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Estimating Tax Buoyancy for Nigeria in the light of Emerging Tax Reforms

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ABSTRACT

The need to improve tax revenue amidst rising expenditure and debt levels has necessitated a plethora of tax reforms in Nigeria. Such reforms are usually tailored to enhance tax revenue by widening the tax net and promoting efficiency in tax administration. However, it is unclear whether there is dynamic tax buoyancy in Nigeria in the light of emerging tax reforms. Tax buoyancy provides valuable insights about the role of a country's tax system in macroeconomic stabilisation and fiscal sustainability. This study, therefore, estimates the dynamic tax buoyancy for Nigeria, using data for the period spanning 2010Q1 to 2023Q4, through the mechanism of an error correction model. The buoyancy indicates whether collectability of the tax on income, profit, and consumption increases. We estimate a baseline error correction model before controlling for the contraction and expansion phases of the business cycle, discretionary tax policy changes and inflation. The baseline result indicate tax buoyancy estimates of less than one both in the short-run and long-run, with that of the short-run closer to one. Considering the phases of the business cycles, the buoyancy estimates were not statistically significant as in the case of controlling for discretionary tax policy changes. Finally, accounting for the role of inflation yielded a buoyancy estimate less than one, suggesting absence of short-run and long-run buoyancy. These findings highlight the inefficiencies in the Nigerian tax system, where tax revenues do not grow in tandem with output and discretionary tax policy changes. The paper, therefore, recommends the need for policy to focus on the maximization of tax revenue by plugging leakages through the intensification of the use of technology in tax administration.

KEYWORDS

tax buoyancy, inflation, business cycle, fiscal policy, error correction model

JEL H21, E31, E32, E62, C22

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Оценка динамичности налоговых доходов Нигерии в свете реализуемых налоговых реформ

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АННОТАЦИЯ

Необходимость увеличения налоговых поступлений на фоне роста государственных расходов и долговой нагрузки обусловила необходимость проведения в Нигерии целого ряда налоговых реформ. Такие реформы, как правило, направлены на увеличение налоговых поступлений за счет расширения налоговой базы и повышения эффективности налогового администрирования. Тем не менее не ясно, наблюдается ли в Нигерии динамичное совершенствование налоговой системы в свете реализуемых налоговых реформ. Повышение налоговой эффективности позволяет получить ценную информацию о роли налоговой системы страны в макроэкономической стабилизации и бюджет-

ной устойчивости. Таким образом в данном исследовании оценивается динамичность налоговых доходов для Нигерии с использованием данных за период с 1-го квартала 2010 г. по 4-й квартал 2023 г. с помощью модели коррекции ошибок. Динамичность налоговых доходов – показатель, который характеризует чувствительность налоговых поступлений к изменениям в темпах экономического роста. Мы используем базовую модель коррекции ошибок до учета фаз сжатия и расширения бизнес-цикла, изменений дискреционной налоговой политики и инфляции. Исходный результат указывает на то, что оценки динамичности налоговых доходов составляют менее единицы как в краткосрочной, так и в долгосрочной перспективах, а в краткосрочной перспективе ближе к единице. Рассматривая фазы бизнес-циклов, оценки динамичности налоговых доходов не были статистически значимыми, как в случае контроля за изменениями дискреционной налоговой политики. Наконец, учет роли инфляции дал оценку динамичности налоговых доходов меньше единицы, что предполагает отсутствие динамичности налоговых доходов в краткосрочном и долгосрочном периодах. Эти выводы подчеркивают неэффективность налоговой системы Нигерии, где налоговые поступления не растут в tandem с объемом производства и изменениями в дискреционной налоговой политике. В статье рекомендуется сосредоточить внимание на максимизации налоговых поступлений путем устранения утечек за счет интенсификации использования информационных технологий в налоговом администрировании.

КЛЮЧЕВЫЕ СЛОВА

налоговая устойчивость, инфляция, деловой цикл, налогово-бюджетная политика, модель коррекции ошибок

1. Introduction

Fiscal authorities have continued to grapple with the challenges of growing financing needs, widening financing gaps, elevated debt levels and expanding fiscal deficits in most countries, including Nigeria [1]. The challenges were further aggravated by shocks like the COVID-19 pandemic which stifled fiscal revenues, despite the huge the expenditure requirement to contain it. Over the years, Nigeria has faced rising expenditure levels compared to the available revenue, prompting an interest in the relationship between these macroeconomic variables given their relevance for economic growth and policy.

The need to wean the Nigerian economy off oil revenue on account of volatility in oil price and production has over the years inspired conversations on the need to ramp up tax revenue through various reform measures. The argument is that non-oil taxes are more stable for macroeconomic planning and management. Tax revenue, therefore, serves as a predictable option for financing government expenditure to promote growth [2].

It is expedient to consider the tax system and critically examine how tax revenue responds to the level of economic activities or its specific base. Therefore, tax revenue buoyancy refers to the degree of responsiveness of tax revenue to changes in GDP, and discretionary tax policy changes. Although closely related to tax buoyancy, tax elasticity does not account for discretionary changes to tax rates and bases [3]. Tax buoyancies have fiscal policy relevance as they are widely employed in the analysis, forecasting, and monitoring of fiscal revenue in budgeting [4].

The knowledge of the responsiveness of tax revenue to changes in economic activities is pivotal for different reasons, including, national budgeting, tax collection trend analysis, international comparisons and making revenue projections [5–8]. This implies that the accurate forecast of tax buoyancy is expected to lower the degree of uncertainty in revenue projection and minimise errors while evaluating the fiscal stance.

Although there exist prior studies across different jurisdictions with a focus on estimating short-run and long-run tax buoyancy [9–14], there appears to be paucity of such

studies for Nigeria. This study holds policy significance for Nigeria in the light of recent economic developments such as the 2016 and 2020 recessions, and tax reforms undertaken within the review period.

The purpose of the study is to estimate short-run and long-run tax buoyancy for Nigeria and investigate the behaviour of dynamic tax buoyancy considering the role of discretionary tax policy changes, phases of the business cycle and inflation.

The critical review of the extant literature yields the following *hypotheses*.

H_1 : There exists short-run tax buoyancy in Nigeria.

H_2 : There is long-run tax buoyancy in Nigeria.

Thus, the study contributes to the literature on tax buoyancy in three dimensions.

First, we estimate a dynamic tax buoyancy by employing quarterly data for the period under review. This is driven by the argument that the data on GDP is in its highest natural frequency, thereby, circumventing the problem of loss of information on account of data aggregation.

Second, we account for the role of economic cycles within the review period, notably, the oil market induced contraction in 2016 and the COVID-19 inspired economic downturn in 2020.

Third, we consider the role of discretionary tax policy changes during the period of the study, including the upward review in Value Added Tax (VAT) rate in 2020 and the legislation and implementation of various Finance Acts between 2020 and 2023. Additionally, we consider the role of changes in the general price level on tax revenue buoyancy in line with similar studies in the literature.

Preliminary analyses from the error correction model does not indicate short-run and long-run buoyancy in the Nigerian tax system across the phases of the economic cycle, controlling for discretionary tax policy and price changes. This highlights the apparent challenges in the Nigerian tax system and underscores the need for efficiency in tax administration.

The paper is written in six sections. Following the introduction, section two focuses on the review of relevant literature and stylised facts on tax revenue and tax reforms in Nigeria. Section three dwells on methods and data issues while section four presents the empirical results. Section five discusses the results, while section six concludes the study with recommendations.

2. Literature review

2.1. Theoretical literature

Various frameworks and theories are used to investigate the interaction between taxation and economic growth. This review, considers two relevant theories, including, optimal taxation theory and the Laffer curve theory.

Optimal taxation theory also referred to a normative second-best policy analysis explores how a tax system should be designed to maximize social welfare while considering various constraints. According to Maganya [15], it requires designing a tax system that reduces inefficiency and distortion in the market equilibrium in the presence of certain economic constraints. It is an overtly normative aspect of tax analysis that is rooted in welfare economics, as it relates to a world where the first-best allocation of resources and income distribution are unachievable ([16]).

This theory provides valuable insights into tax policy, including lessons such on optimal marginal tax rates. The underlying theory of optimal taxation encompasses the selection of a tax system that will boost the welfare function of the society within the constraints. Additionally, in a situation where the first best outcome is unattainable and the second best is chosen, the design and execution of the optimal tax demands an understanding of how to adjust the number of outcomes from a diverse population by using methods that are considered socially optimal ([17]).

The basic critique of the theory of optimal taxation is the lack of a clear answer about the optimal level of taxes in which the consumers can maintain the highest possible level of preference, given the government needs for goods and services, competitive production relations, and the consumer's demand-supply reactions. It also ignores the efficiency and equity issue that arise from the cost of collection and enforcement of taxes [16].

An extension of the Neoclassical theory is the Laffer Curve due to Laffer propounded in 1974. The theory elucidates the theoretical basis for the interaction between tax rate and tax revenue. The Laffer curve demonstrates that a change in tax rate has two different effects on tax revenue, namely, the economic effect and the arithmetic effect [18]. The Economic effect holds that lower tax rates engenders a beneficial influence on output, employment and work, and, consequently, the tax base, by improving economic growth through incentives, while the arithmetic effect states that a reduction in the tax rate yields a proportionate fall in tax revenue, and vice versa.

2.2. Empirical literature

One of the attractions of a beneficial tax system is that tax revenue responds to movements in the level economic output. If tax revenues grow slower than the GDP, the tax system is deemed to be non-buoyant and vice versa. A tax buoyancy with a value of one means that a one percent growth in GDP increases tax revenues by one percent, allowing the tax-to-GDP ratio constant. However, a tax buoyancy surpassing one shows that tax revenues rise by more proportion than the increase in GDP. When tax buoyancy is greater than unity the country tends to raise more revenues, strengthen fiscal stability and improves economic development in the short and long-run.

The literature review covers studies using econometric techniques in analysing the nexus between tax revenue and GDP. Some of these studies disaggregate tax revenue into their different components, while others classify the samples into advanced, emerging and low-income economies. For instance, Uwimana et al. [19] applied an Engle-Granger test and OLS regression in understanding the tax buoyancy dynamics in Rwanda and reported a significant tax buoyancy estimate. Sinaga et al. [14] conducted a dynamic analysis of tax buoyancy in Indonesia from 2015 to 2021, with a focus on value-added tax (VAT), corporate income tax (CIT), and personal income tax (PIT). The findings unveiled a persistent inclination of tax revenues towards long-term equilibrium, albeit with variations observed among provinces in Indonesia. PIT demonstrates the most rapid adjustment and buoyancy, followed by VAT and CIT.

Cornevin et al. [20] used data on aggregate tax revenues for 185 countries and the disaggregation into company Income Tax (CIT), personal Income tax (PIT), taxes on goods and Services (TGS), social security contributions (SSC) and value added tax (VAT). From the analysis based the Error Correction Model (ECM), the results showed that long-run buoyancy coefficients hover around one. However, short run buoyancy estimates deviate more substantially across estimators and deviate from long-term buoyancy estimates.

To estimate tax buoyancy for 24 developing Asian economies, Hill, et al. [13] employed an Error Correction Model, and panel data approaches to analyse data spanning 1998 to 2020. The results showed that both short and long-run tax buoyancies are bordering unity and statistically significant. The results are largely unchanged for country-specific analysis in most of the economies.

Gupta et al. [11] estimated dynamic tax buoyancy for a sample of 44 sub-Saharan African countries between 1980 to 2017. The results showed that the long-term tax buoyancy revolve around one in most of the considered countries. Similarly, Audi et al. [12] utilised pooled least squares method to compute tax buoyancy for the South Asian Regional Co-operation Organisation (SAARC) from 1990 to 2019, using excise duty, sales tax, income tax customs duty, and total taxes. The analysis revealed that tax buoyancy surpassed one with regard to both income and sales tax, in addition to total taxes. However, the tax buoyancy of customs duty and excise duty was below one.

De Pascale et al. [21] evaluated the responsiveness of the European environmental taxation system to economic cycles using data from 28 countries between 2000 and 2018. The study reported that energy tax revenues are rigid in the short term but that total tax revenues, especially from transport, are buoyant in the long term.

Lagravinese et al. [22] studied the relationship between economic cycles and tax revenues during economic crises, focusing on dynamic tax buoyancies in 35 OECD countries for the period between 1995 to 2016. Employing the dynamic common correlated effects estimator, the findings showed lower short and long-run tax buoyancies compared with extant cross-country studies.

Tanchev & Todorov [10] examined the correlation between the economic development of Bulgaria and the short and long-run tax buoyancies. The investigation focused on the correlation between various tax revenues and economic expansion, relying on the Fully Modified Ordinary Least Squares (FMOLS) and Autoregressive Distributed Lag (ARDL) techniques. Using 78 observations from Eurostat, the study spans from 1999Q1 to 2017Q2. Long-term differences between the buoyancies of personal income tax, social security contributions and aggregate tax revenue are demonstrated to be substantial. In the long-term, the buoyancies of corporate tax and value-added tax both exceed one. However, the relative buoyancy of aggregate tax revenues, income tax, social security contributions and corporate tax differs in the short term. In another study, Sheefeni et al. [23] reported that there is no evidence of tax buoyancy for Namibia in the short-run as the economy is unable to generate sufficient tax revenue from economic growth and discretionary changes to tax policy.

Dudine & Jalles [9] estimated dynamic tax buoyancies for 107 countries between 1980 and 2014, including an analysis of their determinants. The results indicated that, on average, the long-run buoyancy is close to one, in all country groups. Additionally, it was found that in advanced countries, short-run buoyancy is close to one, while it is higher than one in developing countries and low-income countries. With respect to specific tax categories, results indicate that long-run tax buoyancy is greater than unity in the case of PIT and SSC (in emerging markets); CIT (in advanced economies); and TGS (in low-income countries). Furthermore, tax buoyancy is not neutral after accounting for the role of inflation.

In an earlier study, Jalles [24] analysed tax buoyancy in 37 Sub-Saharan African countries from 1990 to 2015 and found that long-term buoyancy is generally stable around one. However, short-term buoyancy is lower in fragile states due to institutional weaknesses and tax administration challenges.

Olukuru & Mandela [25] estimated the buoyancies of income tax, VAT, import tax, and excise tax in Kenya and South Africa from 1972 to 2014. Using an error correction model, they found that both countries have buoyant long-term tax systems, with revenues increasing as GDP grows. However, short-term buoyancy is lower, showing that tax revenues do not quickly adjust to economic changes.

Omodero & Igodo [26] examines the level at which the existing basic infrastructure can boost tax revenue growth in Nigeria. Information and telecommunication facilities are both substantial and positive in both the long and short term, whereas transport and road network are considerably beneficial in the long run but intangible in the near run.

By proxying GDP with industrial production index, Akar & Sahin [27] estimated tax buoyancy within the framework of an Error Correction Model for Turkey, using monthly data between 2005M1 and 2014M6. The outcome of the analysis showed that tax buoyancy is lower than 1 in the short-run and higher than one in the long-run.

Daniel et al. [28] estimated the responsiveness of Ghana's tax system to national income changes from 1970 to 2007 using the Dummy Variable Technique. They found that Ghana's tax system is both buoyant and elastic in the long run, with tax revenues growing more than proportionately with GDP. However, in the short run, buoyancy

is lower than elasticity, indicating that tax revenues do not immediately adjust to GDP changes due to institutional and administrative delays.

Sheikh et al. [29] reported that the Pakistani tax system is characterised with low buoyancy with respect to income tax.

From the foregoing, there appears a dearth of literature on tax buoyancy in Nigeria, given the recent tax reforms. This paper, therefore, contributes to the literature by estimating dynamic tax buoyancy for Nigeria, in the light of recent global and macroeconomic shocks by using quarterly data from the period spanning from 2010Q1 to 2023Q4, marked by increased tax reforms.

2.3. Overview of tax reforms and stylised facts on tax revenue in Nigeria

2.3.1. Overview of tax reforms in Nigeria

Tax reforms entail the changes to tax laws and policies which influence the way taxes are collected and administered. Like other countries, Nigeria have had to implement different tax reforms over the years with a view to maximising revenue collection and achieving certain macroeconomic objectives. The necessity for the implementation of tax reforms is rooted on the need to boost the efficacy of tax collection and to consolidate the economic and social gains in the tax system [30]. Although, there have been different episodes of tax reforms in Nigeria, this section considers key reforms between 2010 and 2023, in line with the scope of the study.

A comprehensive National Tax Policy (NTP) was adopted by the Federal Executive Council (FEC) in 2010 with the objectives of providing a set of rules, guidelines and operational mechanisms for the regulation of Nigeria's tax system and setting a basis for tax legislation and tax administration in Nigeria. The approval of the NTP was delayed until 2017 when it was approved by FEC. The same period also saw the continuous implementation of Tax Identification Number (TIN). The objective of the TIN was to issue a unique number to taxpayers, thereby widening the tax net and tax revenue. The Voluntary Assets and Income Declaration Scheme (VAIDS) was implemented by the Federal Government to promote the voluntary declaration of past unknown assets and income for the payment of all outstanding tax obligations. VAIDS provided a leeway for the regularization and remediation with regards to pending tax liabilities. The incentives for complete and honest declaration were the waiving of tax penalties and interests on overdue tax [31]. As part reforms to drive tax revenue, the Federal Government implemented the Strategic Revenue Growth Initiatives (SRGI) with the objectives of achieving a revenue-to-GDP ratio of 15 per cent; widening the tax base; preventing tax evasion and encouraging tax compliance; and promoting transparency in the tax system.

More reforms were introduced and implemented in the form of Finance Acts, starting from 2019. The Finance Act, 2019 introduced changes to some of the tax laws, notably, an increase in Value Added tax rate from 5 per cent to 7.5 per cent, among others. The Finance Act, 2020 was enacted to make changes to relevant tax laws and strengthen fiscal policy to address challenges of the COVID-19 pandemic. The Finance Act, 2021 considers taxes in the digital economy, among other reforms. The Finance Act, 2023 introduced reforms that further deepened taxation in the digital economy with the inclusion of digital assets among those to be subject to a capital gains tax of 10%, among other specific reforms with respect to tax incentives and the oil and gas sector. Recent efforts aimed at boosting tax revenue involves the establishment of a Presidential Committee on Fiscal Policy and Tax Reforms, with a goal of transforming revenue generation for sustainable development to achieve at least 18% tax-to-GDP ratio by 2026, among several objectives. The underlying motivation for the reforms is hinged on the maximisation of tax revenue and the attainment of desired macroeconomic objectives.

2.3.2. Stylised facts on tax revenue and GDP in Nigeria

The interaction between total tax revenue¹ and GDP in is shown in Figure 1, indicating that the trend in GDP is relatively stable compared to that of total tax revenue which is characterised by wild fluctuations mostly during periods of economic shocks. Total taxes trended, largely, lower within the periods covering the 2016 oil market-induced economic downturn and the 2020 recession occasioned by the COVID-19 pandemic. Despite more fluctuations, the trend in total tax realisations recovered to an upward trajectory after the COVID-19 period, on account of the various tax reforms during the period.

We also present a plot (Figure 2) of each of the tax components vis-à-vis the total tax revenue to uncover interesting trends and patterns about possible co-movements and interconnections. Panel 1 indicates that customs collections (trade taxes) appear to exhibit some form of co-movement with total tax revenue, but with less volatility up to the period during the Russia-Ukraine conflict and the 2023 political cycle. However, the co-movement between corporate tax² revenue and total tax revenue is most evident among all the tax components across the entire period. The implication is that total tax revenue could be predicted by the movement in corporate taxes. It is also important that the trend followed a higher trajectory after the COVID-19 pandemic, a period coinciding with the implementation of the various Finance Acts and the Strategic Revenue Growth Initiative (SRGI). The trend of Value Added Tax (VAT) revenue (Panel 3) is not volatile, but an upward turn is evident from 2020Q1 where the implementation of the 2019 Finance Act commenced with an increase in VAT rate to 7.5 per cent, from 5 per cent. For the case of Petroleum Profit Tax (PPT)³, the trend appears episodic, with respect to the 2016 oil price shock, the 2020 COVID-19 induced shock and the Russia-Ukraine conflict.

Additionally, PPT appears to be most volatile following episodes of economic downturns, underscoring the challenges of over-dependence on the oil sector. In summary, all the tax revenue components indicate an upward trajectory with some fluctuation during the periods of intense reforms like finance acts, among others. Although these stylised facts provide some useful insights into the behaviour of tax revenues, it will require a formal econometric analysis to ascertain tax buoyancy for Nigeria.

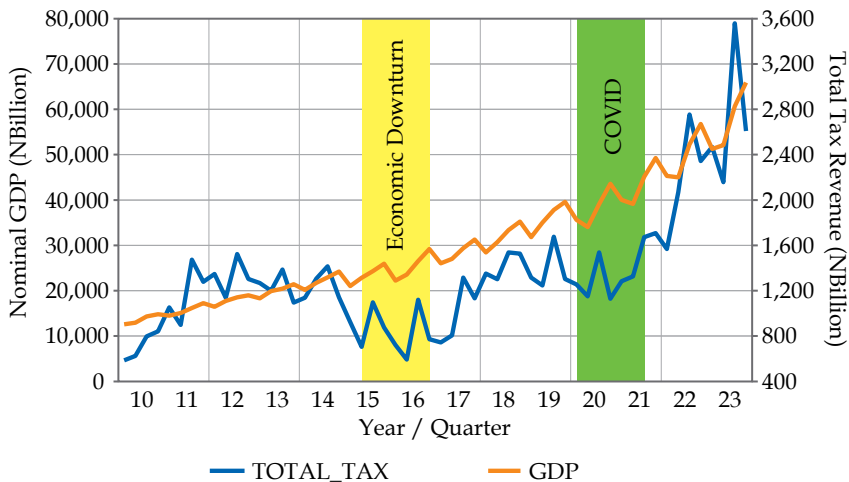


Figure 1. Trends in Total Tax Revenue and Nominal GDP, 2010Q1–2023Q4

Source: Central Bank of Nigeria Quarterly Statistical Bulletin, 2023Q4

¹ Includes Corporate Taxes, Petroleum Profit Tax, Value Added Tax, and Customs collections usually collected at the federal level.

² Includes Company Income Tax (CIT), Capital Gains Tax (CGT) and Stamp Duties.

³ Also includes gas tax.

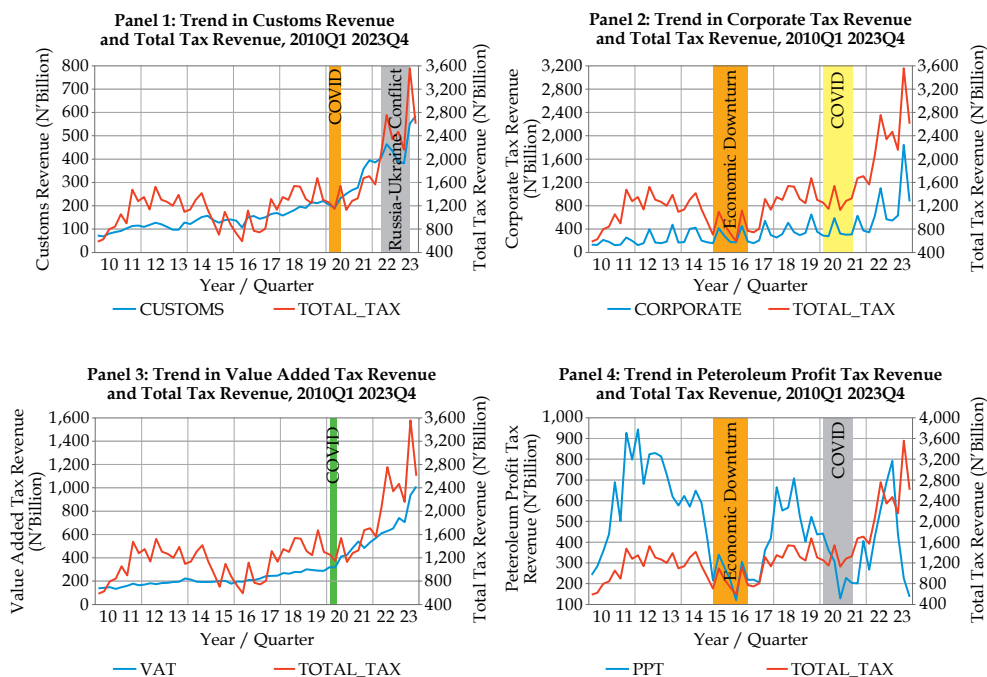


Figure 2. Trends in total tax revenue and its components

Source: Central Bank of Nigeria Quarterly Statistical Bulletin, 2023Q4

3. Methodology and Data

3.1. Methodology

This study estimates dynamic tax buoyancy for Nigeria by accounting for economic cycles, discretionary tax policy changes and changes in the general price level. As a reminder, the concept of tax buoyancy measures the extent of responsiveness of tax revenue to both changes in its base, usually national income, and to discretionary alterations to tax policies over time [9]. In its simplest form, tax buoyancy can be obtained by regressing the natural logarithm of tax revenue on that of GDP.

The empirical strategy for this study is rooted in the error correction model (ECM) in line with similar studies in the literature [9; 13; 19]. Although a popular approach to the ECM is the Engle and Granger [32]. two step method, this study relies on a single step dynamic approach. The attraction of the dynamic approach to ECM lies in its application in the estimation of both long-run and short-run parameters in a dynamic framework, on the assumption that both dependent and independent variable(s) are cointegrated [19]. The ECM in this study is estimated through time series regression for a single country analysis under the assumption of first difference level of stationarity and cointegration for all the variables.

Drawing on Cornevin et al. [19] we specify a baseline error correction model for short-run and long-term tax buoyancy in equation 1.

$$\Delta \ln T_t = \rho \ln T_{t-1} + \alpha \Delta \ln GDP_t + \beta \Delta \ln GDP_{t-1} + \varepsilon_t, \quad (1)$$

where represents the nominal tax revenue at time t, represents the nominal GDP at time, t, and indicates the error term.

The coefficient shows the short-run tax buoyancy. The coefficient, captures the long-run tax buoyancy, while represents the speed of adjustment from short-run disequilibrium to long-run equilibrium.

Additional analyses in the estimation involves the modification of equation 1 to account for economic cycles, discretionary tax policy changes and inflation. This motivation is driven by empirical and theoretical evidence that short-term and long-term buoyancy can be impacted by the identified factors.

3.2. Data

We employ quarterly data on the variables of interest from the quarterly Statistical Bulletin of the Central Bank of Nigeria. The study uses data on nominal GDP (measured in billions of naira), tax revenue⁴ (measured in billions of naira), and inflation rate (measured as percentage change in the consumer price index). To account for the phases in the economic cycle we employ dummy variables. First, an expansion dummy is captured by 1 for all the quarters with economic expansion and 0, otherwise. Similarly, a contraction dummy is represented by 1 for all the quarters with economic contraction and 0, otherwise. Finally, we also measure discretion tax policy changes through the mechanism of a dummy variable, where 1 indicates quarters with tax policy changes, and 0 otherwise. Some of the notable changes in tax policy during the review period include an increase in the Value Added Tax (VAT) rate to 7.5 percent in the first quarter of 2020, from 5 per cent in the prior quarters. In addition, some tax reforms were undertaken through the implementation of Finance Acts starting from the year 2020.

4. Results

4.1. Descriptive statistics

We present the descriptive statistics in Table 1 where we observe the salient statistical properties of the relevant variables in the model as indicated by the various measures of central tendency and dispersion. Notably, the coefficient of variation shows that observations on GDP were the most volatile, while those on inflation were the least, during the review period. In addition, the outcome of the Jarque-Bera statistics and the corresponding probability values indicates that only observations on GDP were normally distributed.

Table 1. Descriptive statistics

Index	GDP	INF	TAX
Mean	30264.94	13.68581	1347.982
Median	26783.95	12.31783	1280.601
Maximum	65908.26	28.15056	3558.69
Minimum	12583.48	7.822323	585.879
Std. Dev.	13215.95	4.588558	566.6208
C. V	0.436675	0.335279	0.420347
Skewness	0.775527	0.99662	1.613773
Kurtosis	2.812051	3.80868	6.379269
Jarque-Bera	5.695878	10.79627	50.95186
Probability	0.057964	0.004525	0.000000
Sum	1694837	766.4052	75487.01
Sum Sq. Dev.	9.61E+09	1158.018	17658252
Observations	56	56	56

Note: C.V denotes coefficient of variation calculated as C.V = Std.Dev./Mean

⁴ Total tax revenue data used in this study is calculated as the summation of the federally collected taxes with available data. This excludes most of the sub-national taxes like personal income tax and direct assessment, where the data is not readily accessible.

4.2. Unit root test

We begin the econometric analysis by conducting a formal unit test to verify the time series characteristics of the variables and prevent the risk of a spurious regression associated with non-stationary series. We present the unit root results based of the Augmented Dickey-Fuller test by Dickey & Fuller [33] and the Phillips-Perron unit root by Phillips & Perron [34] in Table 2. The findings the reveal that all the variables are stationary only at first difference, that is, I(1).

4.3. Empirical Analysis

We present the error correction model estimates on both short-run and long-run tax buoyancy in Table 3, for the baseline model and economic cycles in the short-run. A value of long-run tax buoyancy greater one indicates fiscal sustainability, while that of the short-run tax buoyancy above one implies that revenue policy plays a stabilisation role over the business cycle [9]. The estimated results reveal short-run tax buoyancy coefficients of 0.87, 1.46 and 0.80 for the baseline, contraction and expansion models, respectively.

However, the coefficient is only significant in the baseline model. This implies that the short-run result does not indicate buoyancy for the baseline, contraction and expansion models. However, the significant buoyancy estimates in the short-run is close to one is at the baseline, suggesting near equilibrium between tax revenue and GDP, and implying stability in the tax system [10].

Furthermore, the results indicate an estimated significant long-run tax buoyancy coefficient of 0.55 in the baseline model, pointing to the absence of long-run tax buoyancy for in Nigeria. This result means that aggregate tax revenue grows at a slower pace than output in the long-run. Thus, the fiscal sustainability role of tax policy is not validated.

We present the dynamic tax buoyancy estimates indicating the role of discretionary tax policy changes and inflation in Table 4. The result reveals short-run tax buoyancy estimates of 0.98 and 0.82 for the models with discretionary tax policy changes and inflation, respectively. It is observed that the estimated coefficient in the model on discretionary tax policy changes is closest to one, but not statistically significant.

Table 2. Unit root tests

Variables	Augmented Dickey-Fuller (ADF)		Phillips-Perron(PP)		Decision
	Level	First difference	Level	First Difference	
LGDP	0.5742	-3.4026**	0.2840	-11.6358***	I(1)
LTAX	-0.8079	-2.9791**	-2.4549	-11.4308***	I(1)
INF	-0.3538	-3.4820**	0.3935	-3.2682**	I(1)

Note: *** and ** denote statistical significance at 1% and 5%, respectively.

Table 3. Estimates for short-run and long-run tax buoyancy in Nigeria

	Baseline	Contraction	Expansion
Short – Run Buoyancy			
D(LOGGDP)	0.8726**	1.4558	0.8014
Speed of adjustment	-0.3750***	-0.4034***	-0.4557***
Long – Run Buoyancy			
LOGGDP	0.5512***		

Note: *** and ** indicate statistical significance at 1% and 5% levels, respectively. The dependent variable is D(LOGTAX).

Table 4. Estimates for short-run and long-run tax buoyancy: Controlling for discretionary tax policy changes and inflation

	Baseline	Discretionary tax policy changes	Inflation
Short – Run Buoyancy			
D(LOGGDP)	0.8726**	0.9849	0.8188**
Speed of adjustment	–0.3750***	–0.389***	–0.3747***
Long – Run Buoyancy			
LOGGDP	0.5512***	0.2030	0.4358

Note: *** and ** indicate statistical significance at 1% and 5%, respectively. The dependent variable is D(LOGTAX).

However, the estimate generated on account of the effect of inflation is positive and significant, but less than one and the value in the baseline model. This implies that there is no evidence of short-run and long-run tax buoyancy for Nigeria, in the presence of discretionary tax policy changes and inflation. Therefore, the tax system neither play a role in macroeconomic stabilisation in the short-run nor ensures fiscal sustainability in the long-run.

5. Discussion

The estimation of dynamic tax buoyancy provides a basis for the analysis of the stabilisation and fiscal sustainability roles of a tax system in the short and long-run, respectively. An understanding of the tax system and its responsiveness to economic activities and changes to tax policies based on discretion is pivotal for a deeper appreciation of fiscal dynamics. Tax buoyancy is essential in the budget process, with useful application in the analysis, forecasting, and monitoring of revenue projection. Consequently, precise forecasts of tax buoyancy can reduce uncertainty in revenue projections and minimize errors in fiscal evaluations.

The study, therefore, estimates the short and long-run tax buoyancy for Nigeria, while accounting for the phases of the business cycle, discretionary tax policy changes and inflation. The result indicates the absence of short-run tax buoyancy for Nigeria across the models for the baseline, phases of the business cycle, discretionary tax policy changes and inflation. Based the result, H_1 is rejected.

In sum, the result holds that tax revenue policy does not serve as an automatic stabiliser over the business cycle in Nigeria. The finding is consistent with the extant submissions in Akar & Sahin [27], Sheefeni et al. [22], Tanchev & Todorov [10] and Lagravinese et al. [21], but contrary to those in Dudine & Jalles [9] and Hill et al. [13].

Further evidence from the results does not support the existence of long-run tax buoyancy in Nigeria across the models for the baseline, phases of the business cycle, discretionary tax policy changes and inflation. The result serves as the basis through which H_2 is rejected. While this finding agrees with Lagravinese et al. [21], it is at variance with Akar & Sahin [27], Gupta et al. [11], Cornevin et al. [19] and Sinaga et al. [14], Stoilova [35]. The finding therefore means that the Nigerian tax system does play a role in fiscal sustainability.

6. Conclusion

The objective of this study focused on estimating the dynamic tax buoyancy for Nigeria, using data for the period spanning 2010Q1 to 2023Q4. The underlying motivation was anchored on the implications of the buoyancy estimates for short-run macroeconomic stabilisation and long-run fiscal sustainability. In addition, the estimates are indicators of the health of the tax system and its revenue-yielding potential from economic growth and discretionary tax policy changes.

The study also covered additional analyses by controlling for the contraction and expansion phases of the economic cycle, discretionary tax policy changes and inflation. The baseline result did not indicate buoyancy both in the short-run and long-run as the estimates were less than one, with that of the short-run closer to one. Considering the phases of the business cycles, the buoyancy was not significant at both the expansion and contraction phases, with buoyancy estimate greater than one at the contraction phase. After controlling for discretionary tax policy changes, there was no evidence of dynamic tax buoyancy. Finally, accounting for the role of inflation yielded a buoyancy estimate less than one, suggesting absence of short-run and long-run buoyancy.

The findings in this study have highlighted the apparent weaknesses in the Nigerian tax system, where tax revenues do not grow in tandem with output and discretionary tax policy changes. This, therefore, underscores the need for policy to focus on the maximization of tax revenue by plugging leakages through the adoption of technology in tax administration.

The primary limitation of this study is that it only includes federally collected tax revenue data, as obtaining tax data from sub-national entities proved challenging. Future research could yield more comprehensive and robust results by incorporating data from sub-national governments, if accessible. Additionally, future studies might provide more insightful estimates of tax buoyancies for specific tax types relative to their bases.

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