Profitability Management: How Can Macro and Microeconomic Determinants Influence Commercial Bank Profitability in the EU-27?

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***Abstract* – This paper examines the role of macro and microeconomic determinants in bank profitability in the EU-27. To identify how defined variables can affect profitability, a regression model was constructed with a multicollinearity condition, with multicollinearity below the defined value. Data were collected based on 3,257 bank balance sheets and the World Bank and ORBIS Bank Focus databases. Based on a literature review, we have stated that the bank sector profitability is measured by Net Interest Margin (NIM), Return on Average Assets (ROAA), and Return on Average Equity (ROAE) as dependent variables. The statistical model showed no acceptable solution for Return on Average Equity. Four allowable solutions were found for the profitability of average assets and six solutions for net interest margin. Lastly, the results indicate a clear effect of rising inflation on increasing bank interest rates, and therefore higher interest margins. A healthy economy, also characterized by a growing GDP rate, also positively affects the interest margin.**

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1. Introduction

This paper examines the role of macroeconomic and microeconomic determinants in the profitability and product portfolio management of commercial banks in the EU-27. Based on a literature review focusing on bank-specific, industry-specific, and macroeconomic determinants as the pillar of bank profitability, the leading role of product management was defined. The main objective was to explore whether there is a connection between defined determinants and profitability indicators. The regression model was defined with a multicollinearity condition: the multicollinearity has to be below the defined value.

Based on previous research, studies can be divided locally into i) global studies [1], [2], [3] where the authors examine selected determinants worldwide, or local [4], which examine determinants of yield for only one country. In our research, some studies examine determinants between different banks in a given region, where the region can be defined as Europe [5], [6], [7], [8], America [9], [10], or Asia [11], [12].

The profitability of the banking sector can be measured using the indicators of Return on Equity (ROE = net profit/total equity) and Return on Assets (ROA = net profit/total assets). [13]

As other authors have reported [14], it is useful to consider the indicator of Net Interest Margin (NIM) as well. Some authors [15] state that profitability is more accurately measured using the indicators of Return on Average Equity (ROAE = net profit / total average equity) and Return on Average Assets (ROAA = net profit / total average assets).

This research incorporates previous approaches and considers the dependent variables more comprehensively, and therefore considers the following indicators to determine the profitability of European banks: (i) net interest margin (NIM); (ii) return on average equity indicator (ROAE); and (iii) return on average assets indicator (ROAA).

This paper examines the role of macro and microeconomic determinants in bank profitability in the EU-27 and discusses how it can be supported by product portfolio management. To identify how the defined variables can affect profitability, a regression model was constructed with a multicollinearity condition, multicollinearity below the defined value.

The remainder is organized as follows: Section 2 offers a literature review; Section 3 discusses the methodology and data used in the empirical analysis; Section 4 introduces the findings and results of the paper, followed by Section 5 with the conclusions of the paper.

2. Literature Review

The European region is a dynamic one, its financial system is characterized by the impact of financial technologies. It has a diversified product portfolio, and in 2019 it was an area with higher Gross Domestic Product growth rates and a low interest rate environment. The COVID-19 pandemic signified a change in these trends; however the last year available for the dataset was 2019, which was the last year before the aforementioned crisis.

Based on the literature review, cost-to-income ratio is defined as the ratio of operating costs to total revenues generated by the financial institution. The second indicator investigated is the loan loss reserves to gross loans ratio. We expect these variables (x_1, x_2) to impact banks' profitability negatively.

Indicator x_4 (equity / total assets) measures capital strength; indicator x_6 is defined as the ratio of loans to short-term financial assets; and x_7 is the ratio of liquid assets to deposits, including short-term funding. There was a clear positive dependence of x_6 and x_7 here [16], [17]. The ratio of net loans to total assets is also expected to be positive [18].

The TIER 1 ratio (x_3) measures the bank's registered capital against risk-weighted assets. It is interesting to note that the higher the level of capital, the higher the level of profitability expected, since the additional capital means that the bank can easily comply with regulatory capital standards. Capital ratio shows a non-significant impact on bank profitability, which means that well-capitalized banks experience negative returns. However, because the relationship is not statistically significant, this is not a conclusive relationship.

The indicator x_5, or the relative size of bank loans, indicates how many total assets are loans. However, there is no clear relationship.

The indicator x_{12} expresses the size of the bank's total assets. According to the literature review, we expect that the larger the bank, the higher its profitability. The size of the bank is most often expressed as the size of total assets. [19] shows that the larger the bank, the higher the profitability that can be expected. In contrast, [20] shows that the cost curve is U-shaped; in other words, medium-sized banks are the most efficient in the industry, i.e. more efficient than small and large banks.

Table 1. Dependent and independent variables

Symbol		Variables
y	**NIM**	Net Interest Margin
	ROAE	Return on Average Equity
	ROAA	Return on Average Assets
x_1	**COST**	Cost-to-Income Ratio
x_2	**LOS**	Loan Loss Reserves / Gross Loans Ratio
x_3	**TIER1**	Tier 1 Ratio
x_4	**CAD**	Equity / Total Assets Ratio
x_5	**LS**	Net Loans / Total Assets Ratio
x_6	**DEP**	Net Loans / Deposits & Short-Term Funding Ratio
x_7	**LAR**	Liquid Assets / Deposits & Short-Term Funding Ratio
x_8	**GDP1**	GDP Growth (annual %)
x9	**GDP2**	GDP per capita, PPP (constant 2017 international $)
x_{10}	**GS**	Gross Savings (% of GDP)
x_{11}	**INF**	Inflation, Consumer Prices (annual %)
x_{12}	**SIZE**	Total Assets (log)
x_{13}	**UNM**	Unemployment
x_{14}	**COMP**	5-bank Asset Concentration
x_{15}	**bCOST**	Bank Cost-to-Income Ratio (%)
x_{16}	**CRE**	Bank Credit to Bank Deposits (%)
x_{17}	**DEP**	Bank Deposits to GDP (%)
x_{18}	**bNIM**	Bank Net Interest Margin (%)
x_{19}	**bROA**	Bank Return on Assets (%, before tax)
x_{20}	**bROE**	Bank Return on Equity (%, before tax)
x_{21}	**DMBA**	Deposit Money Bank Assets to GDP (%)
x_{22}	**EPAY**	Electronic Payments used to complete transactions (% age 15+)
x_{23}	**bLAR**	Liquid Assets to Deposits and Short-Term Funding (%)
x_{24}	**SMR**	Stock Market Return (%, year-on-year)

Source: Author analysis

Gross domestic product (GDP, x9) is the sum of gross value added of all resident producers in the economy. It is an essential indicator for evaluating the country′s economy and it can be said that it has a significant impact on every business, including the banking sector.

The importance of inflation has been intensely discussed in the literature, mainly due to its impact on the bank's business mix. There is strong empirical evidence to suggest that inflation (x_{11}), taken as a rising trend in the general level of goods and services prices, has a positive effect on bank performance.

According to [21], unemployment (x_{13}) should negatively impact profitability; in this case, it is specifically the net interest margin (NIM) that is affected. In addition, this study is considering determinants (x_{14} - x_{24}) specific to the banking industry. Previous studies do not consider the given indicators to such an extent. Instead, the indicators were selected according to the availability of data in the World Bank's Financial Indicators database. The applicable variables are listed in Table 1.

To better understand this survey's content, partial goals were set, for which working hypotheses were concurrently formulated. Based on previous studies, the following hypotheses were defined (H1 – H4):

H1: Although the ROAE, ROAA, and NIM profitability indicators show a specific dependence, they will differ in the real possibility of finding linear explanatory regression equations.

H2: The number of solutions will vary for each profitability indicator. The smallest can be expected for ROAE, the larger for ROAA, and the largest for NIM.

H3: Many explanatory variables of profitability indicators (ROAE, ROAA, and NIM) are naturally characterized by 100% of both the aggregate correlation coefficient and, of course, multicollinearity. We assume that controlled exclusion of explanatory variables can be used to obtain admissible solutions for which the aggregate correlation coefficient will be more significant than 50%, and the multicollinearity will be less than 50%.

H4: By analyzing the admissible solutions, it is possible to confirm some results thus far in comparison with the findings from the research and, at the same time to contribute new stimuli to this discussion.

3. Materials and Methods

Based on the literature review, we have defined the following model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n + \varepsilon_i, \quad \text{or}$$

$$Y = \beta_0 + \sum_{i=1}^{n} \beta_i X_i + \varepsilon_i \tag{1}$$

Where Y is the dependent variable, β_0, β_i $i = 1,\ldots,n$ are the regression coefficients (or partial regression coefficients), Xi $i = 1,\ldots,n$ is the independent variable, and ε_i is a random component $i = 1,\ldots,n$.

The higher the values of regression coefficients, the greater the effect on the final value of bank profitability. If the regression coefficient value is zero, the dependent variable is not dependent on it. The resulting estimation vector of all regression parameters can be expressed as follows:

$$b = (X^T X)^{-1} \; X^T y \tag{2}$$

The expression (XTX)-1 represents an inverse matrix. The inverse matrix calculation is defined only for a square matrix, i.e. one with the duplicate rows as columns and regular. The reliability of estimates of regression coefficients of multiple linear regression is significantly affected by multicollinearity [22]. The aggregate coefficient of determination (Rj2) is given by the following relationship:

$$R_j^2 = 1 - \frac{|\mathbf{R}|}{|\mathbf{R}_{-j}|} \tag{3}$$

│R-j│ can be defined whenever │R-j│ ≠ 0, where R-j is the minor matrix R, which is the correlation matrix determinant of the set (m) of variables without the variable xj. Since the determinant │R-j│ as well as the determinant│R│and the newly introduced indicator Φ2 is always less than or at most equal to 1, │R│≤│Rj│holds for j = 1,… m+1.

The multicollinearity indicator Mj can be defined as the proportion of tightness of a system that does not include and includes a dependent variable by the index j, based on the following relationship:

$$M_j = \frac{\Phi_{-j}^2}{\Phi^2} \tag{4}$$

The concept of tightness is defined based on: Φ2 = 1 - │R│ and Φ2-j = 1 - │R-j│. Mj can be defined whenever Φ2 ≠ 0 and for Φ2 = 0, we also set Mj = 0. Multicollinearity can be measured in the range from 0 to 1 or in % from 0 to 100 %. Based on Mihola and Bílková (2014), multicollinearity acquires the limit values to 0; if the independent variables are uncorrelated, the expression's numerator is zero (5). It acquires the second limit value if the system's tightness does not change following the dependent variable in the system, then Φ2-j = Φ2. The same determinants determine multicollinearity as the aggregate correlation coefficient given by expression (4).

As shown above, a multiple regression and correlation analysis works with several aggregate interrelated characteristics such as:

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1/ the aggregate regression correlation coefficient;

$$R_j^2 = 1 - \frac{|\mathbf{R}|}{|\mathbf{R}_{-j}|} = 1 - \frac{1-\Phi^2}{1-\Phi^2_{-j}} \quad (5)$$

2/ the total tightness or subdeterminant of the complete correlation matrix;

$$\Phi^2 = 1 - |\mathbf{R}| \quad (6)$$

3/ aggregate tightness or subdeterminant of the correlation matrix of independent variables;

$$\Phi^2_{-j} = 1 - |\mathbf{R}_{-j}| \quad (7)$$

and 4/ multicollinearity.

$$\mathrm{M}_j = \frac{\Phi^2_{-j}}{\Phi^2} = \frac{1-|\mathbf{R}|}{1-|\mathbf{R}_{-j}|} \quad (8)$$

If we monitor each of these quantities separately, we could miss some interrelationships, so it is useful to look for a display of results that allows the simultaneous display of all these quantities at once using their interrelationships. This allows easy evaluation of the solved task. However, it is clear from the above definitions how strongly the above quantities are interconnected. For example, the aggregate correlation coefficient is given by the exact quantities as multicollinearity; only a different function is used.

Figure 1 was constructed based on this theory, and it is possible to plot all four of the aggregate quantities mentioned at once. The values of the aggregate (total) tightness of the dependent and independent variables Φ^2 are plotted on the x-axis, while the total tightness of the independent variables Φ^2_{-j} are plotted on the y-axis. There are also two bundles of lines representing isoquants. The highest value of 1 is given by the multicollinearity on the diagonal representing identity, i.e. for the 45° line. Zero multicollinearity is on the x-axis. The scale of multicollinearity is not plotted on the graph. Instead, it corresponds to the scale of the total tightness of the system of independent variables Φ^2_{-j} for the value $\Phi^2 = 1$.

The second volume starting at point [1; 1], form isoquants of the aggregate correlation coefficient R_j^2. The lowest value of 0 is the aggregate correlation coefficient on the 45° diagonal representing the identity, i.e. on the axis of the Quadrant I. The unit aggregate correlation coefficient R_j^2 is parallel with the y-axis, with a value of $\Phi^2 = 1$. The scale of the aggregate correlation coefficient R_j^2 on the graph is not plotted because it corresponds to the aggregate tightness scale Φ2 for zero multicollinearity $M_{-j} = 0$.

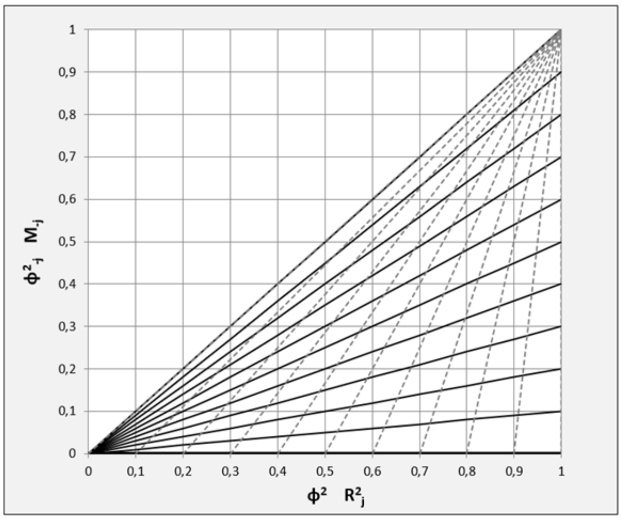

Figure 1. Summary display of regression and correlation problems, Source: [22].

In reality, there can be points in this graph only below the diagonal, where all the quantities are defined. Each point represents the value of all four monitored variables. The solution should give a high overall correlation coefficient with low multicollinearity. Such points are located at the bottom right of the graph.

Although there may be a high aggregate correlation at the top right, the multicollinearity is too high. However, the solution is not valuable because the estimates of most regression parameters (independent variables) have too large a standard deviation (they are very volatile) and cannot be relied upon.

The bottom left points have low multicollinearity and a fundamentally low value of the overall correlation coefficient. If we "treat" the multicollinearity by omitting, replacing, or aggregating independent variables, we can monitor the progress of the problem by gradually moving the points representing the new solutions in the graph. In is shown in Figure 1.

4. Dataset Description

This research uses annual data from the World Development Indicators (2012-2019), Financial Indicators (2012-2019), and ORBIS Bank Focus (2012-2019) databases and obtained data from 4,049 banks in the EU-27 for 2012-2019. In the second step, we cleared the dataset from banks that had incomplete annual data, and there were 3,257 European banks in the final data set. Dependent variables represent indicators (ROAA, ROAE, NIM), see Table 2.

Table 2. Dependent variables

	ROAE y_1	ROAA y_2	NIM y_3
Min	-4,2	-0,5	0,4
Max	46,2	2,9	5,3
Avg	9,9	0,9	2,0
Rozptyl	37,8	0,5	1,1

Source: Author analysis

The independent variable is represented by twenty-four indicators, of which eight have been selected as bank-specific variables. It is shown in the Table 3.

Table 3. Bank-specific variables

	COST x1	LOS x2	TIER1 x3	CAD x4
Min	35,6	0,2	11,4	4,0
Max	92,7	17,7	42,0	19,0
Avg	59,1	2,4	17,1	8,7
Rozptyl	135,7	9,1	22,6	12,6
	x5	**x6**	**x7**	**x12**
Min	16,2	38,0	4,0	3 245
Max	86,7	373,7	124,6	2 558 124
Avg	58,2	76,7	37,0	61 339
Rozptyl	205,9	1 693,3	479,6	-

Source: Author analysis

Romania had to be excluded due to missing data. Another eleven indicators were selected as industry-specific variables. It is shown in the Table 4.

Table 4. Industry-specific variables

	x14	x15	x16	x17	x18	x19
Min	52,1	41,5	25,6	31,6	1,1	-0,1
Max	98,9	85,1	289,7	399,7	4,6	3,2
Avg	82,6	59,2	93,8	69,5	2,5	1,1
Rozptyl	142,1	78,1	2 253	4 347	1,0	0,4

	x20	x21	x22	x23	x24
Minimum	-6,6	18,3	32,7	6,8	0,7
Maximum	17,6	172,3	98,5	60,6	39,4
Průměr	10,5	82,7	88,2	30,2	15,3
Rozptyl	26,6	1 294	276,2	189,3	95,1

Source: Author analysis

Table 5 shows defined values for macroeconomic variables.

Table 5. Macroeconomic variables

	GDP1 x8	GDP2 x9	GS x10	INF x11	UNM x13
Min	0,9	22 191	13,4	0,5	2,2
Max	8,2	114 110	34,4	4,6	15,3
Avg	3,1	40 360	24,2	1,8	5,6
Rozptyl	2,7	-	25,1	0,7	6,9

Source: Author analysis

Tables 2, 3, 4, and 5 specify the minimum and maximum values; the arithmetic explicitly refers to the median and the standard deviation. The descriptive statistics are based on an extracted sample; all extreme values and undefined ratios are excluded.

5. Findings, Results, and Discussion

Based on a literature review focusing on macro and micro determinants as the pillar of product portfolio management, success factors of bank profitability were defined as key. Low interest rates and the need for product profitability have transformed perceptions of which macroeconomic and microeconomic factors are considered valuable and necessary for bank profitability management.

Figure 2 is set for the maximum range of multicollinearity and an overall coefficient of determination from 0 to 1 (0 to 100%). In all cases, it is based on the sample of European banks mentioned above and considers all 24 selected representative indicators. The quadrant of admissible solutions is in the upper left; it holds that $0 \leq Mj \leq 0.5$ and at the same time that $0.5 \leq Rj \leq 1$.

The problem was solved for 3 different profitability indicators: ROAE (return on average equity), ROAA (return on average assets), and NIM (net interest margin). As shown, for all 24 indicators the multicollinearity is always 100% and the aggregate coefficient of determination Rj is:

$$\text{ROAE} \quad Rj = 0{,}4988 \tag{9}$$
$$\text{ROAA} \quad Rj = 0{,}7098 \tag{10}$$
$$\text{NIM} \quad Rj = 0{,}8271 \tag{11}$$

It is evident that Rj is different for the selected profitability; NIM shows the highest value. However, a reduction of the unacceptable 100% multicollinearity can be achieved by gradually eliminating the indicators until we end up in the range of acceptable solutions 5 and 6.

In all other cases, the value of Rj will be decreased. For the ROAE profitability indicator, the default value for Rj = 0.5, and it is no longer possible to reach an acceptable solution by gradual exclusion. However, ROAE estimates will be available based on ROAA estimates if we know the value of the self-financing ratio (equity/assets).

For ROAA and NIM, there are two ways to select indicators for exclusion. First, the most significant possible decrease in multicollinearity or the smallest possible decrease in the overall coefficient of determination is preferred. Thus, two branches are created for each considered profitability, which leads to different admissible solutions. In Figures 2, 3, and 4, the elimination trajectories as part of the correlation task are shown by squares and a solid connecting line for ROAA and circles and a dashed line for NIM.

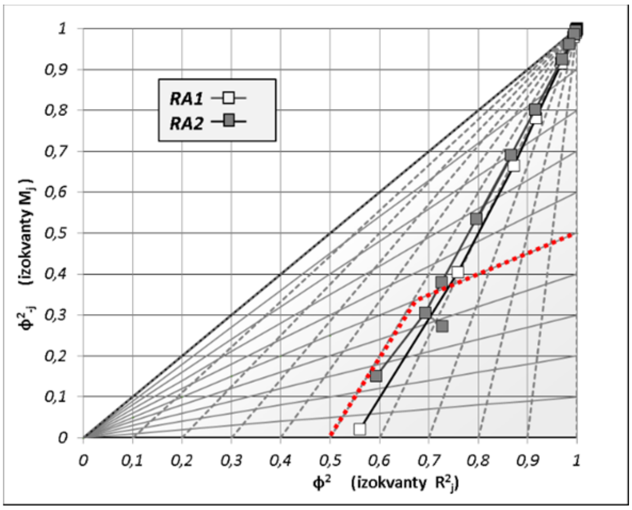

Figure 2. ROAA - Regression and correlation problems, Source: Author analysis

All four branches plotted in Figures 2 and 3 start at the right edge of the graph, where there is 100% multicollinearity, and Rj takes values (5) for ROAA and (6) for NIM. In all cases, by excluding the indicator, both Φ^2 and Φ^2_{-j} decrease, which can be seen directly in Figures 2 and 3 from the course of the isoquants of these composite characteristics in graph 6. Figure 2 shows two ROAA branches (RA1 and RA2), and Figure 3 shows two NIM branches (NM1 and NM2). In both cases, the full range of the aggregation coefficient of determination and multicollinearity is used, i.e. 0 to 1.

Within the first branch (designated RA1), preferring to minimize the decrease in Rj, 13 indicators were gradually eliminated: 11; 7; 5; 2; 24; 12; 10; 6; 8; 4; 19; 3; 22; 23; 14; 20; 16; 17; 9; 15; and 18. There is only one acceptable solution for multiple indicators on this branch:

R_j = 0,5505 a M_j = 0,0367.

$$ROAA = 3,3612 – 0,0255.x_1 – 0,0101.x_{21} \quad (12)$$

Within the second branch (designated RA2), preferring a decrease in Mj, 9 indicators were gradually eliminated; 6; 20; 4; 18; 21; 5; 8; 15; 3; 23; 14; 12; 11; 10; 17; and 13. Ultimately, there are 3 acceptable solutions:

R_j = 0,5581 a M_j = 0,4396

$$ROAA = 2,2201 - 0,0280.x_1 + 0,0688.x_2 - 0,0030.x_{16} + 0,2744.x_{19} + 0,0101.x_{24} \quad (13)$$

R_j = 0,5218 a M_j = 0,2543

$$ROAA = 2,9577 - 0,0338.x_1 + 0,0626.x_2 - 0,0039.x_{16} + 0,0119.x_{24} \quad (14)$$

R_j = 0,5378 a M_j = 0,4110

$$ROAA = 2,4337 - 0,0285.x_1 + 0,0694.x_2 - 0,0033.x_{16} + 0,2921.x_{19} \quad (15)$$

Analogously, Figure 3 shows two branches (NM1 and NM2) showing the trend of the correlation problem in terms of composite indicators in the search for acceptable solutions for NIM.

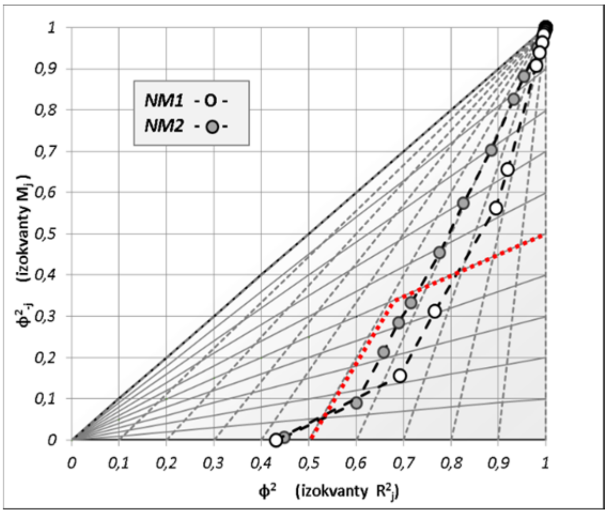

Figure 3. NIM - Rgression and correlation problems, Source: Author analysis

Within the first branch (designated NM1), preferring to minimize the decrease in Rj, indicators were gradually eliminated; 15; 17; 18; 19; 16; 21; 9; 6; 12; 20; 7; 24; 13; 8; 14; 23; 22; 10; and 3.

Ultimately, the NM1 branch contains two acceptable solutions:

R_j = 0,6600 a M_j = 0,4084

$$NIM = 0,7947 – 0,0155.x_1 + 0,1222.x_2 + 0,1270.x_4 + 0,3410.x_{11} \quad (16)$$

R_j = 0,6349 a M_j = 0,2253

$$NIM = -0,3287 + 0,1131.x_2 + 0,1424.x_4 + 0,3912.x_{11} \quad (17)$$

Within the second branch (designated NM2), 21 indicators were gradually eliminated; 19; 18; 4; 22; 5; 16; 9; 12; 20; 14; 1; 23; 6; 10; 3; 13; and 7. There are a total of 4 acceptable solutions on the NM2 branch:

R_j = 0,5743 a M_j = 0,4647

$$NIM = 0,5436 + 0,4712.x_2 + 0,1230.x_8 + 0,2379.x_{11} - 0,0113.x_{15} + 0,0001.x_{17} + 0,0097.x_{24} \quad (18)$$

R_j = 0,5656 a M_j = 0,4129

$$NIM = -0,1138 + 0,4869.x_2 + 0,1192.x_8 + 0,2411.x_{11} - 0,0002.x_{17} + 0,0081.x_{24} \quad (19)$$

R_j = 0,5655 a M_j = 0,3235

$$NIM = -0,1387 + 0,4901.x_2 + 0,1200.x_8 + 0,2415.x_{11} + 0,0082.x_{24} \quad (20)$$

R_j = 0,5603 a M_j = 0,1507

$$NIM = -0,0583 + 0,5241.x_2 + 0,1212.x_8 + 0,2380.x_{11} \quad (21)$$

All possible solutions are shown in Figure 4. Selected isoquants of total tightness Φ2 are also displayed here. Figure 4 shows all 10 admissible solutions found, as mentioned above.

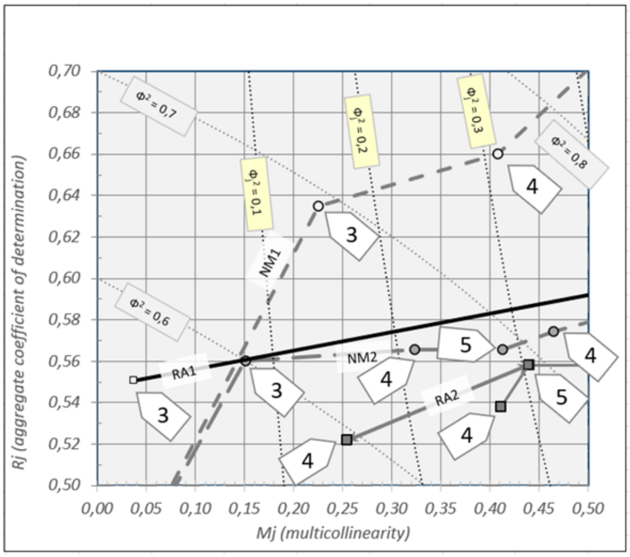

Figure 4. Regression and correlation problems – all solutions Source: Author analysis

Both branches marked "1" (i.e. RA1 and NM1) generally have a higher Rj, while branches marked "2" have a more significant number of explanatory variables. The solution with the highest possible Rj and at the same time with the lowest possible Mj is given by the ratio Rj / Mj. For NIM, this is a solution on branch NM1 for three indicators, where this ratio is 15; for ROAA, it is a solution on branch RA1 for two indicators, where the observed ratio is 2.8. In Table 1, these solutions are highlighted in bold in the last two columns. This solution will verify the ability to estimate the selected defining characteristic.

The research showed no acceptable solution for Return on Average Equity. Four allowable solutions were found for Return on Average Assets and six allowable solutions for Net Interest Margin.

H1: Although by definition the returns of ROAE, ROAA, and NIM show some dependence, they will differ in the real possibility of finding linear explanatory regression equations.

H2: Large numbers of explanatory variables ROAE, ROAA, and NIM always show both an aggregate correlation coefficient and, of course, multicollinearity equal to 1, i.e. 100%. Systematic elimination of explanatory variables reveals admissible solutions that have an aggregate correlation coefficient greater than 50% and at the same time a multicollinearity less than 50%.

H3: We expect a different number of real solutions for the individual measures of profitability. The definitions of profitability indicate that the smallest number will be found for ROAE, the largest for ROAA, and the largest for NIM.

6. Conclusion

This paper seeks to investigate the critical microeconomic and macroeconomic determinants that affected the profitability of European banks in the years 2012 to 2019. Since 2020, the global economy has faced a negative economic shock caused by the COVID-19 pandemic. The national central banks responded to this shock with monetary policy measures, namely interest rate cuts and interventions in foreign exchange markets, to prevent excessive volatility in the exchange rate of the domestic currency.

A regression model was used with a multicollinearity condition to ensure the reliability of the regression model. The model examines independent variables selected according to a literature review on a sample of 3,257 European commercial banks for the 27 EU countries. The data file was obtained from the ORBIS Bank Focus and World Bank databases.

The research showed that no acceptable solution was found for Return on Average Equity. Four allowable solutions were found for Return on Average Assets and six allowable solutions for Net Interest Margin. For example, the analysis showed that the significant determinants of Return on Average Assets and Net Interest Margin for the most part differ. The first to third hypotheses were confirmed by the empirical analysis.

Surprisingly, the Return on Average Assets indicator has a negative impact on cost efficiency yet a positive impact on banking sector profitability.

There are three main limitations to this research. The first limitation is that the research has been done only for EU-27 countries. The second limitation is the timeframe: future studies should be conducted over a longitudinal timeframe to explore the complexities of the COVID-19 impact on bank profitability. The third limitation is that we have investigated only two profitability indicators. Future research could also be conducted among other types of financial institutions. Lastly, there is a need to address the COVID-19 crisis; it could be interesting to investigate how this affected bank profitability during and after the crisis.

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