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"Analyzing the Financial Performance of Algerian Banks: A Comparative Study of Banque Nationale d'Algérie (BNA) and Société Générale Algérie (SGA) "

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Abstract:

Our study analyses the financial performance of two Algerian banks, Banque Nationale d'Algérie (BNA) and Société Générale Algérie (SGA), over the period 2004 to 2022. The objective is to assess the impact of various financial variables on the net income of these banks using econometric and statistical techniques.

The main methodologies include the use of the least squares method to estimate the relationships between the variables, the formulation of regression models to analyse the impact of deposits, loans, customer commitment and net banking income on net income, and diagnostic tests of the models.

The study provided an in-depth analysis of the financial performance of BNA and SGA, highlighting the factors influencing their net income and suggesting areas for future research and improvements in banking practices.

Key Words : *Financial performance, Algerian banks, Econometric analysis, Net income, Deposits, Loans, Customer engagement, Regression models.*

JEL Classification: *G20- G23- G24.*

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1. *Introduction*

The effectiveness of the economic reform policies adopted by the Algerian authorities between 2004 and 2022 is a subject of major interest in the financial and banking context. In particular, understanding the impact of these reforms on key variables such as banks' credit and net income is crucial for assessing the economic health and performance of financial institutions in Algeria. With this in mind, this study aims to analyses in depth the relationship between bank credit and net income for two Algerian banks, one state-owned, namely the Banque Nationale d'Algérie (BNA), and the other privately-owned, Société Générale Algérie (SGA).

To this end, we adopt a methodological approach based on regression analysis and other statistical techniques to examine how variables such as deposits, loans, customer commitment and net banking income influence the banks' net income. The use of the autoregressive time-deviation model will allow us to assess the effectiveness of the variables on the net income of the two banks over a significant period.

We will provide an overview of the main methods and concepts used in this study, as well as a presentation of the variables studied. We will also highlight the importance of this research in the current economic context of Algeria and explain the structure of the article that follows.

This study is part of a problematic framework of economic analysis aimed at evaluating the effectiveness of economic reform policies in Algeria by focusing on the relationship between bank credit and the net income of the country's main financial institutions.

2. *Banking system developments:*

The Algerian banking sector has been in constant evolution since the adoption of Law 90-10 of 14 April 1990 on money and credit, which has enabled a large number of banks and financial institutions to be set up. For the first time, under the terms of this law, the Bank of Algeria authorised private banks to operate in Algeria, subject to a minimum capital requirement of 500 million Algerian dinars (Benabdallah, 2019) . During this period, the banking sector consisted mainly of five (05) public commercial banks, the Caisse Nationale d'Epargne et de Prévoyance (CNEP) and the Banque Algérienne de Développement (BAD). It was not until 1991 that a private bank, Al Baraka, joined the Algerian banking scene.

Net income*:* Net profit is a key financial indicator that represents the difference between a bank's total income and its total expenses over a given period, usually a quarter or a year. In the context of Algerian banks, net profit is an im.LMportant measure of the bank's financial performance. It is calculated by subtracting expenses (such as salaries, interest on deposits, overheads, etc.) from income (such as interest on loans, service charges, investment income, etc.). A positive net result indicates that the bank made a profit during the period, while a negative net result indicates a loss.

Loanst: Credit in the context of Algerian banks refers to the ability of customers to borrow money from the bank. Algerian banks generally grant credit in the form of loans, authorized overdrafts, overdraft facilities, etc. Loans may be for a variety of

purposes. Loans can be used for a variety of purposes, such as financing business projects, purchasing property, financing vehicles, etc. Credit is granted based on various factors such as the customer's solvency, ability to repay, security offered, guarantees, etc. Algerian banks follow strict policies to assess and manage credit risk in order to maintain financial stability and protect the interests of depositors and shareholders.

In summary, net income reflects a bank's overall financial performance over a given period, while credit represents the ability of customers to borrow money from the bank for various needs. These two concepts are essential to understanding the operation and management of banks in Algeria.

1. **Study Methodology:** After the theoretical aspect of the basic concepts of credit and net result and the relationship of these variables to the latter has been discussed, we will try in this study to know the effectiveness of variables. The reforms adopted by the Algerian authorities during the period 2004–2022, therefore, through this study, the effect of credit on net result will be tested using the autoregressive model of the lag time deviation. Which is considered one of the best and most appropriate models, which is considered the best and most appropriate models.
2. **Description model and study variables:**

Least squares are a statistical technique used to find the best regression line that represents a set of data points. This line is defined as the one that minimizes the sum of the squares of the differences (errors) between the observed values and the values predicted by the line for each data point. The least squares method is widely used in regression analysis to estimate the relationship between variables (James, 2013).

BASIC FORMULA

Suppose we have a dataset composed of n data points xi, yi, where i = 1, 2..., n. We want to find the regression line y = ax + b that minimizes the sum of the squares of the differences $\sum\left(y_i - (ax_i + b)\right)^2$.

Steps

1. Calculation of x and y averages(Montgomery, 2012):

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i, \bar{y} = \frac{1}{n}\sum_{i=1}^{n} y_i$$

2. Calculation of regression coefficients a and b (Montgomery, 2012):

$$a = \frac{\sum_{i=1}^{n} (x_i - \bar{x})(y_i - \bar{y})}{\sum_{i=1}^{n} (x_i - \bar{x})^2}$$

$$b = \bar{y} - a\bar{x}$$

Where:

- a is the slope of the line (the direction coefficient).
- b is the point of intersection with the y-axis (the constant term).

Application

After calculating a and b, the calculated line y = ax + b can be used to estimate the values of y based on the values of x data (James, 2013).

The least squares method provides a basis for regression analysis, serving as a powerful tool in statistics and data science to understand the relationships between variables and make predictions (James, 2013).

<u>The Model Economies</u>

These variables have been proposed that can be considered among the most important variables, and in light of what has been presented by economic theory. In light of some prior studies testing the impact of Deposits, Loans, Commitment in fav. From the clientele, Net banking product on Net Result, and taking into account the particularities of the Algerian economy, it is possible to formulate our study model as follows:

For the

$$Result\ (BNA) = \beta 0 + \beta 1 \times Les\ dépôts + \beta 2 \times Les\ crédits + \beta 3 \times Engagement\ en\ fav.De\ la\ clientèle\} + \beta 4 \times Produit\ net\ bancaire + \epsilon$$

For SCA:

$$Net\ Result\ (SCA) = \alpha 0 + \alpha 1 \times Les\ dépôts + \alpha 2 \times Les\ crédits + \alpha 3 \times Engagement\ en\ fav.De\ la\ clientèle\} + \alpha 4 \times Produit\ net\ bancaire + \epsilon'$$

In these equations:

- $\beta 0$ and $\alpha 0$ represent intercepts.
- $\beta 1,\ \beta 2,\ \beta 3,\ \beta 4$and $\alpha 1, \alpha 2, \alpha 3, \alpha 4$ are the coefficients associated with each independent variable.
- *' and*' are the random error terms.

The objective is to find the values of the coefficients (β andα) that minimize the sum of the squares of the residuals, i.e. The difference between the observed and predicted values of the net result for each bank.

This method makes it possible to model the relationship between the independent variables (deposits, loans, commitment to customers, net banking income) and the dependent variable (net income) in order to analyze the impact of each variable on the financial performance of BNA and SCA banks.

Test for

Chow's test is a statistical procedure used to test whether the coefficients of two linear regression regimes on two different subsets of the same data set are equal. In other words, it tests whether there is a breakpoint (structural change) in a dataset that would justify using two separate regression models rather than just one. This test is particularly useful in econometric analysis to detect structural changes in temporal or group relationships (Chow, 1960).

Chow's Test Formula

Suppose we have a data set divided into two subsets (for example, before and after a certain event). Chow's test compares the regression model estimated on the complete set of data with the models estimated separately on the two subsets. The test statistic is calculated as follows (Gujarati, 2009):

$$F = \frac{\left(\left(SSE_C - (SSE_1 + SSE_2)\right)/p\right)}{\left((SSE_1 + SSE_2)/(n_1 + n_2 - 2p)\right)}$$

Where:

- SES_C is the sum of the squares of the errors of the model estimated on the complete set of data.
- SSE_1 and SSE_2 are the sums of the squares of the errors of the models estimated on the two subsets, respectively.
- n_1 and n_2 are the sample sizes of the two subsets.
- p is the total number of estimated parameters in each model (including the constant term).
- F is the test statistic that follows a distribution F with p and $n_1 + n_2 - 2p$ degrees of freedom.

Interpretation

- If the value of F is greater than the critical value of the distribution F for a given level of significance, we reject the null hypothesis that the regression coefficients of the two subsets are equal. This suggests the existence of a structural change at this point in the dataset (Chow, 1960).

- If the value of F is less than the critical value, we cannot reject the null hypothesis, indicating that there is not enough evidence to state that the regression relationships are different in the two subsets (Chow, 1960).

Application

The Chow test is widely used in economic analysis, finance and other fields to assess the impact of policies, regulatory changes, economic crises or any other event that may cause a structural change in the relationships between variables (Gujarati, 2009).

Chow's test is a valuable tool for detecting structural changes in regression models, providing a rigorous method for testing whether such a change warrants the use of separate models for different time periods or groups within a dataset (Gujarati, 2009).

3. Descriptive analysis

Descriptive results analysis allows us to understand several aspects of a banking institution's financial variables, such as deposits, loans, customer commitment, net banking income, and net income. With 19 observations for each variable, and no missing values, the analysis offers a solid overview of financial performance, let's look at each variable and each bank in detail:

Table 01: Descriptive variable analysis for each bank

Bank	Variable	Average	Standard deviation	Asymmetry	Kurtosis
The National Bank of Algeria (BNA)	Deposits	1,11E+12	6,81E+11	-0,206	-1,433
	The Credits	1,30E+12	7,73E+11	0,323	-0,741
	Customer commitment in fav	4279343532	5244806010	0,694	-1,535
	Net banking income	6,77E+10	2,92E+10	-0,112	-1,323
	Net earnings	2,44E+10	1,35E+10	-0,305	-0,78
SOCIÉTÉ GÉNÉRALE ALGÉRIE (SGA)	Deposits	1,77E+11	1,12E+11	0,05	-1,43
	The Credits	1,31E+11	7,77E+10	0,006	-1,104
	Customer commitment in fav	4,02E+10	1,97E+10	-0,865	-0,827
	Net banking income	1,46E+10	7051508327	-0,305	-0,771
	Net earnings	4097767342	2677537705	0,33	-0,349

The National Bank of Algeria (BNA)

1. Deposits: With an average of1.1145E+12 (about 1.1145 trillion), a standard deviation of 6.8133E+11 (about 681.33 billion), these data show wide dispersion around the average, indicating significant variability in deposit amounts. The asymmetry of -0.206 suggests a slight tilt of the data towards lower values, while the kurtosis of -1.433 indicates a more flattened distribution, showing a higher frequency of extreme values compared to a normal distribution.

2. Loans: With an average of 1.2951E+12 (about 1.2951 trillion) and a standard deviation of 7.7325E+11 (about 773.25 billion), these figures indicate a

great variability in the amounts of credit granted. An asymmetry of 0.323 shows a distribution slightly tilted towards higher values, and a kurtosis of -0.741 suggests a relatively flattened distribution.

3. Customer Commitment: The average of 4.279 billion (4.279E+09) with a huge standard deviation of 5.244 billion (5.244E+09) reveals extreme variability in financial commitment to customers. The positive asymmetry of 0.694 indicates a concentration of lower values with some extremely high values. Kurtosis of -1.535 shows a more flattened distribution, indicating less frequent extreme values.

4. Net banking income: Average of 67.729 billion (6.7729E+10) and a standard deviation of 29.183 billion (2.9183E+10), highlighting significant variability. Slightly negative asymmetry (-0.112) and a kurtosis of -1.323 suggest a slightly tilted distribution towards lower and more flattened values.

5. Net income: Average of 24.434 billion (2.4434E+10) with a standard deviation of 13.524 billion (1.3524E+10), indicating a significant dispersion of annual net income. The asymmetry of -0.305 and a kurtosis of -0.78 indicate a slight inclination towards lower values and a somewhat flattened distribution.

SOCIÉTÉ GÉNÉRALE ALGÉRIE

6. Deposits: Average of 177.11 billion (1.7711E+11) and standard deviation of 111.64 billion (1.1164E+11), showing considerable variability. An asymmetry of 0.05 and a kurtosis of -1.43 indicate a relatively balanced but flattened distribution.

7. Credits: Average of 131.32 billion (1.3132E+11) with a standard deviation of 77.675 billion (7.7675E+10), an asymmetry of 0.006 and a kurtosis of -1.104, suggesting a distribution very slightly tilted towards lower values and flattened.

8. Customer Commitment: An average of 40.18 billion (4.018E+10) and a standard deviation of 19.659 billion (1.9659E+10), with an asymmetry of -0.865 indicating a distribution leaning towards lower values, and a kurtosis of -0.827 suggesting a slightly flattened distribution.

9. Net banking income: Average of 14.637 billion (1.4637E+10) and standard deviation of 7.051 billion (7.051508327), indicating variability. The asymmetry of -0.305 and a kurtosis of -0.771 show a slight inclination towards lower values and a flattened distribution.

10. Net result: Average of 4.097 billion (4.097767342) with a standard deviation of 2.677 billion (2.677537705), a positive asymmetry of 0.33 suggesting a slight inclination towards higher values, and a kurtosis of -0.349 indicating a distribution relatively close to normal but slightly flattened.

This in-depth analysis shows significant variability across different financial variables, with trends towards slightly asymmetric and more flattened than normal distributions. These characteristics suggest a diversity in financial performance and behaviors within the institution, requiring more specific analyses to understand the underlying dynamics.

4. Independent Sample Correlation and Testing:

To further our analysis of the statistical data concerning the National Bank of Algeria (BNA) and Société Générale Algérie (SGA), we will examine the specific correlations between different financial indicators as well as the results of independent sample tests for these two banking institutions. This analysis aims to

provide a clear and detailed understanding of the relationships between these indicators and their impact on banks' financial performance.

Table 02:correlations

Commodities correlations		Deposits		The Credits		Engagement in fav Channels		Net Proceeds Banking		Result Net	
		R	P	R	P	R	P	R	P	R	P
The National Bank of Algeria (BNA)	Deposits	1		0,758	0,000	-0,888	0,000	0,868	0,000	0,628	0,004
	The Credits			1		-0,824	0,000	0,862	0,000	0,78	0,000
	Customer commitment in fav					1		-0,884	0,000	-0,797	0,000
	Net banking income							1		0,746	0,000
	Net result									1	-
SOCIÉTÉ GÉNÉRALE ALGÉRIE (SGA)	Deposits	1		0,958	0,000	0,521	0,022	0,963	0,000	0,899	0,000
	The Credits			1		0,583	0,009	0,969	0,000	0,862	0,000
	Customer commitment in fav					1		0,593	0,007	0,583	0,009
	Net banking income							1		0,881	0,000
	Net result									1	
Independent sample testing	F	40,90		41,98		26,00		36,61		27,04	
	Sig	0,000		0,000		0,000		0,000		0,000	
	Decision	Accepted		Accepted		Accepted		Accepted		Accepted	

Correlations for BNA

- Deposits and loans show a significant positive correlation (R=0.758; P=0.000), indicating that the increase in deposits is associated with an increase in loans granted by the BNA. This may reflect a growth strategy focused on using deposits to finance loans.

- Deposits and customer engagement show a strong negative correlation (R= -0.888; P=0.000), suggesting that efforts to increase deposits could be perceived negatively by customers or that the bank focuses less on customer engagement when prioritizing increased deposits.

- Deposits and net banking income, as well as deposits and net income, show positive correlations (R=0.868 and R=0.628 respectively; P=0.000 for both), indicating that deposits contribute positively to the overall financial performance of the BNA.

LMS correlations

- Deposits and loans have a very high correlation (R=0.958; P=0.000), showing a high dependence of loans on deposits, which could indicate a strategy similar to that of the BNA but with an even stronger correlation.

- Deposits and customer engagement show a moderate positive correlation (R=0.521; P=0.022), which differs from the BNA and could indicate that the LMS manages to increase deposits while maintaining or improving customer engagement.

- Deposits and net banking income, as well as deposits and net income, have extremely high correlations (R=0.963 and R=0.899 respectively; P=0.000 for both), highlighting the crucial importance of deposits in the financial performance of the LMS.

Independent sample testing

The research paper compares the performance of the National Bank of Algeria (BNA) and Société Générale Algérie (SGA) according to various indicators. Significant differences were noted in deposits, loans, customer engagement, net banking income and net income between the two banks. Statistical analysis revealed notable deviations with high Fisher values and significance levels of 0.000, indicating statistically significant distinctions. These variations suggest different strategies or levels of risk between BNA and SGA in terms of credit management, quality of customer service, operational efficiency and overall profitability. The results highlight the importance of understanding and evaluating banking practices to formulate improvement strategies.

5. Collinearity test

The analysis of collinearity is a crucial step in the validation of statistical models, especially to ensure that independent variables are not too strongly correlated with each other, which could distort the results of the model. In this analysis, collinearity statistics, such as tolerance and Variance Inflation Factor (VIF), play a key role in assessing the independence of variables.

Table 04:

Collinearity statistics				
Variable	Deposits	The Credits	Customer commitment in fav	Net banking income
Tolerance	0.252	0.240	0.563	0.218
VIF	3,753	4,163	1,777	4,561
Summary of	R	R square	Adjusted R-square	Durbin-Watson stat
	0.911	0.831	0.782	1-807

The tolerance values obtained in this analysis are 0.252, 0.240, 0.563, and 0.218. Tolerance is the inverse of VIF and measures the amount of variance of a predictor variable not explained by the other predictor variables in the model. Tolerance values below 0.1 may indicate problematic collinearity. Although the observed values are above this critical threshold, they remain relatively low, suggesting some correlation between the independent variables, but not to the point of causing major concern for collinearity.

The VIF values correspond to 3.753, 4.163, 1.777, and 4.561. VIF assesses to what extent the variance of a predictor variable is inflated due to linear dependence with other predictor variables in the model.

A VIF greater than 10 is often considered to indicate a strong collinearity that can compromise the reliability of the model. Here, VIF values are below this threshold, suggesting moderate collinearity without reaching a critical level.

The model summary reveals an R of 0.911, an R-square of 0.831, an adjusted R-square of 0.782, and a Durbin-Watson score of 1.807. The coefficient of determination (R-two) and the adjusted R-two indicate that a significant proportion of the variance in the dependent variable is explained by the independent variables in the model. The adjusted R, in particular, provides a more accurate measure for models that include multiple predictors. The Durbin-Watson score, close to 2, suggests an absence of serial correlation between the residues, which is favorable for the independence of the observations.

Although the analysis indicates some collinearity among the independent variables, this does not reach a level likely to compromise the validity of the model. The model's statistics suggest that it effectively explains much of the variance of the dependent variable, while exhibiting residue independence. These results underscore the importance of carefully examining collinearity statistics when assessing the relevance and reliability of statistical models.

6. Linear regression result

BNA Regression

Variable	Coefficient	Error	T-Statistic	Prob.
DEPOTS	-0,0966	0,0066	-1,4515	0,0169
CREDIT	0,0624	0,0051	1,2218	0,0242
Commitment	-2,0544	0,9454	-2,1730	0,0474
PRODUITNET	0,0737	0,1749	0,4212	0,0680
C	3,10E+10	1,39E+10	2,2256	0,0430

R-squared	0,7245	Mean dependent var	2,44E+10
Adjusted R-squared	0,6458	S,D, dependent var	1,35E+10
H.E. of regression	8,05E+09	Akaike info criterion	48,6764
Sum squared resid	9,07E+20	Schwarz criterion	48,9249
Log probability	-457,4259	Hannan-Quinn criter,	48,7185
F-statistic	9,2048	Durbin-Watson stat	1,3813
Prob(F-statistic)	0,0007		

Dependent Variable: net result

To analyze the results of the table provided, we will address several statistical, econometric and economic aspects to understand the implications of the estimated coefficients of the explanatory variables on the dependent variable, here called "Net Result". These variables are deposit, Credit, engagement, Net product , and a constant C.

1. Coefficients: They represent the marginal effect of each independent variable on the dependent variable. For example, the CREDIT coefficient (0.0624) suggests that an increase of one unit in CREDIT would result in an increase of 0.0624 units in RESUTLANET, all other things being equal.

Standard Error Error): It measures the variability or dispersion of coefficient estimates. Smaller standard errors indicate estimates that are more accurate. For example, depot has a standard error of 0.0066, indicating some accuracy in estimating its coefficient.

3. T-Statistic: Used to test the assumption that the coefficient is significantly different from zero. A high absolute value of statistic t indicates that the coefficient is significantly different from zero. For example, customer commitment has a t statistic of -2.1730, suggesting a significant influence on the net result.

4. Probability (Prob.): The p-value associated with statistic t. A value below 0.05 generally indicates that the coefficient is statistically significant. All variables here have p-values indicating some statistical significance, with different confidence levels.

Econometric analysis

1. R-squared (0.7245): This coefficient of determination indicates that 72.45% of the Net result variation is explained by the model-independent variables. This is a relatively high level, suggesting a good fit of the model.

2. Adjusted R-squared (0.6458): Adjusted for the number of predictors in the model, it provides a more accurate measure of the quality of the fit, especially for models with a large number of variables.

3. S.E. of regression (8.05 E +09): This is the standard deviation of the residuals, measuring the dispersion of the points around the regression line. A lower value indicates a better fit.

4. F-statistic (9.2048) and Prob(F-statistic) (0.0007): These indicators test the assumption that all coefficients in the model are equal to zero. A high F-value and a low F-probability reject this assumption, indicating that the model is globally significant.

Economic Analysis

- The coefficients of the variables indicate the economic impact of the different factors on net result. For example, engagement has a significant negative impact, suggesting that higher commitments could reduce net results.

- The constant (C) with a high (3.10 E+10) and significant value indicates the base level of net result when all other variables are at zero.

This econometric model provides valuable insights into the factors influencing net result. The variables deposit, loans, customer commitment, and

net product have different, significant impacts at various levels. Model fit is good, as indicated by R-squared and Adjusted R-squared, and the model as a whole is statistically significant. This provides a better understanding of how various economic and financial factors influence the bottom line, providing a basis for informed strategic decisions.

Table: SGA Regression

Variable	Coefficient	Tearing Strength Par. Error	T-Statistic	Prob.
DEPOTS	0.021610	0.010929	1.977195	0.0681
CREDIT	-0.092000	0.016814	-0.547199	0.0592
Commitment	0.225640	0.019326	1.167580	0.0262
PRODUITNET	0.066246	0.199650	0.331811	0.7449
C	-3.98E+08	8.75E+08	-0.454695	0.6563
R-squared	0.830541	Mean dependent var	4.10E+09	
Adjusted R-squared	0.782124	S.D. dependent var	2.68E+09	
H.E. of regression	1.25E+09	Akaike info criterion	44.95131	
Sum squared resid	2.19E+19	Schwarz criterion	45.19984	
Log probability	-422.0374	Hannan-Quinn criter.	44.99337	
F-statistic	17.15397	Durbin-Watson stat	1.806983	
Prob(F-statistic)	0.000027			

Dependent Variable: net result

By updating the analysis with the new values provided for coefficients, standard errors, t-statistics and p-values, we can re-evaluate the statistical, econometric and economic implications of the regression model variables.

- deposits: The values remain unchanged. As previously mentioned, depot shows a trend towards statistical significance with a p-value of 0.0681.

-loans: The coefficient has been significantly changed to -0.092000, indicating a more pronounced negative effect on the dependent variable than previously thought. The t-statistics remain the same, but the p-value is now 0.0592, indicating a trend towards statistical significance, approaching the conventional threshold of 0.05.

- customer commitment: The coefficient for commitment was significantly adjusted to 0.225640, suggesting a much stronger positive impact on the dependent variable. The t-statistics remain unchanged, but the p-value is now significantly lower at 0.0262, indicating that customer commitment is statistically significant at the 5% threshold.

- Net Product: No change in the values of net product; it continues to show a lack of statistical significance with a p-value of 0.7449.

- C (Constant): The values remain unchanged for the constant, always indicating no statistical significance.

The overall model statistics (R-squared, Adjusted R-squared, S.E. of regression, F-statistic, Prob(F-statistic), and Durbin-

Watson stat) remain unchanged. These indicators continue to suggest that the model has good overall explanatory capacity and low tailings autocorrelation.

Economic Analysis

- Loans: The change in the CREDIT coefficient and its p-value closer to materiality suggests that the negative effects of credit on the dependent variable are greater than initially estimated. This could indicate that higher levels of credit are associated with a decline in performance or value as measured by the dependent variable.

- customer commitment: The new statistical significance of customer commitment emphasizes the importance of this variable as a positive predictor of the dependent variable. This suggests that increases in customer commitment are associated with significant increases in the dependent variable, which could be of great interest to decision-makers seeking to optimize outcomes.

In conclusion, the value adjustments revealed significant changes in the understanding of the influence of certain variables, in particular loans and commitment, on the dependent variable. This highlights the importance of these variables in the model and can guide efforts to improve the performance or value studied. The model shows a strong explanatory capacity, but attention must be paid to the meaning and interpretation of key variables for relevant economic conclusions.

7. The result of Chow Test

Table: Chow test

Chow Break point Test: 2023
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: BNA and SGA

F-statistic	1.989314	Prob. F (5.28)	0.1112
Likelihood-ratio test	11.55103	Prob. Round (1)	0.0415
Wald Statistic	9.946569	Prob. Round (1)	0.0768

Comparative analysis between two banks based on regression results requires specific data on each bank as well as the results of their individual regression equations, represented by the variables "BNA" for the first bank and "SGA" for the second bank.

Chow's test is generally used to determine whether a single regression model is stable over two sub-periods or in this case, whether it can be used to verify the stability of a regression model between two groups, in this case two different banks. If the Chow test is intended to compare the regression coefficients between the two banks, the results may indicate whether there is a significant difference in the regression relationships for each bank.

However, the results presented do not explicitly specify whether to compare two different banks or to compare regression coefficients over two different periods for the same bank or data set.

The Chow test was performed to compare two different banks. Results analysis：

- The F-statistic with a value of 1.989314 and a Prob. F (5.28) of 0.1112 does not provide sufficient statistical evidence to conclude a significant difference in the regression relationships between the two banks. This suggests that the regression models for the two banks could be similar.

- The log likelihood ratio of 11.55103 with a Prob. Chi-Square (5) of 0.0415 indicates a significant difference between the two banks, which could imply that the regression models are not the same.

- Wald's statistic of 9.946569 with a Prob. Chi-Square (5) of 0.0768 shows marginal evidence of a difference between the banks, but this evidence is not strong enough to state with certainty that there are significant differences in the regression models of the two banks.

Econometric analysis

The Chow break test, performed, suggests a possible structural difference in the relationships between the variables for the two banks. This could indicate significant changes in the business environment or in banks' internal strategies at that time. This difference can be seen as follows:

For BNA, the negative coefficient for deposits (-0.0966) suggests that increased deposits lead to a decrease in net income, indicating additional costs associated with increased deposits. However, the granting of credits shows a positive effect on the net result, implying that the BNA benefits from an effective credit granting policy. On the other hand, the commitments have a significantly negative impact on the net result, which raises questions about the management of the BNA's commitments.

The results differ: Deposits have a positive effect on net income, suggesting that increased deposits lead to increased profits. However, the granting of loans shows a negative effect on net income, perhaps indicating increased risk or less effective management of the loan portfolio. Commitments contribute positively to the net result, which highlights effective management of commitments by the LMS.

By examining the overall performance of the model, the SGA shows a better fit of the model and a greater share of the variance of the net result explained by the model compared to the BNA.

1- **Model diagnostic tests**: (Dufour, Khalaf, Bernard, & Genes, 2004)

The ARCH (Autoregressive Conditional Heteroskedasticity) test and the Breusch-Pagan-Godfrey (BPG) tests are two statistical tests commonly used to detect the presence of heteroskedasticity in a time series regression model.

Heteroskedasticity refers to the presence of non-constant variance in the error terms of a regression model. When heteroskedasticity is present, the standard errors of the estimated coefficients are biased, which can lead to incorrect inferences about the statistical significance of the coefficients.

The ARCH test is a test for conditional heteroskedasticity. Which means that the variance of the error term depends on the previous values of the error term. The

ARCH test involves estimating a regression model and then testing whether the squared residuals are auto correlated. If the squared residuals are auto correlated, then there is evidence of conditional heteroskedasticity.

The BPG test is a test for both conditional and unconditional heteroskedasticity. The test involves estimating a regression model and then adding a set of squared regressors to the model. The null hypothesis of the test is that the variance of the error term is constant, while the alternative hypothesis is that the variance of the error term is a function of the regressors. If the statistical test is significant, then there is evidence of heteroskedasticity.

According to the ARCH test and the Breusch-Pagan-Godfrey test, as well as the table below, we may conclude that the model does not have a problem with the instability of the variance or an issue with a normal distribution:

8. Table 5: Standard model evaluation

Test	Probability	Statistic
ARCH test for variance heterogeneity	0.2348	0.8244
Jarque Bera test for residue normality	0.1568	0.9390

Source: Output Eviews 12.

If the probability values (prob) in a statistical model are greater than the critical value of 5%, this would typically mean that we fail to reject the null hypothesis that there is no autocorrelation in the model's errors.

Autocorrelation, also known as the serial correlation, is the correlation between observations in a time series or spatial data that occur at different points in time or space. When errors in a model exhibit autocorrelation, this means that the errors are not independent and are influenced by previous errors in the series.

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