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The Long-Run Macroeconomic Determinants of Banks' Performance in Nigeria

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Abstract. Banks and the banking sector of every economy in terms of their intermediation role are regarded as the epicenter of development financing. But due interference of macroeconomic fundamental, the effectiveness and potency of this role can be somewhat hampered. Hence, the focus of this study is to identify the long-run macroeconomic determinants of banks performance, and to empirically model the link between banks and the long-run macroeconomic determinants of their performance. Time series data on both banks performance and macroeconomic indicator for Nigeria for the period 1990 to 2020 were used in validating our models. The study applied the unit root and Johansen cointegration tests in an innovative and robust manner. This study focused on the evaluation and investigation of the long-run macroeconomic determinants of banks performance in Nigeria. This gamut of the body of studies investigating the long-run macroeconomic determinants of the performance of banks in Nigeria is one of the most important because the results obtained from it would highlight the core macroeconomic determinants of the performance of banks in the Nigerian banking sector. This would act as empirical guide to monetary authorities and regulatory institutions when formulating and/or implementing banking sector reforms in particular and policies in general.

Keywords: Banks, Macroeconomic Determinants, Long-run, Nigeria

1. Introduction

The economic and finance literature investigating the determinants of the performance of banks in particular and the banking sector in general has focused principally on either bank-specific or banking industry-level factors. In most cases, the indicators selected and considered often lack well-defined or well-described internal consistency (Athanasoglou, Brissimis, and Delis, 2005), while the affinity between the macroeconomic environment and the performance of the banks caused by macroeconomic indicators was not properly investigated and situated within the contextual purview of such studies.

Sometimes, this is due to the restricted time frame involved in either the panel or time series data used in the econometric modelling process. Besides, the majority of the studies drew inferences and conclusions from the outcomes of the short-run analysis without recourse to the long-run impacts of the macroeconomic variables on the performance of banks and the banking industry. Furthermore, most of the studies adopted econometric estimation techniques that were inappropriate for the dataset used without adequately describing how such methods accommodated special features of long-run bank performance, which presupposes that the estimates obtained from such studies may either be biased or inconsistent with either economic theory or both economic and finance theories.

The literature and studies investigating the sustainable implications of external determinants (henceforth macroeconomic variables) on the long-term performance of banks in the Nigerian banking industry are scarce, sparse, and/or still emerging. Macroeconomic indicators are used in the literature to represent the vectors of the cyclically imposed pattern of behaviour of the economy with regard to how they affect the performance of the banking sector. Hence, the main objective of this current study is to investigate how selected macroeconomic fundamentals affect bank performance in the long run. Furthermore, this study sheds light on the appropriate application of the Johansen cointegration test, with details of its econometric and statistical qualities painstakingly espoused.

The rest of this paper is organised according to the following structure: Section two discusses the existing literature relating to the performance of banks. Section three describes the materials and methods with a special focus on the sources, nature,

and definition of the data used, the estimation techniques, and the model specification. Section four presents our keynote empirical findings, while the last part presents the résumé of the study.

2. Literature Review

The literature on the macroeconomic determinants of banks' performance has essentially focused on the following macroeconomic indicators, among others: unemployment, rate of inflation, growth rate of money supply, output (GDP) or its growth rate, business cycle, etc., and their long-run impacts on banks' performance. However, this study adopted the following macroeconomic indicators: GDP, rate of inflation, and unemployment. The affinity between each of these indicators and banks' performance in Nigeria is highlighted hereunder:

2.1 GDP Versus Banks' Performance Indicators

Zhang and Daly (2014) identified GDP as one of the most commonly adopted macroeconomic variables used to measure the effects of cyclical macroeconomic performance on the banking sector, especially its impact on the demand and supply of loans and deposits. Also, it has been corroborated by Neely and Wheelock (1997), Demirguc-Kunt and Huizinga (1998, 2000), and Sufian and Habibullah (2009) that, during favourable economic conditions, GDP, the annual growth rate of GDP, and GNP per capita will have positive effects on the performance of the earnings of the banking sector. The argument is that, as economic conditions improve, the demand for bank services will also improve, accompanied by reduced credit default risk, culminating in improved asset quality for banks (Laker, 1999; Bikker and Hu, 2002).

Furthermore, St. Clair (2004), using data drawn from the Singapore banking sector, noted that GDP exhibited a very essential, unique, and undeniable impact on the performance of banks. The study observed that as the GDP of Singapore rises, the commercial banks are encouraged to venture into investment areas with greater risks, thereby earning higher profits and hence high performance. Conversely, as the GDP rises, the total expenditure of commercial banks will increase more than the income earned by such banks. Hence, the affinity between GDP and banks' performance has been described as bi-partite in nature (Bikker and Hu, 2002).

2.2 Inflation Versus Banks' Performance Indicators

Revell (1979) was one of the first studies to look into the nature of the relationship between inflation and bank performance. Revell (1979) investigated the macroeconomic affinity between bank performance (represented as the profitability of banks) and the rate of inflation, assuming that the macroeconomic effect of the rate of inflation on banks' performance is a function of whether the wages banks paid and their operating costs rise at a rate faster than that of inflation (Jamel and Mansour, 2018). The major problem with this assumption is that, with a lot of political and institutional interjections, inflation targeting or forecasting by banks and supervisory authorities in the Nigerian economy is very difficult, if not impossible.

Perry (1992), in agreement with Bourke (1989), observed that the macroeconomic impact of inflation on banks' performance depends on whether inflation was expected, anticipated, or spontaneous. If the rate of inflation (*roi*) is adequately anticipated by the management and regulatory authorities of banks, then the revenues of the banking sector can grow faster than the costs of operation, thereby obtaining greater economic profits (Sufian and Habibullah, 2009; Jamel and Mansour, 2018).

However, some studies such as Bourke (1989), Molyneux and Thornton (1992), and Zhang and Daly (2014) have established a long-term positive link between rate of inflation and bank performance (profitability).

Athanasoglou, Brissimis, and Delis (2005) examined the impact of inflation on the successful attainment of the statutory goals of Greek commercial banks using panel data spanning from 1985 to 2001. The fixed and random effects panel data estimation techniques were applied. The *expected rate of inflation* was represented by the actual *rate of inflation* during the previous period. The study established that inflation positively and significantly affected commercial banks' fulfillment of their organizational goals in Greece. The study concluded that the observed positive effect of inflation on the performance of banks is due to the ability of Greece's banks' supervisory and monetary authorities to forecast future inflation, implying that interest rates were appropriately adjusted in consonance with the prevalent *rate of inflation* to achieve higher performance.

2.3 Unemployment Versus Banks' Performance Indicators

The interconnectivity between the rate of unemployment and banks' performance has been considered a very important one because of its link to the banks' operating expenses (Narueviius, 2017). Unemployment has a multifaceted impact on banks' performance. For instance, higher rates of unemployment would compel banks to suspend the increase or reduction in the salaries of employees, while a lower rate of unemployment would encourage employees to opt for better service conditions. Hence, the rate of unemployment and its changes may also be an important determinant of the ability of banks to regulate their operating expenses within certain acceptable thresholds (Trenca, Petra, and Corovei, 2015).

St. Clair (2004) used a number of macroeconomic variables (such as aggregate demand, level of competition, unemployment rate, exchange rates, and interest rate differential) to evaluate the affinity between banks' performance and macroeconomic indicators in Singapore. Specifically, St. Claire (2004) established a positive affinity between the rate of unemployment and non-performing loans in Singapore. The study further observed that, in the banking system, changes in banks' expenditure are more responsive to swings in the rate of unemployment than banks' income.

Gonzalez-Hermosillo, Pazarbasioglu, and Billings (1997) identified GDP growth, unemployment, interest rates, exchange rates, and the level of competition as important macroeconomic determinants of banks' performance. The study evaluated the impacts of these macroeconomic variables on the Mexican financial system and its 1994 financial downturn.

3. Materials and Methods

This section discusses and describes the variables used and adopted in estimating the long-run external / economic determinants of banks' successful attainment of organizational goals in Nigeria. The section discusses the econometric procedure adopted in this study as well.

3.1 Data and Econometric Procedure

The time series data used for this study are annual in nature and were extracted for the period 1980–2020 from the International Monetary Fund (IMF) Financial Soundness Indicators for 2021.

Table 1 : Description and Definition of Data

S/No	Performance Variable	Notation	Description of the Variable
1	Return on Assets before Tax	**ROAB**	This is measured as Net Income for the Year as a quotient of total assets and usually measured as annual mean value. **ROAB** is a performance indicator that is used as a measure of the return on average total assets of the banking sector before tax.
2	Return on Assets after Tax	***ROAA***	***ROAA*** is a performance indicator that is used as a measure of the return on average total assets of the banking sector after tax.
3	Return on Equity before Tax	***ROEB***	Internal Performance measure of Shareholders' value. ***ROEB*** is a performance indicator that is used as a measure of the return on average total equity of the banking sector before tax.
4	Return on Equity after Tax	***ROEA***	***ROEA*** is a performance indicator that is used as a measure of the return on average total equity of the banking sector after tax.
5	Net Interest Margin	**NIRM**	**NIRM** represents net income of the bank as a quotient of the average earning assets of the bank (that is, the difference between interest expense and interest income expressed as a percentage of earning assets).Earning assets include leases, net loans and investments.
	Macroeconomic Variable		
6	Real Gross Domestic Product	***RGDP***	***RGDP*** represents the log of real GDP and it is a proxy for economic activities.
7	Rate of Inflation	***INFL***	***INFL*** is the annual inflation rate.
8	Unemployment	***UMPM***	***UMPM*** is unemployment rate

Source: *Author's Compilation*

Annual data were preferred and applied due to the high frequency volatility associated with banks' quarterly data, whose growth rates are about three times more volatile than annual data (St. Clair, 2004). Annual data possess higher explanatory power due to their lower frequency and volatility (St. Claire, 2004).

Huang (2010) is of the view that bank performance, often measured by either ROA or ROE, has almost always been expressed as a function of both external and internal determinants (this empirical opinion is in consonance with Athanasoglou, Delis, & Staikouras, 2006; Ishioro, 2017).

Return on Assets

ROA has been expressed by some researchers as specified in equation (1):

$$ROA = \frac{NI}{ATA} \quad (1)$$

In equation (1), *NI* represents net income while *ATA* is average total assets.

Of the two performance indicators highlighted above, ROA is a very good measure of the overall performance of the banking sector because it assesses the ability and capability of commercial banks to maximize shareholders' funds to generate profits from their assets. Zhang and Daly (2014) described ROA as an indicator of profits earned per dollar by the bank on the assets accumulated over a specific time frame, and it represents the competence of the management and authorities of the bank to fully utilize both financial and investment resources to obtain the desired performance (Sufian and Habibullah, 2009; Garza-Garcia, 2011).
Furthermore, ROA, according to Hassan and Bashir (2003), is a lucid reflection of the quality of the banks' policies, decisions, and economy-boosting innovative regulations. Rivard and Thomas (1997) identified "the non-dictionary effects of high equity multipliers," usually recorded for banks, as a core merit of applying ROA as a performance indicator. However, ROA is fraught with the problem of not accommodating profits generated from extra-balance-sheet banking activities (Huang, 2010; Athanasoglou, Brissimis, & Delis, 2005; Ayadi & Pujals, 2005).

Return on Equity

ROE is another efficient measure of a bank's performance that is designed to account for the return on the owners' and shareholders' investment (Huang, 2010). Zhang and Daly (2014) have defined ROE as the ratio of net income to the bank's shareholders' equity during its financial year. It is the bank's net income as a percentage of shareholders' funds, and it has been described by the ECB (2010) as the scorecard of how efficiently the bank's authorities manage the resources at their disposal. Hence, ROE is used as a parameter for measuring the performance of shareholders' funds and investments during the financial year. ROE has often been referred to as the "bank's equity multiplier" that measures its financial leverage (Huang, 2010; Athanasoglou, Brissimis & Delis, 2005). The main components of ROE can be mathematically and summarily represented as follows:

$$ROE = \frac{NI}{ATE} = \left[\frac{NI}{PI}\right]\left[\frac{PI}{EBIT}\right]\left[\frac{EBIT}{R}\right]\left[\frac{R}{ATA}\right]\left[\frac{ATA}{ATE}\right] \quad (2)$$

In equation (2),NI represents net income (net income after taxes); ATE represents average total equity (shareholders equity); PI represents Pre-tax income; EBIT represents earnings before interest and taxes; R represents revenue of the banks; and ATA represents average total assets.
But according to Huang (2010), a prominent setback associated with ROE as a measure of performance is that, its denominator vary across banks with similar sizes (Garza-Garcia, 2011).

Net Interest Margin

NIM is a performance indicator that measures the banks' operating performance and concentrates on the profit-earning capacity of the bank's assets or interest-generating activities (Huang, 2010). One of the major advantages of the NIM is that it acts as an unambiguous parameter for ascertaining the performance of banks. For instance, NIM shows that the higher the NIM ratio, the higher the profit margin the bank is expected to obtain and the cheaper the funding of its operations (ECB, 2010).

NIM, on the other hand, is frequently criticized as a too-broad measure because it expands and eventually vents into commercial banks' off-balance-sheet activities (Athanasoglou, Brissimis, & Delis, 2005; Garza-Garcia, 2011; Heffernan & Fu, 2008; Ishioro, 2017).

Market-Based Metrics: Banks Performance Indicators

Market-based metrics of banks' performance are concerned with the manner in which the capital market evaluates and rates the operational activities of the banks and compares them with the accounting (economic) value of the banks (ECB, 2010).

Economic Metrics: Banks Performance Indicators

Economic metrics of banks' performance focus on the development of shareholder value creation within a year from the economic outcomes produced by the bank(s) from its economic assets and the efficiency of banks as a core element of performance (ECB, 2010).

Estimation Technique

Unit Root Test

The unit root testing procedure has become a regular tradition in statistical and econometric analysis of time series data, including bank performance and growth series (Ishioro, 2022c). Unit root tests are required in econometric studies because non-stationary data require special analytical procedures before applying standard econometric techniques (Ishioro, 2020a, 2020b; Maddala, 2002; Diebold and Nerlove, 1990; Cochrane, 1991).

In this study, we are more concerned about the bank performance variables and other macroeconomic fundamentals than we are about GDP or its growth rate because, according to Cochrane (1988), Maddala (2002), Mbabazize, Turyareeba, Ainomugisha, and Rumanzi (2020), and Ishioro (2015a, 2015b, 2018, 2022c), GDP does not quickly revert towards a trend point whenever a shock occurs. Consider these autoregressive models:

$$Y_t = Y_{t-1} + e_t \tag{3}$$

$$Y_t = \theta Y_{t-1} + e_t \qquad |\theta| < 1 \tag{4}$$

In equation (3) and (4) , e_t represents a zero-mean stationary process; Y_{t-1} is the one-period lagged variable of Y_t; and θ is the coefficient of Y_{t-1}. In the two models, the root θ is either equal to unity or less than unity; implying either the presence or otherwise of unit root(Vougas, 2002). This is very important whenever macroeconomic fundamentals and monetary variables are analyzed (Maddala, 2002; Ishioro, 2020a, 2020b).

Pantula Principle of Cointegration

This study applied the Pantula Principle: a modified application of the Johansen (1991, 1995) cointegration test after Ishioro (2019; 2018). The Johansen long-run equilibrium test is designed to ascertain and test the nature of the restrictions imposed on the unrestricted Vector Autoregression (VAR) model by the cointegration mechanism (Ishioro, 2022a and 2022b). The VAR model of order *r* is specified as:

$$Z_t = \vartheta_1 Z_{t-1} + \vartheta_2 Z_{t-2} + \ldots + \vartheta_r Z_{t-r} + \phi W_t + \varepsilon_t \tag{5}$$

ϑ and ϕ are matrices of the VAR coefficients to be estimated in the model. Z_t is a vector representing *P*-non stationary series that are integrated of order one [I(1)]. W_t represents vector of deterministic series (exogenous variables) while ε_t represents the vector of innovations that are correlated contemporaneously with each other. ε_t are uncorrelated with their own past values and the exogenous variables. in the model. We can rewrite the VAR as:

$$\Delta Z_t = \prod Z_{t-1} + \sum_{i=1}^{r-1} \delta_i \Delta Z_{t-i} + \phi W_t + \varepsilon_t \tag{6}$$

In equation (6), $\prod = \sum_{i=1}^{r} \vartheta_i - I, \delta_i = -\sum_{j=i+1} \vartheta_j$

Using equation (5) and (6) as benchmarks, the different models of cointegration are presented as equation (7), (8), (9),(10) and (11).

$$H_2(r): \Pi[Z_{t-i}] + \vartheta[W_t] = \phi\vartheta'[Z_{t-i}] \quad \text{(Model One)} \tag{7}$$

$$H_1^*(r): \Pi[Z_{t-i}] + \vartheta[W_t] = \phi\left[\vartheta' Z_{t-i} + \vartheta_0\right] \quad \text{(Model Two)} \tag{8}$$

$$H_1(r): \Pi[Z_{t-i}] + \vartheta[W_t] = \phi\left[\vartheta' Z_{t-i} + \vartheta_0\right] + \phi_\perp \Gamma_0 \quad \text{(Model Three)} \tag{9}$$

$$H^*(r): \Pi[Z_{t-i}] + \vartheta[W_t] = \phi\left[\vartheta' Z_{t-i} + \vartheta_0 + \vartheta_1 t\right] + \phi_\perp \Gamma_0 \quad \text{(Model Four)} \tag{10}$$

$$H(r): \Pi[Z_{t-i}] + \vartheta[W_t] = \phi\left[\vartheta' Z_{t-i} + \vartheta_0 + \vartheta_1 t\right] + \phi_\perp\left[\Gamma_0 + \Gamma_1 t\right] \quad \text{(Model Five)} \tag{11}$$

$$H_2(r) \subset H_1^*(r) \subset H_1(r) \subset H^*(r) \subset H(r) \tag{12}$$

Model One: Vectors representing the series portrayed as equation (7) have no deterministic trends or components in the time series data but the cointegrating equations do not possess intercepts (no intercept or trend in cointegrating equation or VAR);

Model Two: Vectors representing the series specified in equation (8) have no deterministic trends but the cointegrating equations possess intercepts;

Model Three: Vectors representing the series in equation (9) have linear trend but the cointegrating equations possess only intercepts;

Model Four: Both the vectors representing the series and the cointegrating equations have linear trends as shown in equation (10)

Model Five: The vector representing the series have quadratic trends and the cointegrating equations have linear trends. This is expressed as equation (11). The nested form of the five models is presented as equation (12)

4. Discussion of Results

The outcomes of the estimation of our unit roots and cointegration models are discussed in this section. Those of unit roots are presented first, followed by a discussion of the results of cointegration models.

Table 2: Results of Unit Root Tests

Results of Augmented Dickey Fuller Unit Root Test for Macroeconomic and Banking Sector Indicators								
Series	**GDP**	**INF**	**UNEMP**	**ROAB**	**ROAA**	**ROEB**	**ROEA**	**NIM**
Level	-1.668	-2.185	-2.8128	-4.524***	-1.004	-4.023	-0.413	-3.0406
First Difference	-3.288**	-5.974***	-3.938**	-7.087***	-5.031***	-5.711***	-4.221**	-5.003***
Results of Phillip Perron Unit Root Test for Macroeconomic and Banking Sector Indicators								
Series	**GDP**	**INF**	**UNEMP**	**ROAB**	**ROAA**	**ROEB**	**ROEA**	**NIM**
Level	-1.530	-2.466	-2.238	-4.6180	-1.214	-4.854	-2.003	-2.992
First Difference	-3.751***	-8.006***	-6.825***	-9.672***	-5.211**	-8.281***	-5.042**	-7.921***

Source: *Author's Computation*

NOTE:

The results of the ADF and PP unit root tests show that ROAB was stationary at level, which means that we cannot reject the null hypothesis of stationarity at level for the series. All the other series were not stationary at level, implying that we rejected the null hypothesis of stationarity at level. However, the series were stationary after first differencing, in which case we couldn't reject the null hypothesis of stationarity at first difference. This varied order of integration is one of the reasons and justifications for the application of the Pantula Principle in this study.

Johansen Cointegration Test: Long-run Relationship Between Banks Performance and Macroeconomic Variables

We determine the long-run co-integrating affinity between bank performance and selected macroeconomic variables in Nigeria using the Johansen Cointegration Test. In the econometric literature, it has been empirically accepted that if two variables are cointegrated, there must be at least one-way directional causality between them. Also, the determination of the long-run relationship serves as a check to authenticate if a linear combination of the two series when they are non-stationary can generate stationary series (Ishioro, 2022c).

However, if this happens, the series are said to be cointegrated, implying that in the long run they are significantly related (that is, there is no spontaneous correlation between bank performance and the selected macroeconomic variables).

Results of Return on Assets Versus Macroeconomic Indicators

Table 3 : Results of Return on Assets Before Tax Versus Real Gross Domestic Product

Panel 3A :Results of Return on Assets Before Tax Versus Real Gross Domestic Product						
Cointegration Results of ROAB and Real GDP						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	Alt Hypothesis					
r = 0	r >= 1 None	0.6320	17.1810	15.4947	15.9980	14.2650
r < = 0	r >= 2 At most 1	0.07125	1.18270	3.8415	1.18270	3.8415
Normalized Cointegrating Coefficients of ROAB and Real GDP						
Series	**ROAB**	**Real GDP**				
Coefficients	1.0000	-6.17×10^{-05}				
Standard Errors	None	4.8×10^{-05}				
Panel 3B : Results of Return on Assets Before Tax Versus Inflation						
Cointegration Results of ROAB and INFL						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	Alt Hypothesis					
r = 0	r >= 1 None	0.6021	19.5885	25.8721	14.7454	19.3870

r < = 0 r >= 2 At most 1		0.2612	4.843	12.5180	4.8431	12.5180
Panel 3C :Results of Return on Assets Before Tax Versus Unemployment						
Cointegration Results of ROAB and UNEMP						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
r = 0: r >= 1 None		0.5941	18.986	15.495	15.327	14.265
r < = 0: r >= 2 At most 1		0.1936	3.659	3.841	3.659	3.841
Normalized Cointegrating Coefficients of ROAB and UNEMP						
Series	**ROAB**	**UNEMP**				
	1.000	4.5520(1.2250)				

Source: *Author's Computation*

The cointegrating affinity between ROAB and real Gross Domestic Product was established using one cointegrating equation using both the trace and maximum Eigen value statistics. The results imply the existence of an extended series of affinities between ROAB and real gross domestic product. Furthermore, changes in ROAB (however defined) would have an impact on real GDP and vice versa. As a result, both ROAB and real GDP have a proclivity to move towards a common extended series of equilibrium.

We normalized the cointegrating vector on real GDP to specifically identify the nature of the extended series of relationships. The results show that real GDP has a positive sign, which means that as real economic activities improve, the ROAB will experience an improvement as well. Therefore, we conclude that real GDP is a potent determinant of the performance of the return on assets before tax.

Return on Assets Before Tax Versus Inflation

Using the modified Pantula Principle, we confirmed that the restricted intercepts without trends are the most appropriate assumption for the estimation of the deterministic components of the affinity between ROAB and inflation in Nigeria. The results show that there is no cointegrating affinity between return on assets before tax and inflation during the period under consideration (using the five cointegrating models: models one to five). The extended series of affinity between ROAB and inflation was not responsive to changes and variations in ROAB (inflation) and inflation (return on assets before tax), which has policy implications.

Results of Return on Assets Before Tax Versus Unemployment

The results of the extended series of affinity tests between return on assets before tax and unemployment show one cointegrating equation. This confirms the existence of a unique long-run affinity between ROAB and unemployment. But the normalized cointegrating coefficient indicated an extended negative series of affinity between them. The coefficient of unemployment suggests that a 1 percent increase in the rate of unemployment would reduce the performance of the ROAB by about 445 percentage points. This means that an increase in the unemployment rate is bad for bank performance, but only in the long run and only on the return on assets before tax.

Return on Assets After Tax Versus Real Gross Domestic Product

Using the Modified Pantula Principle, we confirmed based on the results displayed in the table that "no deterministic trend and restricted constant" is the most appropriate assumption about the deterministic component of the analysis of the return on assets after tax versus real Gross Domestic Product. Using both the trace statistic and the maximum Eigen value, our results established the existence of one cointegrating equation between return on assets after tax and real GDP at a 5 percent level of significance. Also, it connotes the existence of an extended series of affinities between the variables.

Results of Return on Assets After Tax Versus Macroeconomic Indicators

Table 4: Results of Return on Assets After Tax Versus Real Gross Domestic Product

Panel 4A :Results of Return on Assets After Tax Versus Real Gross Domestic Product						
Cointegration Results of ROAA and Real GDP						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null Alt Hypothesis						
r = 0 r >= 1 None		0.6687	22.9578	20.2618	17.6743	15.8921
r < = 0 r >= 2 At most 1		0.2812	5.2834	9.1645	5.2834	9.1645
Normalized Cointegrating Coefficients of ROAA and Real GDP						

Series	**ROAA**	**Real GDP**		**C**		
Coefficients	1.000	-8.29×10^{-05}		-6.8074		
Standard Errors	None	4.9×10^{-05}		2.0747		
Panel 4B : Results of Return on Assets After Tax Versus Inflation						
Cointegration Results of ROAA and INFL						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	**Alt Hypothesis**					
r = 0	r >= 1 None	0.5952	19.2727	25.8721	14.4718	19.3870
r < = 0	r >= 2 At most 1	0.2592	4.8008	12.5180	4.8008	12.5180
Panel 4C :Results of Return on Assets After Tax Versus Unemployment						
Cointegration Results of ROAA and UNEMP						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	**Alt Hypothesis**					
r = 0:	r >= 1 None	0.830	**24.575****	22.0201	**34.1824****	11.225
r < = 0:	r >= 2 At most 1	0.0013	**0.2428**	4.130	0.2428	4.130
Normalized Cointegrating Coefficients of ROAA and UNEMP						
Series	**ROAA**	**UNEMP**				
	1.0000	$-0.04107(1.3 \times 10^{5})$				

Source: *Author's Computation*

We normalized the cointegrating vector on real GDP to determine the exact extended nature of the series of relationships. The coefficient of real GDP (-0.0000829) implies that, for every one percentage point increase in the economic activities of economic agents and decision-making units of the economy, the ROAA would increase sluggishly by 0.0000829, indicating a positive extended series of relationships with return on assets after tax. The results mean that as the tempo of economic activities heightens, the performance of the ROAA improves, albeit sluggishly.

This has serious policy implications for both banks' management and regulatory authorities. Because there is a positive extended series of affinity between ROAA and real GDP, any adverse banking sector reform policy that slows ROAA performance will have a negative extended series of impact on real GDP and vice versa.

Return on Assets After Tax Versus Inflation

The results of the modified Pantula Principle authenticated that the most appropriate assumption for the estimation of the deterministic components of the affinity between return on assets after tax and inflation in Nigeria is the Johansen cointegration model with restricted intercepts without trends. The results show that there is no cointegrating affinity between return on assets after tax and inflation during the period under consideration (using all the cointegrating models: models one to five). One of the main policy implications of our result is that the extended series of affinity between return on assets (after tax) and inflation was not responsive to variations in the performance of return on assets after tax and inflation; that is, both variables are not the long-run determinants of each other.

Return on Assets After Tax Versus Unemployment

The modified Pantula principle results show one cointegrating equation when examining the extended series of affinity between return on assets after tax and unemployment. This is a confirmation of the existence of a long-run cointegrating affinity between return on assets after tax and unemployment. However, the normalized cointegrating coefficient of unemployment indicated the existence of an extended positive series of affinities between the bank and the macroeconomic indicators. The coefficient of unemployment suggests that a one percent positive variation in unemployment would increase the performance of the return on assets of banks after tax by about 0.041 percentage points. This means that a rise in the rate of unemployment enhances the performance of the return on assets and banks (but only in the long run and only on the return on assets after tax). It further authenticates unemployment as a long-run macroeconomic determinant of the return on assets after tax in Nigeria.

Return on Equity Before Tax Versus Macroeconomic Indicators

Table 5: Results of Return on Equity Before Tax Versus Real Gross Domestic Product

Panel 5A :Results of Return on Equity Before Tax Versus Real Gross Domestic Product						
Cointegration Results of ROEB and Real GDP						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	Alt Hypothesis					
r = 0	r >= 1 None	0.8393	**36.8575**	18.3977	**29.2514**	17.1477
r < = 0	r >= 2 At most 1	0.3783	**7.6060**	3.8414	**7.6060**	3.8414
Normalized Cointegrating Coefficients of ROEB and Real GDP						
Series	**ROEB**	**Real GDP**				
Coefficients	1.0000	-0.001137				
Standard Errors	None	(7.6×10^{-03})				
Panel 5B : Results of Return on Equity Before Tax Versus Inflation						
Cointegration Results of ROEA and INFL						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	**Alt Hypothesis**					
r = 0	r >= 1 None	0.5909	**22.8240**	15.4947	**14.3025**	14.2646
r < = 0	r >= 2 At most 1	0.4055	**8.3215**	3.8414	**8.3215**	3.8414
Normalized Cointegrating Coefficients of ROEB and INFL						
Series	**ROEB**	**INF**				
Coefficients	1.0000	-0.5715				
Standard Errors	None	(0.7391)				
Panel 5C :Results of Return on Equity Before Tax Versus Unemployment						
Cointegration Results of ROEB and UNEMP						
Hypothesized No. of CE(s)		**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	**Alt Hypothesis**					
r = 0:	r >= 1 None	0.3490	12.139	15.494	7.720	14.264
r < = 0:	r >= 2 At most 1	0.2180	4.418	3.841	4.418	3.841

Source: *Author's Computation*

Results of Return on Equity Before Tax Versus Real Gross Domestic Product

The results of the modified Pantula Principle generated from the Johansen cointegration confirmed the quadratic deterministic trend as the most suitable assumption for the estimation of the extended series of affinity between return on equity before tax and real output in Nigeria. Furthermore, the results identified one cointegrating vector between return on equity before tax and real output using the benchmarks of both the trace statistics and maximum Eigen values. The implication of the results is that any policy that is designed or formulated to reduce the performance of output in the long run would lead to a decrease in the performance of the return on equity before tax in the long run.

To identify the type of extended series of relationship existing between the variables, we normalized the coefficient of the cointegrating vector and established that there is a positive extended series of affinity between return on equity before tax and real output in Nigeria. This means that real output is a positive long-run macroeconomic determinant of the return on equity before tax in particular and bank performance in general.

Results of Return on Equity Before Tax Versus Inflation

The results of the cointegration test of the affinity between return on equity before tax and inflation show the existence of two cointegrating equations, that is, both return on equity before tax and inflation tend to a long-run equilibrium. This depicts the existence of extended series of co-movement, co-variation, and *co-change*. In specific terms, when we normalize the cointegrating vector of inflation on the return on equity before tax, the coefficient of inflation has a positive sign. The sign of the coefficient shows that, if inflation in the economy rises by a percentage point, the return on equity before tax (representing the banking sector) would increase by about 57 percent.
Our results are in agreement with both theoretical expectations and the findings of Athanasoglou, Brissimis, and Delis (2005) and Huang (2010), who established that as the rate of inflation in the economy increases, banks' performance increases commensurately, leading to high income earned by the banks.

Return on Equity Versus Real Gross Domestic Product

Table 6: Results of Return on Equity After Tax Versus Real Gross Domestic Product

Cointegration Results of ROEA and Real GDP						
Hypothesized No. of CE(s)			**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	Alt Hypothesis						
r = 0	r > = 1	None	0.6459	25.1260	20.1259	16.6125	15.8921
r < = 0	r > = 2	At most 1	0.4126	8.5134	9.1646	8.5134	9.1645
Normalized Cointegrating Coefficients of ROEA and Real GDP							
Series	**ROEA**	**Real GDP**	**Constant**				
Coefficients	1.0000	-4.40E-05	-18.4317				
Standard Errors	None	(6.0E-05)	(2.3921)				

Source: *Author's Computation using Eviews 10.1*

The results of the cointegrating extended series of affinity between return on equity after tax and real GDP shown in Table 6 confirmed the existence of one cointegrating equation, implying that there is a unique long-run affinity between return on equity after tax and real GDP. But the results of the normalized cointegrating coefficient indicate the existence of an extended positive series of affinity between return on equity after tax and real GDP. Specifically, the coefficient of real GDP seems to suggest that a 1 percent increase in real GDP would boost the performance of the return on equity after tax by about 0.0000445 percentage points. This means that a rise in real GDP is not detrimental to the performance of banks (but only in the long run and only on return on equity after tax). Furthermore, it means that real GDP is a long-run macroeconomic determinant of the performance of banks in Nigeria through its positive impact on the return on equity after tax.

Net Interest Margin Versus Macroeconomic Indicators

Table 7 : Results of Net Interest Margin Versus Real Gross Domestic Product

Panel 7A :Results of Net Interest Margin Versus Real Gross Domestic Product							
Cointegration Results of NIM and Real GDP							
Hypothesized No. of CE(s)			**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	Alt Hypothesis						
r = 0	r >= 1	None	0.5658	15.4947	**16.0802**	**13.3472**	14.2646
r < = 0	r >= 2	At most 1	0.1570	**2.7329**	3.8415	**2.7329**	3.8415
Panel 7B : Results of Net Interest Margin Versus Inflation							
Cointegration Results of NIM and INFL							
Hypothesized No. of CE(s)			**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	**Alt Hypothesis**						
r = 0	r >= 1	None	0.5128	12.9310	12.3209	11.5062	11.2248
r < = 0	r >= 2	At most 1	0.08519	1.4247	4.1299	1.4247	4.1299
Normalized Cointegrating Coefficients of NIM and INFL							
Series	**NIM**	**INFL**					
Coefficients	1.0000	-0.7025					
Standard Errors	None	(0.01891)					
Panel 7C :Results of Net Interest Margin Versus Unemployment							
Cointegration Results of NIM and UNEMP							
Hypothesized No. of CE(s)			**Eigen Value**	**Trace Statistics**	**0.05 Critical Value**	**Max. Eigen Statistic**	**0.05 Critical Value**
Null	**Alt Hypothesis**						
r = 0:	r >= 1	None	0.3421	**12.7802**	15.4947	**7.5373**	14.2646
r < = 0:	r >= 2	At most 1	0.2527	**5.2429**	3.8415	**5.2429**	3.8415

Source: *Author's Computation*

Results of Net Interest Margin Versus Real Gross Domestic Product

The results of the long-run cointegrating affinity between the bank net interest rate margin and real GDP using the model with a linear deterministic trend displayed in Panel 7A of Table 7 indicated the absence of a cointegrating equation. That is, no extended series of relationships exists between the net interest rate margin and real GDP. The long-run implication of our result is that, as the rate of real GDP rises, the performance of the banking sector is

neither hampered nor advanced (connoting the existence of a neutral long-run relationship). We concluded from this study that the performance of the banking sector, particularly NIM, is real GDP effect-neutral during the period under consideration. It means that real GDP is not a long-run macroeconomic determinant of the performance of banks' NIM in Nigeria.

Results of Net Interest Margin Versus Inflation

The results of the cointegration test of the affinity between NIM and inflation displayed in Panel 7B of Table 7 show the existence of one cointegrating equation, that is, both NIM and inflation tend to a common long-run equilibrium. This implies the existence of a long series of co-movement and the effect of one variable on the other. To be specific about the nature of the extended series of relationships, we normalized the cointegrating vector NIM on inflation; the coefficient of inflation has a positive sign. The sign of the coefficient indicated that, as inflation increases by a percentage point, the NIM (which represents the banking sector's operating performance and the earning capacity of the banks' assets and interest-earning activities) increases by about 70 percent. As NIM improves due to the heightening of inflation, the profit margins of the banks become higher, leading to lower operation costs. Our results are in consonance with the findings of Athanasoglou, Brissimis, and Delis (2005) and Huang (2010), who established that as the rate of inflation in the economy takes a serious toll and assumes sinister dimensions, the interest rate on bank loans increases, leading to high income earned by the banks.

Results of Net Interest Margin Versus Unemployment

The results of the extended series of affinity between bank net interest rate margin and unemployment using a linear deterministic trend displayed in Panel 7C of Table 7 indicated no cointegrating equation. That is, no extended series of relationships exist between them. The long-run implication of our result is that, as the rate of unemployment increases, the performance of the banking sector is not hampered (implying a neutral extended series of relationships). As a result of this research, we concluded that the banking sector's performance was unemployment-free during the time period under consideration. Our findings differed significantly from those of most previous studies, such as Hefferman and Fu's (2008), which found a long series of negative associations between unemployment and the net interest rate margin.

5. Conclusion

This study evaluated and investigated the long-run macroeconomic determinants of commercial banks' performance in Nigeria from 1990 to 2020. Essentially, studies investigating the long-term macroeconomic determinants of bank performance in Nigeria are classified as some of the most important because of the policy implications of the results obtained from such studies, which would assist in identifying and highlighting the principal macroeconomic determinants of bank performance in the Nigerian banking sector (the sector that is one of the most patronized in the Nigerian economy). Our findings would act as empirical signposts to monetary authorities and regulatory institutions during the process of formulating and/or implementing banking sector reforms in particular and banking and financial sector policies in general. Specifically, the results of the extended series of affinity between ROAA and ROAB (before and after tax) and real GDP established the existence of a unique positive extended series of affinity between them. The results suggest that real GDP has a long-run positive macroeconomic impact on the ROAA and ROAB (before and after tax).

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