



Impact of size of banks and insurance companies on their profitability in Bosnia and Herzegovina

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Abstract

In this paper, we investigate the determinants of bank profitability by examining endogenous factors used to measure the size of a financial institution. We underscore the significance of bank employees in embodying institutional values and playing a pivotal role in sales channels, as well as the impact of technological integration on customer expectations and workforce dynamics.

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Utilizing a dataset from regulatory agencies, which includes information from 47 banks and insurance companies in Bosnia and Herzegovina for the year 2021, the study explores the relationship between the independent variables which include the volume of total assets and the number of employees, and the dependent variable for profitability. By calculating Return on Equity (ROE) and employing a multiple linear regression model, the study finds that a statistically significant relation between independent variables and the dependent variable does not exist. Despite this, the research highlights the need for further investigation, particularly considering the differentiation between banks and insurance companies, the potential impact of outliers, and the broader economic context of the year studied. The findings suggest that a more refined model, possibly incorporating panel data, could provide clearer insights into the profitability determinants of financial institutions in Bosnia and Herzegovina.

Keywords: *financial institutions, profitability, size, employees, Bosnia and Herzegovina*

1. Introduction

It is often argued that larger financial institutions as well as larger companies in general are able to spread their fixed costs over a larger assets base to exploit the economies of scale and also have access to more different investment opportunities such as approving larger loans, or buying more diversified securities as well as exploiting the economies of scope by utilizing their sales channels, all with the end result of them being more profitable as compared to smaller financial institutions. However, it is also argued that this is not always the case due to increased regulatory and administrative burdens larger financial institutions face.

To test this, the focus is put on endogenous factors, specifically examining how the size of a financial institution, as measured by total assets and the number of employees, impacts its profitability. This approach is driven by our previously explained understanding that larger institutions, with more assets and employees, might leverage these resources to achieve higher profitability.

The paper will consist of multiple sections including an introduction, a literature review on the topic of the effect of size of financial institutions on their profitability, followed by the section where the applied methodology is described as well as the used secondary data. The main section of the paper is titled data analysis and results which is followed by the conclusion and references.

2. Literature review

In the context of evaluating banks' profitability, many questions arise about the extent to which variations are attributed to endogenous factors within the control of the bank's management, as opposed to the influence of external factors on their financial performance. Addressing these inquiries is essential for identifying the determinants of successful commercial banks, thus enabling the formulation of effective strategies to enhance their profitability (Sufian and Habibullah 2009).

Then we come to the significance of bank employees in shaping financial institutions. Primarily, they should serve as the physical representation of an institution's values in its interactions with customers. Additionally, employees now assume a crucial role in the sales channels, reflecting the growing commercial responsibilities assigned to them (Diskiene et al. 2019).

In the 21st century, the observed growth of technological integration has significantly impacted customer behavior and expectations which, in turn, caused financial institutions to adjust their services to incorporate digital platforms. This transformation had, and still has major implications for workforce dynamics, with limited research on the topic of bank profitability, the presence of ATMs, branch networks, and the number of employees (Diskiene et al. 2019).

According to theory as well as various case studies, recognizing the role of human capitals in the long-term success of any businesses is well established (Diskiene et al. 2019). For example, Iuga and Budeci (2020) found that an increase of 1% in the profitability indicator known as the Return on Assets (ROA) corresponds to a notable rise of 195 employees in the banking sector supporting the fact that the contribution of employees to a company's growth is a universal truth with them having a pivotal role in sustaining profitability and ensuring the future prospects of all companies within the financial sector.

Empirical investigations have further affirmed the significance of employees in company dynamics. Anjaneyulu and Haranath (2022) observed a robust positive correlation between the

number of employees and annual revenues across various researched companies. Exploring the relationship between employee productivity, as measured by profit per employee, and overall profitability has also garnered attention, revealing a modest but statistically significant influence on financial institutions' profitability (Batten and Vo 2019).

According to theory and current research as well as for the purpose of investigating the relationship between a financial company's size and its profitability we will test the following hypothesis:

- Profitability of banks and insurance companies in Bosnia and Herzegovina is dependent on their size as measured by total assets and the number of employees.

3. Methodology

A database containing the information about total assets, capital, net income, and the number of employees of all banks and insurance companies on the B&H market was created using the publicly available annual reports published by the regulatory agencies in the B&H market which include:

- The Federal Banking Agency;
- Banking Agency of RS;
- The Insurance Agency of Bosnia and Herzegovina.

Data on total assets, capital, net income, and the number of employees was collected for 47 banks and insurance companies that were active on the B&H market in the year 2021, as that is the last year for which full data is available. Summary statistics for the dataset can be seen in Table 1.

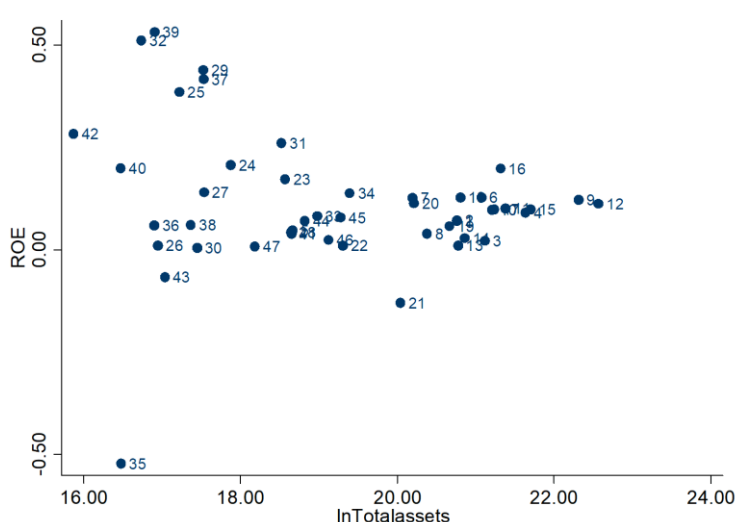
Table 1: Summary statistics for the observed variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Totalassets	47	797,041.30	1,256,608.00	7,841.63	6,315,320.00
Capital	47	97,794.79	149,341.80	3,955.51	784,577.00
Netincome	47	10,194.70	17,431.95	-7,344.62	88,091.00
NoOfemployees	47	296.81	252.69	32	1277

Source: Author's research

In the following step we calculated the Return on Equity (ROE) for all financial institutions by dividing net income by capital, and have thus created a new variable. In addition, the literature review suggested the use of natural logarithms for the number of employees and total assets in order to avoid issues with heteroskedasticity. In line with this, new variables $\ln\text{Totalassets}$ and $\ln\text{NoOfemployees}$ were created by calculating the natural logarithm for the value of assets and the number of employees. Also in order to further examine the data, scatterplots were created.

Figure 1: Scatterplot of ROE and $\ln\text{Totalassets}$



Source: Author's research

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Figure 2: Scatterplot of lnNoOfemployees and ROE



Source: Author's research

A similar situation is observed between the dependent variable and the other independent variable which is the logarithm of the number of employees. We can see a grouping resembling a moderate linear correlation if we were to turn a blind eye on couple of data points which are possibly outliers. Further analysis reveals that there are six smaller insurance companies with total asset equaling BAM 40 million or less and capital equaling BAM 20 million or less in the database which punched well beyond their weight in terms of net income for the observed time period as well as one insurance company which incurred a sizable loss. Excluding them would produce a more consistent scatter plot, however, since they make approximately 16% of the database, this action will not be performed and they will be kept within the database.

Because we are testing the effect of more independent variables on a dependent variable as well as attempting to explain its variability the most appropriate statistical technique to apply would be the multiple linear regression.

$$y_i = b_0 + b_1x_1 + b_2x_2 + \dots + b_nx_n + e_i$$

While in our case the initial model looked like:

$$ROE = b_0 + b_1 Totalassets + b_2 NoOfemployees$$

However as the previous research on similar topics reveals, the model would not work. This was confirmed during its testing in a statistical software as an issue with heteroskedasticity. The issue was solved by opting for logarithmic model, by taking the natural logarithm of the number of employees with the natural logarithm of total assets per institution, which solved the aforementioned issue.

$$ROE = b_0 + b_1 \ln Totalassets + b_2 \ln NoOfemployees$$

After estimating the model, diagnostic tests would be performed to determine its validity.

4. Data analysis and results

The results from running the described model and data in stata are represented in figure 4. As we can see the model is not statistically significant as the p-value associated with the F value of 0.74 is significantly above the threshold of 5% (0.4846) meaning that the independent variables do not reliably predict the dependent variable. The R-squared value is at low 3.24%, with the adjusted R-squared being negative at -1.16%.

Table 2: Model estimation and results summary

Source	SS	df	MS
Model	0.0419	2	0.0209
Residual	1.2541	44	0.0285
Total	1.2960	46	0.0282
Statistic		Value	
Number of obs		47	
F (2, 44)		0.74	
Prob > F		0.4846	
R-squared		0.0324	
Adj R-squared		-0.0116	
Root MSE		0.1688	

Source: Author's research

ROE	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
lnTotalassets	-0.0158	0.0228	-0.69	0.491	-0.0617 to 0.0301
lnNoOfemployees	-0.0022	0.0515	-0.04	0.966	-0.1059 to 0.1015
cons	0.2736	0.2736	20455	0.126	-0.1247 to 0.9780

Source: Author's research

Looking at the parameter estimates we can see observe the manifestation of expectations formed based on scatter plots. The model is not statistically significant and the coefficients of independent variables of lnTotalassets and lnNoOfemployees are negative, which is not in-line with reviewed literature. Also the independent variables are not statistically significant and have standard errors larger than the implied coefficients. All of this points to the existence of significant problems within the model, for which diagnostic test will be performed in the following pages. After the constructing the model we conducted the Breusch-Pagan test for heteroskedasticity as seen in the figure below:

Table 3: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

H0: Constant variance Variables: fitted values of ROE
chi2 (1) = 29.02
Prob > chi2 = 0.0000

Source: Author's research

Since the p value is very small we accept the null hypothesis that the variance of residual is homogenous, meaning that there is an issue with heteroskedasticity in the model. Just to further confirm this White's test and Cameron & Trivedi's tests were conducted.

Table 4: White's test and Cameron & Trivedi's test

H0 = homoscedasticity Ha = unrestricted heteroskedasticity
chi2 (5) = 13.39
Prob > chi2 = 0.0200

Source: Author's research

Table 5: Cameron & Trivedi's test

Source	chi2	df	p
Heteroskedasticity	13.39	5	0.0200
Skewness	1.71	2	0.4259
Kurtosis	1.51	1	0.2189
Total	16.61	8	0.0344

Source: Author's research

According to white test, since the p values for heteroskedasticity are below the 0.05 threshold, thus confirming the results from Breusch-Pagan / Cook-Weisberg test. The Cameron and Trivedi's test also points to the same issue but since the p values for skewness and kurtosis are above the threshold, we cannot reject the null hypothesis in these cases, meaning that they do not represent an issue in the model.

Table 6: Ramsey reset test

H0: model has no omitted variables
$F(3, 41) = 0.53$
Prob > F = 0.6642

Source: Author's research

Despite all the issues which we currently observed, the Ramsey reset test yields some interesting results. In its case the null hypothesis is that the estimated model is correctly specified in regards of the functional form given to the variables. Since the p value is above the threshold of 0.05, we accept the null hypothesis that the model is correctly specified.

Table 7: VIF test

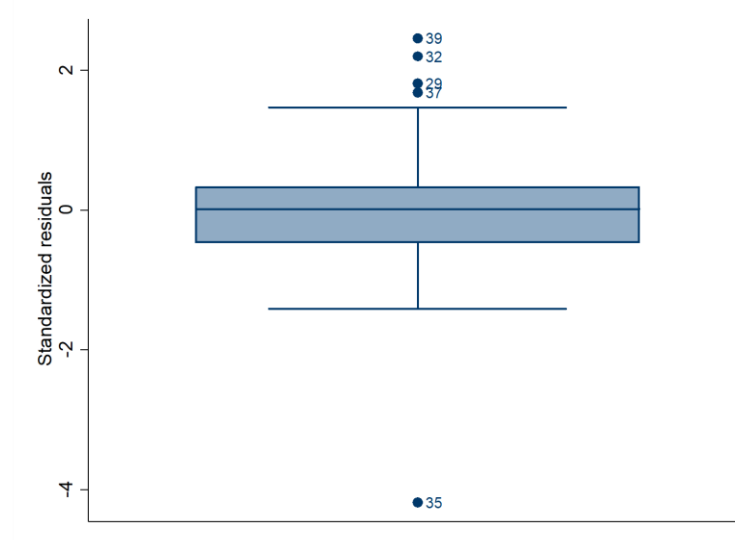
Variable	VIF	1/VIF
lnNoOfEmployees	2.77	0.3607
lnTotalAssets	2.77	0.3607
Mean VIF	2.77	

Source: Author's research

To test for multicollinearity, the variance inflation factor (VIF) metric. It measures whether a correlation exists between independent variables and how strong it is. A value of 1 indicates that there is no correlation, while a value between 1 and 5, as is the case here indicates that a moderate correlation exists, but it does not represent a problem that requires attention.

A box plot of standardized residuals was also drawn, and it confirmed the existence of outliers which is one of the reasons that the model was not statistically significant.

Figure 3: Box-plot of standardized residuals



Source: Author's research

5. Conclusion

The goal of this research was to probe whether financial institutions with a higher value of assets and more employees is also more profitable. In that regard, secondary data was successfully collected from relevant government bodies and a model was constructed. It was, however, not statistically significant and the independent variables could not reliably predict the dependent variable, so we had to reject the hypothesis. The model also showcased issues with heteroskedasticity, non-normal distribution of residuals as well as the existence of outliers. The model was correctly specified as was confirmed with the Ramsey reset test and there were no issues

with kurtosis and skewness and multicollinearity. Since the model was not statistically significant, the next step would be to specify the identified outliers as dummy variables and see how that affects the model. There are also other major concerns that could have led to this outcome of the research.

In addition to exploring the option of adding variables that link employees to costs, dummy variables that distinguish between banks and insurance companies should also be added. It is quite possible that the differences in nature of operating and business between insurance companies and banks is causing problems to this model, and separating them could provide additional information. The year 2021, for which data was collected could be an outlier altogether, since it was the year where restrictive measures implemented due to the COVID pandemic were lifted which had various effects on the entire economy. Due to this, the use of panel data should be more appropriate as it would include the dimension of time and would expand the database. And finally, the literature review should definitely be expanded in order to aid in testing new variables and new models.

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Sažetak

U ovom radu istražujemo determinante profitabilnosti banaka ispitivanjem endogenih faktora koji se koriste za mjerenje veličine finansijske institucije. Ističemo značaj zaposlenih u banci u utjelovljivanju institucionalnih vrijednosti i igranju ključne uloge u kanalima prodaje, kao i uticaj tehnološke integracije na očekivanja klijenata i dinamiku radne snage. Koristeći skup podataka regulatornih agencija, koji uključuje informacije iz 47 banaka i osiguravajućih društava u Bosni i Hercegovini za 2021. godinu, studija istražuje odnos između nezavisnih varijabli koje uključuju obim ukupne aktive i broj zaposlenih, te zavisne varijable za profitabilnost. Izračunavanjem povrata na kapital (ROE) i primjenom modela višestruke linearne regresije, studija otkriva da statistički značajna veza između nezavisnih varijabli i zavisne varijable ne postoji. Uprkos tome, rezultati naglašavaju potrebu za daljim istraživanjem, posebno uzimajući u obzir diferencijaciju između banaka i osiguravajućih kompanija, potencijalni uticaj vanrednih faktora i širi ekonomski kontekst proučavane godine. Nalazi sugeriraju da bi rafiniraniji model, koji bi eventualno uključivao podatke panela, mogao pružiti jasniji uvid u determinante profitabilnosti finansijskih institucija u Bosni i Hercegovini.

Ključne riječi: *finansijske institucije, profitabilnost, veličina, zaposleni, Bosna i Hercegovina*