



An Econometric Study on the Growth of Foreign-Owned Private Banks

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Abstract :

Algeria is the region's most promising future market, and one of the most dynamic in the developing world. However, the non-existence of a financial market in Algeria means that banks and financial institutions play a crucial role, both in collecting resources and in granting medium- and long-term loans to businesses.

In order to guarantee the development of their share of the Algerian market, private banks are offering new products in the credit sector. To this end, we have formulated the following problem: what impact does the diversification of loans granted have on the ABG bank's net profit?

Key Words: Net result, Credit, Multinational Banks, Foreign-owned private banks, ARDL.

JEL Classification : G21, E26, C97

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Introduction :

With the goal of improving the still extremely low standard of banking and facilitating interbank transactions by introducing the entire spectrum of contemporary payment methods and enhancing secure communication networks, the Algerian banking system has now permitted foreign banks and financial institutions to open offices or be represented there. The GDP penetration rate may rise as a result of all this. State-owned banks dominate Algeria's banking industry, with vast branch networks dispersed across the nation .

State-owned banks dominate the Algerian financial market, with vast branch networks dispersed throughout the nation. We must not, however, ignore the fact that the number of private bank branches has increased recently, which has aided in the growth of competition in terms of the distribution of credit and the collection of resources as well as the offering of basic banking services to clients. This prompted us to research the development of Arab Gulf Bank in the Algerian sector. The question we have developed to address this is: **What effect does the diversification of loans granted have on the net profit of the ABG bank"**

Loans and net income are the two main metrics on which our study is based.



We will try in this study to know the effectiveness of variables. The reforms adopted by the Algerian authorities during the period 2004–2021, 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, with 36 views (2004S1-2021S2).

I. The Econometric Model:

1. Description model and study variables:

The autoregressive model of delayed time lag (autoregressive distributed lag) called (ARDL) model, which is included in the economic models for the co-integration test, from solves our problem. Which is to test the effect of Credit on net result in the long and short terms. The validity of the proposed hypotheses in comparison to other approaches like the Engel Granger method or the Johansen Cointegration test method. This model is regarded by the Bound test approach as the finest co-integration test models in the situation of time series (Dechera & Bouchelaghem , 2023, p. 342; Dechera & Bouchelaghem , 2023).

The ARDL model produces effective results because it estimates and measures the joint integration relationship between the variables regardless stability degree of the time series. Whether they are integrated to degree (0) or degree (1) as long as they are not integrated to degree (2). In addition, this model works to distinguish between the effects of the short term and the long term, and through it, it is possible to determine the relation of integration between the variables. (Dahmani & Samir, 2012)

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 Credit on Net Result, and taking into account the particularities of the Algerian economy, it is possible to formulate our study model as follows:

Net Result = f(Credit). (1).

And through the equation No (1), the ARDL model will be estimated according to the following formula:

$$\begin{aligned} Net_Result = & a + B1 Net_Result\ t - 1 + B2 Credit\ t \\ & - 1 \sum_{i=1}^p \alpha 1 \Delta Net_Result\ t - p + \sum_{i=1}^p \alpha 2 \Delta Credit\ t - p + \mu_t \end{aligned}$$

Where:

Δ : the first difference of the variable, p: represents the number of lags contained in the model,

B1, B2: are the parameters of the long-term relationship, a: represents the constant term,

$\alpha 1, \alpha 2$: represents the parameters of the short-term relationship (error correction),

i: represents the trend of time. As for the variables of the study can be defined briefly as follows:



Net Result: Net accounting income, or net income, is the amount of money a company actually earned. It is made up of operating, financial and exceptional results, from which taxes must be subtracted. Net income serves as the basis for calculating many ratios

Credit: A credit is a provision of money in the form of a loan, granted by a creditor to a debtor. For the creditor, the transaction gives rise to a claim on the borrower, under which he can obtain reimbursement of funds and payment of remuneration according to a planned schedule.

To validate the correctness of the data utilized in the model before we begin estimating it, we must perform the following tests:

- **Data Cleaning:** This involves checking for any errors or inconsistencies in the data, such as missing values, duplicate data, or outliers. Once identified, these issues can be resolved or removed to improve the quality of the data.
- **Descriptive statistics:** Descriptive statistics can help summarize the data and identify any potential issues with the data, such as skewness, outliers, or unusual patterns.
- **Correlation analysis:** Correlation analysis helps identify the strength of the relationship between different variables in the data. This can help identify any potential issues with the data, such as multicollinearity.
- **Hypothesis testing:** Hypothesis testing involves testing the significance of a relationship or difference between variables in the data. This can help identify any potential issues with the data or the model.
- **Cross-validation:** Cross-validation involves dividing the data into multiple subsets and using each subset as both training and testing data. This helps identify any potential issues with overfitting or underfitting the model.
- **By performing these tests, we can ensure that the data utilized in the model is correct and of good quality, which can improve the accuracy and the model's estimate reliability.**

2. The stationary Test (unit root test):

The Dickey-Fuller test is a statistical test used to determine if a time series is stationary or non-stationary. Stationary time series have constant statistical properties over time, such as a constant means and variance. Non-stationary time series, on the other hand, have statistical properties that change over time, such as a trending or cyclic pattern.

The test is usually applied to the first-differenced series. Which is obtained by making the difference between consecutive observations in the original time series. This is because differencing can often make a non-stationary time series stationary.... (Agiakloglou & Newbold, 1992, p. 472)

The test works by estimating the following regression model:

$\Delta y_t = \alpha + \beta t + \gamma y_{(t-1)} + \delta_1 \Delta y_{(t-1)} + \dots + \delta_p \Delta y_{(t-p)} + \varepsilon_t$
 where Δy_t is the first difference of the time series at time t , $y_{(t-1)}$ is the lagged level of the time series, and ε_t is the error term. The null hypothesis of the test is



that the time series is non-stationary, and the alternative hypothesis is that it is stationary.

The test statistic is then calculated and compared to critical values from the Dickey-Fuller distribution to determine whether the null hypothesis should be rejected or not. If the test statistic is less than the critical value, then the null hypothesis is rejected, and the time series is considered stationary. Otherwise, if the test statistic is greater than the critical value, then the null hypothesis is not rejected, and the time series is considered non-stationary.

The Dickey-Fuller test is widely used in econometrics and other fields to analyze time series data. It is an important tool for detecting trends and seasonality in data, and for making forecasts based on historical patterns.

The Dickey Fuller test is used to determine the level of stability of the time series at both the level and the first difference. The results of this test are shown in the following table:

Table 1: Time series stationary test

	variables		credit		Net result		
Augmented Dickey-Fuller	level	constant	-6.6451	0.0000	-5.937339	0.0000	
		constant and trend	-7.3145	0.0000	-6.142812	0.0001	
	first Difference	constant	-	-	-	-	
		constant and trend	-	-	-	-	
PP	level	constant	-6.6138	0.0000	-5.938269	0.0000	
		constant and trend	-7.3059	0.0000	-6.472398	0.0000	
	first Difference	constant	-	-	-	-	
		constant and trend	-	-	-	-	
	Decision		I(0)		I(0)		

Source: Output Eviews 12.

Assuming the null hypothesis that the time series will be nonstationary, i.e. the series has a unit root, and the alternative hypothesis that the series will be constant and based on Mackinnon 1996 values according to the SCI standard, indicates that the null hypothesis is rejected at the level of 1%, 5%, 10% respectively. The results of Table No. (1), we can say that each series for: credit, net result is a constant series at the level. Therefore the results of the Dickey Fuller test and Phillips-Perron showed that the conditions for using the ARDL model are available and there is no second-order integral series.



3. Bound test Cointegration approach:

The bound test cointegration approach, also known as the ARDL (autoregressive distributed lag) bounds test, is a statistical method for testing the existence of a long-run relationship between two or more non-stationary variables. The approach involves estimating an ARDL model, which includes lagged values of the dependent variable and lagged values of the independent variables. The order of integration of the variables should be determined beforehand using unit root tests such as the Augmented Dickey-Fuller (ADF) test or the Phillips-Perron (PP) test (Ozturk & Acaravci, 2010, p. 1940).

Once the ARDL model is estimated, the F-test is used to test for the significance of the long-run relationship between the variables. The bound test is called so because it involves setting upper and lower bounds for the number of lags to include in the ARDL model. The bounds are determined based on the order of integration of the variables and the sample size.

According to this test, the null hypothesis which states that there is no long-term equilibrium relationship between the model variables (no co-integration) and the tested hypothesis is as follows (Dahmani & Samir, 2012, p. 343):

$$H_0 : B1 = B2 = B3 = B4 = \dots = BK + 1 = 0 .$$

$$H1: \text{At least we have } B_i, B_i \neq 0 \dots \text{ where } i = 1, 2, 3, \dots, BK + 1.$$

The following table demonstrates the limit approach test for the presence of a long-term equilibrium connection (Pesaran, Shin, & Smith, 2001, p. 290).

If ($F_{\text{statistic}}$) is lower than the lowest critical values, we accept the null hypothesis that there is no long-term equilibrium relationship.

The null hypothesis, which states that there is no long-term equilibrium connection, is accepted when ($F_{\text{statistic}}$) is less than the lowest critical values. The limit approach test for the presence of a long-term equilibrium relationship is shown in the following table.

Table 2: Bound test cointegration

Critical values	Maximum	Minimum	Fstatistic	Result
level 10%	3.02	3.51	14.506291	There is a long— term equilibrium relationship
level 5%	3.62	4.16		
level 2.5%	4.18	4.79		
level 1%	4.94	5.58		

Source: Output Eviews 12.

According to the results presented in the table above, it can be said that the null hypothesis which states that there is no long-term equilibrium relationship between the variables of the model is rejected because the value $F_{\text{statistic}}$ which has reached 14.506291 is above the upper limit value set by Pesaran at the significance level 1% and 5%. This means that net result is co-integrated with its determinants of the credit. Which means that the variables behave similarly in the long term.



4. Lag length Selection Test: with Automatic AIC Criteria Selection Test:

AIC is a measure the goodness fit of a statistical model that takes into account the parameters number in the model. It is based on the idea that a good model should fit the data well while using as few parameters as possible. A lower AIC value indicates a better fit (McDonald, 1989, p. 98).

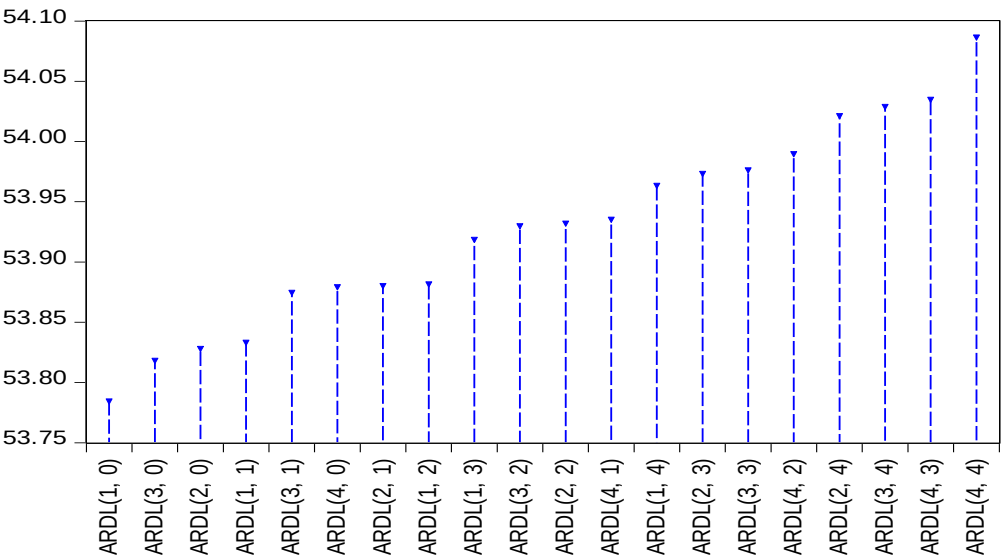
When selecting the best model, we compare the AIC values of different models and choose the one with the lowest AIC value. The deceleration times referred to in your statement are likely the parameters of a model, and the accompanying figure shows the AIC values for different values of the deceleration time.

In general, we would choose the deceleration time that corresponds to the lowest AIC value. This is because the model with the lowest AIC value is considered the best compromise between goodness of fit and complexity.

It is important to note that AIC is not the only criterion for model selection, and other measures, such as the Bayesian information criterion (BIC), can also be used. Additionally, AIC should not be used in isolation, and other factors, such as the interpretability and simplicity of the model, should also be considered when selecting the best model.

Based on Akaike's information criterion, the best deceleration times for the selected model are shown in the accompanying figure. According to the outputs, the ARDL model (4.4) demonstrates that it is optimum:

Figure 1: Optimal slowdown test
Akaike Information Criteria



Source: Output Eviews 12



5. Estimation of long-term equilibrium relationship model and error correction model (short term):

5.1. The long-term equilibrium relationship model:

The long-term equilibrium relationship can be obtained from the estimated parameters of the ARDL model. This relationship reflects the long-run behavior of the variables and is useful for predicting their future behavior. By examining the long-term equilibrium relationship, we can assess whether the variables are moving towards or away from their equilibrium values.

We may estimate this relationship by getting the parameter estimates and the long-term equilibrium relationship after validating that there is an equilibrium relationship between the long-term model variables under the ARDL model. The results of table n° (3) demonstrate this as follows:

Table 3: Estimations of long-term parameters

Dependent Variable: NET_RESULT
Method: ARDL
Date: 02/19/23 Time: 09:58
Sample (adjusted): 2004S2 2021S2
Included observations: 35 after adjustments
Maximum dependent lags: 2 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (3 lags, automatic): CREDIT
Fixed regressors: C
Number of models evaluated: 8
Selected Model: ARDL(1, 0)
Note: final equation sample is larger than the selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
NET_RESULT(-1)	-0.039900	0.176649	-0.225870	0.8227
CREDIT	-0.224521	0.470504	-0.477193	0.0365
C	6.73E+10	5.72E+10	1.175763	0.0484
R-squared	0.081402	Mean dependent Var	5.21E+10	
Adjusted R-squared	-0.053850	S.D. dependent Var	2.82E+11	
S.E. of regression	2.89E+11	Akaike info criterion	55.70187	
Sum squared resid	2.68E+24	Schwarz criterion	55.83519	
Log likelihood	-971.7828	Hannan-Quinn criter.	55.74790	
F-statistic	0.131335	Durbin-Watson stat	2.018911	
Prob(F-statistic)	0.877394			

*Note: p-values and any subsequent tests do not account for model selection.

Source: Output EvIEWS 12

Through the results presented in the table above. In terms of credit, it has a negative relationship with net result, which is consistent with economic theory. In finance, credit refers to borrowed funds that are used to finance investments or



operations. Borrowing can allow to expand its operations, invest in new projects, and increase its revenue. However, borrowing also comes with interest payments and repayment obligations, which can negatively affect a net result. Therefore, it is expected that there would be a negative relationship between credit and net result, with high levels of debt may have lower net result due to interest payments and other repayment obligations. All of these factors would reduce investment and consumption, a 1% increase in credit resulting in a decline of 22% in net result would suggest that has a high degree of financial leverage. Which means that it relies heavily on borrowed funds to finance its operations. In such a situation, even a small increase in credit could result in a significant increase in interest payments, which would reduce the net result.

The results of the long-term estimation are presented in the following equation:

$$Net_{Result} = 6.73E + 10 - 0.039900Net_Result - 0.224521Credit$$

5.2. Error correction model (short term):

In error correction model (ECM), the short-term parameters are estimated, where the model variables appear as the first difference with the coefficient of error correction for a single delay period with a negative value less than one (1). We will attempt to test the short-term equilibrium relationship. The following table displays the results of the error correction model as follows:

Table 4: Estimation of the error correction model

Vector Error Correction Estimates		
Date: 02/18/23 Time: 17:04		
Sample (adjusted): 2005S2 2021S2		
Included observations: 33 after adjustments		
Standard errors in () & t-statistics in []		
Cointegrating Eq:	CointEq1	
CREDIT(-1)	1.000000	
NET_RESULT(-1)	0.656114	
	(0.17617)	
	[3.72433]	
C	-9.38E+10	
Error Correction:	D(CREDIT)	D(NET_RESULT)
CointEq1	-0.239820	-1.731252
	(0.19387)	(0.52545)
	[-1.23703]	[-3.29477]
R-squared	0.584813	0.524274
Adj. R-squared	0.507926	0.436177
Sum sq. resids	3.62E+23	2.66E+24
S.E. equation	1.16E+11	3.14E+11



F-statistic	7.606186	5.951081
Log likelihood	-884.1688	-917.0727
Akaike AIC	53.94962	55.94380
Schwarz SC	54.22172	56.21589
Mean dependent	4.20E+09	1.27E+08
S.D. dependent	1.65E+11	4.18E+11
Determinant resid covariance (dof adj.)	1.29E+45	
Determinant resid covariance	8.66E+44	
Log likelihood	-1800.944	
Akaike information criterion	109.9966	
Schwarz criterion	110.6315	
Number of coefficients	14	

Source: Output Eviews 12

According to the results presented in Table No (4), the value of the error correction coefficient was negative and statistically significant at a degree of significance of 1%, 5% and 10%. This proves the accuracy of the equilibrium mechanism of adjustment between the short run equilibrium and long-term equilibrium, where the error correction parameter measures the speed of adjustment of 0.5776 period to go from the short run equilibrium to the long-term equilibrium position and the value of this coefficient is approximately (-0.751252). The mechanism adjusted about 175% in one period to reach the long-term equilibrium position.

On the other hand, the results showed that the credit is inversely proportional to net result in the short term and it is significant, but its effect, contrary to the relationship which was positive in the long term. This result can be accepted from an economic point of view, because the currency has an impact on economic activity in the short term, but it is neutral in the long term.

6. Test of structural stability of the parameters of the model:

The Cumulative Sum of Recursive Residuals (CUSUM) is a statistical test used to detect structural changes or shifts in the parameters of a statistical model over time. The test is based on the cumulative sum of the recursive residuals. Which is the difference between the observed values and the predicted values from the model. There is stability in the parameters of the ARDL model if the condition of the graph of the two previous tests is met within the bounds of the critical region at the level of 5%.

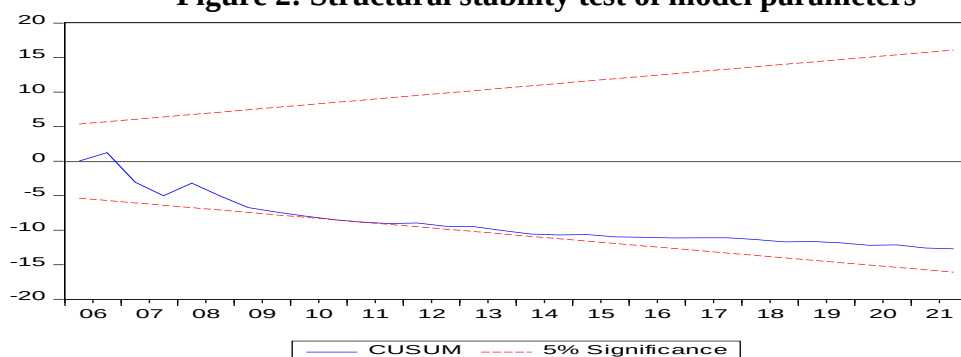
By plotting the CUSUM values against time, we can detect changes in the parameters of the model. If the CUSUM values remain within a specified range, we can conclude that the model is stable and consistent over the short term. However, if the CUSUM values exceed the range, we can conclude that there is a structural change in the data, and the model needs to be modified or updated to account for the change.



The CUSUM test is commonly used in time-series analysis and is an important tool for ensuring the validity of the data used in statistical models. It helps to identify when the assumptions of the model are violated and provides a way to assess the reliability of the model over time.

The following graph shows that, although the model parameters are stable at the 5% level. The cumulative sum of residuals (CUSUM) for the estimated model quickly returns to and settles in the critical region, indicating the presence of harmony and stability in the results of the long-term and short-term model. The following figure illustrates this:

Figure 2: Structural stability test of model parameters



Source: Output Eviews 12

7. Model diagnostic tests: (Dufour, Khalaf, Bernard, & Genes, 2004, pp. 317-347)

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 autocorrelated. If the squared residuals are autocorrelated, 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 test statistic 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

Table 5: Standard model evaluation

Test	Probability	Statistic
Test ARCH pour l'hétérogénéité de la variance	0,6820	0,030726
Test de Jarque Bera pour la normalité des résidus	0,8729	0,136533

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.

The probability values (prob) are greater than the critical value of 5%. Which indicates that the model does not exhibit error autocorrelations, as shown in the following table. The residual do not deviate from zero during the slowdown periods from 1 to 4, and this is in accordance with the AC standard:

Table 6: Autocorrelation of errors

Date: 02/19/23 Time: 10:44
Sample: 2004S1 2021S2
Included observations: 35
Q-statistic probabilities adjusted for 1 dynamic regressor

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob*
. .	. .	1-0.010	-0.0100	0.0042	0.948
. .	. .	2-0.053	-0.0540	1.161	0.944
. .	. .	3-0.057	-0.0580	2.472	0.970
. .	. .	4-0.056	-0.0610	3.784	0.984

*Probabilities may not be valid for this equation specification.

Source: Output Eviews 12.



II. Results and Discussion:

Sharia-compliant credit now represents a quarter of the bank's total portfolio of commitments per fund and is becoming increasingly demanded by its customers. It should be noted that this type of financing meets a specific need of AGB's customers which has grown by 137%. However, the majority of credits remain in classic form whether for the short term or for the long term. and medium term and this, despite the preference of Algerian customers who fall towards the version conforming to Sharia law. Since the creation of Algeria Gulf Bank has continued to evolve, particularly in the field of credit. . For the opening year, the bank recorded a credit amount which did not exceed 200,000 DA. But over the years the progression of credit has doubled particularly between 2007 and 2008 where the increase recorded is 121%. The main reason for this increase is explained by the launch of the first products aimed at individuals since they ultimately represented 2008 59% of total medium-term credits. Added to this is :

- Loans conforming to the precepts of Islam.
- The marketing of the “Bayti” property loan product was launched at the end of 2008.

Financing of individuals recorded a clear progression through the launch of the auto loan called “Sayarati” which quickly established itself on the market but not for long since the supplementary finance law of July 2009 stopped the marketing of loan products to individuals, which explains the timid increase in loans between 2009 and 2010 after the activity of credit to individuals was reduced to “Bayti” housing loans which was launched in the 1st quarter of 2010.

In the same year, the bank launched in the last quarter a credit called "proline" intended for traders and liberal functions with the two formulas: "classic, and in accordance with the precepts of sharia" which will replace the product "Sayarati" and “Tashilet.” For the period 2010 until 2020, we note that the credit rate has become increasingly increasing, particularly for operations compliant with Sharia, especially for short-term credits, since they represent more than 77% of the total credits.

Conclusion :

The present study has delved into the dynamics of the Algerian banking sector, with a specific focus on the evolution of the Arab Gulf Bank in the Algerian market. Through the use of an ARDL model, the analysis aimed to comprehend the relationship between credit and net income, both in the short and long term. The obtained results shed light on several crucial aspects. Firstly, the co-integration between credit and net income suggests a long-term relationship between these two variables, indicating that their behaviors converge over the long term.

Examining the short-term results, the Error Correction Model (ECM) unveils an intriguing dynamic. The negative relationship between credit and net income in the short term, coupled with a significant error correction coefficient, underscores the gradual adjustment of short-term imbalances towards a long-term equilibrium position.



The structural stability of the model parameters, assessed through the CUSUM test, confirms the consistency of results both in the short and long term. This stability suggests that the identified relationships in the model remain robust over time, thus reinforcing the reliability of the conclusions drawn from the analysis.

Moreover, model diagnostic tests, including ARCH and Breusch-Pagan-Godfrey tests, did not reveal significant issues such as heteroskedasticity or non-normal distributions of residuals, further solidifying the validity of the results.

In conclusion, this study provides an in-depth perspective on the relationship between credit and net income in the specific context of the Algerian banking sector. The findings suggest that the Arab Gulf Bank has evolved significantly over the years, with particular attention to the growing demand for Sharia-compliant credits. These conclusions can offer valuable insights for financial stakeholders and policymakers, aiding them in making informed decisions in a constantly evolving economic environment.

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