IDENTIFYING AND QUANTIFYING THE INFLUENCE OF THE DETERMINING FACTORS OF CREDIT INSTITUTIONS' PERFORMANCE THROUGH ECONOMETRIC RESEARCH

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Abstract
In the current context, due to the changes taking place in the national business environment, we can also observe certain changes in the business environment of credit institutions, which are forced to take certain decisions with a direct or indirect impact on the profitability of the institutions in question. Therefore, the aim of this research is to identify the factors that generate banking performance, as measured by return on assets (ROA). The data collected from Raiffeisen Bank Romania's newsletters in the period 2007-2022., were processed econometrically with the statistical software SPSS using a simple linear regression in order to assess the existence of a dependency relationship between the dependent variable represented by Return on Assets (ROA) and a series of statistical regressors, represented by: number of banking units, own funds ratio, number of employees, ROBOR index, monetary policy interest rate and digital customers. The results of the study revealed the existence of a causal relationship between ROA and the chosen statistical regressors, and based on these correlations, the most optimal decisions that can contribute to the improvement and efficiency of the banking unit's activity were identified.

Keywords
return on assets (ROA), own funds rate, monetary policy interest rate, digital customers, number of banking units

JEL Classification
B17, B27, F65, M41

Introduction

Credit institutions are a fundamental part of the global financial structure, acting as intermediaries between savers and those in need of capital. They are a vital link in the process of mobilising financial resources for productive activities and investment. At a fundamental level, credit institutions attract deposits from individuals and companies

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and convert these resources into loans. This kind of transformation is what makes the economy work. Loans from banks facilitate home purchases, business development and even government funding for various public interest projects.

Profitability is not just a goal as far as lending institutions are concerned, but also a necessity for lending institutions. They enable them to fulfil their mission of financial intermediation, i.e. to gather surplus financial resources and redistribute them to those in need of finance. Without profitability, banks would be vulnerable to financial crises and have difficulty sustaining their operations.

An important part of profitability is providing financial services to customers in an efficient and cost-effective way. This often requires significant investment in technology and infrastructure, as well as intelligent management of human resources. Banks need to keep abreast of technological innovations to maintain their efficiency and meet the changing needs of their customers.

Profitability is also not just a goal for banks, but a factor affecting the whole economy. Profitable banks have the ability to lend more to customers and support investment in different economic sectors. This helps to stimulate economic growth and create jobs, while profitable banks pay considerable taxes and government levies, contributing relatively significantly to national budgets.

On the other hand, credit institutions facing financial difficulties can become a risk factor in the economy. In extreme cases they may require government or central bank intervention to prevent financial collapse. This can have a significant negative impact on financial and economic stability. Profitability analysis of credit institutions aims to reflect the health and vitality of a financial institution, revealing many subtle and complex aspects of its functioning. In this context, the aim of this research is to analyze the main aggregate indicators of Raiffeisen Bank Romania, from 2007 to 2022, in order to identify the relationship between Return on Assets (ROA) and indicators such as: number of banking units, own funds ratio, number of employees, ROBOR index, monetary policy interest rate and digital customers. Therefore, based on the analysis of the profitability of credit institutions, we can contribute to financial stability and sustainable economic development.

The research results revealed correlations between ROA and the number of banking units, the ROBOR index, the monetary policy interest rate and digital customers, these correlations are the basis of the decision-making process and can contribute to the improvement and efficiency of the bank's business. We also believe that careful management of these factors is essential to ensure the performance and sustainability of the credit institution in a complex and changing financial environment.

1. Review of the scientific literature

Credit institutions are constantly developing and implementing various strategies to improve efficiency. These types of measures also help to optimise business processes and ensure better functioning in the financial services market.

One of the key strategies used by credit institutions is the strategy of diversification of products and services, which seeks to attract the most diversified customer base possible and thereby secure stable sources of income.

In order to improve customer experiences and increase customer loyalty, credit institutions are also actively implementing policies to digitise and automate the services offered. Thus, online banking, mobile apps and online lending create convenient tools for interacting with customers, reducing the time needed to process applications and thus improving the quality of customer service.

A study by Apostu et al. (2023) conducted on a sample of Baltic countries (Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Montenegro, Albania, Macedonia, Bulgaria and Romania) shows that the Balkan countries are not homogeneous in terms of Fintech and financial inclusion, the differences being generated both by IT development and the openness of the population to the use of new financial services and products, but also by public policies in the financial field.

Siemionek-Ruskań and Fanea-Ivanovici (2023) conduct a descriptive qualitative analysis used to investigate the green banking products and services of the five largest banks, by number of customers, in Poland and Romania, as the banking system has taken on the role of educating the public towards the goals of raising awareness of sustainability.

In this context, the research undertaken by Neacșu et al. (2023), focused on identifying the opinions of consumers of banking services regarding the relationship with financial-banking institutions from the perspective of financial education and sustainable development, highlights the need to develop contractual relationships based on transparency, fairness and also better financial information and education of consumers.

A relevant study is that of the authors Ionașcu et al. (2023), whose results highlight the advantages that Romanian banks have gained as a result of adopting digital innovations and artificial technologies, which include increased competitive advantage, but also improved customer experiences. The research results also indicate a strong positive correlation between a bank's return on assets (ROA) and its liquid assets on deposits and short-term funding ratios, therefore, as digital adoption and integration occurs, there is a significant increase in financial robustness.

Credit rating and credit scoring policies also play an important role. Credit organisations are actively developing risk assessment algorithms and techniques that allow them to more accurately determine the likelihood of borrowers repaying loans. This helps minimise defaults and losses, increasing the financial stability of the organisation.

The study by Nedelescu and Ciulei (2022) examines the relationship between non-performing loans and return on equity (ROE), return on assets (ROA) and solvency ratio, respectively. The results of the study show a negative effect of non-performing loans on financial performance, profitability (ROA) and solvency.

Risk management policy is an integrated part of credit organisations' strategy. Effective credit and operational risk management contributes to loss prevention and stable

financial performance. Stan and Huidumac-Petrescu (2022) present how the Romanian banking system managed potential risks during the COVID 19 pandemic and analyze to what extent this health pandemic affected the profitability of the banking sector. The results of the study highlight that during the crisis caused by the Covid 19 pandemic, the Romanian banking system managed credit risk, operational risk, regulatory risk and market risk and also managed to reduce the impact and exposure on the profitability and profitability of the banking sector.

In this context, the results of the study conducted by Spilbergs et al. (2023) show that credit risk management in the Baltic countries has improved significantly compared to the period before the global financial crisis, with the capitalisation of credit institutions being one of the highest in the European Union and banking units being liquid and also profitable.

The study by Rădoi and Panait (2023) which aims to analyse financial performance based on bank performance indices and highlights correlations between return on equity and risk. The authors state that if in industrial enterprises the return on assets (ROA) must be higher than the inflation rate to maintain its economic substance, in the case of a banking unit, it is on the one hand, the result of the turnover of banking assets and on the other hand,the result of the net profit of the banking unit obtained from the total receipts.

Thus, credit institutions combine product diversification, accurate credit assessment, digital innovation and risk management in their strategy and policies. These types of measures also aim to improve the efficiency and competitiveness of credit institutions in the financial services market. The above-mentioned studies have highlighted the importance of identifying performance drivers in credit institutions, which is the motivation for this study. From this perspective, we considered it relevant to broaden the variables taken into account in the analysis of bank profitability, in comparison with the previously mentioned studies.

2. Research methodology

The performance of a credit institution is a key measure of the financial health, stability and effectiveness of the credit institution in fulfilling its core mission of providing financial services. In order to comprehensively assess the performance of Raiffeisen Bank Romania's credit institution, measured by the ROA indicator, in correlation with a set of key performance variables, which we considered relevant for our research. Thus our research uses as dependent variable ROA, calculated as the ratio of annualized net profit / total assets at average value and a set of statistical regressors such as: number of banking units, own funds ratio, number of employees, ROBOR index, monetary policy interest rate and digital customers.

The data were collected manually using Raiffeisen Bank Romania's newsletters over the period 2007-2022. The data thus obtained were subjected to statistical-mathematical procedures in order to be further processed with SPSS statistical software using simple linear regression to test the extent of the influence of each statistical regressor on the dependent variable.

3. Results and discussions

This section is dedicated to presenting the most important results obtained from the econometric modelling carried out. Thus, in the following, we present the impact of the independent variables on the performance of the banking institution, taken into analysis and measured with the ROA.

3.1. Correlation between ROA and number of banking units

In order to test the dependence relationship between ROA and the degree of territorial dispersion, measured by the number of banking units, we proceeded to the elaboration of the ANOVA table, using SPSS.

Table no. 1. ANOVA model - ROA and the number of banking units

	Sum of Squares	df	Mean Square	F	Sig.
Regression	16340,184	1	16340,184	21,251	,044
Residual	1537,816	2	768,908		
Total	17878,000	3			
The independent variable is ROA.					

Source: Own processing in SPSS

Thus, table no. 1 shows the variance component estimates, the degree of freedom, the variance estimates, the Fischer ratio value and last but not least the significance of the test.

The variance data components represent the amount of variance estimated and attest to the fit of the regression model on the data we have econometrically modelled. Due to the fact that the total of the analyzed model is smaller compared to the regression value (17878>16340,184), it indicates that the applied model fits the data.

The Residual Sum of Squares indicator signifies the estimated variance of the residual signifying the variance of the modeling errors. We note that this indicator has a smaller value compared to the sum of sums of squares (1537,816<17878). The Sig value is 0.44 the Fisher test has a value less than 0.05 which explains the dependence between the variables by a simple linear relationship, which we consider significant. Thus, according to the above table the model is validated.

To validate the above, we also calculated the coefficients table, also using SPSS.

Table no. 2. Table of Coefficients - ROA and number of banking units

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
ROA	-498,328	108,100	-,956	-4,610	,044

(Constant)	1330,024	192,916		6,894	,020

Source: Own processing in SPSS

If we analyze the above table we observe the regression coefficient for the model under analysis signified by: α=-1330.024 and β=-498.328. Thus we can determine the estimated equation of the simple linear regression model:

Y=1330,024+(-498,328) Number of bank units

The parameter α=1330.024, represents the ROA level, the indicator value signifies an inverse correlation which means that if the number of banking units increases by one unit the ROA value decreases by 498.328 units.

From Table 2 we can see that $t_{constant}$=6.894 and t_{ROA}=-4.610, and the Sig. value of t-test is less than 0.05 so the hypothesis H0 is rejected and the hypothesis H1 is accepted, which means that the regression coefficient β is considered significant and different from 0. Thus, we deduce that the ROA variable is significantly influenced by the variable Number of banking units which is also deduced from the figure below.

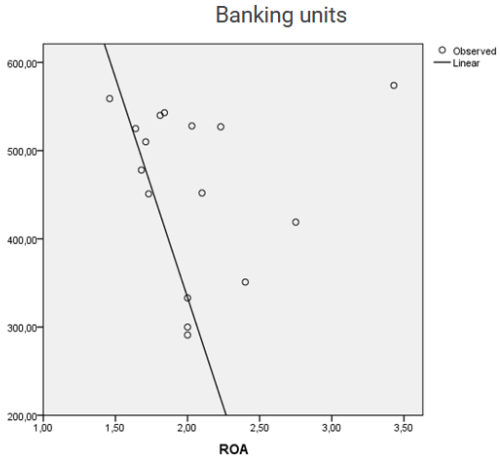

Figure no. 1: Influence of banking units on ROA
Source: Own processing in SPSS

From figure no. 1 we deduce that the joining of the axis variables means that there is a link between the two variables.

3.2. Correlation between ROA and equity ratio

In order to test the dependency relationship between ROA and equity ratio, we used the ANOVA table, using SPSS.

Table no. 3. Anova Model - ROA and equity ratio

	Sum of Squares	df	Mean Square	F	Sig.
Regression	26,956	1	26,956	9,519	,091
Residual	5,663	2	2,832		
Total	32,619	3			
The independent variable is ROA.					

Source: Own processing in SPSS

Table no. 3 shows the variance component estimates, the degree of freedom, the variance estimates, the Fischer ratio value and finally the significance of the test.

The variance data components represent the estimated variance value and also attest that the collected data can be processed through the regression model. Due to the fact that the total of the analyzed model is smaller compared to the regression value (32.619>26.956), it indicates us that the applied model is valid for econometrically processed data.

The Residual Sum of Squares indicator signifies the estimated variance of the residual signifying the variance of the modeling errors. We note that it has a smaller value compared to the sum of sums of squares (5.663<32.619). The Sig value is 0.91 for the Fisher test has a value greater than 0.05 which shows that there is no dependence relationship between the variables analyzed by a simple linear relationship which is expressing a non-significant relationship. Thus, according to Table 3 above, the model is not validated, which is also confirmed by the correlation figure between ROA and Own Funds Ratio.

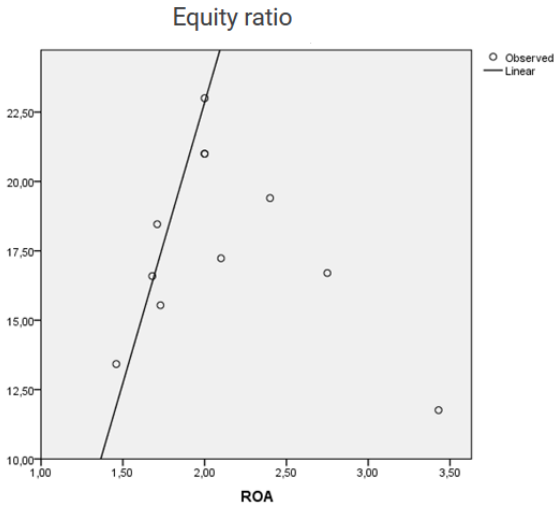

Figure no. 2: No correlation between ROA and Equity Ratio
Source: Own processing in SPSS

From figure no. 2 we deduce that the variables are far from the axis, which shows that there is no link between the two variables.

3.3. Correlation between ROA and number of employees

Another indicator considered relevant for our analysis was the impact of the number of employees on bank performance, as shown in table no. 4 above.

Table no. 4. ANOVA model - ROA and number of employees

	Sum of Squares	df	Mean Square	F	Sig.
Regression	104771,746	1	104771,746	16,693	,055
Residual	12553,004	2	6276,502		
Total	117324,750	3			
The independent variable is ROA.					

Source: Own processing in SPSS

Table no. 4 shows the variance component estimates, the degree of freedom, the variance estimates, the Fischer ratio value and finally the significance of the test. The components of variance data represent the amount of estimated variance and also attest that the linear regression model, depending on the data collected, can be determined. Due to the fact that the total of the analyzed model is smaller compared to the regression value (117324.750>104771.746), it indicates us that the applied model can be applied to our data.

The Residual Sum of Squares indicator signifies the estimated variance of the residual signifying the variance of the modeling errors. Since it has smaller value compared to the total sum of squares (12553.004<117324.750). Sig value is 0.55 for Fisher test has a value greater than 0.05 which shows us that there is no dependence relationship between the variables analyzed by a simple linear relationship which is expresses a non-significant relationship. Thus, according to Table 4 above, the model is not validated, which is also attested by the correlation figure between ROA and Number of employees.

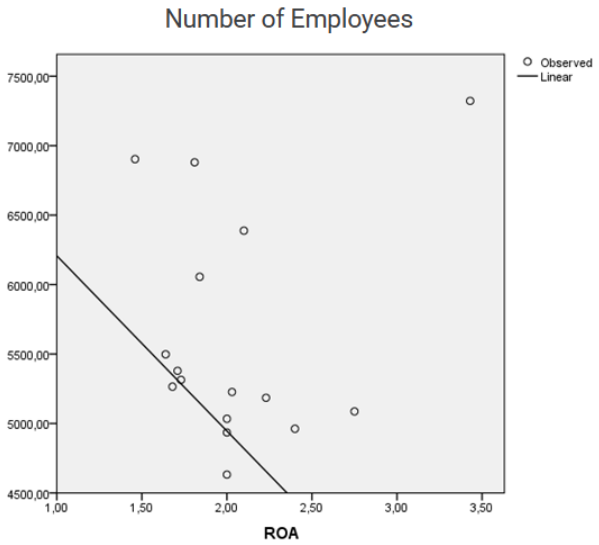

Figure no. 3: Graphical evidence of non-validation of the model between ROA and number of employees

Source: Own processing in SPSS

From figure no. 3 we deduce that the variables are positioned outside the axis, which shows that there is no link between the two variables.

3.4. Correlation between ROA and ROBOR index

The same analysis was also used to test the dependence relationship between ROA and ROBOR. Thus, we proceeded to the elaboration of the ANOVA table, using SPSS, presented below.

Table no. 5. ANOVA model - ROA and ROBOR index

	Sum of Squares	df	Mean Square	F	Sig.
Regression	1,788	1	1,788	90,482	,011
Residual	,040	2	,020		
Total	1,828	3			
The independent variable is ROA.					

Source: Own processing in SPSS

Table no. 5 shows the variance component estimates, the degree of freedom, the variance estimates, the Fischer ratio value and finally the significance of the test.

The variance data components represent the estimated variance value and attest that the simple linear regression model is able to explain the existence of the dependence

relationship between the two variables, which is also rendered by the fact that the total of the analyzed model is smaller compared to the regression value (1.828>1.788), indicating that the applied model fits the data.

The Residual Sum of Squares indicator signifies the estimated variance of the residual signifying the variance of the modeling errors and has a smaller value compared to the total of the sums of squares (1.828>1.788). The Sig value is 0.11 for the Fisher test so it is attested that it has a value less than 0.05 which explains the dependence between the variables by a simple linear relationship which is considered significant. Thus, according to the above table the model is validated.

Table no. 6. Table of Coefficients - ROA and ROBOR Index

	Unstandardized Coefficients		**Standardized Coefficients**	**t**	**Sig.**
	B	**Std. Error**	**Beta**		
ROA	5,213	,548	,989	9,512	,011
(Constant)	-8,004	,978		-8,184	,015

Source: Own processing in SPSS

If we analyse the above table we observe the regression coefficient for the model under analysis signified by: β= - 5.213 and α=8.004. Thus we can determine the estimated *equation of the simple linear regression model:*

Y= -8, 004 +5,213 ROBOR index

The parameter α= - 8,004, represents the ROA level, the negative indicator value means an inverse correlation which means that if the ROBOR index increases by one unit the ROA value decreases by 5,213 units.

From table no. 6 we can see that $t_{constant}$=-8.004 and t_{ROA}=-5.213, and the Sig. value of the t-test is less than 0.05 respectively 0.015 so the hypothesis H0 is rejected and the hypothesis H1 is accepted, which means that the regression coefficient β is considered significant and different from 0. Thus, we deduce that the ROA variable is significantly influenced by the ROBOR index variable which is also deduced from the figure below.

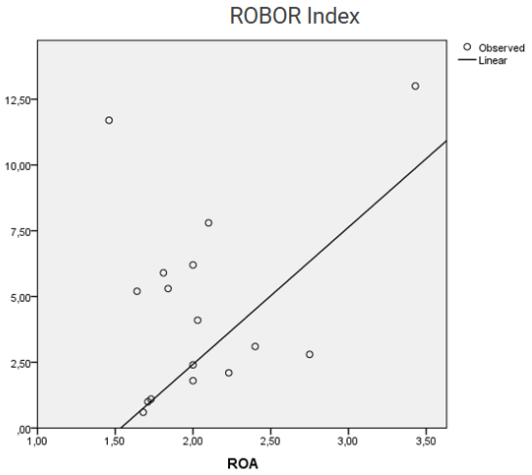

Figure no. 4: Graphical validation of the correlation model between ROBOR and ROA index indicators

Source: Own processing in SPSS

According to figure no. 4 above we can deduce that there is a direct correlation between the 2 variables without the need for correlation tables.

3.5. Correlation between ROA and Monetary Policy Interest Rate

Also for this correlation, the way of working was identical, by using the ANOVA table through SPSS, presented below.

Table no. 7. ANOVA Model - ROA and Monetary Policy Interest Rate

	Sum of Squares	df	Mean Square	F	Sig.
Regression	,046	1	,046	101,895	,010
Residual	,001	2	,000		
Total	,047	3			
The independent variable is ROA.					

Source: Own processing in SPSS

Table no. 7 shows the variance component estimates, the degree of freedom, the variance estimates, the Fischer ratio value and finally the significance of the test.

The variance data components represent the amount of estimated variance and attest that the simple linear regression model is correctly chosen based on the econometrically modelled data. Due to the fact that the total of the analyzed model is smaller compared to the regression value (0.047>0.046), it indicates that the applied model is correctly correlated with the presented data.

The Residual Sum of Squares indicator signifies the estimated variance of the residual signifying the variance of the modelling errors. It has a lower value compared to the total sum of squares (0.001<0.047). The Sig value is 0.10 for the Fisher test so it is attested that it has a value less than 0.05 which explains the dependence between the variables by a simple linear relationship, which we consider significant. Thus, according to the above table the model is validated.

Table no. 8. Table of coefficients - ROA and Monetary Policy Interest Rate

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
ROA	-,836	,083	-,990	-10,094	,010
(Constant)	3,175	,148		21,487	,002

Source: Own processing in SPSS

If we analyze the above table we observe the regression coefficient for the model under analysis signified by: α=3.17 and β= -,836. Thus we can determine the estimated equation of the simple linear regression model:

Y=3.175+ (-.836) Monetary policy interest rate

The parameter α=3.175, represents the level of ROA, the value of the indicator signifies an inverse correlation which means that if the Policy Interest Rate increases by one unit the value of ROA decreases by 0.836 units.

From Table 6 we can see that $t_{constant}$=21.487 and t_{ROA}=--10.094, and the Sig. value of the t-test is less than 0.05 respectively 0.002 so the hypothesis H0 is rejected and the hypothesis H1 is accepted, which means that the regression coefficient β is considered significant and different from 0. Thus, we deduce that the ROA variable is significantly influenced by the variable Monetary Policy Interest Rate which is also deduced from the figure below.

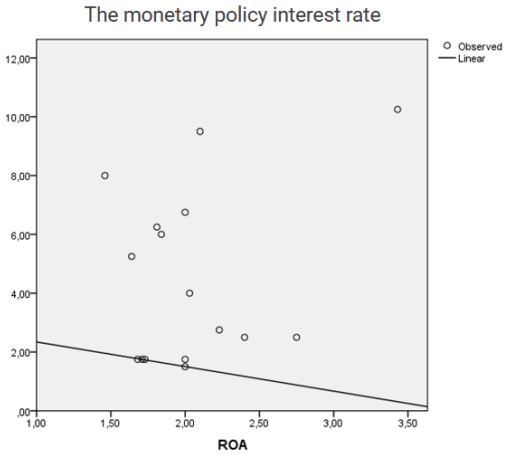

Figure no. 5: Graphical validation of the correlation model between the Monetary Policy Interest Rate and ROA

Source: Own processing in SPSS

According to figure no. 5 above we can deduce that there is a direct correlation between the 2 variables without the need for correlation tables.

3.6. Correlation between ROA and digital customers

And for the last independent variable, we proceeded to the ANOVA table, as shown in the table below.

Table no. 9. ANOVA Model - ROA and Digital Customers

	Sum of Squares	df	Mean Square	F	Sig.
Regression	244003405775,076	1	244003405775,076	18,883	,049
Residual	25843344224,924	2	12921672112,462		
Total	269846750000,000	3			
The independent variable is ROA.					

Source: Own processing in SPSS

Table no. 9 shows the variance component estimates, the degree of freedom, the variance estimates, the Fischer ratio value and finally the significance of the test.

The variance data components represent the estimated variance value and attest that our data could be analyzed using the simple linear regression model. Due to the fact that the total of the analyzed model is smaller compared to the regression value

(269846750000,000>244003405775,076), it indicates that the model used is optimal according to the collected data.

The Residual Sum of Squares indicator signifies the estimated variance of the residual signifying the variance of the modelling errors. It has a smaller value compared to the sum of sums of squares (25843344224,924<269846750000,000). The Sig value is 0.49 for the Fisher test so it is attested that it has a value less than 0.05 which explains the dependence between the variables by a simple linear relationship, which we consider significant. Thus, according to the above table the model is validated.

Table no. 10. Table of coefficients - ROA and Digital Customers

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
ROA	1925683,891	443145,569	,951	4,345	,049
(Constant)	-2966967,325	790844,144		-3,752	,064

Source: Own processing in SPSS

If we analyze the above table we observe the regression coefficient for the model under analysis signified by: α=-2966967.325 and β=1925683.891. Thus we can determine the estimated equation of the simple linear regression model:

Y=(-2966967,325)+ 1925683,891Digital Customers

The parameter α=-2966967,325, represents the ROA level, the negative indicator value means an inverse correlation which means that if the variable Digital Customers increases by one unit, the ROA value decreases by 1925683,891 units.

From Table 10 we can see that $t_{constant}$=--3.752 and t_{ROA}=--4.345, and the Sig. value of the t-test is less than 0.05 respectively 0.064 so the hypothesis H0 is rejected and the hypothesis H1 is accepted, which means that the regression coefficient β is considered significant and different from 0. Thus, we deduce that the ROA variable is significantly influenced by the Digital Customers variable which is also deduced from the figure below.

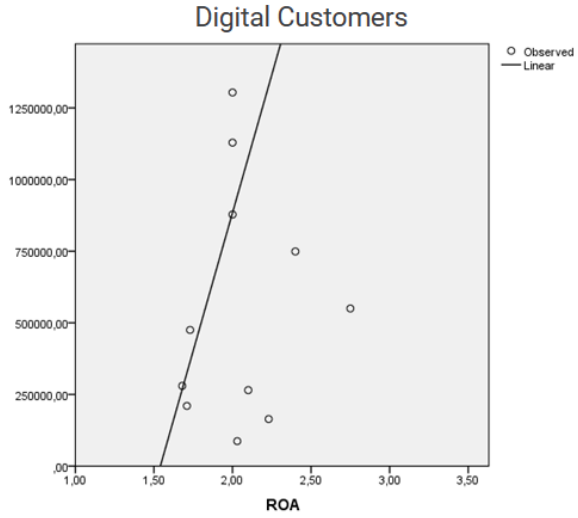

Figure no. 6: Graphical validation of the correlation model between digital customers and ROA

Source: Own processing in SPSS

According to figure no. 6 we can deduce that there is a direct correlation between the 2 variables, as we could also observe through the coefficients of the model presented in the table.

Conclusions

Following the analysis, the variables that had a positive or negative impact on the profitability of Raiffeisen Bank Romania assets were identified. Therefore, in the following, we will present in a synthetic manner the main conclusions derived from the analyzes carried out.

The number of banking units is a factor that can affect market competition in the banking sector. An increase in the number of banks may intensify competition for customers, which may reduce profit margins. On the other hand, a consolidation of banks can lead to greater pricing power and higher margins. The bottom line is that the competitive environment in the banking sector can vary depending on the number of banking units, which has a direct impact on profitability.

Raiffeisen Bank Romania launched, in a first for the Romanian banking sector, the first issue of sustainable non-preferential senior Eurobonds on the international capital market, the bank receiving high requests from investors. Therefore, this type of bonds are eligible to be calculated as the bank's own funds, which leads to an increase in the bank's solvency (see Profit.ro, 2023).

The ROBOR index is another influencing factor on bank profitability. This index reflects the cost at which banks lend to each other and can affect the cost of resources

for a credit institution. An increase in the ROBOR index can lead to an increase in financing costs for banks, thus affecting their interest margin and implicitly profitability. Banks should carefully note developments in this index and adjust their funding strategies accordingly.

The monetary policy interest rate has a significant impact on banking activity. A cut in the policy interest rate, often promoted by the central bank to stimulate the economy, lowers the policy interest margin may increase the interest margin for banks, but may reduce the demand for credit from customers. Careful management of the loan portfolio and asset allocation strategy is essential to adapt to changes in monetary policies and to maintain or improve profitability.

Digital customers are a significant factor in the modern banking world. These increasingly numerous customers use digital channels to access banking services, which reduces banks' operational costs and increases efficiency. Moreover, these digital customers provide banks with opportunities to develop new products and services, thereby strengthening relationships with them. However, it is essential that banks invest in technology and cyber security to maintain and increase the trust of these customers. By attracting and retaining digital customers, credit institutions can strengthen their customer base and, implicitly, their profitability.

Thus, the number of banking units, the ROBOR index, the monetary policy interest rate and digital customers are essential factors in terms of the profitability of credit institutions. Careful management of these factors is essential to ensure the performance and sustainability of these institutions in a complex and ever-changing financial environment.

The analysis of performance indices, their evolution over time, but also the correlations between them, we believe contribute to the improvement and efficiency of the banking unit's activity.

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