1.74	0.096
F-value	0.0000		
R2	0.8146		
Adjusted R2	0.7978		

Source: Data created and prepared by authors

In search for an answer to the question: „Can independent variables reliably forecast dependent variable?“, testing was conducted and the following hypothesis was posed:

H0: *The model is significantly better in forecasting dependent variable when only the arithmetic mean was used for forecasting purposes.*

H1: *The model is not significantly better in forecasting dependent variable when only the arithmetic mean was used for forecasting purposes.*

Upon hypothesis testing completion, the result of the F-test (p-value = 0.0000) shows that hypothesis 0 is refuted, therefore, both tested variables have a significant influence on CAR as dependent variable affirming that the model is significantly better in forecasting dependent variable when only the arithmetic mean is used for forecasting purposes.

The results of the analysis of variance (ANOVA), used to test whether or not the model is significantly better in forecasting the value of a dependent variable when only the arithmetic mean is used for forecasting, is significant ($F(2,22) = 48.34$, $p < .001$). As the p value is 0.0000 it is reasonable to conclude that dependent variables such as LR and GDP Growth rates reliably forecast the dependent CAR variable.

The model explains 81.46% variability of the dependent variable (CAR), meaning 79.78% variance for CAR variable is explained by independent variables such as LR and GDP Growth rates. The research studies conducted for the Croatian banking system indicate that the GDP Growth rate causes a long-term drop in the CAR rate. (Benazic & Masic, 2016) It is very important to understand how a macroeconomics affair, especially in instances of this research (GDP Growth), influences the everyday life of individuals. The research shows that the negative value of GDP Growth leads to an increase in CAR, meaning as GDP Growth decline results in an increase of interest rates, lending rates... (the list can go on), which leads to an increase in the rate of NPL and in the long-run leads to an increase in CAR trends. Even though, the model is utilized from the total population as opposed to the sample, almost the same explanation would follow in relation to the variance of the dependent variable. Given the model significance, it is reasonable to proceed with the further interpretation of collected results.

Table 4: Correlation matrix

	LV rate	GDP Growth rate
LR rate	1.0000	
GDP Growth rate	-0.4471	1.0000

Source: *Data created and prepared by authors*

If amongst the predictors exist a perfect linear relation, the forecast for regression model cannot be calculated singularly, and given the increasing level of multicollinearity, the forecast of coefficients of regression models become unstable and standard errors can be unstable too.

From the designed correlation matrix it is visible that there is no high correlation between LR and GDP Growth rate. As a supplemental review, the variation inflation (VIF) and tolerance (1/VIF) factors were used. VIF indicator means the factor of variance inflation. As a rule, variables with VIF values greater than five (5) represent a basis for further exploration, while VIF values greater than ten (10) definitely, and show the existence of very high multicollinearity. The tolerance, defined as 1/VIF, is used for checking the levels of multicollinearity. The tolerance lower than 0.1 is comparable with the VIF 10 indicating that there is a significant problem. The tolerance 1/VIF lower than 0.2 indicates that there is a potential problem.

Table 5: Multi-correlation matrix: variance inflation factor (VIF)

Variable	VIF	1/VIF
GDP Growth	1.25	0.800076
LR	1.25	0.800076
Mean VIF	1.25	

Source: *Data created and prepared by authors*

The output shows that all individual values are significantly below 10, while all values for tolerance are greater than 0.2. Simultaneously, the average VIF is 1.00 therefore, confidently can be stated that within indicators there is no multicollinearity.

The coefficient b_1 that is attached to the LR variable tells that if LR increases by 1% it is expected an average increase of CAR in the amount of 2.21% points. The coefficient b_2 that is attached to the GDP Growth variable tells that if GDP Growth increases by 1%, the decrease in CAR in the amount of .100% points is expected. Based on findings, it is reasonable to say that both coefficients are statistically significant. The negative correlation between GDP Growth and CAR tells that an increase in GDP leads to a decrease in CAR and vice versa. The negative correlation and higher CAR than the regulated minimum requirement, lead to the conclusion that banks increase CAR because of NPL resulting in lower growth of GDP.

In order to compare the relative strength of different predictors in the model, the option beta, used to calculate standardized regression coefficient (z-score), was included. Given the fact that all beta coefficients are expressed through standard deviation, their value is standardized. This enabled the comparison of the forecasts of the relative strength of each predictor. Comparing the achieved standardized values led to the conclusion that LR (z-score=.7606522) has higher relative importance within a model in relation to the GDP Growth rate (z-score= -.2529404). This way all features were tested and all assumptions of regression analysis were completed.

6. The influence of endogenous factors on car

On the basis of gathered data, the following regression model for determining the influence of endogenous factors on CAR was created:

$$CAR = b_0 + b_1ROAA + b_2UPPA + b_3NIM + \varepsilon \quad (3)$$

The forecasting model is expressed in the following formula:

$$CAR = 17.16164 - 0.2525663_{ROAA} + 0.810234_{UPPA} - 1.473914_{NIM}$$

Table 6: Results of regression

Independent variables	Coef.	t-value	p-value
ROAA	-0.2525663	-0.22	0.827
UPPA	.810234	2.61	0.016
NIM	-1.473914	-2.08	0.050
_cons	17.16164	26.94	0.000
F-value	0.0935		
R2	0.2579		
Adjusted R2	0.1518		

Source: Data created and prepared by authors

In search for an answer to the question “Can independent variables reliably forecast dependent variable?”, testing was conducted and the following hypothesis posed:

H0: *The model is significantly better in forecasting dependent variable when only the arithmetic mean was used for forecasting purposes.*

H1: *The model is not significantly better in forecasting dependent variables when only the arithmetic mean was used for forecasting purposes.*

The result of the analysis of variance (ANOVA), used to test whether or not the model is significantly better in forecasting the value of the dependent variable when only the arithmetic mean is used for forecasting, is significant ($F(3, 21) = 20.43, p < .10$). It is worth noticing that determined variables are significant and that the coefficient of NIM -1.47 is significantly different from 0 while using alpha 0.05 due to its p-value of 0,050. Like the UPPA, the ROAA (-0.2525663) is statistically insignificant given that the p-value (0,827) is significantly higher than 0.05. With respect to the unified model, p-value is 0.0935 and therefore, it is reasonable to conclude that independent variables such as ROA, UPPA and NIM reliably forecast CAR as a dependent variable. The model provides 25.79% variability from the dependent variable (CAR), meaning 15.18% variance for the CAR variable is explained by independent variables ROA, UPPA and NIM. If the model is taken out of the total population as opposed to the sample, it would be the same explanation of variance values for dependent variables.

Table 7: Correlation matrix

	ROAA	UPPA	NIM
ROAA	1.0000		
UPPA	0.6672	1.00001	
NIM	0.7701	0.9125	1.0000

Source: *Data created and prepared by authors*

Table 7 indicates that there is no high correlation between dependent variables ROAA, UPPA and NIM. As an additional supplemental review, the VIF and tolerance (1/VIF) indicators were used.

Table 8: Multi-correlation matrix: Variance Inflation Factor (VIF)

Variable	VIF	1/VIF
UPPA	8.30	0.120499
NIM	6.09	0.164316
ROAA	2.50	0.399345
Mean VIF	5.63	

Source: *Data created and prepared by authors*

The output shows that all individual values are below 10 while all values for tolerance are greater than 0.1. Simultaneously, the average VIF is 5.63, therefore, confidently can be stated that within indicators there is no multicollinearity.

The coefficient b_1 that is attached to the ROAA variable tells that if the profit on average assets increases by 1% then it is expected to have the average lowering CAR for 0.252% points. Given that the ROAA indicator puts in a relationship between profit and average asset, then it can be stated that NPL, part of the assets, with its increase negatively influence this coefficient (lowering coefficient). The coefficient speaks about the governance efficiency in the management of assets as to accomplish higher returns, meaning the management of investments in generating profits. Hence, the bank governance and management must continuously work on the prevention and minimization of non-performing loans in order to have successful banking and realized profit. The coefficient b_2 that is attached to the UPPA variable tells that if the relationship between the total return and average asset lowers by 1% then it is expected that CAR increases by .810% points. The coefficient b_3 that is attached to the NIM variable tells that if relationship between the net interest income and average assets lowers by 1% then it is expected that CAR decreases by 1.473% points. Based on the results, it can be concluded that variables UPPA and NIM are statistically significant at the level of 5%.

Observing the correlation between independent and dependent variables, it is reasonable to conclude that an increase in the value of all estimated variables attached to the income and profit positively influence lowering the capital adequacy. Specifically, it is the case with the UPPA and NIM variables that are statistically meaningful when at the level of 5%. As previously stated, the higher CAR leads to an increase in the banks' capacity to absorb losses that occurred due to poor placements of assets. Given that the CAR value is higher than the legal minimum requirement, it is advisable for banks that with an increase in the higher-quality asset placements the banks can expect an increase in the NIM value. Ultimately, this would result in an increase in income and profit while lowering the CAR value.

Comparing the standardized coefficient (beta) it was concluded that the relationship between net interest income and average asset (z -score=1.208) has the highest relative significance inside the model in relation to the ROAA (z -score= -.0657) and UPPA (z -score=-1.128). This way all features were tested and all assumptions of regression analysis were completed.

7. CONCLUSION

In order to arrange capital requests for banks operating within the Federation of Bosnia and Herzegovina, the unified rules were established in accordance with Basel III Accord, an international regulatory accord of agreed upon standards for capital adequacy. It is of importance to understand that the stability within the banking system represents a foundation for the avoidance of eventual economic shocks. Broadly looking, capital adequacy shows the ability to absorb losses so the higher capital adequacy banks have the higher potential to absorb losses due to non-performing loans. Therefore, it is very challenging to decide whether or not to have a higher or lower CAR. The stability perspective tells that it is better to have the higher CAR; however, the profitability perspective tells that is desirable to have the lower CAR.

This research tested endogenous and exogenous factors impacting capital sensitivity. For that reason, the research was focused on the 2014-2020 period. The tested variables are capital adequacy ratio (dependent), leverage rate, GDP growth, return on average assets (ROAA), total income/average asset (UPPA) and net interest income / average asset (NIM) (independent).

For the purpose of maintaining the optimal CAR, banks must control and monitor non-performing loans with applicable credit forecasting and measuring that would contribute to the decline of the NPL rate. Therefore, if banks want to be ready for new challenges, they must focus their activities on controlling and monitoring the NPL rate.

Given the research theme attractiveness and significance of the banks' capital adequacy for the entire state and society, the future research model should include the banks operating in the pockets of RS as well as some other determinants that would better explain the impact of ever-changing exogenous and endogenous factors on the sensitivity of the capital in Bosnia and Herzegovina.

REFERENCES

1. Adams, Z. & Füss, R. (2010). "Macroeconomic determinants of international housing markets", . Journal of Housing Economics, No.19, pp.38-50.
2. Agić, Z. & Dušanić Gačić, S. (2019). "Kreditni potencijal bankarskog sektora Bosne i Hercegovine", Transition/Tranzicija, No. 21, pp.1-10.
3. Aktas, R., Acikalin, S., Bakin, B. & Celik, G. (2015). "The Determinants of Banks' Capital Adequacy Ratio: Some Evidence from South Eastern European Countries". Journal of Economics and Behavioral Studies, No.7, pp.79-88.
4. Benazić, M. & Mašić, A. (2016). "Utjecaj odabranih makroekonomskih varijabli na stopu adekvatnosti jamstvenog kapitala hrvatskih banaka". EFZG Occasional Publications (Department of Finance), pp.63-80.

5. Bjelica, V., 2001. *Bankarstvo, teorija i praksa*. Novi Sad: Štamparija Budućnost.
6. Cellmer, R., Cichulska, A. & Belej, M. (2020). “*Spatial Analysis of Housing Prices and Market Activity with the Geographically Weighted Regression*”. ISPRS International Journal of Geo-Information, No.9, pp.2-19.
7. Dao, B.T.T. & Nguyen, K.A. (2020). “*Bank Capital Adequacy Ratio and Bank Performance in Vietnam: A Simultaneous Equations Framework*”. Journal of Asian Finance, Economics and Business, pp.39-46.
8. Dreca, N. (2013). “*Determinants of capital adequacy ratio in selected Bosnian banks*”. Dumlupınar Üniversitesi Sosyal Bilimler Dergisi EYİ 2013 Özel Sayısı, pp.149-62.
9. El-Ansary, O., El-Masry, A.A. & Yousry (2019). “*Determinants of Capital Adequacy Ratio (CAR) in MENA Region: Islamic vs. Conventional Banks*”. International Journal of Accounting and Financial Reporting, pp.287-313.
10. Eldomiaty, T.I., Eldin, A.B. & Azzam, I., 2016. Determinants of Capital Adequacy Ratios Under Basel III: Stress Testing and Sensitivity Analysis on Egyptian Banks. [Online] Available at: <https://ssrn.com/abstract=2788482> [Accessed 12 June 2021].
11. Agencija za bankarstvo Federacije Bosne i Hercegovine. 2017. Godišnji izvještaj, [Online] Available at: https://www.fba.ba/images/Publikacije_Banke/informacija_o_subjektima_bank_sist_fbih_31_12_2017.pdf [Accessed 05 June 2021].
12. Agencija za bankarstvo Federacije Bosne i Hercegovine. 2020. Godišnji izvještaj, [Online] Available at: <https://www.fba.ba/bs/informacija-o-subjektima-bankarskog-sistema-federacije-bih-sa-stanjem-na-dan-31122020godine-4> [Accessed 13 May 2021].
13. Giesecke, J.A., Dixon, P.B. & Rimmer, M.T. (2017). “*The Economy-wide Impacts of a Rise in the Capital Adequacy Ratios of Australian Banks*”. Economic record, No.93, pp.13-37.
14. Hewaidy, A.M. & Alyousef, H.Y. (2018). “*Bank-Specific and Macroeconomic Determinants of Capital*”. European Journal of Economics, Finance and Administrative Sciences, No.99, pp.5-20.
15. Islam, M.S. & Islam, M.Z., 2018. Non-performing loan as eroding factor of capital adequacy: evidence from banking industry in bangladesh. *Romanian economic and business review*, Available at: https://www.researchgate.net/publication/328354054_non-performing_loan_as_eroding_factor_of_capital_adequacy_evidence_from_banking_industry_in_Bangladesh [Accessed 13 June 2021].

16. US National Research Council, 2013. *Acute Exposure Guideline Levels for Selected Airborne Chemicals: Volume 14*. Washington, DC: The National Academies Press.
17. Ridker, R.G. & Henning, J.A. (1967). "The Determinants of Residential Property Values with Special Reference to Air Pollution". *The Review of Economics and Statistics*, No.49, pp.246-57.
18. Rosen, S. (1974). "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition". *Journal of Political Economy*, No.82, pp.34-55.
19. Vučković, M., 1958. *Bankarstvo*. Beograd: Naučna knjiga.

Elman Nadžaković

Senada Dupovac

Bedrija Hromić

OSJETLJIVOST KAPITALA BANAKA U FEDERACIJI BOSNE I HERCEGOVINE NA PROMJENU EGZOGENIH I ENDOGENIH FAKTORA

SAŽETAK

Radi osiguranja da rizična aktiva bude pokrivena kapitalom banke, regulator je propisao minimalnu stopu adekvatnosti kapitala. Propisana stopa adekvatnosti kapitala, koja u Federaciji BiH iznosi 12% predstavlja sposobnost banke da apsorbira gubitke nastale lošim plasmanima iskazana kao odnos kapitala i rizične aktive banke. Uzorak ovog istraživanja je izvršen na nivou populacije cjelokupnog bankarskog sistema Federacije Bosne i Hercegovine. Primarni cilj ovog rada je da pokuša prepoznati egzogene i endogene faktore koji utječu na osjetljivost kapitala banaka koje posluju u FBiH. Istraživanje je fokusirano na period OD 2014. do 2020. godine, na kvartalnom nivou, a istraživanje će objasniti deskriptivnu statistiku, korelacionu analizu i regresionu analizu. Tokom istraživanja, estimirana su dva regresiona modela, provjerene su pretpostavke i interpretirani su dobiveni rezultati. Rezultati prvog modela su pokazali da postoji statistički značajna pozitivna korelacija između stope finansijske poluge i stope adekvatnosti kapitala, te statistički značajna negativna korelacija između stope rasta GDP-a i stope adekvatnosti kapitala. Drugi model je potvrdio da postoji negativna statistički značajna korelacija između varijabli dobit na prosječnu aktivu (ROAA), ukupan prihod/prosječna aktiva (UPPA), neto kamatni prihod/prosječna aktiva (NIM) sa stopom adekvatnosti kapitala.

Ključne riječi: stopa adekvatnosti kapitala, GDP, finansijska poluga, banke, nekvalitetni krediti

JEL: G22, D24, E58