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Pre and Post Treasury Single Account (TSA) Implementation and the Nigeria's Macroeconomic Performance

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Abstract

The paper examined the impact of pre- and post-TSA implementation on Nigeria's macroeconomic performance. Robust regression estimates were used to analyze the sensitivity of both pre-TSA and post-TSA periods to three macroeconomic performance measures in Nigeria between 2007 and 2014 and 2015 and 2022, respectively. Meanwhile, a paired sample t-test was employed to determine whether the mean values of government total revenue, exchange rate, interest rate, and per capita income differed significantly. The results confirmed that federal government aggregate revenue plays a significant role in influencing Nigeria's macroeconomic performance. Additionally, the mean GTR increased from $8565.95 billion in the pre-TSA period to $9151.93 billion in the post-TSA period. However, this increase was not statistically significant, likely due to delays in TSA implementation. The exchange rate rose significantly, suggesting a notable devaluation of the Nigerian currency. Hence, it is imperative for the government to further strengthen the mechanisms of the TSA.

Keywords: *Treasury Single Account, Consolidated Revenue, Exchange Rate, Interest Rate, Per Capita Income (PCI).*

Introduction

The Treasury Single Account (TSA) program was initiated by past administrations of Nigeria's leaders and was fully implemented in 2015. The primary goal of the TSA is to consolidate government funds held in Nigeria's financial records with commercial banks under the control of the Central Bank of Nigeria (CBN). This aims to establish a centralized, transparent, and accountable system for managing revenue in the country. Additionally, the TSA seeks to ensure the availability of cash, maximize the savings of inactive funds, and eliminate loopholes in the revenue generation of the Federal Government. Under the TSA, all government revenue, receipts (incomes), and payments of Ministries, Departments, and Agencies (MDAs) are pooled into a single bank account managed by the CBN. Prior to this, MDAs administered their funds as self-governing entities and forwarded revenue to government treasuries at their discretion. This practice led to a heavy reliance on crude oil revenue, with substantial revenue losses annually, which hindered the government's ability to provide adequate security for lives and property, and to optimally distribute resources and infrastructure for improved living standards. It is believed that Nigeria should have had a stabilized economy by now to enhance the per capita income (PCI) of its citizens. However, Nigeria is still grappling with high exchange rate instability, high interest rates, hyperinflation, and low Gross Domestic Product (GDP), which continue to affect the economy.

Similarly, Paulson (2024) observed that the inflation rate in Nigeria, starting from January 2024, has risen to a high of about 29.9%, the highest recorded since 1996. Additionally, Nigeria's currency further depreciated to ₦1,500 per dollar, representing a 200% loss in the value of the naira compared to previous years.

The adoption and implementation of the TSA is one of the most commendable projects the Nigerian government has undertaken, aimed at combating corruption and closing revenue leakages to expand the country's revenue sources. A study conducted by Lodikero, Fagboyimu, and Olateru (2018) on the impact

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of the TSA on responsibility and transparency in Nigeria's public sector found that the TSA has the capacity to eliminate monetary leakages in the open sector. Additionally, Ivungu, Ganyam, Agbo, and Ota (2020) evaluated the effect of the TSA on corruption affecting Nigeria's economy. Data was acquired from Transparency International and analyzed using a T-test. The findings revealed an insignificant difference between the TSA and the Corruption Perception Index. After nine years of TSA implementation, the total revenue generated under the TSA has not significantly transformed Nigeria's economic fortunes.

Although the adoption of the TSA was expected to reduce revenue leakages, many prior researchers have focused on the extent to which TSA adoption affects Nigeria's macroeconomic performance. The current study deviates from prior research by suggesting that conflicting findings in previous studies may be due to variations in methodologies, time periods, and data sources. Moreover, the current study posits that the TSA may have been implemented hastily without adequate country-specific empirical evidence supporting its underlying philosophy. Therefore, this study seeks to:

Determine the extent to which TSA (total revenue) affects the exchange rate in Nigeria;

Ascertain the extent to which TSA (total revenue) affects interest rates in Nigeria;

Examine the extent to which TSA (total revenue) affects per capita income in Nigeria;

Determine if the mean government total revenue differs significantly between pre-TSA and post-TSA periods;

Examine if the mean exchange rate differs significantly between pre-TSA and post-TSA periods;

Ascertain if the mean interest rate differs significantly between pre-TSA and post-TSA periods;

Determine if the mean per capita income differs significantly between pre-TSA and post-TSA periods.

Literature Review

The TSA is a consolidated (centralized) arrangement where the administrative accounts of federal institutions with commercial banks are kept with the Central Bank of Nigeria (CBN). All payments and receipt transactions with the government are unified to provide comprehensive scrutiny of the government's currency situation at any given moment. The purpose of implementing TSA in Nigeria is to block all leakages of government revenue, promote transparency, accountability, and reduce corruption in order to enhance economic growth and development. Ndifreke and Benjamin (2021) found that the TSA policy not only enhances effective and efficient financial management but also promotes transparency in funding in Nigeria.

One of the conventional measures of TSA is government total revenue. Government total revenue consists of funds generated from all sources, including direct and indirect taxes, sales of crude oil, fines, penalties, and other government investments. A major portion of Nigeria's revenue comes from oil, and over-dependence on it has been a significant problem. Fluctuations in international markets often result in budgetary deficits, leading to deficit financing and reduced fiscal expansion and growth. In a study conducted by Ugherughe and Ewiwile (2020) on income tax and financial increases in the country's economy, a substantial link between total revenue and GDP growth was observed.

The primary reason for implementing TSA was to reduce financial leakages by ensuring relative macroeconomic stability. Three principal macroeconomic performance variables are the exchange rate, interest rate, and per capita income. Firstly, the exchange rate refers to a nation's currency used for buying and selling activities in another country's legal tender. The strength or weakness of a country's currency is relative and depends on its purchasing power compared to other currencies. When a country's currency is weak and cannot sufficiently match with the exchanging country in the international market, it often leads to currency devaluation. In Nigeria's case, the official exchange rate was ₦1,500 to $1 as at January 2024.

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These results in high costs of goods and services from other countries, contributing to inflation, reduced per capita income (PCI) for Nigerians, and slow economic growth. Ewiwile (2020) reported a significant relationship between external debt profiles and the exchange rate.

Interest rate is the rate at which a lender charges a percentage on the principal money borrowed. For a savings account, banks calculate a certain percentage interest rate and credit customers' accounts for the cost of the money loaned. When dealing with physical assets, interest rates can be charged on simple interest, calculated as: Principal x Rate *Time (Year). However, the study used the prime lending rate to measure interest rates. Lastly, per capita income measures the average income per person in a particular country over a given time period. It is used primarily to calculate and present the standard of living and quality of life in a country. Ewiwile, Ugherughe, and Ojoh (2020) found a significant relationship between government revenue and per capita income.

Available data from the CBN statistical bulletin (2022) revealed that the aggregate federal government revenue amounted to *$*68,527.6 billion from 2007 to 2014. Overall, the aggregate federal government revenue moves in upward downward trend throughout the pre-TSA periods. This suggests that before TSA periods (2007-2014), government revenue dwindled throughout the periods. This rationalized why TSA was introduced to address financial leakages. However, the total revenue generated increased throughout the Post-TSA periods (2015-2022). This evidenced that the goal of TSA in reducing revenue leakages was achieved.

Similarly, Exchange Rate (₦/$) was still not relatively stable within the periods. The available evidenced further confirmed that in 2007, it cost ₦125.83 to purchase a dollar but as at 2014, it rose to ₦ 158.55 to purchase a dollar. However, the Naira continues to lose it value while foreign currency (US dollar) continues to appreciate. The rise in US dollar suggests that it is relatively expensive for Nigerians to purchase a dollar. This further underscores that Nigerian currency continued to depreciate throughout the pre-TSA periods. Possible attributable factors that may have cause this include the devaluation of the Nigerian currency, multiple exchanges, high demand for foreign currency, and high import penetration amongst others (Agbogun & Ehiedu, 2022).

The available data further confirmed that, the interest rate (%) falls within single and double digit on year-on-year basis suggesting intense government efforts to reduce the financing cost according to changes in economic conditions. Meanwhile, per capital income-PCI ($' billion) as at *$*494 billion in 2007 but rose to *$*1652 billion was at 2014. The rise per capital income ($' billion) suggests rise in standard of living. The PCI was more relatively stable in the Post-TSA periods (2015-2022) than in the pre-TSA periods (2007-2014)

Table 1: Government Total Revenue and Nigeria's Macroeconomic Performance (Pre-TSA)

Year	Government Total Revenue (*$' Billion*)	Exchange Rate (₦/$)	Interest Rate (%)	Per Capital Income (*$' Billion*)
2007	7866.6	125.83	9.49	494
2008	4844.6	118.57	11.86	563
2009	7303.7	148.88	12.63	583
2010	11116.8	150.3	2.46	734
2011	10654.7	153.86	2.4	787
2012	9759.8	157.5	7.62	993
2013	10068.9	157.31	6.71	1250
2014	6912.5	158.55	9.89	1652
Total	**68,527.6**	**1170.8**	**63.06**	**7056**

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Table 2: Government Total Revenue and Nigeria's Macroeconomic Performance (Post-TSA)

Year	Government Total Revenue (*$' Billion*)	Exchange Rate (₦/$)	Interest Rate (%)	Per Capital Income (*$' Billion*)
2015	5616.4	193.28	8.26	1876
2016	7444.8	253.49	5.46	2228
2017	9544.3	305.79	7.78	1942
2018	9819.8	306.08	8.85	2126
2019	8569.2	306.92	9.67	2334
2020	9291.4	358.81	9.9	2075
2021	10343	400.24	9.77	2066
2022	12586.5	425.98	9.5	2163
Total	**73215.4**	**2550.59**	**69.19**	**16810**

Source: CBN Statistical Bulletin (2022)

Government Total Revenue and Exchange Rate (EXCR)

Government total revenue consists of revenue collected from all sources, including direct and indirect taxes, levies, fines, penalties, sales of crude oil, and other government investments. The aggregate of all these funds form the total revenue. The amount of revenue collectible by the government determines the funds available for meeting obligations to citizens as well as investing in infrastructure and other capital projects that promote economic growth and development. Ezeala and Agbata (2022) reported that TSA significantly improves government debt performance but had an insignificant effect on the exchange rate.

Government Total Revenue and Interest Rate (INTR)

The government, through CBN monetary policies, pumps money into circulation by lending to commercial banks at an interest rate. These commercial banks, in turn, lend to individuals, corporations, and enterprises at their own interest rates. The interest rates fixed by the CBN and various commercial banks determine the level of funds available for economic purposes. In the study by Doron and Penman (2003) on the effects of changes in interest rates, earnings, and equity value, a significant effect of interest rates on earnings was observed.

Government Total Revenue and Per Capita Income

Per capita income is an index that shows the average income an individual earns per person in a country, which reflects the livelihood and value of citizens' lives. PCI can also be used as a metric by policymakers to determine the economic well-being (standard of living) of the citizenry. A higher PCI indicates a higher standard of living. Ogbonna (2016) discovered a significant effect of personal income tax on the per capita income of Nigerians. The introduction of TSA aimed to block financial leakages with the intent to increase Nigeria's PCI. By centralizing all government revenues and expenditures, TSA helps prevent revenue leakages and ensures that public funds are used to provide essential public goods, which, in turn, has the potential to increase PCI.

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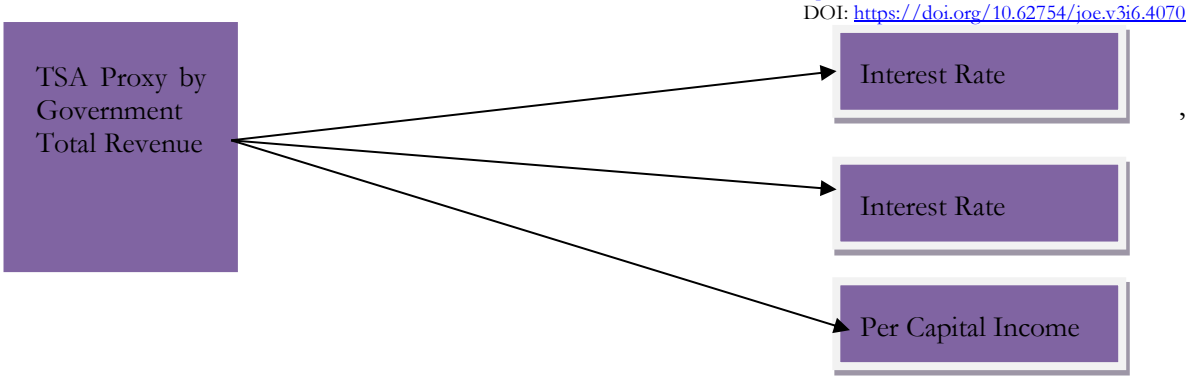

Figure 1: TSA and the Nigeria's Macroeconomic Performance

Source: Researchers' Compilation (2024)

Theoretical Review

This paper is grounded in the theory of Public Financial Management (PFM). Although PFM is a well-regarded theory in development economics and finance, it cannot be traced to a single theorist or year of origin. Instead, it has evolved through various historical periods and economic reforms, influenced by numerous economic experts and international organizations. The core tenet of this theory is to ensure accountability, enhance the management of public resources, and promote transparency.

This theory has practical implications for the Nigerian economy. Specifically, it highlights the need to understand the interaction between the Treasury Single Account (TSA), exchange rates, interest rates, and per capita income before developing public financial management strategies. This understanding allows policymakers in Nigeria to better manage public resources (funds) and address economic challenges arising from interest rate and exchange rate volatility, and low per capita income, by incorporating these interactions into the Nigerian economic framework.

Empirical Review

Amaefule and Bangbon (2019) examined TSA and the performance recorded by the Federal Government of Nigeria in terms of economic growth. A pre-post analysis using performance indices was conducted. Data were obtained from the CBN statistical bulletin, reported quarterly, and analyzed using E-Views statistical tools. The study found that TSA significantly affected income generation in Nigeria.

Gbegi et al. (2019) reported that the adoption of TSA had an insignificant effect on bank performance. Using the t-test, Olaoye and Talabi (2019) discovered that TSA had an insignificant effect on bank profitability. In contrast, Yusuf (2016) demonstrated that TSA mitigates financial loopholes, enhances openness, and ensures accountability in Nigeria's MDAs.

Ocheni (2016) reported that TSA policy had a minimal effect on national revenue generation based on information gathered from 234 top and lower management officials of MDAs, commercial banks, and CBN officials. Obara et al. (2020) examined the pre-post effect relationship of TSA and economic development in Nigeria using a meta-analysis method. Findings revealed that TSA implementation had an insignificant effect on government revenue generation.

Arumona, Lambe, and Lawal (2022) studied the effect of TSA on Nigeria's public sector management. Data were sourced from the CBN statistical bulletin and economic reports. Data analysis was conducted using a statistical package, E-Views. Results indicated that TSA had an insignificant effect on income generated by the government.

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Conversely, Iloeje and Okowo (2022) investigated the influence of TSA on public funding administration in Nigeria's economy, utilizing data from the CBN statistical bulletin and Transparency International. T-Test statistical techniques were employed for data analysis. Results showed that TSA had an insignificant effect on government revenue.

Olajumoke et al. (2023) assessed the effect of TSA on the management of listed Nigerian Deposit Money Banks (DMBs). Data were obtained from CBN numerical official statements and analyzed using correlation analysis. Findings revealed that the implementation of TSA affected DMB performance in terms of working capital management.

Okoh et al. (2021) examined the effect of TSA policy on Nigeria's public sector. Variables considered included TSA, Human Development Index (HDI), Gini coefficient, and poverty rate. Data were sourced from the CBN statistical bulletin and analyzed using paired sample t-tests. Results revealed that the Gini coefficient and poverty rate had an insignificant effect on TSA implementation, except for HDI.

Igbekoyi (2022) investigated the influence TSA had on Nigeria's monetary strength. Data were acquired from the CBN statistical bulletin and processed with both descriptive and inferential statistics. Findings demonstrated that TSA had a minimal effect on government debt performance but significantly affected commercial bank advances.

Abubakar et al. (2019) investigated the effect of TSA on Nigerian banks' liquidity using robust techniques for data analysis. Findings revealed that TSA significantly affected banks' liquidity and interest rates in Nigeria.

From the literature reviewed, various gaps were identified that make the current study stand out. First, the studies show inconsistent findings; while some empirical studies (e.g., Amaefule&Bangbon, 2019) found significant effects on income generation, others (e.g., Arumona, Lambe&Lawal, 2022) reported insignificant effects. The current study addresses this gap by emphasizing that these conflicting findings are due to variations in methodologies, time periods, and data sources. While Gbegi et al. (2019) and Olaoye and Talabi (2019) used t-tests, other studies employed meta-analysis, regression analysis, and correlation analysis. However, none of the previous research utilized robust regression analysis, which is introduced in this paper to address methodological weaknesses. Consequently, many results from previous studies were not sensitive to outliers or violations of classical OLS assumptions, such as homoscedasticity and normality of residuals. This paper compares our results with those of prior studies to validate the consistency of our findings.

Another significant gap addressed by the current research is the data period. While this study extends to 2022, prior studies used data up to earlier years (see Gbegi et al., 2019, or Iloeje and Okowo, 2022). This research incorporates current economic trends and conditions, alongside policy changes, to analyze the impact of TSA adoption—an aspect that earlier studies did not consider.

Additionally, most previous studies focused on the impact of TSA on economic growth, bank performance, and government debt, without examining the interplay between TSA and interest rates, exchange rates, and per capita income. This study explores these relationships and the interactions between these variables.

Lastly, while some of the studies reviewed provided insights into policy implications, others focused mainly on empirical findings. This study bridges this gap by offering practical recommendations for policymakers based on our analysis. It also highlights how our findings can influence TSA-related policies and reforms.

Research Methods

This study used an *ex-post* facto research design to examine the dynamics linked with certain behaviours by analyzing past events or existing conditions. Secondary data related to the regressors and regressand were collected from the CBN statistical bulletin from 2007 to 2022, covering pre-TSA (2007-2014) and post-TSA (2015-2022) implementation periods in Nigeria. The selected periods of eight years for pre-TSA

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adoption were used to provide a balanced time series for comparison with the post-TSA adoption period. The chosen periods are significant both in the Nigerian and global contexts, as they encompass fragmented and inefficient financial management practices, technological integration, global economic downturns, financial sector reforms, and also marked global events such as geopolitical uncertainties, trade tensions, and the COVID-19 pandemic. Notably, the division into pre- and post-TSA periods justifies why international organizations such as the World Bank and the International Monetary Fund (IMF) advocated for economic reforms like TSA to address public sector inefficiencies by reducing financial leakages.

The method of data analysis involved econometric techniques, including robust regression analysis and paired sample t-tests. Robust regression analysis was used to test the extent to which TSA affects macroeconomic performance variables (exchange rate, interest rate, and per capita income) individually. This method was introduced to address the methodological weaknesses of previous studies. The paired sample t-test was used to compare whether the means of exchange rate, interest rate, and per capita income differ significantly between the pre- and post-TSA periods. Preliminary statistics conducted included summary statistics, unit-root tests, and multicollinearity tests.

The empirical model is based on the Public Financial Management (PFM) theory stated earlier. The various forms of the model are presented as follows:

Simplified Equation (Functional) Form:

Under the functional form (f), exchange rate (EXCR), interest rate (INTR), and per capita income (PCI) are expressed as functions (f) of government total revenue (GTR). They are presented in equations 1 to 3.

$$\text{INTR} = f(\text{GTR}) \quad (1)$$

$$\text{EXCR} = f(\text{GTR}) \quad (2)$$

$$\text{PCI} = f(\text{GTR}) \quad (3)$$

Expanded (Econometric) Form

As an extension of the functional form (f), the econometric form was introduced to convert theoretical relationships into quantifiable and testable forms, while also providing empirical validation through statistical testing. Additionally, the econometric form incorporates error terms (Ut) to account for randomness. These are presented in equations 4 to 6:

$$INTR_t = \beta_0 + GTR + U_t \quad (4)$$

$$EXCR_t = \beta_0 + GTR + U_t \quad (5)$$

$$PCI_t = \beta_0 + GTR + U_t \quad (6)$$

Log Form

To ensure that the variables are in the same order, TSA and per capita income were logged (log). The log form is expressed as follows:

$$INTR_t = \beta_0 + logGTR + U_t \quad (7)$$

$$EXCR_t = \beta_0 + logGTR + U_t \quad (8)$$

$$logPCI_t = \beta_0 + logGTR + U_t \quad (9)$$

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Paired Sample T-Test Specification

The paired sample t-test was introduced to determine whether the means of exchange rate, interest rate, and per capita income differ significantly between the pre- and post-TSA periods. This approach was adapted from the empirical studies of Enakirerhi, Ewiwile, and Wobo (2022), and is stated in equation 10:

$$t = \frac{\hat{x}_1 - \hat{x}_2}{\sqrt{\left(\frac{s_1^1}{n_1} + \frac{s_2^2}{n_2}\right)}}$$

Where:

$\hat{x_1} and \hat{x_2}$ are the sample mean/average of GTR, EXCR, INTR and PCI in pre and post-TSA periods.

$s^1{}_2$and $s^2{}_2$ are the variance values of GTR, EXCR, INTR and PCI inpre and post-TSA periods.

$n_1$and n_2 are the sample size (observations) for both periods

The statistical software used for analyzing the sourced data was STATA 13.0. STATA is a user-friendly and highly intuitive statistical package.

Table 1: Variable Measurement

Variables	Abbreviation	Nature	Measurement	Theoretical Expectations
Treasury Single Account	TSA	Regressor	Total Government Revenue	Nil
Exchange Rate	EXCR	Regressed	US Dollar/Nigeria Naira	Negative (-)
Interest Rate	INTR	Regressed	Prime Lending Rate	Negative (-)
Per Capital Income	PCI	Regressed	Annual Volume of PCI	Positive (+)

Source: Authors' Compilations (2024)

Results and Discussions

Preliminary Test

This paper investigated a pre (2007-2014) and post (2015-2022) TSA implementation on economic performance in Nigeria. Hence, per capital income (PCI), interest rate (INTR), exchange rate (EXCR) [measures of economic performance] and aggregate government revenue (GTR) were obtained from 2007-2022; results of the study are presented as follows:

Table 2: Descriptive Statistics

Statistics Pre-TSA Periods (2007 to 2014)	EXCR (₦/$)	INTR (%)	PCI ($' Billion)	GTR ($' Billion)
Mean	146.35	7.88	882	8565.95
Maximum	158.55	12.63	1652	11116.8

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Minimum	118.57	2.40	494	4844.6
Standard Deviation	15.42	3.89	398.79	2178.419
Observations	**8**	**8**	**8**	**8**
Post-TSA Periods (2015 to 2022)				
Mean	318.82	8.65	2101.25	9151.925
Maximum	425.98	9.90	2334	12586.5
Minimum	193.28	5.46	1876	5616.4
Standard Deviation	75.79	1.50	147.69	2055.94
Observations	**8**	**8**	**8**	**8**

Source: Authors' Computation (2024)

Table 2 established the level of consistency in the data-series as mean and median scores lie within the minimum and maximum values for all the variables. From Table 2, the mean EXCR increased significantly from ₦146.35/$1 in the Pre-TSA period to ₦318.82/$1 in the Post-TSA period, indicating that the cost of purchasing dollar became more expensive in the post TSA periods than in the pre-TSA periods. Also, the EXCR reported higher variability in the Post-TSA periods (2015 to 2022) than in the pre-TSA periods (2007 to 2014). Similarly, the range between the least and highest EXCR values widened more in the Post-TSA periods (2015 to 2022) than in the pre-TSA periods (2007 to 2014).

Within both periods, the mean interest rate (INTR) rose marginally from 7.88% to 8.65%. However, INTR is less volatile in the Post-TSA periods (2015 to 2022) than in the pre-TSA periods (2007 to 2014). This suggests that the prime lending rates is relatively stable interest rate environment. Although the global financial crises of 2007 to 2008 led to substantial financial markets volatility which is reflected in the higher variability value of 3.89% during the Post-TSA Period (2015 to 2022), many economies (Nigeria inclusive) employed various monetary policies to stimulate growth. Again, the estimate evidenced that, most countries during the Post-TSA Period (2015 to 2022) structure their economic policies to withstand to the previous crisis, thereby leading to a lower interest rates of 1.50% in the Post-TSA Period (2015 to 2022).

The mean PCI value of $2101.25 billion recorded in the Post-TSA Period (2015 to 2022)almost doubled the mean PCI value of $882 billion recorded in the Pre-TSA Period (2007 to 2014)**,** suggesting that standard of living increase greatly. Also, *PCI was less volatile in the* Post-TSA Period (2015 to 2022)almost doubled the mean PCI value of $882 billion recorded in the Pre-TSA Period (2007 to 2014)**,**

Lastly, government total revenue was lesser volatile in the Post-TSA Period (2015 to 2022**)** than in thePre-TSA Period (2007 to 2014) as it recorded lesser standard deviation value. This suggests that, TSA adoption was able to achieve its goal of reduce financial leakage. Justifiably, government revenue reported higher mean value in the Post-TSA Period (2015 to 2022**)** than in thePre-TSA Period (2007 to 2014). By implication, government total revenue reported high level of consistency more in the Post-TSA Period (2015 to 2022**)** than in thePre-TSA Period (2007 to 2014).

Table 3: Normality Test

Pre-TSA Periods	Normality Test	**GTR**	**EXCR**	**INTR**	**PCI**
	Jarque-Bera	0.5813	1.5757	0.6492	1.1913
	Probability	0.7478	0.4548	0.7228	0.5512
	Observations	8	8	8	8
Post-TSA Periods	Normality Test	**TSA**	**EXCR**	**INTR**	**PCI**
	Jarque-Bera	0.0326	0.2427	2.2742	0.2117
	Probability	0.9838	0.8857	0.3208	0.8996
	Observations	8	8	8	8

Source: Researcher's Computation (2024)

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Table 3 accounts for the normality test both in the Pre-TSA Period (2007 to 2014) and Post-TSA Period (2015 to 2022). The probabilities associated with the Jarque-Bera test are above 5% both in the Pre-TSA Period (2007 to 2014) and Post-TSA Period (2015 to 2022) suggesting that, the model is reliable and is fit for policy formulation.

Table 4: Results for Unit Root

Variables	ADF Level	CV (5%)	ADF – 1st DF	CV (5%)	Lag	Model	Order of Integration
GTR	-0.666	-3.047	-0.326	-3.049	1	Constant	I(1)
EXCR	-6.502	-3.047	-5.238	-3.049	1	Constant	I(0)
INTR	-3.254	-3.047	-3.629	-3.049	1	Constant	I(1)
PCI	-4.304	-3.047	-4.362	-3.049	1	Constant	I(0)

Source: Researcher's Computation (2024)

Presented in Table 4 is the unit root test for GTR and economic performance variables. The unit root tests demonstrated that GTR was integrated series of order one, I(1); the non-stationary behaviour of GTR reflects breakup or discontinuities in government policies on its treasury (movements from pre-TSA to post-TSA). The Nigerian economy was also repressed due to increased corruption in governance; this confirms why INTR is also integrated series of order one, I (1). Contrarily, EXCHRAE and PCI reported integrated orders of zero, I(0); these are not astonishing since exchange rate and consumer price index is the first difference of price and exchange rate levels; hence, it needs to be stationary, else, it would denote that it is an issue that cannot be controlled. For exchange rate fluctuations being stationary, reflects volatility cluster in exchange rate during the period under investigation.

Regression Estimate

Tables 5 and 6 present robust regression estimates analyzing the sensitivity of both pre-TSA and post-TSA periods to three macroeconomic performance measures in Nigeria between 2007 and 2014, and 2015 and 2022, respectively. Meanwhile, Table 7 seeks to determine whether the mean values of GTR, EXCR, INTR, and PCI differ significantly. A paired sample t-test was used for this analysis.

Table 5: Sensitivity of Pre-TSA to Nigeria's Macroeconomic Performance (EXCR, INTR & PCI)

Independent Variable: GTR						
Sample (adjusted):	**2007-2014**					
Variable	**EXCR**		**INTR**		**PCI**	
	Coef.	**T-value (Prob)**	**Coef.**	**T-value (Prob.)**	**Coef.**	**T-value (Prob.)**
Constant (C)	-2.2692	11.3342 (0.0003)	8.6440	6.2042 (0.0250)	-0.0594	-1.50574 (0.1828)
GTR	-0.4356	-3.0572 (0.0378)	-0.4246	-3.6218 (0.0003)	0.0687	1.7722 (0.1366)
R^2	0.5844		0.5219		0.6107	
Adj. R^2	0.5830		0.5162		0.5864	
F. Statistics	14.0775		5.7232		1.6905	
Prob (F. Statistics)	0.0378		0.0003		0.1366	
Durbin Watson	2.0362		1.7518		2.1171	

Source: Authors'Computation (2024)

Presented in Table 5 is the sensitivity analysis of pre-TSA to economic performance indicators (EXCR, PCI, & INTR) using yearly time-series data. The model reveals that R^2 values are 0.5844, 0.5219, and 0.6107, suggesting that 58.44%, 52.19%, and 61.07% of the variation in EXCR, PCI, and INTR, respectively, is

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influenced by variations in federal government aggregate revenue during the pre-TSA periods. The adjusted R^2 values further affirm that the model has high predictive value. Meanwhile, the Durbin-Watson values of 2.036, 1.7518, and 2.1171 suggest that the model is free from autocorrelation issues. Additionally, the p-values for the F-statistics (0.0378 and 0.0003)for EXCR and INTR models have a highly significant effect. Consequently, federal revenue is a major driver of Nigeria's macroeconomic performance except PCI.

The negative coefficients for EXCR confirm the prior results reported in the Pearson correlation; this negative relationship is attributed to persistent leakages in government revenue measures, often due to corruption. Twomacroeconomic performance variables (EXCR&INTR) were significant at the 5% level, reflecting the impact of financial leakages and corrupt practices on government revenues. The policy implication of a 6.87% increase in PCI is that if PCI increases by 1%, government total revenue will only increase by 6.87%. Consequently, government total revenue did not lead to a substantial improvement in the standard of living of the average Nigerian during the pre-TSA periods. However, the positive result aligns with the theoretical expectations of this research. This finding is consistent with Gbegi et al. (2019), Obara et al. (2020), Olaoye and Talabi (2019), and Ocheni (2016), who found that TSA had an insignificant effect on bank profitability. In contrast, Amaefule and Bangbon (2019) and Yusuf (2016) demonstrated that TSA mitigates financial loopholes, enhances transparency, and ensures accountability in Nigeria's MDAs.

Furthermore, using the coefficients, it was observed that a unit increase in pre-TSA will lead to a 42.46% decrease in INTR, and a 43.56% decrease in EXCR. The policy implication of the 43.56% decrease in EXCR suggests that as total government revenue increases during the pre-TSA periods, Nigeria's ability to import more goods at lower costs improves. However, this also tends to devalue the domestic currency (Naira). Meanwhile, the 42.46% decrease in INTR resulting from an increase in pre-TSA indicates a strong inverse relationship. Consequently, lower INTR indirectly stimulates investors to borrow more funds from banks due to more favorable borrowing conditions. Overall, the rise in total government revenue is sensitive to changes in EXCR and INTR during the pre-TSA periods. This finding aligns with Amaefule and Bangbon (2019) and Yusuf (2016), who showed that TSA reduces financial loopholes, enhances transparency, and ensures accountability in Nigeria's MDAs. However, it deviates from the findings of Gbegi et al. (2019), Obara et al. (2020), Olaoye and Talabi (2019), and Ocheni (2016).

Table 6: Sensitivity of Post-TSA to Nigeria's Macroeconomic Performance (EXCR, INTR & PCI)

Independent Variable: GTR						
Sample (adjusted):	**2015-2022**					
Variables	**EXCR**		**INTR**		**PCI**	
	Coef.	**T-value (Prob)**	**Coef.**	**T-value (Prob.)**	**Coef.**	**T-value (Prob.)**
C	4.8290	4.8250 (0.0048)	6.1423	3.2554 (0.0312)	-0.0984	-1.5057 (0.1828)
TSA	-0.1487	-3.1643 (0.0250)	-0.4136	-3.0288 (0.0027)	0.4659	3.2977 (0.0011)
R^2	0.6585		0.5460		0.7596	
Adj. R^2	0.6219		0.5350		0.7544	
F. Statistics	4.1718		5.0469		3.1698	
Prob. (F. Statistics)	0.0250		0.0027		0.0011	
Durbin Watson	2.0568		2.0770		1.5007	

Source: Authors' Computation (2024)

Presented in Table 6 is the sensitivity analysis of pre-TSA to economic performance measures (EXCR, PCI, & INTR) using yearly time-series data. The model reveals that R^2 values are 0.6585, 0.5460, and 0.7596,

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suggesting that 65.85%, 54.60%, and 75.96% of the variation in EXCR, PCI, and INTR, respectively, is influenced by variations in federal government aggregate revenue during the Post-TSA periods. The adjusted R^2 values further affirm that the model has high predictive value. Meanwhile, the Durbin-Watson values of 2.0568, 2.0770, and 1.5007 suggest that the model is free from autocorrelation issues. Additionally, the p-values for the F-statistics (0.250, 0.0027 and 0.0011 for all models) suggest that the models have a highly significant effect. Consequently, federal revenue is a major driver of Nigeria's macroeconomic performance.

The negative coefficients for EXCR confirm the prior results reported in the Pearson correlation; this negative relationship is attributed to persistent leakages in government revenue measures, often due to corruption. All economic performance variables (EXCR, INTR, and PCI) were significant at the 5% level, reflecting the financial leakages and corrupt practices on government revenues reduced during the post-TSA periods. The policy implication of a 46.59% increase in PCI is that if PCI increases by 1%, government total revenue will only increase by 46.59%. Consequently, government total revenue did lead to a substantial improvement in the standard of living of the average Nigerian during the Post-TSA periods. Also, the positive result aligns with the theoretical expectations of this research. This finding is consistent withAmaefule and Bangbon (2019) and Yusuf (2016) findings who demonstrated that TSA mitigates financial loopholes, enhance transparency, and ensure accountability in Nigeria's MDAs. However, it deviated from Gbegi et al. (2019), Obara et al. (2020), Olaoye and Talabi (2019), and Ocheni (2016), who found that TSA had an insignificant effect on bank profitability.

Agan, it was observed that a unit increase in post-TSA will lead to a 42.46% decrease in EXCR, and a14.87% decrease in INTR. The policy implication of the 42.46% decrease in EXCR suggests that as total government revenue increases during the Post-TSA periods, Nigeria's ability to import more goods at lower costs improves. However, this also tends to devalue the domestic currency (Naira). Meanwhile, the 14.87% decrease in INTR resulting from an increase in post-TSA indicates a strong inverse relationship. Consequently, lower INTR indirectly stimulates investors to borrow more funds from banks due to more favorable borrowing conditions.

Overall, the result indicates that TSA implementation significantly influences economic performance variables of the study. This demonstrated that implementing TSA will stabilise economic performance; consequently, TSA implementation is a good source of increasing economic performance. This further evidenced that, TSA implementation help in blocking leakages in government income. The results, is in support of the findings of Arumona et al (2019) but refute the findings of Okoh et al (2021), and Obaraet' al (2021) in terms of economic performances indexes.

Table 7: Paired T Test

Variable	Obs.	Mean	Std. dev.	t Value	Pr(T < t)
Pre-GTR	8	8565.95	2178.42	-0.6045	0.2823
Post-GTR	8	9151.93	2055.94		
Diff (Mean Pre-GTR- Post-GTR)		-585.97	122.48		
Pre-EXCR	8	146.35	15.42	-7.6926	0.0001
Post-EXCR	8	318.82	75.79		
Diff (Mean Pre- EXCR- Post- EXCR)	8	-172.47	-60.37		
Pre-INTR	8	7.88	3.89	-0.4402	0.3365
Post-INTR	8	8.65	1.50		
Diff (Mean Pre- INTR- Post- INTR)		-0.77	2.39		
Pre-PCI	8	882.00	398.80	-8.8411	0.0000
Post-PCI	8	2101.25	147.69		
Diff (Mean Pre- PCI- Post- PCI)		-1219.25	251.11		

Note Ho: diff = 0 H1: diff ≠ 0; &df = 7

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Source: Researcher's compilation, 2024.

The paired t-test estimate in Table 7 shows that the mean Government Total Revenue (GTR) increased from $8565.95 billion in the pre-TSA period to $9151.93 billion in the post-TSA period. Additionally, the mean GTR in the post-TSA period did not differ significantly from the pre-TSA period. This lack of significant difference could be attributed to delays in the implementation of the TSA in Nigeria. With a 99% confidence level and a mean difference of -$585.97 billion, the outcome remains minimal.

While the paired t-test confirmed that TSA implementation significantly improved PCI, it did not have the same effect on the EXCR. The rise in EXCR led to a significant devaluation of the Nigerian currency. Consequently, the null hypothesis (H_0), which states that there is no significant difference between EXCR in the pre-TSA and post-TSA periods, is rejected in favour of the alternative hypothesis (H_1). With a 99% confidence level and a mean difference of ₦172.47 to purchase $1, a significant difference between the pre-TSA and post-TSA periods was recorded. This nuanced result can be attributed to complementary economic reforms, such as enhanced audits, better compliance, and improved revenue collection efforts during the post-TSA periods.

Conclusion

Summary: Key Findings

Robust Regression Estimate

The analysis confirms that while GTR impacts EXCR and INTR significantly, it has a minimal effect on PCI. By implication, higher GTR during the pre-TSA periods improved Nigeria's capacity to import goods at lower costs, though it devalued the Naira. Additionally, lower INTR stimulates more borrowing by investors due to friendly conditions for borrowing.

Paired Sample T-test

Government Total Revenue (GTR)

The mean GTR increased from $8565.95 billion in the pre-TSA period to $9151.93 billion in the post-TSA period. However, this increase was not statistically significant, likely due to delays in TSA implementation. Despite a 99% confidence level and a mean difference of -$585.97 billion, the effect on GTR was still minimal.

Per Capita Income (PCI)

The implementation of TSA significantly improved PCI, indicating positive economic growth.

Exchange Rate (EXCR)

The EXCR rose significantly, leading to a notable devaluation of the Nigerian currency. This result led to the rejection of the H_0 and acceptance of the H_1. The significant change, with a mean difference of N172.47 per dollar, reflects the impact of TSA alongside other economic reforms such as enhanced audits and better revenue collection.

Policy Recommendations/Practical Consideration

The research work therefore, recommended that

Policies of the Federal government aimed at strengthening the blockages of financial leakages should be encouraged in other to sustain Nigeria's economic performance.

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Small and medium scale Enterprises who are catalyst of economic growth be improved upon to international Standards for local manufacturing and export promotion strategies to enhance naira rate to the dollar.

The government through the CBN should ensure that the Interest rates are regulated in line with the prevailing economic conditions in the country.

The government should develop the human resources of the country through skill acquisition and Youths empowerment to increase the living Standards of the citizens.

Contribution to Knowledge

The study provides a significant contribution to the understanding of how TSA implementation collectively impact on Nigeria's macroeconomic performance variables such as exchange rate, interest rates and per capita income (PCI). The research is particularly relevant as addresses the methodological weaknesses of previous studies using both robust regression analysis and paired sample t-test. Again, this research was able to addresses the complexity of the Nigerian economy by focusing on how the implementation of TSA can help resolve the issue of misappropriation of public funds.

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