POLAC MANAGEMENT REVIEW (PMR)
DEPARTMENT OF MANAGEMENT SCIENCE
NIGERIA POLICE ACADEMY, WUDIL-KANO

OIL PRICE VOLATILITY AND DEPOSIT MONEY BANKS' PERFORMANCE IN SELECTED AFRICAN COUNTRIES

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Abstracts

The study investigates the nexus between banking sector performance and changes in oil prices in the some selected African region. The ratio of non-performing loans to return on assets (ROA) and return on equity (ROE) was used to gauge the performance of the banking industry using the GARCH framework to measure the volatility of oil prices. Panel data from 2000 to 2022 for four oil-exporting nations in some selected African region were used to analyse this study empirically. The study indicated a long relationship between oil price volatility and banking sector performance among African countries. Also, oil price fluctuation exerts a significant negative long-run impact on banks' return on assets in these countries. The return on equity of deposit money banks in African countries that export oil is significantly impacted negatively over the long term by the volatility of oil prices. Additionally, the volatility of oil prices raises the ratio of non-performing loans among banks in the African countries as well as loan failure. Therefore, the study recommend that banks should create mechanisms that can respond to the impact of external market shocks on their operations. These actions could take the shape of systems for a well-diversified portfolio that will enhance the banks' hedging.

Keyword: Deposit Money Banks, Oil Price, Oil Producing Countries, African

1. **Introduction**

One of the most significant natural resources is crude oil, which also has the biggest global commodities market. Unlike other commodities, the sale of crude oil is one of the few activities that can affect banks' performance in oil-producing countries. The banking institutions are intermediaries between all sectors of the economy. The financial performance of banks can be affected by the volatility of oil prices in oil-producing countries because of the intermediation functions that banks perform. Oil prices have been unsteady extensively and cannot be predicted. Thus, these fluctuations cause changes in the price of raw materials for everyday life, thus affecting the economy, which also includes the bank because most of these funds used to purchase raw materials are deposited in the bank (Uwubanmwen & Omorokunwa, 2015, Omorokunwa & Ogbeide, 2023).

The potential effects of oil price volatility on any given economy are contingent upon the economy's classification and, of course, the type of price fluctuation. However, due to the fact that they import refined petroleum products, such as Nigeria, while exporting crude oil, 80 percent of African oil-producing nations are classified as both importers and exporters. Therefore, making a conclusive and authoritative statement on the impact of oil price volatility on them has become so controversial (Iyoha & Oriakhi, 2013). Consequently, it is especially crucial to look into how changes in oil prices affect bank performance in the case of African oil-producing nations. This is due to the fact that those economies, which buy refined petroleum products and export crude oil, are impacted by fluctuations in oil prices. Simple logic suggests that changes in the price of oil, whether positive or negative, can both help and hinder their economies. The main issue, though, is that the oil-producing nations of Africa have become entirely dependent on oil over the years,

turning their economies into mono-products, which has caused serious structural issues for their economies.

The sharp decline in global oil prices since the middle of 2014 has also prompted a review to determine how oil prices and bank performance are related. Examining the impact of oil price volatility on bank performance a surge of empirical research attempts to measure how increasing energy prices affect bank performance. However, given the dearth of empirical data, it is not always evident how the various theoretical studies relate to practice, even though they look at the potential channel through which the price of oil could affect bank performance and offer valuable insights into the transmission mechanism.

Thus, the goal of this study is to establish the connection between the dynamics of oil prices and bank performance in Africa by combining theoretical and empirical methods. This study's primary goal is to investigate the connection between the performance of deposit money banks and the volatility of oil prices in a few chosen African nations.

2. Literature Review

2.1 Conceptual Review of Oil price volatility

The oil and banking sectors have the leading positions in the economies of oil-producing countries in Africa. The oil sector is the main source of government revenues and expenditures, while the banking sector is the second largest contributor to the Gross Domestic Product of African oil-producing countries (Paul & Mandy,2016). The strategy of diversification from these two key areas could benefit the economic system and banking sector in facing economic challenges. The banking sector in oil-producing countries in Africa is well-capital-oriented and characterised by a decreasing level of liquidity and financial performance (El-Chaarani, 2013).

Additionally, the oil industry has suffered a significant setback since the middle of 2014 due to a prolonged period of low oil prices. Many scholars have attempted to understand whether the price fluctuations and the most recent decline have a direct effect on the banking industry's performance in oil producing and exporting countries. The oil industry in the African region significantly impacts bank performance, and governments in African oil producing countries use the money they generate to boost foreign exchange reserves, create and develop mega infrastructure, employ more people overall, and increase full-scale investments. The oil industry has also integrated the African oil-producing nations into the global economic pattern.

The economic components of African oil-producing nations are directly impacted by the oil sector. Many researchers have revealed that oil price fluctuations have greatly impacted macroeconomic activity during the last decade, such as gross domestic product, inflation rate, unemployment rate, and budget deficit in developed and developing countries (Nwankwo & Desmond, 2015).

2.2 Conceptual Review of Deposit Money Bank

The banking industry and financial system in the African region are the primary sectors of the economy that are impacted by oil revenue. Government spending on infrastructure, building, and development in African oil-producing nations is heavily reliant on oil earnings. Banks in the oil-producing countries in Africa rely heavily on the growth of these industries. The banking industry is exposed to oil prices through funding real estate project investments. Therefore, the stability of the banking and financial systems in African oil-producing nations is significantly impacted by global variations in the price of oil.

Nowadays, many African oil-producing countries, such as Nigeria, Angola and Algeria, are considered among the world's top 10 oil exporters (OPEC, 2019). According to OPEC (2019), 34.6% of the world's proven crude oil reserves are located in oil-producing countries in Africa. The nations that produce and sell oil have seen a significant decline in government spending and revenue since the oil price fall in mid-2014. Africa's oil-exporting nations' poor economic indices and large budget deficits prompted governments to restructure the economy by fostering the private sector and, diversifying away from the oil industry and moving toward industries like manufacturing, services, tourism, and technology. Additionally, the central banks of African nations that

produce oil have advised all banks, both domestic and foreign, to lessen their reliance on the oil industry and steer clear of the various risks connected with it.

The governments of oil-producing African nations also raised their debt by issuing foreign bonds and reformed their tax structures by enacting new taxes such as the value-added tax (VAT), as a result of the last significant decline in oil sector income. The VAT system was recently implemented in a number of nations, including Kuwait, Dubai, and Qatar, in an effort to lower the government budget deficit. Additionally, it has been noted that between December 2015 and the end of August 2016, Saudi Arabia's debt climbed by about $73 billion. This condition was observed in numerous other Middle Eastern nations, including Kuwait, Iran, and Qatar.

Banks in African oil-producing countries are well-developed and highly efficient. It is characterised by well-structured capital and a high rate of return (El-Chaarani, 2019). By distributing the excess funds to expand the various sectors, banks in African oil-producing nations have played a crucial role in the economy and encouraged the growth of the private sector. Additionally, the banking industry has helped governments in the oil-producing regions of Africa by lending them various forms of debt in order to lower the budget deficit.

In many African nations that produce oil, such as Algeria and Tunisia, Islamic banks hold a dominant position alongside regular banks. Islamic banks have become an increasingly integral part of the banking sector in African oil-producing countries (Ragab, 2018). They showed a remarkable and resourceful ability to withstand the 2008 financial crisis. Many academics believe that the Islamic banking system's success in the oil-producing region of Africa is mainly due to the profit-and-loss sharing philosophy.

During the last decade, a large number of foreign banks have been introduced into the African oil-producing countries due to the elimination of many economic, political and taxes barriers. Through the introduction of new services and financial products, their presence in the African market has advanced the banking industry. In order to guard against future financial, economic, and political crises, the oil-producing nations of Africa were prompted by the global financial crisis of 2008 to overhaul their banking industry and financial system by enacting new regulations. Based on the most recent advice of the relevant regulations, governments in African oil-producing nations have raised the minimum necessary capital and their level of control. Moreover, they improved the risk management system and banks' transparency to reduce the risk of any international volatility (Peter & Ebitae, 2016).

The banking industry in African nations that produce and sell oil has amassed a substantial amount of assets in recent decades as a result of the surge in oil prices and earnings. However, since the drop in the price of oil in mid-2014, the industry has been beset by poor liquidity and numerous other financial issues. El-Chaarani (2019) reported a decline in the banking sector's performance and liquidity in oil-producing regions of Africa. Since the mid-2014 drop in oil prices, all African governments, mostly those in oil-producing nations, have been attempting to direct their expenditures toward non-oil industries such as the banking, manufacturing, health, and tourism sectors. Numerous researchers have examined the relationship between changes in the price of oil and the performance of the banking industry, but there is no discernible pattern that reveals the nature of the relationship.

2.3 Empirical Review

Poghosyan and Hesse (2009) investigated the connection between bank profitability and shocks to the price of oil. Based on data from 1994 to 2008 on 145 banks in 11 MENA oil-exporting nations, the findings show that while the direct impact of oil price shocks on bank profitability is negligible, the indirect influence is mediated by institutional and macroeconomic factors unique to each nation. In contrast to commercial and Islamic banks, investment banks seem to be the most impacted. Our results emphasize the significance of oil price shocks for macro-prudential regulation in MENA nations and the systemic effects they have on bank performance.

Jarrett, Mohaddes, and Mohtadi (2018) used a Panel CS-ARDL technique to study 30 oil-rich nations from 1980 to 2016, showing that improved financial

institutions can lessen the impact of oil price volatility on GDP. The findings provide compelling evidence in favour of the beneficial contribution that financial development makes to growth and development. Amin (2022) investigates the uneven effects of stock and oil prices on the profitability of Saudi Islamic banks between 2000 and 2020. Return on Equity (ROE) and Return on Assets (ROA) are two metrics used to analyze the profitability of two Saudi Islamic banks using a nonlinear autoregressive distributed lag (NARDL) model. The study's findings indicate that the profitability of Saudi Arabia's Islamic banks is significantly influenced by the price of oil and stocks. The ROE and ROA of Saudi Islamic banks are positively impacted by rising oil and stock prices.

Jreisat and Al-Mohamad (2022) used the two-stage Data Envelopment Analysis (DEA) to examine the oil price volatility and bank efficiency in the Gulf Cooperation Council (GCC) member countries. The study's empirical findings show that the oil price shock in 2014 and the global financial crisis (GFC) in 2008 significantly lowered the GCC banks' efficiency scores. According to the findings, bank efficiency is more affected by domestic macroeconomic indicators than by institutional or bank-specific factors.

Katricioglu, Ozatac, and Taspinar (2020) looked into the connection between oil prices in Turkey and the profitability of the banking industry. The study's findings demonstrate that fluctuations in oil prices have a substantial indirect impact on the profitability of the Turkish banking industry through inflationary pathways. Furthermore, it is discovered that oil prices have a direct and detrimental impact on bank profitability due to the decline in commercial loans related to oil. The findings of the causality test show that there are unidirectional correlations between inflation and the profitability of the banking industry as well as between oil prices and inflation. The study's conclusions are thought to be applicable to both emerging and oil-importing nations in order to start taking preventative measures against fluctuations in oil prices.

3. Methodology

The general form of the model estimated is based on the study by Poghosyan and Hesse (2009) and Ashamu et al. (2021). The specified model involves bank performance function generally in the form below:

$$PB_{it} = \gamma_0 + \gamma_1 OILP_{it} + \gamma OILPV_{it} + \beta X_{it} + \varepsilon_{it} \quad (1)$$

Where *PB* is the measure of bank performance, *OILP* is oil prices, *OILPV* is volatility of oil prices, *X* is a vector of control variables, *i* represents individual countries, and *t* is the time period. Here, they contend that bank performance is directly impacted by the risk arising from changes in the price of oil on the global market.

Objectives One and Two: To evaluate how changes in oil prices affect bank profitability *in the forms of return on asset and return on equity among African countries.* Return on equity (ROE) and return on assets (ROA) are the metrics used to quantify bank profitability (PROF) for this purpose. Thus, the compact form of the basic model is as follows:

$$PROF_{it} = \alpha + \beta_1 OILP_{it} + \beta_2 OILPV_{it} + \sum_{m=1}^{m} \gamma_m X_{it} + e_{it} \quad (2)$$

Where *PROF* is bank profitability measure and other variables are as earlier defined. Additionally, t denotes time, i denotes the individual nations, and et denotes the error term. It is expected that the value of oil prices (OILP) and oil price fluctuation negatively affects banks' profitability, especially both through the supply and demand sides. As a result, a negative sign is anticipated for the parameter β. In order to capture the impact of the goverment's fiscal stance, the vector of control variables includes the interest rate (the monetary policy rate, or MPR), exchange rate (EXRT), inflation (INFL), the level of liquidity in the economy (m2/GDP ratio, or FD), real GDP per capita growth (RGDPG), and fiscal deficit to GDP ratio (FDR). While per capita GDP growth and financial liquidity are expected to positively affect bank profitability, the other control variables are expected to negatively affect bank profitability.

For more appropriate specification of the profitability models, the following Equations will be estimated:

$$ROA_{it} = \beta_0 + \beta_1 OILP_{it} + \beta_2 OILPV_{it} + \beta_3 MPR_{it} + \beta_4 EXRT_{it} + \beta_5 INFL_{it} + \beta_6 RGDG_{it} + \beta_7 FDR_{it} + \beta_8 FD_{it} + e_{it} \quad (3)$$

Where all the variables are as earlier defined. Apriori expectations: $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7 < 0$; $\beta_6, \beta_8 > 0$.

For the effects on return on equity, the model is specified as:

$$ROA_{it} = \beta_0 + \beta_1 OILP_{it} + \beta_2 OILPV_{it} + \beta_3 MPR_{it} + \beta_4 EXRT_{it} + \beta_5 INFL_{it} + \beta_6 RGDG_{it} + \beta_7 FDR_{it} + \beta_8 FD_{it} + e_{it} \quad (4)$$

Where, all the variables are as earlier defined and apriori expectations are similar to the parameters in Equation (3).

Objective Three: To investigate the relationship between African banks' non-performing loans and changes in oil prices.

The ratio of non-performing loans to total loan disbursement (NPL) is a measure of non-performing loans. The model's small specifications are as follows:

$$NPL_{it} = \beta_0 + \beta_1 OILP_{it} + \beta_2 OILPV_{it} + \beta_3 MPR_{it} + \beta_4 EXRT_{it} + \beta_5 INFL_{it} + \beta_6 RGDPG_{it} + \beta_7 FDR_{it} + \beta_8 FD_{it} + e_{it} \quad (5)$$

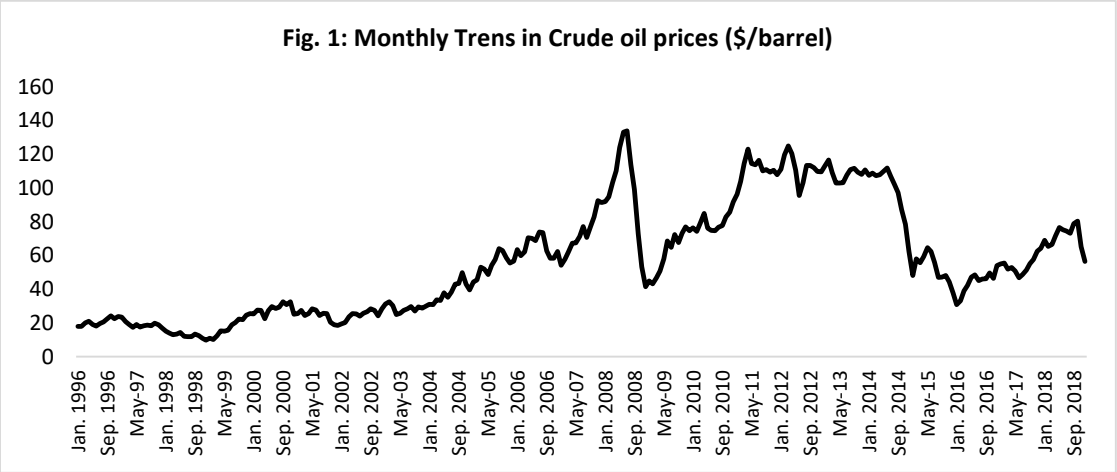
Where all the variables are as defined earlier. Apriori expectations are stated as: $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_7 > 0$; $\beta_6, \beta_8 < 0$.

3.5 Data and Sources

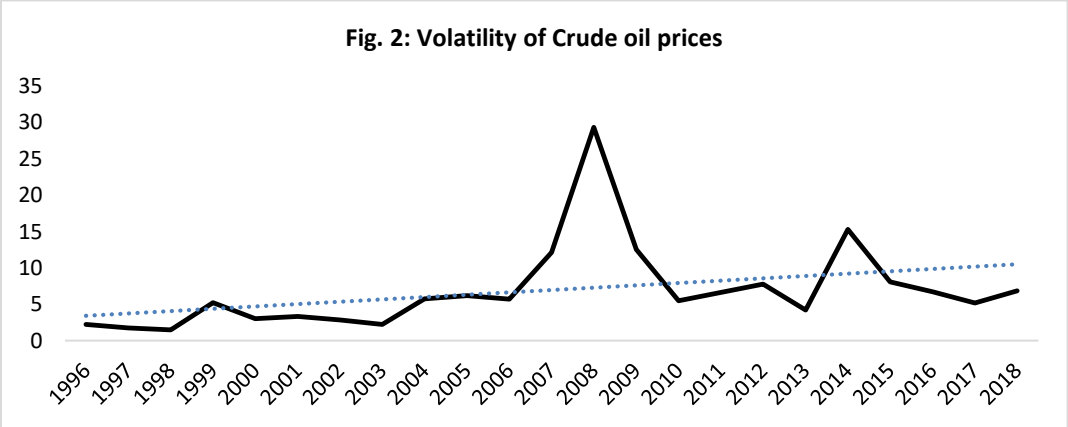
According to UNCTAD 2022 records, there are few major oil-producing and exporting countries in Africa, namely, Nigeria, Angola, the Republic of Congo, Gabon, South Sudan, Chad, and Equatorial Guinea. Among these countries, complete data (especially for banking sector performance) is available for four, which are Nigeria, Angola, Gabon, and Chad. Thus, data used in the study is annual data for each of the four countries, implying that a panel of four oil exporting countries in Africa is included in the study. The data covers the period from 2000 to 2022 for which reliable data was available for all the oil prices. Moreover, the period includes two major oil price fluctuation experiences (in 2007/2008), and in 2014-2016). Hence, the data selection period will be based on the period where deep fluctuations can be captured over a period of time. The IMF World Financial Statistics (IFS) database is the source of information on oil prices. The IMF Financial Structure Database, which includes a wealth of financial data gathered for numerous nations, is the source of information on country series for the banking sector performance. The World Bank World Development Indicators database provided additional data utilized as controls in the research.

4.2 Results and Discussion

The trends in monthly oil prices between 1996 and 2022 are also reported in Figure 1. There is a clear upward trend in the price of oil over the years, indicating that the oil prices have generally increased over the period (since the 2000s). The periods of negative shocks in 2008 and 2015 have been clearly marked in the chart for oil prices. The sharp decline in the prices were felt more by crude oil in the international market. Moreover, the highest general periodic rise in oil prices was in 2007, although there was a sharp decline after 2008 following the global financial crisis.



The patterns and trends of volatility displayed by the oil prices over the study period are displayed in the following set of charts. The objective is to demonstrate the type or degree of volatility and assess if patterns of volatility have evolved (become more or less frequent) during the course of the study. Figure 2 chart indicates that, from 1996 to 2022, 2008 saw the highest amount of volatility. Volatility also appears to be rising (i.e., becoming more intense) over the period of the study.



The descriptive statistics for the panel of the variables across all the countries in the study are presented in Table 1. Average ROE is 23.77 per cent, which is high and shows that shareholders' funds in the banks are well utilised. The maximum and minimum values also indicate that the ROE value is generally impressive for the banks over the period. The standard deviation is also less than the mean value, indicating that the ROE for the banks are generally similar among the SSA countries. Average return on asset (ROA) is 2.42, with a standard deviation of 2.28. This shows that the ROA for the banks is generally more spread out, with some banks having a value of up to 6.28 and others with poor performance of -15.10 percent. This shows that the return on equity (efficiency of use of shareholders' funds) is more stable in the banking sector of SSA countries than the return on asset (operational efficiency in the banks). There is general, low profitability or operational efficiency within the banking sectors. Non-performing loan ratio is 11.23 percent on average and the standard deviation is lower than the mean value. Thus, the high loan default ratio is quite similar among the countries in the sample. In general, the banking systems among SSA countries is prone to high levels of loan failures, which is a critical aspect of banking sector stability (Amidu & Wilson, 2012).

Table 1: Descriptive Statistics

Variable	Mean	Max.	Min.	Std. Dev.	Skew.	Kurt.	J-B	Prob.
ROA	2.42	6.58	-15.10	2.28	-5.11	40.59	5564.91	0.00
ROE	23.77	70.59	-1.79	13.18	0.89	4.52	20.08	0.00
NPL	11.23	37.30	2.01	6.71	1.31	4.86	37.86	0.00
OILPV	0.05	0.54	-0.65	0.28	-0.79	3.26	9.31	0.01
OILP	64.01	99.67	25.98	23.88	0.04	1.79	5.38	0.07
MPR	19.52	103.16	2.56	21.79	2.79	9.79	283.16	0.00
GGDPPC	1.59	28.68	-11.13	5.45	1.43	8.75	151.33	0.00
CPI	93.90	323.61	0.09	54.62	1.36	6.87	81.79	0.00
EXRT	335.88	732.40	0.23	235.01	0.05	1.40	9.41	0.01
FDEP	19.12	45.61	7.22	8.03	1.07	3.79	19.16	0.00
FDR	10.84	25.15	0.91	6.14	0.40	2.32	4.02	0.13

Source: Authors' computation, 2024

Among the explanatory variables, oil price fluctuation (OILPV) was 0.05 on average, suggesting that commodity prices have moved within 5 per cent of its mean values over time on a regular basis. This outcome may sound low, but the extent of volatility is better observed by considering the minimum and maximum values, which lie between 54 per cent and negative 65 per cent which is over 100 percentage points. This shows a very large proportion of oil price volatility over the period of the study. Moreover, the standard deviation is much larger than the mean value which indicates a high coefficient of variation and strong variability of oil prices over the period. Average oil prices were 64.01 dollars per barrel over the period, which is also relatively high, given that the minimum value for the period was 25.98 dollars per barrel. Average regulatory interest rate is 19.52, with a standard deviation of 21.79. The mean interest rate value is large and shows that central banks in the oil producing countries have tended to fix high rates in the money market. Average financial depth is 19.12 per cent while average fiscal deficit ratio (FDR) is 10.84, which is very large and shows the overbearing nature of fiscal policy among the oil producing countries. With the exception of the fiscal deficit ratio (FDR), all of the variables' Jarque-Bera (J-B) statistics are significant at the 1 per cent level, indicating the absence of normality among them. Given that a pool of many nations and banks was used for the datasets, this result is to be expected. Therefore, the outcome indicates that the datasets may be subject to significant heterogeneous effects from country-level variables. This is a solid foundation for offering a panel-form analysis during the study's regression procedure. Essentially, considering the highly significant J-B test values for the variables, the country-specific factors are probably going to differ among the nations in the study.

To further examine the initial characteristics of the variables, the correlation of the dataset are also presented in Table 2. The correlation among the variables is presented. The Table shows that the non-performing loans ratio has negative relationship with both ROE and ROA. This suggests that loan applications by banks in the SSA region tend to limit efficiency, as the banking sector's efficiency performances tend to decline as loan disbursement failure increases. The two profitability performance indicators are positively correlated. Among the explanatory variables, oil prices and its volatility are positively correlated, suggesting that oil price volatility is more likely to occur during periods of high oil prices in the international market. Oil price volatility is not significantly correlated with any of the other variables. Oil prices are positively correlated with GDP growth indicating that oil prices and GDP growth move in the same direction. There is also a strong

negative correlation between the two policy variables of MPR and FDR, indicating that monetary and fiscal policies are not well harmonised among the countries.

Table 2: Correlation Matrix

Variable	ROA	ROE	NPL	OILPV	OILP	MPR	GGDPPC	CPI	EXRT	FDEP	FDR
ROA	1										
ROE	0.54	1									
	(0.00)										
NPL	-0.51	-0.24	1								
	(0.00)	(0.02)									
OILPV	-0.04	-0.12	0.28	1							
	(0.68)	(0.27)	(0.01)								
OILP	-0.05	0.08	0.08	0.32	1						
	(0.67)	(0.48)	(0.46)	(0.00)							
MPR	0.00	0.08	0.10	0.10	-0.06	1					
	(0.98)	(0.45)	(0.34)	(0.38)	(0.55)						
GGDPPC	0.07	0.19	-0.08	-0.03	0.24	0.13	1				
	(0.54)	(0.08)	(0.48)	(0.75)	(0.03)	(0.24)					
CPI	-0.07	-0.27	-0.03	0.04	0.19	-0.42	-0.29	1			
	(0.49)	(0.01)	(0.81)	(0.74)	(0.07)	(0.00)	(0.01)				
EXRT	0.06	-0.14	-0.18	0.06	-0.02	-0.56	-0.19	0.17	1		
	(0.61)	(0.20)	(0.09)	(0.56)	(0.83)	(0.00)	(0.08)	(0.10)			
FDEP	-0.14	-0.09	-0.17	-0.09	0.03	0.02	-0.25	0.48	-0.41	1	
	(0.20)	(0.42)	(0.11)	(0.38)	(0.75)	(0.87)	(0.02)	(0.00)	(0.00)		
FDR	0.02	0.14	-0.33	-0.02	-0.02	0.50	-0.10	-0.14	-0.23	0.50	1
	(0.84)	(0.19)	(0.00)	(0.85)	(0.83)	(0.00)	(0.36)	(0.19)	(0.03)	(0.00)	

Source: Authors' computation 2024

4.1 Panel Unit Root and Cointegration Tests

The data used for this analysis reflects both the common (homogenous) and country-specific (individual heterogeneity) characteristics of the countries included in the investigation. To prevent the occurrence of "spurious" inference, panel unit root tests must be used to verify that the data is stationary. We investigated the homogenous panel's stationarity characteristics using the tests created by Levin, Lin, and Chu (LLC).

Also, the lm, Pesaran and Shin (IPS, 2003), the Augmented Dickey-Fuller tests, and the Phillip-Peron tests, which allow for heterogeneity in the panel's cross-section and assume a null hypothesis of no cointegration in the panel data, are used to address heterogenous concerns. The test results are presented in Table 3 below. In the test result, the LLC coefficient for all the variables is significant for variables at levels. Moreover, the IS, ADF-Fisher and P-P statistics for most of the variables is significant at levels. Thus, it can be demonstrated that the variables are all stationary at levels, indicating that the variables are all I[0].

Table 3: Result of Panel Unit Root Test for Variables

Variable	Homogenous Process	Heterogeneous Process			Remarks
	LLC	IPS	ADF-Fisher	P-P	
NPL	2.731**				I[0]
ROA	-1.840*				I[0]
ROE	-2.125**				I[0]
OILP					I[0]
OILPV					I[0]
CPI					I[0]
EXRT					I[0]
FDEP					I[0]
FDR					I[0]
GDPPC					I[0]
MPR					I[0]

Given that each variable is I[0], the unit root findings clearly show that the variables' stationarity status is identical. Thus, the panel cointegration tests can be used to determine the long-term conditions of the variable interactions. The panel cointegration test results are shown in Table 4. The residual-based (Kao) panel cointegration tests show that every coefficient is significant at the 5 per cent significance level. The Kao residual cointegration test can be used to reject the null hypothesis that there is no cointegration for any given equation. Consequently, the cointegration test results show that the study's variables have substantial long-term correlations. Therefore, the panel estimation paradigm can be applied to the empirical study.

Table 4: Kao Panel Cointegration Test Results

Equation	Kao statistic	Prob.
NPL	-5.01	0.00
ROA	-1.72	0.04
ROE	-1.36	0.08

Source: Author's computation 2024

4.2 Empirical Analysis

4.2.1 Estimation of Exchange Rate Volatility

The volatility of oil prices is estimated using the EGARCH estimation framework to generate volatilities. The results from the EGARCH estimates are presented in Table 5. The adjusted R-squared value of 0.49 is moderate, suggesting that past oil prices explain a large proportion of current prices. From the mean result, it is seen that lagged oil prices play critically significant roles in the current values of the prices. In particular, the coefficient of the lagged exchange rate indicates that past oil price positions matter for the determination of current oil prices position. This shows that oil price volatility is persistent over time.

Table 5: EGARCH Results for Exchange Rate Volatility

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Mean Equation				
C	20.02	2.472	8.77	0.00
$OILP_{t-1}$	0.77	0.582	19.80	0.00
Variance Equation				
	3.69	0.00	951.36	0.00
	-1.86	0.00	-106.05	0.00
	0.31	0.23	1.49	0.14
	0.61	0.00	470.63	0.00
Adjusted R-squared	0.459			
Durbin-Watson stat	1.792			

Source: Author's computation

The variance equation of the EGARCH estimation also contains important indicators that highlight the pattern of volatilities in the oil prices. The mean term in the result () is positive and significant at the 1 per cent level. This confirms the general tendency of oil prices in the international market to spiral upwards at any given time, even without shocks in the market. The α parameter represents the "GARCH" effect in the estimation or instability effect. The coefficient of this term passes the significance test at the 1 per cent level and is negative. This shows that volatility in oil prices is persistent and self-sustaining over time. With every 1 per cent shock in the current oil prices, the price level in the closest future period has the tendency to further spiral downwards by a further 1.86 percentage points within the next periods. This is a high volatility persistence measure for oil prices in the international market. While the conditional volatility term (γ) fails the significance test at the 5 per cent level, the volatility persistence term (β) passes the test at the 1 per cent level. This shows that external news exerts significant and strong effects on the time path and movement of oil prices in the international market.

4.2.2 Regression Analysis

Estimating the panel data-based link between oil price variations and banking performance for the four African banking sectors is the main goal of the econometric analysis conducted for the empirical analysis. The fixed effects or random effects models must be chosen as the best representation of the relationships for the panel data analysis process. In order to choose the best panel analysis technique, the time-varying conditions of the study's panel data are thus identified using the usual Hausman test for random effects. Alongside the findings are the Hausman test results for each of the study's equations. The fixed effects or random effects models must be chosen as the best representation of the relationships for the panel data analysis process. In order to choose the best panel analysis technique, the time-varying conditions of the study's panel data are thus identified using the usual Hausman test for random effects. Together with the findings, the Hausman test results for each of the study's equations are presented.

Table 6 shows the impact of oil price fluctuations and other factors on the banking sectors' return on assets (ROA) in the nations that were sampled. In choosing the correct prediction about the time-varying and cross-sectional effects, the Chi-Square statistics for the Hausman test are shown. The null hypothesis is rejected since both outcomes pass the significance test at the 1% level. Therefore, the regression analysis fits best with a fixed effect estimation technique. Only 13.6% of the variations in ROA in the banking sectors of the individual nations in the model were explained by the independent variables, according to the result's comparatively low adjusted R-squared value of 0.136.This outcome is to be expected

given that panel data was used for the estimation where ROA performances of the different countries vary extensively.

The particular impacts of the explanatory variables on ROA are examined by considering the coefficients of the explanatory variables in terms of signs and significance. In the result in Table 6, the coefficient of oil price levels (OILP) and that of oil price volatility are both insignificant at the 5 percent level. This shows that neither the movement of oil prices (or mild volatility) nor actual and deep volatility of oil prices has any significant impact on the ROA of banks in the selected oil-producing countries in SSA. Thus, the result shows that the operational efficiency of banks in the countries is not influenced by patterns of oil price volatility.

Table 6: Oil prices and ROA

Variable	Coefficient	t-Statistic	Prob.
OILP	0.005	0.823	0.413
OILPV	-0.549	-1.469	0.146
GDPPC	0.514	5.190	0.000
MPR	-0.008	-0.888	0.377
CPI	0.003	0.860	0.392
EXRT	-0.001	-2.143	0.035
FDEP	-0.090	-2.795	0.007
FDR	0.025	0.959	0.341
R-sq.	0.205		
Adj. R-sq.	0.136		
Hausman test coef.	53.5 (0.00)		

Source: Author's computation

The coefficients of the other variables in the model also highlight important outcomes. In the result, the coefficients of GDP per capita and financial development (FDEP) pass the significant test at the 1 per cent level, while the coefficient of exchange rate passes the test at the 5 per cent level. This shows that it is only the level of economic performance and financial development as well as the exchange rate in the countries, that affect the ROA of the banking system. The other variables do not exert significant impacts on ROA of the banking sectors. In particular, the coefficient of GDP per capita is positive, indicating that economic growth promotes return on assets among the banks. On the other hand, the coefficient of financial development is negative, indicating that more financial development tends to limit ROA performance among the banking sectors. In the same vein, the coefficient of exchange rate is negative, which shows that depreciation of the currency significantly affects ROA performance among the banking sectors of the countries.

The result of the effects of oil price volatility and other factors on return on equity (ROE) of the banking sectors of the oil producing countries is shown in Table 7. It is seen that a fixed effect estimation framework is preferred based on the coefficient of the Hausman test which is significant at the 1 percent level. In the result, the adjusted R-squared value is 0.188, also showing that a low proportion of ROE movements was captured in the model.

Table 7: Oil prices and ROA

Variable	Coefficient	t-Statistic	Prob.
OILP	0.129	2.673	0.009
OILPV	-6.726	-2.352	0.021
GDPPC	2.841	2.877	0.005
MPR	-0.002	-0.021	0.983
CPI	-0.030	-1.064	0.291
EXRT	-0.008	-1.202	0.233
FDEP	-0.343	-1.269	0.208
FDR	0.378	1.250	0.215
R-sq.	0.254		
Adj. R-sq.	0.188		
Hausman test coef.	21.8 (0.00)		

Source: Author's computation

A glance at the coefficients of the key variables, OIL and OILPV, shows that changes in oil prices significantly boost both ROE. This demonstrates that, when ROE is taken into account, oil prices' moderate movement or volatility directly improves the financial performance of the banking industries in the SSA nations. Therefore, less severe volatility will increase the banks' application of shareholders' cash more efficiently. Thus, there is proof that banks in African countries can withstand mild to moderate fluctuations in commodity prices. However, at the five percent level, the real oil price volatility factors (OILPV) have a negative and significant impact on ROE. This demonstrates that the reduction in the financial performance of banks in SSA nations is mostly caused by the extreme volatility of oil prices on the global market. Only the GDP per capita coefficient is significant for the other study variables, indicating that economic growth significantly affects the ROE of banks in the nations. Even at the 5 per cent level, none of the other factors' coefficients pass the significance test.

The result of the effect of oil price variation, together with other factors, on the non-performing loan ratios of the banking sectors in the sampled nations is reported in Table 8. The null hypothesis is rejected as the non-performing loan equation passes the significance test at the 1 per cent level. Therefore, the regression analysis fits best with a fixed effect estimation technique. At 0.83, the result's adjusted R-squared value is quite high, suggesting that the independent variables in the model accounted for a sizable amount of the variances in non-performing loans in the banking sectors of the oil-producing nations.

Table 8: Oil prices and ROA

Variable	Coefficient	t-Statistic	Prob.
OILP	-0.009	-0.586	0.560
OILPV	5.760	4.109	0.000
GDPPC	2.041	20.835	0.000
MPR	0.144	9.937	0.000
CPI	-0.024	-1.103	0.273
EXRT	0.001	0.661	0.511

FDEP	0.162	2.228	0.029
FDR	-0.860	-35.699	0.000
R-sq.	0.844		
Adj. R-sq.	0.830		
Hausman test coef.	37.1 (0.00)		

Source: Author's computation

Therefore, the increase in non-performing loan ratios is one of the primary ways that the banking system is impacted by the severe and ongoing volatility of oil prices. The fiscal deficit ratio, GDP per capita, and monetary policy rate all pass the significance test at the one per cent level, while the financial development coefficient does so at the five per cent level. Regardless of the performance metrics taken into consideration, this conclusion unequivocally demonstrates that economic growth is essential for enhancing the banking sector's performance. Furthermore, the outcome demonstrates that the non-performing loan ratio of the banking industry is highly impacted by the two policy variables of MPR and FD.

This demonstrates that bank performance with regard to non-performing loans can be influenced by policy initiatives. Deeper loan failures in the banking industry are also thought to be a result of financial development. At the five per cent level, the other variables do not pass the significance test.

4.2.2. Robustness Check (Dynamic Relationships)

In order to improve on the robustness of the study, the dynamic impacts of oil prices on the banking sector performance variables are also estimated using the ARDL procedure in order to obtain both the short run and long run effects. The result of the ARDL estimates are presented in Table 9 for each of the indicators of banking sector performance. In the result, the coefficient of the error term is negative for each of the equations although it is not significant in the NPL equation. This generally shows that a long run stability is ensured for the banking sector after any short-term deviation from equilibrium.

Table 9: ARDL Estimates for the Effects of Oil Price Volatility on ROA

Variable	ROA		ROE		NPL	
	Coef.	Prob.	Coef.	Prob.	Coef.	Prob.
Long Run Equation						
OILP	-0.025	0.00	0.019	0.68	-0.075	0.05
OILPV	-2.465	0.04	-18.830	0.02	13.171	0.00
LGDPPC	-1.507	0.38	-37.430	0.01	-0.555	0.91
MPR	0.117	0.13	0.066	0.65	1.367	0.00
CPI	0.049	0.04	-0.379	0.00	0.202	0.00
EXRT	-0.007	0.00	-0.063	0.00	0.002	0.64
FDEP	-0.348	0.02	1.056	0.01	-1.724	0.00
FDR	0.249	0.11	-3.206	0.00	1.434	0.00
Short Run Equation						
ECM_{t-1}	-0.932	0.03	-0.977	0.00	-0.271	0.33
D(OILP)	0.067	0.01	0.301	0.30	0.1	0.15
D(OILPV)	-0.396	0.70	-2.635	0.76	0.418	0.13
D(LGDPPC)	0.38	0.97	-3.999	0.88	23.039	0.46

D(MPR)	-0.356	0.18	0.858	0.08	0.347	0.41
D(CPI)	-0.062	0.21	1.086	0.00	0.071	0.52
D(EXRT)	-0.011	0.22	-0.127	0.15	0.025	0.73
D(FDEP)	0.351	0.08	-0.507	0.49	0.517	0.15
D(FDR)	-0.053	0.83	3.156	0.00	-0.305	0.42
Constant	14.982	0.02	367.8	0.00	-1.894	0.18
Trend			1.405	0.22		

Source: Author's computation

The short run results indicate that oil prices significantly promote ROA but do not have significant impacts on ROE and NPL. On the other hand, the coefficient of oil price volatility is insignificant in each of the equations in the short run. This shows that volatility in oil prices is not a short run affair, rather, the effects on the banking sector is more of a long run activity. In the long run results, the coefficients have similar signs to those of the fixed effects estimates, indicating that the fixed effects estimates are robust.

4.4 Discussion of Major Findings

The empirical study yielded broad findings that are typically appropriate for both empirical and policy orientations. This serves as the foundation for the explanation of these findings. First, it is well known that increased volatility in the price of oil has a detrimental effect on the operation of the banking industry in SSA nations. The banking system may have evolved coping strategies to adjust to moderate shocks resulting from fluctuations in oil prices, as evidenced by the fact that the impacts of regular or smooth variations in oil prices are either nonexistent or favourable. Various forecasting mechanisms have been built into banking sector growth models that help to adjust operational and policy decisions to regular oil price changes. This result appears to be in consonance with previous studies by Muritala (2012). Thus, this study provides evidence that banks in African nations are resilient to mild to moderate oil price volatility. Since primary commodities continue to be the main source of foreign exchange earnings for many SSA countries, the effects of oil price shocks on the economy are considerable. The necessity to develop suitable policies to protect the economy as much as possible from external shocks is becoming increasingly important in a globalised world economy with intricately linked market patterns. This study has put into perspective how the ongoing fluctuations in oil prices may eventually damage the banking industry and the potential contributions of policy to the domestic stabilisation of the banking industry in SSA economies. The study's outline is not comprehensive, but it has demonstrated the wide-ranging impact that oil price volatility has on the banking industry in SSA nations.

The study however established that oil price volatility significantly limits bank performance in the long run irrespective of the measure of bank performance being considered. The study has shown that the profitability of banks shrinks while non-performing loans expand in the economy when oil prices fluctuate more rapidly. The supply and demand sides provide an explanation for the shrinkage. As Presbitero et al. (2020) has noted, the demand for loans for different purposes may reduce when the effect of commodity price volatility hits other segments of the economy who are make up the demand for loans. On the supply side, banks' balance sheets have been known to shrink during periods of commodity price volatility, especially when banks' portfolios are linked with the commodity sector.

These results are consistent with earlier research showing the importance of basic domestic conditions for the stability of the banking sector. For instance, Obadan & Adegboye (2013), Acemoglu et al. (2004), and Kaminsky & Reinhart (1999) have considered the place of weak institutional setups, poor policy applications and unstable regulatory frameworks as major factors that lead to financial sector problems in the African region, including Nigeria. The study also

discovered that any advantages banks can gain from early, mild volatility might be completely erased by the detrimental effects of severe and intense volatility, particularly in terms of the banks' profitability.

Thus, intense volatility erodes efficiency of financial management among banks in SSA countries. This outcome is also in line with the findings by Thomas and Thakur (2020). The overall results obtained from the study are generally in line with previous studies like Ramos and Veiga (2013), and Amidu and Wilson (2014), which showed that on a broad level oil price instability or volatility either limits banking sector expansion, weakens the ability of the sector to withstand external shocks, increases the likelihood for banking sector crises or reduce the level of integration of the financial sector with the international markets.

5. Conclusion and Recommendation

Since primary commodities continue to be the main source of foreign exchange earnings for many SSA countries, the effects of oil price shocks on the economy are considerable. The necessity to develop suitable policies to protect the economy as much as possible from external shocks is becoming increasingly important in a globalised world economy with intricately linked market patterns. This study has put into perspective how the ongoing fluctuations in oil prices may eventually damage the banking industry and the potential contributions of policy to the domestic stabilisation of the banking industry in SSA economies. The study's outline is not comprehensive, but it has demonstrated the wide-ranging impact that oil price volatility has on the banking industry in SSA nations. The nature of the connections between the external and banking sectors, as well as the heightened impact of supply shocks (caused by unstable oil revenues), which consistently undermine the stability of overall economic performance among SSA countries, were the reasons given in this study for the banking sector's poor performance, particularly with regard to loan and overall bank default.

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