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Measuring The Operational Efficiency Of Algerian Commercial Banks During The Period 2016-2020

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Summary: This study aims to measure the operational efficiency of a sample of 6 Algerian commercial banks (AGB, BNA, SG Bank, BNP PARIPAS, BEA and ABC Bank) using a set of financial indicators (ROE, ROA, CA and LUIQ), where the study model was estimated using Panel models.

The study concluded that the random model is the appropriate model for this study, which showed that there is a statistically significant relationship between return on equity and capital adequacy on the dependent variable (banking efficiency), and the existence of a statistically significant inverse relationship between return on assets (ROA) and banking efficiency (OE) There is also no statistically significant relationship between liquidity and banking efficiency.

Keywords: banking efficiency, return on equity, return on assets, utility of assets , capital adequacy and liquidity.

.**Jel Classification Codes :** G10, G18, G20

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I-Introduction:

The topic of efficiency in banking holds significant importance, as the assessment of banking efficiency has been and continues to be one of the key elements contributing to the success of banking institutions. This is achieved by determining the degree of prudent utilization of available resources, identifying the optimal combination of inputs that achieve the lowest cost without compromising the quality of outputs. Assessing the efficiency of banks and monitoring their activities is crucial for their sustainability amidst risks and changes, as well as to address many financial crises primarily caused by banks. Therefore, measuring the efficiency of banks enables the identification of strengths and weaknesses, attempting to correct deviations and address situations before it's too late.

The evolution in measuring operational efficiency in banks underscores the importance of positive performance in the banking industry. This is evident through the development or improvement of various indicators and techniques to measure this efficiency.

This study focuses on measuring operational efficiency in banks using a set of financial indicators. Accordingly, the main problem statement of the study can be formulated as follows:

To what extent can the operational efficiency of Algerian commercial banks be measured in the study sample during the period 2016-2020?

Sub-problems:

Based on the main problem statement, the sub-problems can be formulated as follows:

- Is there a statistically significant impact of the return on equity on bank efficiency?
- Is there a statistically significant relationship between return on assets and efficiency?
- Is there a statistically significant relationship between capital adequacy and efficiency?
- Is there a statistically significant relationship between liquidity ratio and efficiency?

Hypotheses:

Derived from the sub-problems, the following hypotheses can be formulated as preliminary answers:

- There is a statistically significant relationship between return on equity and efficiency.
- There is a statistically significant relationship between return on assets and efficiency.
- There is a statistically significant relationship between capital adequacy and efficiency.
- There is a statistically significant relationship between liquidity ratio and efficiency.

I.1. Previous Studies:

- **Talal Zaghba,Naija Razika Ahlam (2020)[1]:** This study focuses on measuring operational efficiency in commercial banks through an empirical study of a group of banks operating in Algeria, consisting of six banks, including two public banks, one foreign bank, and three Arab banks. The aim was to measure the operational efficiency of Algerian banks reflecting their ability to control their costs. Financial analysis using financial ratios was employed to achieve the study's objectives. The general results of the study indicate that small-sized banks demonstrate high operational efficiency in management and cost control compared to large-sized public banks.

- **Cherifa Djaadi, (2014)[2]:** This study examines the measurement of operational efficiency in banking institutions, focusing on a sample of banks operating in Algeria, consisting of seven banks, including two public banks, one mixed bank, and four private foreign banks, during the period from 2006 to 2012. The researcher attempted to measure operational efficiency by addressing its components, determinants, and measurement methods using a set of financial indicators following the stochastic frontier cost function approach. The main findings of the study suggest that small-sized banks are more efficient in managing their costs compared to large-sized banks. Additionally, the studied banks demonstrate efficiency in input substitution but lack control over their costs through input prices due to the absence of price elasticity of demand. Moreover, the sample banks did not achieve economies of scale except for two small-sized banks, but they did achieve scope economies enabling them to diversify their products.

- **Chaouki Bouragba, (2011)[3]:** Operational Efficiency of Islamic Banks: A Comparative Applied Study." This research, published as a doctoral thesis at the University of Setif in 2011, aimed to compare the efficiency of traditional banks with Islamic banks. The researcher addressed methods of measuring operational efficiency and its influencing factors. The study used financial ratios and the standard method to measure and analyze operational efficiency in a sample of 32 banks (17 Islamic banks and 15 traditional banks) from 2000 to 2008. The main findings suggest that traditional banks are more efficient in utilizing available resources and controlling their costs compared to Islamic banks.

- **Ibtisam Saad, (2009)[4]:** Evaluation of the Efficiency of the Algerian Financial System and Its Role in Economic Financing." This study, presented as a master's thesis at the University of Biskra in 2009, aimed to evaluate the efficiency of the Algerian financial system in economic financing. The researcher examined the nature of the Algerian financial system and used two methods to evaluate cost efficiency and profit efficiency in Algerian banks:

financial ratios and the stochastic frontier cost function model for a sample of Algerian banks, including four public banks and the Algerian Baraka Bank, from 1995 to 2006. The study aimed to measure the size efficiency and scope efficiency of this bank sample. The main findings indicate that private banks in Algeria are more efficient and capable of controlling their costs compared to public banks.

- **Mohamed El Djemoui Korichi, (2006)**:[5] Economic Efficiency Measurement in Banking Institutions: A Theoretical and Field Study of Algerian Banks, 1994-2003." This study, presented as a doctoral thesis at the University of Algiers in 2006, focused on banking efficiency and measurement methods. The researcher used the profit margin indicator as a financial ratio to measure cost management efficiency and the logarithmic cost function to calculate demand elasticity and input substitution and estimate economies of scale and scope for a sample of Algerian banks from 1994 to 2003. The main findings indicate that small-sized banks are more capable of controlling their costs compared to large-sized banks, and small-sized banks have positive scale economies, while large-sized banks have negligible or negative scale economies. Furthermore, all small and large banks enjoy scope economies.
- **Mohamed Youssef Al-Omari, (2004)[6]:** "Productive Efficiency in Jordanian Banks in the Context of Financial Globalization." This research, presented as a doctoral thesis at the University of Jordan in 2004, aimed to evaluate productive efficiency and performance in Jordanian banks. The study compared productive efficiency and performance between Jordanian and foreign banks in Jordan, comprising 16 banks, 13 Jordanian banks, and 3 foreign banks, from 1996 to 2002, using a set of financial ratios. The main findings indicate a decrease in productive efficiency and performance in Jordanian banks compared to foreign banks in Jordan, as indicated by various indicators such as return on capital, return on equity, and return on assets.

I. 2. LITERATURE REVIEW:

2.1 Definition of Efficiency:

Efficiency refers to an organization's ability to effectively utilize its resources and control its costs. The concept of efficiency originates from the Italian economist Vilfredo Pareto, who developed the concept into what is known as Pareto optimality. According to Pareto, resource allocation is either efficient or inefficient[7]. Inefficient resource allocation reflects inefficiency. Philippe Lorino defines efficiency as the ability to maximize value and reduce costs. Efficiency cannot be achieved solely by reducing costs or increasing value; rather, it requires the simultaneous achievement of both objectives.

Agbodan and Amoussouga define efficiency[8] as the optimal utilization of available resources in the production process.

Efficiency is also defined as the prudent use of available resources, achieving the lowest cost level without sacrificing the quality of the organization's outputs. It represents rational use in comparing alternatives and selecting the best one, allowing for cost reduction or profit maximization to the fullest extent possible.

From the above, it can be inferred that efficiency means[9] an organization's ability to achieve its objectives, whether increasing production or reducing costs, through optimal utilization of available resources in terms of both quantitative and qualitative returns with minimal possible expenses.

2.2 Types of Bank Efficiency:

- **Operational Efficiency:**

Operational efficiency, or production efficiency, refers to the economic relationship between available resources and achieved results by increasing outputs based on a certain quantity of inputs or reducing the quantity of inputs used to reach a certain volume of outputs. Efficiency implies the absence of waste and the optimal utilization of available material, financial, and human resources. It is measured by the ratio of actual outputs to maximum outputs from available resources. Optimal efficiency is achieved when this ratio equals one, indicating that the marginal product of production factors equals their cost. Operational efficiency comprises two aspects: the technical aspect, represented by the quantity of outputs produced from using a certain quantity of inputs, and the cost aspect, represented by input prices. Therefore, production efficiency is the result of both technical efficiency and cost efficiency, also known as cost efficiency.

- **Industrial Structural Efficiency:**

Structural efficiency expresses the technical efficiency of the industry[10]. It was introduced by the American economist Farrell in 1957 and further developed by Hjalmarsson and Forsund in 1978 and 1974. This type of efficiency aims to measure the continuous development and improvement of the industry by relying on its best institutions. Structural efficiency of an industry is calculated by determining the weighted average of the technical efficiency of institutions constituting the industry, with weighting by the quantity of output produced by each institution relative to the total industry output.

- **Resource Allocation Efficiency for the Economy as a Whole:**

This type of efficiency aims to measure the loss of social welfare resulting from suboptimal resource use or allocation. While most economists believe that inefficiency in resource allocation results in a loss of societal welfare, empirical evidence suggests that the loss of social welfare due to suboptimal allocation of resources is less than 1% of the gross national product, particularly in the United States. The analysis of resource allocation efficiency depends on estimating the social welfare loss by comparing the monopoly state to perfect competition, to measure consumer surplus and producer surplus from the transition from monopoly to perfect competition.

- **Relative Efficiency:**

Relative efficiency lies in the success of a unit in producing a larger number of outputs from a set of inputs compared to the most efficient unit within the organization[11]. It allows for the interpretation of total production deviations of production factors by assessing homogeneous units compared to the most efficient unit among them.

- **Market Efficiency:**

Market efficiency was first formulated by the English economist Eugene Fama in 1965. He defined it as follows: "A market is efficient if all available information about a particular financial asset is reflected in its price at any given time." Market efficiency refers to the degree to which market prices reflect all available information, allowing no opportunity for arbitrage profits based on that information.

2.3 Measuring Operational Efficiency Using Financial Indicators:

Financial indicators[12] are typically used to measure financial deviations of institutions and to determine the quality of their management. Financial ratios are among the most important tools in financial analysis and are widely used because they are more capable than absolute values of expressing the financial position of a bank. Within this, we will discuss the Return on Equity (ROE) model as a means of measuring banking efficiency.

- **Return on Equity (ROE):**

The Return on Equity rate is one of the most important models used in performance evaluation. It was initially used in the early twentieth century to measure the rate of return on investment by deriving it from two ratios. The first ratio represents the management's efficiency in generating profits, calculated as the net profit divided by total revenue. The second ratio reflects the efficiency of management in using its assets, calculated as net revenue divided by total assets. ROE is calculated using the following relationship:
ROE = frac{Net Income}/{Total Equity}

- **Return on Assets (ROA):**

The Return on Assets rate is one of the traditional methods for measuring banks' efficiency in using their assets. It measures the management's effectiveness in employing resources optimally and is calculated based on profit margin and asset utilization:
ROA = Net Income/ Total / Assets

- **Liquidity Ratios (LIQ):**

These ratios aim to evaluate the financial capability of the company in the short term by measuring its ability to meet short-term obligations with regular cash flows resulting from operations.

- **Capital Adequacy Ratio (CA):**

This ratio reflects the capital's ability to withstand unexpected losses and face obligations. It is determined in its value and calculation method according to different levels of implementation of Basel Committee regulations in each country:
CA = Total Equity/Total Assets

- **Asset Utilization (AU):**

Asset utilization is[13] an indicator used to measure the ratio of total revenue generated per monetary unit of bank assets. It is obtained by dividing total revenue by total assets as follows: AU = /Total Revenue/Total Assets/
Currently, banks can use this relationship as an indicator to assess the efficiency of managing their assets. A proficient bank is capable of achieving a balance between its assets and revenues. The higher this ratio compared to benchmark values, the better the indication. Conversely, if this ratio is low, it signals poor performance, prompting the bank to take measures to improve it. This can be achieved by increasing revenue through marketing policies that generate additional revenue while retaining the overall value of assets, reducing excess assets, or at least maintaining current total revenue and working to reduce total assets by reviewing the prices of high-cost assets that do not generate sufficient revenue.

- **II– Methods and Materials:**

1. Study Community and Sample:

The study sample consisted of 06 Algerian commercial banks, both public and private: Banque Nationale d'Algérie (BNA), Banque Extérieure d'Algérie (BEA), Gulf Bank Algeria (AGB), Arab Banking Arab Bank (ABC), Société Générale (SG), and BNP Paribas Data for the study was collected from the annual reports of these banks for the period 2016-2020.

2. Study Variables:

Operational efficiency (OE) was measured using financial ratios: Return on Equity (ROE), Return on Assets (ROA), Capital Adequacy (CA), and Liquidity (LIQ). These ratios were analyzed for 06 banks over the study period 2016-2020. Statistical tools were used, and three options were considered for data usage:

- 01 - Time series format: Analyzing the relationship separately for each bank over time.

- 02 - Cross-sectional data format: Studying the relationship between variables for all banks in one year.
- 03 - Panel data format: Studying the relationship over time for all banks, utilizing both time and bank indicators. This option was deemed superior as it allows for more information usage, yielding higher degrees of freedom and efficiency in interpreting the relationship, and enables measuring the impact of each bank.

3. Descriptive Statistical Study of Study Variables:

- For the operational efficiency index OE, the average value for banks is 1.63, ranging from 3.66 to 0.33. Half of the dependent variable values were greater than the median value of 1.51. These statistical indicators suggest that the efficiency index is related to the volume of large loans granted by the banks in the study sample.
- For the Return on Equity (ROE) index, the average value for banks is 0.138, ranging from 0.32 to 0.030. Half of the dependent variable values were greater than the median value of 0.125343.
- For the Return on Assets (ROA) index, the average value for banks is 0.017, ranging from 0.027 to 0.0055. Half of the dependent variable values were greater than the median value of 0.018.
- For the Asset Utilization (AU) index, the average value for banks is 0.07, ranging from 0.22 to 0.042. Half of the variable values were greater than the median value of 0.06.
- For the Capital Adequacy (CA) index, the average value for banks is 0.144, ranging from 0.30 to 0.052. Half of the dependent variable values were greater than the median value of 0.14.
- For the Liquidity (LIQ) index, the average value for banks is 0.96, ranging from 1.32 to 0.76. Half of the dependent variable values were greater than the median value of 0.93.

4. Measurement of Linear Correlation between Study Variables:

An attempt was made to estimate the direction and strength of the relationship between study variables using Pearson's linear correlation coefficient.

The positive or negative sign of R indicates the nature of the relationship between the variables, while the value of R indicates the strength of the relationship. It was observed that the probability value for the Return on Equity, Return on Assets, Capital Adequacy, and Liquidity indices lacked statistical significance in their effect on efficiency and were independent of efficiency (Prob>0.05). The linear correlation coefficient between the operational efficiency index and the return on assets showed a negative relationship of -0.181736, while the rest of the indices exhibited positive and strong correlation coefficients.

5. Estimation of Bank Efficiency Models:

Panel data suggests estimating efficiency models using three formulas, which differ in their interpretation of the relationship studied between banks:

- **Aggregated Model Estimation of the Studied:**

In this model, we assume constant coefficients and a constant intercept for the studied relationship in all banks. We interpret this equation with an R^2 of 52.96%, indicating the high quality of the estimated equation for banks in terms of the independent variables' significance. Statistical significance is found for the coefficients of the independent variables, indicating their influence on the dependent variable. Notably, the probabilities for the Return on Equity, Return on Assets, and Capital Adequacy indices lack statistical significance in their effect on efficiency (Prob>0.05), while Liquidity index is independent of efficiency (Prob>0.05). The coefficients between the financial indices and bank efficiency show negative relationships for Return on Assets and Liquidity, while the rest exhibit positive and strong correlations.

- **Fixed Effects Model:**

In this formula, individual differences for each bank and time are considered, distinguishing them in the constant for each institution, while the slope remains constant across banks. Under this assumption, six equations for the studied relationship are estimated, differing in their intercepts while the coefficients of the independent variables remain constant. The variability represented in the automatic dependent variable across banks is accounted for, utilizing the Fixed Effects Model (FEM) with Least Squares Dummy Variables (LSDV). Similar to the aggregated model, the probabilities for the Return on Equity, Return on Assets, Capital Adequacy, and Liquidity indices lack statistical significance in their effect on efficiency (Prob>0.05).

- **Random Effects Model:**

Banks are distinguished in the random intercept, which is valid when there are differences in unobserved variables affecting bank efficiency across banks. The differences between banks in the error term value for each institution are observed. Notably, the probabilities for the Return on Equity and Return on Assets indices have statistical significance in their effect on efficiency (Prob $\leqslant$0.05), while Capital Adequacy is independent of efficiency (Prob>0.05). The Liquidity index is statistically acceptable at a 10% level. The linear correlation coefficient between the Return on Assets index and Capital Efficiency shows a negative relationship. Positive and strong correlations were observed for the remaining indices.

- **Best Model Selection:**

In this aspect, we try to select the best formula for explaining the relationship between study variables among the three previous models through the following tests:

• Breusch-Pagan Test: With a significance level of 0.05, the test indicates that the Random Effects Model is better for representing the relationship between variables.

• Hausman Test: With a significance level of 0.6030, the test suggests accepting the Random Effects Model, indicating it is better for representing the relationship between variables.

After testing both models, it can be concluded that if there is an impact among banks, the Random Effects Model is accepted. This test confirms that the Random Effects Model is the best in representing the relationship between study variables.

III- Results and discussion:

Interpretation of Results and Hypothesis Testing:

- First Hypothesis: There is an Effect of Return on Equity (ROE) on Bank Efficiency

Through the estimation results of the Random Effects Model, we observe a statistically significant relationship between Return on Equity (ROE) and Bank Efficiency (OE), where the coefficient reached -6.11 with a statistical significance level of 0.019, which is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative hypothesis, indicating a statistically significant relationship between Return on Equity and Efficiency. Hence, we accept the first hypothesis.

- Second Hypothesis: There is an Effect of Return on Assets (ROA) on Bank Efficiency

Based on the estimation results of the Random Effects Model, we observe a statistically significant inverse relationship between Return on Assets (ROA) and Bank Efficiency (OE), where the coefficient reached 60.59 with a statistical significance level of 0.01, which is less than 0.05. Therefore, we reject the null hypothesis and accept the alternative hypothesis, indicating a statistically significant relationship between Return on Assets and Efficiency. Hence, we accept the second hypothesis.

- Third Hypothesis: There is an Effect of Capital Adequacy (CA) on Bank Efficiency

Through the estimation results of the Random Effects Model, we observe a statistically significant relationship between Capital Adequacy (CA) and Bank Efficiency (OE), where the

coefficient reached -3.82 with a statistical significance level of 0.22, which is greater than 0.05. Therefore, we accept the null hypothesis and reject the alternative hypothesis, indicating no statistically significant relationship between Capital Adequacy and Efficiency. Hence, we reject the third hypothesis.

- Fourth Hypothesis: There is an Effect of Liquidity (LIQ) on Bank Efficiency

According to the estimation results of the Random Effects Model, we observe no statistically significant relationship between Liquidity (LIQ) and Bank Efficiency (OE), where the coefficient reached -0.91 with a statistical significance level of 0.10, which is less than 0.05. Therefore, we reject the null hypothesis at a 5% level and accept the alternative hypothesis at a 10% level, indicating a statistically significant relationship between Liquidity and Efficiency. Hence, we accept the fourth hypothesis.

IV-Conclusion:

Through this study, financial analysis tools and statistical analysis were combined as the most important methods of measuring efficiency. Financial analysis was conducted using a set of financial ratios to measure cost efficiency and profitability efficiency, while statistical analysis was conducted by presenting the translog cost function for the sample of banks using panel regression method. This was done to obtain a set of statistical estimates to measure economies of scale and scope, as well as to measure price elasticity as indicators of the ability of the studied banks to manage costs efficiently. We reached the following key results:

1. There is a relationship between return on equity and efficiency, with statistical significance observed through the random effects model estimation results. We notice a statistically significant relationship between return on equity (ROE) and bank efficiency (OE), where the coefficient was -6.11 at a significance level of 0.019, indicating a relationship between return on equity and efficiency. Thus, we accept the alternative hypothesis, indicating a statistically significant relationship.
2. There is an impact of return on assets on bank efficiency. Through the random effects model estimation results, we observe an inverse statistically significant relationship between return on assets (ROA) and bank efficiency (OE), where the coefficient was 60.59 at a significance level of 0.01, indicating a statistically significant relationship between return on assets and efficiency. Hence, we accept the alternative hypothesis.
3. There is no impact of capital adequacy ratio on bank efficiency. Through the random effects model estimation results, we observe no statistically significant relationship between capital adequacy ratio (CA) and bank efficiency (OE), where the coefficient was -3.82 at a significance level of 0.22, indicating no statistically significant relationship between capital adequacy ratio and efficiency. Thus, we reject the alternative hypothesis.
4. There is an impact of liquidity index on bank efficiency. Through the pooled model estimation results, we observe no statistically significant relationship between liquidity index (LIQ) and bank efficiency (OE), where the coefficient was -0.91 at a significance level of 0.10. However, considering a 5% significance level, we reject the null hypothesis and accept the alternative hypothesis, indicating a statistically significant relationship between liquidity index and efficiency at a 10% significance level. Thus, we accept the alternative hypothesis.

- Appendices:

Table (01): Descriptive statistical indicators of the study variables

	OE	ROE	ROA	AU	CA	LIQ
Mean	1.625882	0.138671	0.016968	0.069855	0.143555	0.962884
Median	1.510235	0.125343	0.017884	0.066607	0.136190	0.933285
Maximum	3.661378	0.323950	0.027172	0.222327	0.300001	1.317127
Minimum	0.332565	0.030418	0.005459	0.042818	0.051889	0.763662
Std. Dev.	0.596038	0.069464	0.005260	0.030831	0.058198	0.159062
Skewness	1.405910	0.902419	-0.344340	4.165297	0.476836	0.918166
Kurtosis	6.520511	3.581539	2.601891	21.40089	3.291713	2.899435
Jarque-Bera	25.37542	4.494531	0.790963	509.9895	1.243232	4.227789
Probability	0.000003	0.105688	0.673356	0.000000	0.537076	0.120767
Sum	48.77645	4.160126	0.509048	2.095656	4.306652	28.88653
Sum Sq. Dev.	10.30257	0.139931	0.000802	0.027566	0.098224	0.733724
Observations	30	30	30	30	30	30

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

Table No. (02): Linear correlation matrix between the study variables

Date: 25/03/24 Time: 19:19
Sample: 2016 2020
Included observations: 30

Correlation Probability	OE	ROE	ROA	AU	CA	LIQ
OE	1.000000					

ROE	-0.181736	1.000000				
	0.3365	-----				
ROA	0.162440	0.300611	1.000000			
	0.3911	0.1065	-----			
AU	0.125970	0.171242	0.198607	1.000000		
	0.5071	0.3656	0.2927	-----		
CA	0.158110	-0.751999	0.262390	-0.081995	1.000000	
	0.4040	0.0000	0.1613	0.6667	-----	
LIQ	-0.074124	-0.364256	0.245926	-0.101826	0.590645	1.000000
	0.6971	0.0478	0.1902	0.5924	0.0006	-----

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

Table No. (**03**): Aggregate model of the studied relationship

Dependent Variable: OE?
Method: Pooled Least Squares
Date: 25/03/24 Time: 19:09
Sample: 2016 2020
Included observations: 5
Cross-sections included: 6
Total pool (balanced) observations: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROE?	-6.113823	3.816658	-1.601879	0.1217
C	2.876984	0.932713	3.084531	0.0049
ROA?	60.59705	34.27209	1.768117	0.0892
CA?	-3.826326	4.795101	-0.797966	0.4324
LIQ?	-0.916237	0.853050	-1.074072	0.2930

Root MSE	0.532145	R-squared	0.175415
Mean dependent var	1.625882	Adjusted R-squared	0.043482
S.D. dependent var	0.596038	S.E. of regression	0.582935
Akaike info criterion	1.909531	Sum squared resid	8.495340
Schwarz criterion	2.143064	Log likelihood	-23.64296
Hannan-Quinn criter.	1.984240	F-statistic	1.329571
Durbin-Watson stat	0.643676	Prob(F-statistic)	0.286483

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

Table No. (04): Fixed effects model

Dependent Variable: OE?				
Method: Pooled Least Squares				
Date: 25/03/24 Time: 19:10				
Sample: 2016 2020				
Included observations: 5				
Cross-sections included: 6				
Total pool (balanced) observations: 30				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROE?	-0.980477	6.305738	-0.155490	0.8780
C	1.648942	0.935720	1.762218	0.0933
ROA?	8.333928	60.62111	0.137476	0.8920
CA?	-3.027331	4.897335	-0.618159	0.5434
LIQ?	0.421732	0.763991	0.552012	0.5871
Fixed Effects (Cross)				
_1--C	-0.112606			
_2--C	1.068597			
_3--C	0.185273			
_4--C	-0.332006			
_5--C	-0.497997			
_6--C	-0.311261			
	Effects Specification			
Cross-section fixed (dummy variables)				
Root MSE	0.305770	R-squared		0.727751
Mean dependent var	1.625882	Adjusted R-squared		0.605239
S.D. dependent var	0.596038	S.E. of regression		0.374491
Akaike info criterion	1.134701	Sum squared resid		2.804863
Schwarz criterion	1.601767	Log likelihood		-7.020515
Hannan-Quinn criter.	1.284119	F-statistic		5.940241
Durbin-Watson stat	2.231574	Prob(F-statistic)		0.000454

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

Table No. (05): Random effects model

Dependent Variable: OE?				
Method: Pooled EGLS (Cross-section random effects)				
Date: 25/03/24 Time: 19:11				
Sample: 2016 2020				
Included observations: 5				
Cross-sections included: 6				
Total pool (balanced) observations: 30				
Swamy and Arora estimator of component variances				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
ROE?	-6.113823	2.451905	-2.493499	0.0196
C	2.876984	0.599196	4.801410	0.0001
ROA?	60.59705	22.01715	2.752266	0.0109
CA?	-3.826326	3.080479	-1.242121	0.2257
LIQ?	-0.916237	0.548018	-1.671910	0.1070
Random Effects (Cross)				
_1--C	0.000000			
_2--C	0.000000			
_3--C	0.000000			
_4--C	0.000000			
_5--C	0.000000			
_6--C	0.000000			
	Effects Specification			
			S.D.	Rho
Cross-section random			0.000000	0.0000
Idiosyncratic random			0.374491	1.0000
	Weighted Statistics			
Root MSE	0.532145	R-squared		0.175415
Mean dependent var	1.625882	Adjusted R-squared		0.043482
S.D. dependent var	0.596038	S.E. of regression		0.582935
Sum squared resid	8.495340	F-statistic		1.329571
Durbin-Watson stat	0.643676	Prob(F-statistic)		0.286483
	Unweighted Statistics			
R-squared	0.175415	Mean dependent var		1.625882
Sum squared resid	8.495340	Durbin-Watson stat		0.643676

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

Table No. (06): Lagronge test

Lagrange Multiplier Tests for Random Effects			
Null hypotheses: No effects			
Alternative hypotheses: Two-sided (Breusch-Pagan) and one-sided			
(all others) alternatives			
	Test Hypothesis		
	Cross-section	Time	Both
Breusch-Pagan	14.87524	1.585189	16.46042
	(0.0001)	(0.2080)	(0.0000)
Honda	3.856843	-1.259043	1.836922
	(0.0001)	(0.8960)	(0.0331)
King-Wu	3.856843	-1.259043	1.632793
	(0.0001)	(0.8960)	(0.0513)
Standardized Honda	6.515480	-1.133093	-0.067911
	(0.0000)	(0.8714)	(0.5271)
Standardized King-Wu	6.515480	-1.133093	-0.333991
	(0.0000)	(0.8714)	(0.6308)
Gourieroux, et al.	--	--	14.87524
			(0.0002)

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

Table No. (**07**): Hausman test results

Correlated Random Effects - Hausman Test				
Pool: PANEL				
Test cross-section random effects				
Test Summary		Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random		40.473753	4	0.6030
** WARNING: estimated cross-section random effects variance is zero.				

Source: Prepared by the researcher based on the study data and the outputs of the Eviews10 program

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