The Impact of Oil Price on Banking Financial Performance in Algeria: A Panel Regression Analysis

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Abstract:

This paper aimed to measure the impact of oil price on the financial performance of commercial banks in Algeria. The empirical side of the paper was based on balanced panel data obtained from 11 commercial banks active in Algeria during The period (2011-2020), using multiple linear regression analysis by applying the standard (FGLS) estimator using the statistical program STATA16.

The article concluded that there is a positive and statistically significant effect of oil price (op) on the financial performance of the studied commercial banks active in Algeria expressed as the ROAA and PBT during the period (2011-2020).

Keywords: oil prices, financial performance, banks, Algeria, panel data.

(JEL) Classification : C33, G21, Q43

1. Introduction:

Oil is an essential source of energy necessary for various economic activities. Therefore, oil prices play a decisive role in facilitating or impeding the economic development of countries, and assuming that the Algerian state is a rentier economy, that is to say that, it almost, entirely depends on the entrances of oil exports to cover its public expenditures. The rise in oil prices leads to the availability of financial resources to finance the Algerian economy while the drop in oil prices leads to a shortage in these resources.

Thus, oil price have an important impact on the overall economy with its various variables such as consumption and investment, and it is natural that it has an impact on the banking industry, specifically the financial performance of banks in Algeria.

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1.1. Research Problematic:

Based on the foregoing, and the important impact of oil price on the financial performance of banks,and since Algeria is a rentier country, we may ask:
« **What is the impact of oil price on the financial performance of Algerian banks during the period 2011-2020? »,** The study is based on the following two hypotheses:

1- There is a significant and positive impact of oil price on the return on average assets ROAA in the studied banks during the period 2011-2020;
2- There is a significant and positive impact of oil price on the return on average equity ROAE in the studied banks during the period 2011-2020.

1.2. Research Aims:

Through this study, we seek to:

- Shed the light on the problem of oil price and its impact on the banking industry in Algeria, especially that the Algerian economy almost, entirely depends on oil revenues, which makes it more exposed to risks arising from low oil prices, so it is necessary for the banking industry to remain flexible and ready for any volatility in oil prices even Protect and improve its financial performance ;
- find out the relationship between oil price and the financial performance of banks by preparing an econometric model that determines the impact of oil price on the financial performance of active banks in Algeria.

1.3.The study approach

This study relied on the descriptive approach with analysis. Standard analysis methods were used to analyse the relationship between the indicators representing the variables of the study, using Data Panel models by the statistical program (STATA16), to build a econometric model that shows the impact of oil price on financial performance for the studied banks.

1.4 Literature review:

Literature that study Determinants of Banks' Profitability or financial performance of banks, generally focus on Bank-spesific variables (bank size, liquidity, credit risk …), industry-specific variables (concentration ratio) and macroeconomic variables (inflation, GDP…), meanewhile we noticed a lack or a limited number of literatures that studied the impacts of oil price volatility on the financial performance of commercial banks, although this variable is concidered as the most important macroeconomic variable. Among these studies we have :

The study of **Maria Carmen L.Vidal, Albert Bryan R.Vidal (2021)**, which dealt with the study of the impact of oil price changes on the profitability and stability of banks in the Sultanate of Oman**,** where the study confirmed the existence of a strong positive impact of oil price on ROE that was statistically significant, and also a non-significant positive impact of oil price on both ROA and CAR.

We also find a study by Luís Manuel Fernandes Justino Patrão (2021) analysing the impact of oil price shocks on the performance of US banks, The study variables were the dependent variable ROA, three variables that measure oil price shocks, bank-specific variables and macroeconomic variables. The results of this study show that oil price shocks have a strong direct positive impact on the performance of US banks. Moreover, many macroeconomic and bank-specific variables have been found to affect the performance of the bank.

In another study by **Abduallah Alfadhli & Husam Rjoub (2019)**, which analyses the impact of bank-specific, industry-specific and macroeconomic variables on the financial performance of commercial active banks in Gulf Cooperation Council (GCC) countries, This study included oil prices as one of the macroeconomic variables, Where he concluded that the oil price has an important positive impact on the bank performance in the GCC, The study also showed that there is a significant negative impact of efficiency, credit risk, diversification and concentration ratio on all performance measures. The capital adequacy ratio affects positively all measures of the bank's performance (ROAA,ROAE,NIM and PBT).

After that, we move on to a study that was applied in another environment (Canada) by **Chengcheng Xu and Bingqing Xie (2015),** this paper analyses the impact of oil price on bank profitability in Canada. The researchers used data on 10 public banks from 1995 to 2015, The study also included bank-specific and macroeconomic variables. Using the ordinary least squares OLS estimation it was concluded that We find that there is a significant positive relationship between the oil price and the profitability of banks at the beginning of the period, but no evidence shows that they have been related in recent years, the researchers explained this as that Canadian banks have taken action to hedge against the risk of oil price drop.

On the other hand, we find the study **of Chi-chuan lee and Chiang lee (2018),** that dealt with the problem of oil price shocks on the performance of Chinese banks using GMM for dynamic panels, Chinese banking performance are

estimated according to CAMEL indicators. The results of the study concluded that oil prices have a significant negative impact on banking performance.

We noticed during our research that the studies that dealt with the subject of the impact of oil price volatility on the profitability of banks are very few.

To the best of knowledge, this is the first research that has been conducted on this topic for banks active in Algeria, as it gains its importance from the fact that the Algerian economy is depend overly on oil, which are susceptible to its price volatility.

2. Financial performance

2.1. Defining financial performance

Financial Performance is defined as: « Financial performance reflects the ability of the company to create economic value in the context of efficiently using resources for increasing its market share. (Prostean, Villahos, Brancu, & Bakacsi, 2019, p. 238)

Which means that, the financial performance shows the way in which the bank uses its financial, human and material resources, which enables it to achieve its goals.

2.2. Measuring financial performance:

In order to diagnose the bank's financial position and evaluate its financial performance, we calculate a set of financial indicators and ratios based on the institution's financial statements. The financial performance may be measured using a large number of indicators, Among them are the following:

✓ **Return on average Asset (ROAA)**

Another ratio that measures the Bank financial performance is the Return on Asset, This indicator measures the ability of one unit of the bank's assets to achieve net profits after tax (Clauss & Pansard, 2021), and it is calculated as follows :

$$ROAA = \frac{Net\ Income}{Av.\ Total\ Assets}$$

✓ **Profit before tax (PBT)**

It refers to the net operating income after deducting "operating expenses » but before deducting taxes and interest. Proceeding further on the p&L statement we can see that ARBL has mentioned their profit before tax and exceptional item numbers. (CHOUDHARY, 2022, p. 2022) Profit before tax will always be profit

before appropriation for general reserves, dividends and provision for taxes etc (Singh, 2016, p. 390).

Profit before tax (PBT)= total Revenues – total operating Expenses

3. Oil price (op)

The price of oil is the monetary value of a barrel of crude oil measured in US dollars (Al-Hayali & al, 2016), the international oil market is characterized by change and instability, which makes oil prices constantly changeable, up or down, which is a matter that worries countries, as it is the cause of most industries, and it is the source of movements from one place to another, and it is the basis of the economies of many countries such as Algeria.

The reason for the volatility and instability of world oil prices is due to a group of factors, beyond the forces of supply and demand (Economic factors) and the rate of OPEC production of oil, It extends to include political, environmental and financial factors. (International Transport Forum, 2008). Often the political and economic factors are the main factors, which affect the economic and political decisions of countries, both oil exporters and importers. (Al-Hayali & al, 2016, p. 88)

The Algerian economy is largely based on Fossil fuels. Oil and gas exports represented 96% of the country's total exports, half of its GDP, and 60% of the general budget revenues. (Benhabbour, 2022)

It is in this context, that we find the Organization of Petroleum Exporting Countries (OPEC). The objectives of this organization are to coordinate and standardize oil policies among member states, in order to ensure fair and stable prices for oil producers. (MINISTÈRE DE L'ÉNERGIE ET DES MINES)

Thus, Algeria is a rentier country whose economy is excessively based on the production and export of oil, which makes it more affected by oil price volatility. The risks of the collapse of oil prices lead to a decrease in Algeria's income, which negatively affects the country from all aspects, including the financial side and the banking system in terms of its stability and profitability.

According to Literature review, we expect that the oil prices volatility will have a significant impact on the financial performance of active banks in Algeria (Abduallah Alfadhli & Husam Rjoub (2019), Maria Carmen L.Vidal, Albert Bryan R.Vidal (2021) and Luís Manuel Fernandes Justino Patrão (2021)).

4. Determinants of the bank's financial performance

Many factors affect the financial performance of banks, directly or indirectly, this effect may be large or small, negative or positive. Most researchers divide the factors affecting financial performance into three main groups:

4.1. Bank specific variables

This group includes the bank's internal variables, including the following three variables:

✓ **Capital Adequacy (CAR)**

Capital adequacy is one of the decisive factors in evaluating the health and performance of the bank. (Linh & al, 2019, p. 300), it is a measure of the bank's exposure to risk, which prompted bankers to use the capital adequacy ratio as an important measure of the security and stability of banks, as they see that capital is a tool for absorbing losses and that capital adequacy is a means to meet the bank's requirements and provide sufficient liquidity to maintain its asset base. (Shabani, Morina, & Misiri, 2019, p. 202) This amount serves as a guarantee for depositors, and for the purpose of providing them with safety and gaining their trust, the capital adequacy ratio must be commensurate with the size of the bank and the volume of deposits in relation to its total resources and the amount of losses threatened to it.

The Basel 03 agreement was issued by the Basel Committee on Banking Supervision, which is a basic guiding framework for banks on regulatory capital requirements. In our study, we measured this factor by the ratio of total shareholders' equity to total assets. (Basel Committee on Banking Supervision, 2012)

Some economic theories have explained the impact of the bank's capital adequacy on the financial performance of banks, including the signal theory, which confirms that the more this ratio improves, the more the bank will enjoy good borrowings with low interest costs, which leads to an increase in the bank's financial performance. This positive relationship between capital adequacy and financial performance of the banks is the same as proven by the cost of bankruptcy theory. On the other hand, we find the theory of risk return, which assumes that increasing risks or increasing financial leverage results in achieving greater profits, and therefore the increase in the capital held by the bank has a negative impact on its financial performance. (Al-Fadili & Mahmoud, Factors Affecting the Financial Performance of Commercial Banks - Empirical Evidence from the Kingdom of Saudi Arabia (an arabi article), 2022, p. 7)

✓ **Liquidity ratio (LR)**

Liquidity is the ease of converting securities or assets into cash at market price (Don, 2022, p. 135). That is to say , liquidity reflects the bank's ability to provide the necessary cash to fulfill its obligations to its customers. Liquidity expresses

the bank's ability to replace the securities it owns and other elements of convertible assets easily and quickly, without a decrease in its market value into cash, in order to meet the demands of depositors, especially current deposits, given that they are not linked to a specific date, which allows depositors to withdraw their deposits whenever they want, as well as to meet the requests of borrowers.

The Basel Committee on Banking stipulated the development of precautionary requirements that reflect the bank's need for liquidity and the provision of a strategy that supports prudent management of liquidity risks, taking into account the nature of the risks and the extent of the bank's ability to bear them, in addition to the market and economic conditions. (Basel Committee on Banking Supervision, 2012)

A lot of research has dealt with the liquidity factor and its measurement using different ratios, and we have used a ratio of liquid assets to total assets, this ratio measures the overall liquidity position of the bank (Thakur, 2014, p. 77).

✓ **Operating Efficiency (eff)**

Since the operational efficiency refers to the rate of fluctuations in the bank's costs, mismanagement of expenses leads to an increase in costs, which results in a decrease in financial performance, while the efficient performance of banks results in a decrease in operating expenses, which is reflected positively on the bank's financial performance. Better management and higher operational efficiency, which will improve the bank's financial performance and vice versa. Therefore, it is assumed that this variable will have a statistically significant negative impact on the financial performance of bank. (El-faham, 2020, pp. 135-136)

Based on the foregoing, we expect this efficiency to have a negative and statistical significance impact on the financial performance of the bank, This is what many studies have found, such as the research of Abduallah Alfadhli & Husam Rjoub (2019).

4.2. Industry-specific variables:

✓ **Financial Inclusion:**

Financial inclusion plays an important role in achieving economic development and contributing to the prosperity and stability of the economy, so countries seek to promote it. The World Bank defines financial inclusion as "the ability to access financial products and services necessary to meet the requirements of individuals in terms of granting credit, accepting deposits, and

others at reasonable prices." In the sense that financial inclusion is the process of trading banking products and services all over the world, making it easier for all natural or legal individuals to access and benefit from them, starting with opening a bank account, and then benefiting from various other financial services such as depositing money or borrowing operations.

Several indicators are used to express the dimensions of financial inclusion, and we have chosen to use the indicator of the number of commercial bank branches per 100,000 adults. (Chanda, Sengupta, & Mohanti, 2023, p. 8)

The theory of financial growth that explains the relationship between financial inclusion and the financial performance of commercial banks, as this theory indicates that financial inclusion provides an auxiliary medium for the success of economic growth. (Al-Fadili & Al-Akashi, The impact of financial inclusion on the financial performance of commercial banks: Empirical evidence from the Kingdom of Saudi Arabia (an arabi article), 2022, p. 486) Where many researches prove that progress in financial inclusion enhances financial stability and contributes to the economic growth of banks and increase their financial efficacity (Khatib & al, 2022, p. 1), This confirms the positive impact of the financial inclusion factor on the financial performance of the banks, which is the result that we expect to reach in this research.

4.3. Macroeconomic variables

Among the macroeconomic factors, we address in our study the gross domestic product.

✓ Gross Domestic Product (GDP)

The Bureau of Economic Analysis (BEA) gives a clear definition for GDP: « Gross Domestic Product (GDP) is the value of goods and services produced by a country Economics subtracts the value of goods and services consumed in production. GDP is also equal to that Gross private consumption, gross domestic private investment, net exports Goods and services as well as government consumption and total investment ». (Dynan & Sheiner, August 2018, p. 4) This study measures economic growth using Gross Domestic Product per capita (GPCG), wich is a core indicator of economic performance and commonly used as a broad measure of average living standards or economic well-being (OECD, 2009, p. 20), GDP per capita is the sum of the total value added of all resident producers in the economy plus any taxes on products (less subsidies) not included in the output assessment divided by the mid-year population. (THE WORLD BANK)

During recessions, credit quality deteriorates and default rates increase, which leads to lower profitability. As for the state of economic recovery, it leads to an increase in the demand for credit, thus enhancing the financial performance of banks. (Al-Harbi, 2019) I expect this variable to have a positive impact on the financial performance of banks studied in our research.

5. Data, sample, Variables and Econometric Model:

5.1. Data, sample and Variables:

The study sample was represented in 11 commercial banks in Algeria for the period from 2011 to 2020. Due to the availability of data during this period, the following table in our study summarizes all study variables:

Table (01): Summary and measurement of the variables

Name	Variables	Description	Data Sources
Dependant Variables			
ROAA	Return on average assets	ROAA=(Net Income)/(Av.Total Assets)	bureau van dijk
PBT	Profit	PBT =(Profit before tax)/(Total assets)	bureau van dijk
Independent Variables			
OP	Oil price	Real price of OPEC basket (USD billion)	OPEC
control variables			
Bank-Specific variables			
CAR	Capital adequacy	CAR =(Shareholders' Equity)/ (Total assets)	bureau van dijk
Liq	Liquidity ratio	Liq= liquidassets / total assets	bureau van dijk
Eff	Operational Efficiency Rate	Eff = (operating expenses)/ (net revenue)	bureau van dijk
Industry-specific variables			
Bra	Financial Inclusion	Number of commercial bank branches per 100,000 adults	IMF
Macroeconomic variables			
GDPpc	GDP per capita	The growth rate of real per capita GDP	WDI

Source: prepared by the researchers.

5.2. Econometric Model

This part of the study aims to estimate the impact of Oil price on the financial performance of active banks in algeria during the period 2011-2020, using Data Panel, which is a model that combines of time series and cross-sectional statistical

analysis. We estimated using the OLS method, which is based on the regression estimation of three basic models (pooled regression model, fixed effects model and random effects model), In addition to studying the diagnostic tests related to these models to ensure that the model is free from econometric problems, we have reached the problem of heteroskedasticity, autocorrelation and cross sectional independence**,** which requires us to deal with the study data in particular to ensure Estimation efficiency and to obtain unbiased estimators. Thus, We address these problems by applying the panel-corrected standard error (PCSE) method proposed by (Beck and Katz, 1995), The PCSE method has the ability to correct the standard problems that are discovered as it provides unbiased estimators, more accurate and appropriate results.So we use the PCSE method to estimate our models as follows:

$Y_{it} = B_0 + B_1 OP_{it} + B_2 CAR_2{}_{it} + B_3 LIQ_{it} + B_4 Eff_{it} + B_5 Bra_{it} + B_6 GDPpc_{it} + \varepsilon_{it}$

Where:

Y_{it} = The financial Performance of bank (1, . . .,11) at year t (1, . . ., 10) as expressed by the ROAA and PBT.

β_0 = is the constant parameter.

B1, B2, B3, B4, B5 and B6 = are model coefficient parameters.

ε_{it} = residual term.

5.3. Descriptive Statistics

Descriptive statistics of all variables used in the study are reported in the following Table 2. It is seen from the table that the average value of two flnancial performance measures are 1.637 and 2.181 for ROAA and PBT respectively, with a standard deviation for ROAA and PBT are 0,851 and 1.122 respectively.

The average of oil price is 73.786, whereas the maximum value is 109.45 and minimum value is 40.76. The Efficiency Rate (eff) ranges from a maximum 74.766 to a minimum16.553, whereas the liquidity ranges from a maximum 62.176 to a minimum 14.825, As for the variable Adequacy capital it is limited to the values of 5.139 as a minimum and 38.801% as a maximum, and GDP per capita ranges from a maximum 1.71 to a minimum -6.827. Its average value was 41.093, 35.915 and 15,535 for Efficiency, liquidity and Adequacy capital rate respectively. As for the financial inclusion index, we noticed that its values are close and concentrated between 5 and 6, resulting in an average within the same field and a very small standard deviation of 0.023.

Table (02): Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ROAA	110	1.673	.851	-.502	4.432
PBT	110	2.181	1.122	.227	5.234
OP	110	73.786	26.993	40.76	109.45
CAR2	110	15.535	8.074	5.139	38.801
LIQ	110	35.915	11.173	14.825	62.176
Eff	110	41.093	12.781	16.553	74.766
Bra	110	5.232	.023	5.183	5.257
GDPpc	110	-.186	2.435	-6.827	1.71

Source: Based on Outputs of STATA 16.

5.4. Correlation Analysis

The correlation between the explanatory variables is analyzed using the correlation matrix, and it aims to ensure that there are no linear correlation problems between the explanatory variables of the Study, as there is a multicolinearity problem between the explanatory variables of the model if the correlation value is more than 80% (Abu-Bader, 2016), and Table 03 shows the correlation matrix between the study variables.

The correlation matrix shows that the largest correlation coefficient between the explanatory variables is 0.7%, which is less than 80%, meaning that the correlation matrix confirms that there is no problem of multilinearity among the Study variables.

Table (03): Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ROAA	1.000							
(2) PBT	0.851	1.000						
(3) CAR2	0.553	0.692	1.000					
(4) LIQ	0.017	0.055	0.085	1.000				
(5) eff	-0.176	-0.261	0.001	0.077	1.000			
(6) bra	-0.073	-0.234	-0.071	-0.409	-0.178	1.000		
(7) OP	0.199	0.262	0.096	0.515	0.175	-0.781	1.000	
(8) GpcG	0.168	0.181	0.004	0.268	0.110	-0.383	0.233	1.000

Source: Based on Outputs of STATA 16.

6. Regression Analysis

6.1. Estimation of panel models using the OLS method :

First, we will perform diagnostic tests to determine if the models suffer from econometric problems, such as the problem of autocorrelation, heteroscedasticity and cross-sectional correlation; this is in order to ensure access to robust, appropriate and unbiased results. Table 06 presents the results of these tests:

Table (04): Diagnostic checking

Test		ROAA	PBT
F test that all u_i=0: F(10 , 95) = 2.21	Prob> F =	0.0000	0.0000
Breusch-Pagan Lagrange multiplier (LM)	Prob> chibar2	0.0001	0.0000
Hausman Test	Prob>chi2 =	0.5829	0.9903
Wooldridge test for autocorrelation	Prob> F	0.0124	0.1624
Groupwise heteroskedasticity	Prob>chi2	0.0000	0.0067
Pesaran's test of cross sectional independence	Pr =	0.6566	0.0407

Source: Based on Outputs of STATA 16.

✓ **Wooldridge Test:**

This test aims to detect an autocorrelation problem for the residuals of the model, The null hypothesis assumes that there is no autocorrelation problem in the model. The results of testing the autocorrelation problem for model ROAA showed that the probability value is Pvalue<0.05, thus rejecting the null hypothesis and accepting the alternative hypothesis that there is a autocorrelation problem in the ROAA model. While for the PBT model, we note that the Pvalue >0.05, therefore we accept the null hypothesis that there is no autocorrelation problem in the PBT model.

✓ **Modified Wald Test:**

To reveal the problem of Heteroscedasticity , we will use the Modified wald test, The null hypothesis assumes no Heteroscedasticity problem. Through the table 06, it is clear to us that the probability value for ROAA and PBT models is less than 5%, so the alternative hypothesis is accepted, which states that the models are formed having heteroscedasticity problems.

✓ **Pesaran CD-test:**

The Pesaran CD test examines the cross-sectional independence, so we seek to test the null hypothesis that assumes that there is no cross-section independence, as we note from Table No. 06 that the p-value for the Pesaran CD-test of the ROAA model was 0.0675 It is greater than the 5% level of significance, so we can

accept the null hypothesis at the 5% level of significance, conqeuenty we can conclude that there is no cross-sectional independence problem for the ROAA model, while the value of this probability is 0.0000 for the PBT model, It is less than the 5% level of significance, and accordingly we reject the null hypothesis and accept the alternative hypothesis that there is a cross-sectional independence problem for the PBT model.

6.2. Estimation of final models using the PCSE method

After the heteroskedasticity problem were detected in the ROAA and PBT models, in addition to the detection of cross-sectional independence problem for the PBT model and the autocorrelation problem for the PBT model. We have to apply the panel-corrected standard error (PCSE) method proposed by (Beck and Katz, 1995), For its ability to correct standard problems that have been detected, the PCSE method provides unbiased coefficients, More accurate and convenient results. The regression results after correction are presented in the following table:

Table (05): Coefficients of the study models estimated using the PCSE method

Var.	ROAA		PBT	
	Coef.	z-stat	Coef.	z-stat
OP	.016***	4.25	.014***	4.04
CAR2	.051***	5.02	.089***	13.04
LIQ	-.02***	-2.68	-.016**	-2.54
Eff	-.018***	-3.26	-.035***	-8.16
Bra	11.237***	3.29	.69	0.21
GDPpc	.096***	3.40	.092***	3.61
Constant	-57.569***	-3.19	-1.783	-0.10
R-squared	0.681		0.888	
Wald-test (*p-value*)	$\chi2(4) = 28.634$ 0.000		$\chi2(4) = 22.083$ 0.000	
N. gro	11			
Time	10			
Observations	110			
***, **, * are statistical significance at the 1%, 5% and 10% levels, respectively				

Source: Based on Outputs of STATA 16.

6.2.1 Estimate the ROAA model

According to Table 08, the equation for estimating the ROAA model using the PCSE method was as follows:

$ROAA_{it} = -57.569 + 0.016\ OP_{it} + 0.051 CAR2_{it} - 0.02 LIQ_{it} - 0.018\ Eff_{it} + 11.237\ Bra_{it} + 0.096\ GDPpc_{it} + \varepsilon_{it}$

The results revealed that the regression model (ROAA) is statistically significant and has a explanatory power, because the probability value of chi2 when performing the Wald chi2 test was less than 5% (0.000), in addition to An estimated R-squared value of 68.1%, this ratio reflects the explanatory power of the model, as it means that the explanatory variables of the model explain 68,1 % of the changes of the dependent variable ROAA, while the reste 31.9 % is due to other variables not included in the model. As We note through Table 07 All the parameters estimated (B1, B2, B3, B4, B5 and B6) are statistically significant at the 5% level, This is because the prob (z-static) of the parameters estimates are less than 0.0 5. We note that Oil prices have a positive effect on the dependent variable ROAA. As for the explanatory variables, efficiency and liquidity affect return on assets negatively. While capital adequacy, financial inclusion index and GDP per capita positively affect the ROAA.

6.2.2 Estimate the PBT model

Based on the results of estimating the regression coefficients shown in Table No. 08, we represent the equation of the PBt model as follows:

$PBT_{it} = -1.783 + 0.014\ OP_{it} + 0.089 CAR2_{it} - 0.016 LIQ_{it} - 0.035\ Eff_{it} + 0.69\ Bra_{it} + 0.092 GDPpc$

The results showed that the regression model (PBT) is statistically significant, because the probability value of chi2 when the Wald chi2 test was performed was less than 5% (0.000), since the model estimated by the PCSE method is unbias. It also has good explanatory power, as the R-squared value is 88.8%, Which means that this model has the ability to explain 88.8% of the changes of the dependent variable, and the rest is due to other variables that were not included in the model. As for the parameters estimated (B2, B3, B4and B6), are statistically significant at the 5% level, while B1 and B5 are not significant. Where oil prices positively affect PBT, which is statistically significant at the level of 5% because (P<0,05), also capital Adecuacy, branches rate and GDPpc affect PBT positively, while we find a negative impact of efficiency rate and liquidity onPBT.

6.3. Test hypotheses and Analyze results

Depending on the findings of the statistical analysis in Table 07, the

hypotheses of the study were tested as follows :

 - the value of the regression coefficient for oil prices op amounted to 0.016, which indicates that it positively affects on the return on average assets ROAA. When oil prices increase by one unit while other explanatory variables constant, the return on average assets increases by 0.016 unit, and This value has a statistically significant effect at the level of 5%, and therefore we accept the first hypothesis that there is a positive, statistically significant effect of oil price on the financial performance of the studied banks, expressed as ROAA.

 - the value of the regression coefficient for oil prices op amounted to 0.014, which indicates that oil prices have a positive impact on the return on average equity PBT. If oil prices increase by one unit while other explanatory variables remain constant, the return on average equity increases by 0.014 unit, and this value has a statistically significant effect at a level of 10%, and accordingly we accept the second hypothesis that there is a positive and statistically significant effect of oil price on the financial performance of the studied banks, expressed as PBT.

The experimental results show that the fluctuation of oil prices has a statistically significant positive effect on all measures of the financial performance of the banks under study during the period 2011-2020 (ROAA and PBT), as this positive relationship indicates a positive correlation between the financial performance of the commercial banks active in Algeria and oil prices. This confirms that Algeria's economy depends heavily on oil production. In the global energy markets, Algeria is considered one of the most important oil producing and exporting countries. As the rise in oil prices government spending in oil-producing countries, this leads to stimulating the activities of the private sector, which expands its projects and investments, which led to strengthening the bank's ability to lend, thus increasing the the financial performance of the commercial bank.

With regard to the nature and importance of the relationship between the coefficients of controlling variables and financial performance of the commercial banks, they can be summarized in the following points:

 - The **capital adequacy** ratio (CAR2) has a statistically significant positive effect on financial performance by all measures, ROAA and PBT. Where the positive relationship between the capital of the commercial bank and its financial performance indicates that the financial situation is safe, so the banks with better capital are the soundest and more profitable banks.

- The **liquidity** variable had a statistically significant negative effect on the ROAA and PBT variables. It is a result consistent with our research expectations and means that an increase in the bank's liquidity level leads to a decrease in profits. The more liquidity of the studied banks increased by one unit, this led to a decrease in the financial performance indicators by 2% and 1.6% for the ROAA and PBT variables, respectively. This is consistent with the economic theory, as this increase in liquidity is unemployed money, and it would have been possible to collect profits from it if it had been employed. However, maintaining an appropriate percentage of liquidity is necessary to provide a factor of safety and readiness to face emergency crises.

- The results indicate that the coefficient of **operational efficiency** has a negative and statistically significant for the financial performance measures used , and this result is consistent with our research expectations for this paper, and indicates that the bank's reduction of its operating expenses increases the financial performance of the commercial banks, which is a confirmed fact.

- The results indicate that the coefficient of **financial inclusi**on, expressed as the number of commercial banks per 100,000 adults, has a positive effect on all measures of financial performance , is statistically significant with ROAA and is not statistically significant with PBT. The positive relationship indicates that the higher the coefficient of the number of commercial expenses per 100,000 adults as an indicator of financial inclusion, this leads to an increase in the financial performance of the banks.

- Finally, the **Gross domestic product per capita** estimation coefficient was positive and statistically significant on the financial performance variables (ROAA and PBT), a result that is consistent with our research expectations. Where this result confirms the importance of GDP growth in increasing the level of financial performance of the commercial banks in particular and the financial system in general, which contributes to improving the quality of life and well-being of individuals and achieving sustainable development within the country.

7. CONCLUSION

This study was concerned with determining the impact of oil price on the financial performance of commercial banks active in Algeria, by applying the standard PCSE technique on panel models on a sample of 11 banks for the period from 2011 to 2020. The study concluded that oil prices have an important impact on the financial performance of banks, which is no less important than other determinants of financial performance, and it showed that oil prices has a positive

effect and statistical significance on the financial performance of the Algerian banks, This confirms that the Algerian economy depends heavily on the production and export of oil, so the rise in oil prices in the global oil market revives the Algerian economy and encourages individuals to invest, which reflects positively on the financial performance of Algerian commercial banks.

Based on the findings of this research paper, we recommend that bank officials prepare an effective policy to monitor the fluctuation of oil prices, and be able to predict them in order to take appropriate precautionary measures, allowing the bank to avoid negative effects on the financial performance of banks.

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9. Appendices :

Appendix 01: Descriptive Statistics

Descriptive Statistics

Variable	Obis	Mean	Std. Dev.	Min	Max
ROAA	110	1.673	.851	-.502	4.432
PBT	110	2.181	1.122	.227	5.234
CAR2	110	15.535	8.074	5.139	38.801
LIQ	110	35.915	11.173	14.825	62.176
Eff	110	41.093	12.781	16.553	74.766
branches	110	5.232	.023	5.183	5.257
OP	110	73.786	26.993	40.76	109.45
GpeG	110	-.186	2.435	-6.827	1.71

Appendix 02: Matrix of correlations

Matrix of correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) ROAA	1.000							
(2) PBT	0.851	1.000						
(3) CAR2	0.353	0.692	1.000					
(4) LIQ	0.017	0.055	0.085	1.000				
(5) eff	-0.176	-0.261	0.001	0.077	1.000			
(6) branches	-0.073	-0.234	-0.071	-0.409	-0.178	1.000		
(7) OP	0.199	0.262	0.096	0.515	0.175	-0.781	1.000	
(8) GpeG	0.188	0.181	0.004	0.268	0.110	-0.383	0.233	1.000

Appendix 03: Estimation of the ROAA model by PCSE method

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

ROAA	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
CAR2	.051	.01	5.02	0	.031	.071	***
LIQ	-.02	.007	-2.68	.007	-.034	-.005	***
eff	-.018	.006	-3.26	.001	-.029	-.007	***
branches	11.237	3.417	3.29	.001	4.539	17.935	***
OP	.016	.004	4.25	0	.009	.024	***
GpcG	.096	.028	3.40	.001	.04	.151	***
Constant	-57.569	18.067	-3.19	.001	-92.98	-22.158	***

Mean dependent var		1.673	SD dependent var		0.851
R-squared		0.681	Number of obs		110
Chi-square		48.096	Prob> chi2		0.000

*** p<.01, ** p<.05, * p<.1

Appendix 04: Estimation of the PBT model by PCSE method

Prais-Winsten regression, correlated panels corrected standard errors (PCSEs)

PBT	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
CAR2	.089	.007	13.04	0	.076	.102	***
LIQ	-.016	.006	-2.54	.011	-.028	-.004	**
eff	-.035	.004	-8.16	0	-.044	-.027	***
branches	.69	3.337	0.21	.836	-5.851	7.23	
OP	.014	.003	4.04	0	.007	.02	***
GpcG	.092	.026	3.61	0	.042	.143	***
Constant	-1.783	17.632	-0.10	.919	-36.34	32.775	

Mean dependent var		2.181	SD dependent var		1.122
R-squared		0.888	Number of obs		110
Chi-square		303.735	Prob> chi2		0.000

*** p<.01, ** p<.05, * p<.1