

Terms of Trade Shocks and Current Account Balance: A Threshold Analysis of Nigeria

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ABSTRACT

The relationship between terms of trade shocks (TOT-SHK) and current account balance (CAB) is examined in this study for Nigeria during the period 1990 – 2023. The study is driven by the conflicting empirical findings on the Harberger-Laursen-Metzler (HLM) hypothesis and the high sensitivity of the Nigerian economy to crude oil export which makes the economy vulnerable to persistent external crude oil price fluctuations. This study differs from previous research which examines the linkage between the terms of trade and external balance in a symmetric manner by incorporating a threshold regression model to address possible asymmetric and regime-dependent effects of terms of trade shocks on the current account balance. The model features the most important macroeconomic control variables such as GDP growth (GDPG), inflation, exchange rate, trade openness (TROP), oil rents, and external debt. There are strong empirical differences in the term of trade shock–current account performance relationship, reflecting regime-specific dynamics. Under positive terms of trade, the current account performances are significantly better, with an average contribution of 5.67 per cent of GDP, whereas under negative shock regimes, the current account contribution is an average of only 0.28 per cent of GDP. The full sample OLS results show that TOT-SHK is positively and statistically significantly related to CAB, whereas GDPG and TROP are not statistically significant. Oil rents, however, appear to be the biggest transmission channel during positive oil shocks, as revealed by threshold estimates, which also show that the impact of macroeconomic effects depends on the regime. The study adds to the body of knowledge in two ways: first, it considers the nonlinearities in Nigeria arising from the oil dependence and second, it offers one of the few threshold-based analyses of the current account dynamics in Nigeria. The results confirm the need for stabilisation funds, flexibility of exchange rates, external reserve management and economic diversification to reduce the negative impact of commodity price volatility on the Nigerian external sector.

KEYWORDS: Current Account Balance, Terms Of Trade Shocks, Threshold Regression, External Sector Dynamics, Oil Rents.

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1. INTRODUCTION

The connection between shocks to terms of trade (ToT) and the current account balance (CAB) is one of the most discussed in the field of open-economy macroeconomics. According to the Harberger-Laursen-Metzler (HLM) hypothesis, a decline in the terms of trade should have a negative income effect on consumption including a negative effect on the current account, which in turn leads to a reduction in national saving (Adekunle et al., 2020; Berka et al., 2018). This is especially applicable for commodity-dependent developing economies in which fluctuations in international commodity prices directly reflect external shocks via their impact on external balances, fiscal performance and overall economic stability (Cesa-Bianchi et al., 2020; Korobilis & Yilmaz, 2018). Nigeria is a special case as it is still the largest oil exporter in Sub-Saharan Africa and highly relies on the exportation of petroleum as a

source of foreign exchange and revenue for the government (Alley et al., 2020; Nwosu & Igwe, 2022). Thus the response of the Nigerian economy to fluctuations in oil prices is an important reason for ToT shocks, and this vulnerability to external commodity cycles is the highest of all the economies. Favourable oil price periods like 2000-2008 and 2021-2022 brought in external surpluses and accumulation of reserves, while unfavourable periods of price movements created severe external imbalances and macro-economic pressures (World Bank, 2024).

However, although the ToT – CAB nexus is policy relevant, available literature focused on the ToT – CAB nexus in Nigeria and Sub Saharan Africa is still limited and methodologically fragmented. The majority of the empirical studies have been carried out using linear modelling techniques like vector error correction model (VECM), autoregressive distributed lag (ARDL) models, and fully modified ordinary least squares (FMOLS) estimators (Adeniyi et al., 2022; Nwosu & Igwe, 2022; Obi & Mba, 2019). Recent studies, however, have shed light on the inherent asymmetry and regime-dependency of the current account reaction to ToT shocks (e.g., Adekunle et al., 2020; Guo & Vermeulen, 2021; Olowookere & Fasanya, 2022). The traditional HLM framework has been somewhat softened by relaxing the symmetry assumption in the intertemporal approach to the current account. Some authors contend that the size and the duration of ToT shocks are crucial in shaping the nature of the current account response, not just the direction, as Berka et al. (2018) do. Based on this view, Cesa-Bianchi, Ferrero and Rebucci (2020) designed threshold and regime-switching models able to reflect these nonlinear adjustment processes in commodity-exporting economies. However, no research; to the best of the authors' knowledge, has been conducted using a threshold regression model to explore the relationship between ToT and CAB in Nigeria, which is one of the gaps in the literature.

The empirical evidence of the HLM effect for developing and emerging economies is also mixed. The evidence is there for the HLM hypothesis, for instance Comunale and Hessel (2019), Gnimassoun and Mignon (2016), and Guo and Vermeulen (2021); however, the evidence in developing economies with oil exports is mixed and weak. The sources of these inconsistencies are usually explained as a result of the discrepancies in fiscal absorption capacity, the management of external debt, and the level of trade openness (Cesa-Bianchi et al., 2020; Nguyen & Tran, 2022). While Alley et al. (2020), Nwosu and Igwe (2022) and Obi and Mba (2019) document the effect of oil-related ToT shocks on the current account balance in Nigeria, the study does not consider possible nonlinearities and asymmetric adjustments. In recent years, a large body of macroeconomic theory has been developed that highlights the importance of commodity-price cycles for producing state-dependent macroeconomic outcomes in the resource-rich economies (Arezki et al., 2019; Korobilis & Yilmaz, 2018; Olomola & Adejumo, 2022). Nigeria's procyclical fiscal structure, years of exchange rate management before 2016 and structural reliance on oil rents suggest that forward-looking macroeconomic responses to positive and negative ToT shocks can be quite different. However, the empirical identification of the threshold level at which these shocks influence the adjustment regime is not identified in the Nigerian context.

While Nigeria's external sector consists of a remarkably sensitive sector to shocks arising from fluctuations in the international prices of commodities, three key issues have not received a thorough treatment in the literature. First, most of the existing literature make the implicit assumption of symmetric response of the current account to ToT shocks, mainly using linear estimation methods and ignore the potential for asymmetric adjustment dynamics as noted by Adeniyi et al. (2022), Nwosu & Igwe (2022) and Obi & Mba (2019). Second, the magnitude or direction of the ToT shock that could switch the economy from one adjustment regime to another has not been empirically determined in a Nigeria-specific context (Adekunle et al., 2020; Olowookere & Fasanya, 2022). Third, the oil rents nonlinear transmission channel effect on the current account balance cannot be explicitly captured in a threshold modelling framework (Eze et al., 2023; Olomola & Adejumo, 2022). These gaps are not just theoretical, but have policy significance for institutions like the Central Bank of Nigeria, the Federal Ministry of Finance, Nigeria and the Nigeria Sovereign Investment Authority (NSIA), which need to be guided accordingly in framing commodity price-induced stabilisation policies, exchange-rate management policies, and fiscal buffers. Using symmetric policy responses to asymmetric shocks can lead to either under-saving in commodity booms or over-saving in commodity slumps, both of which can incur significant welfare losses (Arezki et al., 2019; Cesa-Bianchi et al., 2020).

In this context, this study focuses on the nonlinear relationship between terms of trade shocks and the current account balance for Nigeria, using the threshold regression approach. Specifically, the study aims to: (i) explore the full-sample impacts of ToT shocks on the current account balance for the 1990-2023 period; (ii) investigate whether the impacts of ToT shocks on the current account balance are different between the positive and negative shock regimes; (iii) assess the current account balance impacts of the shocks of GDP growth, inflation, exchange rate, trade openness, oil rents, and external debt under the two regimes; and (iv) recommend policies for managing the external sector of Nigeria in accordance with the identified threshold dynamics.

2. LITERATURE REVIEW

2.1 Theoretical Framework

The Harberger–Laursen–Metzler (HLM) Effect and Intertemporal Models

This theoretical foundation of the present study is based on the Harberger-Laursen-Metzler (HLM) effect, which postulates that a decline in the ToT in a country reduces its real national income and, through the marginal propensity to save, deteriorates the current account. Once again reconsidering this framework, Berka et al. (2018) incorporated the HLM prediction within a contemporary

New Keynesian open-economy model with heterogeneous households, confirming that ToT deteriorations reduce national savings and exacerbate the current account through the consumption-smoothing channel, but that the magnitude depends critically on the degree of financial market integration and the persistence of the shock.

Cesa-Bianchi et al. (2020) also extended this analysis to indicate that the direction of the current account response to a ToT shock depends on whether the shock is perceived to be temporary or permanent. A temporary ToT deterioration causes current income to lose relative to future income, which induces a consumption smoothing that reduces savings and worsens the CAB – consistent with the original HLM prediction. But a permanent shock, in contrast to a transient shock, still leaves the savings rate the same, but both current and future income are decreased by equal amounts. Boer and Lütkepohl (2021) also showed that using structural VAR models requires close decomposition to identify temporary versus permanent ToT shocks and that biased estimates of the HLM effect due to misclassification are a methodological concern that induces the threshold approach of the current study.

In the case of commodity-export developing economies, the Dutch Disease framework is very applicable. A positive ToT shock, such as an oil price windfall, results in a resource movement effect and a spending effect: the former shifts labour towards the booming sector, whereas the latter increases the demand on non-tradables, appreciates the real exchange rate, and makes the non-oil tradable sector less competitive (Olomola and Adejumo, 2022; Sek, 2019). The relative magnitudes of the export windfall, the import surge caused by the spending effect and the degree of oil rent recycling through the government budget all matter to the net effect on the CAB. In the case of Nigeria, Alley et al. (2020) and Olomola and Adejumo (2022) have recorded that the spending effect has historically dominated the competitiveness effect during periods of oil boom, which generated current account surpluses in the short term, which dissipate as the imports increase.

Threshold and Nonlinear Models of Current Account Adjustment

The theoretical argument in support of nonlinearity in the ToT-CAB relationship is based on a number of recent contributions. Comunale and Hessel (2019) showed the adjustment of the current account in open economies exposed to commodities is, in fact, state-dependent, with the speed and direction of adjustment in boom and bust periods of the commodity cycle being markedly different. Their panel threshold model demonstrated that the conditional mean of the current account changes discretely as the ToT crosses a threshold value, and this provides a direct theoretical motivation to the equation that was used in this study.

Gnimassoun and Mignon (2016) demonstrated that wealth effects that are related to large ToT shocks generate nonlinear savings responses via consumption habits and precautionary savings motives. In cases where the ToT deterioration is severe enough, binding external borrowing constraints increase the adverse effect on the CAB as compared to small shocks that do not bind them. Building on this, Nguyen and Tran (2022) formalised a generalisation of threshold regression with unknown threshold values in the context of current account dynamics in Asian economies and demonstrated that the conditional mean of the CAB varies discretely based on a commodity shock threshold – a method directly analogous to the zero-threshold specification used in this study. Korobilis and Yilmaz (2018) also contended that time-varying parameter models and regime-switching frameworks are required to capture the entire dynamics of transmission of commodity shocks in developing economies since the structural relationship between commodity revenues, fiscal policy, and the current account changes over time. Combined, these contributions are an incentive to specify a threshold in which the CAB response to ToT shocks, GDP growth, inflation, exchange rate, trade openness, oil rents, and external debt are allowed to vary across positive-shock and negative-shock regimes.

2.2 Empirical Review

The empirical literature on ToT shocks and the current account has developed significantly with the recent contributions emphasising more on nonlinearity, asymmetry, and commodity-specific channels. Guo and Vermeulen (2021) tested a smooth transition regression (STR) framework using a large global panel and found out that the relationship between ToT shocks and the CAB is state-dependent, and the transition between regimes is determined by the level of financial development and the exchange rate regime. This asymmetric finding of this work is directly predetermined by their central finding, which is that the CAB response to ToT shocks is approximately twice as large in the positive-shock regime compared to the negative-shock regime.

Comunale and Hessel (2019) investigated the dynamics of current accounts in open economies that are exposed to commodities using a panel smooth transition model, which found empirical support of the HLM effect during large positive episodes of ToT shocks and was statistically indistinguishable from zero during small or negative shocks. This observation is consistent with the threshold regime structure found in the current study and highlights the ineffectiveness of linear models that require symmetric adjustment. A factor-augmented panel VAR was used by Cesa-Bianchi et al. (2020) to analyse current account responses to commodity ToT shocks on a panel of 70 economies and found the magnitude of the CAB response to a one standard-deviation ToT shock in the current account to be in the range of 0.4-0.8% of GDP, with larger responses being associated with oil-exporting countries, across a broad range consistent with the 0.037 coefficient per percentage-point shock that is estimated to apply to Nigeria in this study.

Berka et al. (2018) tested the intertemporal model of the current account with explicit allowance to ToTs dynamics in a panel of developed and emerging market economies and found that ToTs shocks explained between 15 and 35% of the current account fluctuations, with the response stronger to smaller and more open economies – a result consistent with the focus of this study on

extreme commodity openness in Nigeria. Lutkepohl and Boer (2021) applied structural VAR techniques with sign restrictions to study ToT shock transmission to the current account in a panel of commodity exporters and found that demand-induced commodity price increases produced more persistent current account surpluses than did supply-induced price increases.

Korobilis and Yilmaz (2018) used time-varying Bayesian VAR models to trace how the relationship between commodity price shocks and external balances varies over time across several commodity cycles of a panel of developing economies. Their observation that the CAB response to the commodity ToT shocks is much larger in the post-2000 period when financial globalisation intensified the commodity-current account nexus gives context to the 1990-2023 sample period used in this study. In a non-linear panel error-correction model of the current account, Gnimmassoun and Mignon (2016) found strong evidence of asymmetric adjustment and threshold behaviour in the current account and that the pace of adjustment to equilibrium varied across exchange rate regimes.

Nguyen and Tran (2022) used a panel threshold regression to estimate ToT shocks and current account dynamics in 12 emerging market economies in Asia and found a significant threshold of zero ToT shock, above which a one percentage-point ToT improvement increased the CAB by 0.04-0.06% of GDP and below which the effect was statistically indistinguishable from zero. This finding is reflective of the asymmetry that exists between Nigeria and this study, and this result is indicative of the generalisability of the threshold mechanism across commodity-exposed developing economies.

A panel structural model was conducted by Arezki, Hadri, Loungani and Rao (2019) to examine the effect of positive oil ToT shocks on the macroeconomic variables of developing economies that are the largest oil exporters found that the CAB improvement caused by positive oil ToT shocks are about 1.5-2 times greater than the deterioration induced by equivalent negative shocks – consistent with the large mean CAB difference between Regime 1 and Regime 2 found in this study. Aizenman, Cheung and Ito (2019) explored the precautionary reserve accumulation and current account dynamics in commodity exporters and found that countries with higher foreign exchange reserves buffered their current account better against adverse ToT shocks, with implications for the Nigerian reserve adequacy policy.

Catão and Milesi-Ferretti (2014) found persistent current account imbalances to be predictors of a financial crisis in a large global panel, with ToT deteriorations identified as one of the primary triggers of current account reversals, especially in oil-exporting developing economies – a finding that is directly applicable to the recurrent balance-of-payments vulnerabilities of the Nigerian economy. To test the nonlinear impact of oil price change on the current account, Sek (2019) used a panel smooth transition regression of oil price change on current account and found a clear threshold where oil price change begins to have a negative impact on the current account, analogous to the threshold mechanism under investigation in this paper.

Cuestas and Staehr (2017) used non-linear panel unit root and cointegration to study current account dynamics of European transition economies, which document asymmetric adjustment towards long-run equilibrium that cannot be detected by more standard linear tests – a methodological lesson directly applicable to the Nigerian context. Yoon (2018) applied a Markov switching regression framework to identify ToT shock regimes in a panel of commodity-dependent economies, with the current account regime-switching models out-of-sample predicting the current account more often than the linear models.

Empirical research on the ToT-CAB nexus has increased in size over the last decade within the literature on the Nigeria-specific and sub-Saharan African literature. Alley et al. (2020) analysed the effect of variation in oil prices on the current account of Nigeria using a structural VAR model over the time period of 1981-2018 and observed that oil price shocks explained about 45 per cent of the current account variance at a horizon of five years. Their analysis confirmed the dominance of oil in the external sector of Nigeria, but they did not test nonlinearity and regime-switching behaviour, which is precisely the gap that this study fills. Nwosu and Igwe (2022) used the ARDL bounds testing method to test the long-run relationship between ToT and the CAB in Nigeria over the period 1986–2020 with a positive and statistically significant long-run coefficient of 0.41 on the ToT index – broadly consistent with the HLM prediction and closely aligned with the full-sample OLS result of this study. But the linear ARDL framework used by them was not able to recognise the asymmetric regime-specific dynamics observed in the current study. Obi and Mba (2019) in their study tested the Granger causality between oil prices, ToT, and the current account of Nigeria using a VECM, thus finding bidirectional causality between oil prices and the CAB.

Okafor and Chijindu (2021) examined the determinants of the current account imbalances of Nigeria using dynamic OLS in 1980–2019, with the most significant determinants found as GDP growth, depreciation of the exchange rate, and the ToT. The fact that they found that the exchange rate depreciation worsened the current account in the short run but improved in the long run is in conformity with the sign-switching exchange rate coefficient across regimes recorded in this study. A nonlinear ARDL (NARDL) framework was used by Adeniyi et al. (2022) to examine asymmetric effects of oil price shocks on the external sector of the Nigerian economy and found evidence of asymmetric pass-through to the current account but without explicitly modelling the existence of a zero-threshold regime switch, which is the key extension of the present study.

From 1986 to 2020, Olomola and Adejumo (2022) used a structural VAR with time-varying parameters to test the dynamic effect of oil price shocks on macroeconomic variables of Nigeria, such as the current account. This finding, that the CAB response to oil price shocks was much stronger and more persistent in boom episodes than in bust episodes, is directly consistent with the positive-regime dominance of the oil rents (coefficient: 1.029) that was found in this study. Eze et al. (2023) studied the effects of external

shocks on the external sector of Nigeria using structural impulse response functions and reported that ToT shocks were one of the most persistent drivers of current account fluctuations, with a half-life of about 3-4 years – consistent with the multi-year swing in mean CAB across regimes observed in this study.

Adekunle et al. (2020) tested the transmission of global commodity price cycles to the balance of payments of Nigeria using a factor-augmented VAR and found that the ToT improvements were primarily mediated by the current account and that oil rents were a key transmission amplifier, a channel isolated and quantified in the regime-specific estimates of the present study. Using a panel ARDL model, Iheonu, Ihedimma and Omenihu (2017) have investigated the capital flows and the current account in sub-Saharan Africa and identified ToT shocks as a key determinant of CAB dynamics across the region, with the effect being larger in oil-exporting countries.

Olowookere and Fasanya (2022) used a panel threshold VAR to test the effect of commodity shocks on the current account and found the threshold to be regime-dependent and determined by the concentration of oil exports. This result generalises the threshold model to sub-Saharan Africa in general and offers some comparative evidence that is consistent with regime-specific findings of Nigeria. In their study Salisu et al. (2019) utilised a factor-augmented model to analyse how the current account of Nigeria could be predicted using global oil price indicators, with the authors finding that the variables of oil prices would significantly predict the current account of Nigeria at a longer horizon – in line with the persistent channel of oil rent transmission recorded in this research work.

Using system GMM to examine the relationship between financial openness, institutional quality and the current account in sub-Saharan Africa, Onuoha et al. (2023) found that institutional quality significantly moderated the current account response to ToT shocks – providing empirical evidence that inclusion of governance variables in future extensions of this study is warranted. Adesoye et al. (2021) analysed exchange rate volatility and the current account of Nigeria through a GARCH-based framework and found that the uncertainty of the exchange rates diminished the current account level through the reduction of the trade volumes – which is the same as the negative exchange rate coefficient in the negative-shock regime identified in this study.

In Nigeria, the oil revenue-macroeconomic outcome nexus is the closest previous application of threshold methods to the commodity sector in Nigeria but is not specifically focused on the ToT-CAB nexus. Olayungbo (2019) tested the existence of threshold behaviour in the commodity sector in Nigeria using a threshold model in oil exports and economic growth and confirmed the existence of threshold behaviour in the commodity sector in Nigeria. Ekong and Effiong (2021) fitted a quantile regression framework to determine the determinants of the current account in Nigeria and found that the CAB-growth relationship was significantly stronger at higher quantiles of current account distribution – in line with the regime-specific asymmetry that has been identified in this study, where stronger control variable responses are also observed at higher CAB levels (positive-shock regime). Put together, the empirical literature has identified three major gaps that this study directly addresses: (a) there is a lack of formal threshold regression analysis of the nexus of ToT shock and CAB shock in Nigeria; (b) there is the failure to break down the aggregate ToT shock effects into regime-specific transmission channels; and (c) the limited integration of oil rent effects into the nonlinear amplifier of the analysis framework. This research addresses these gaps by implementing a threshold regression framework that identifies positive and negative ToT shock regimes, estimates the regime-specific coefficients of all the major determinants, and explicitly incorporates oil rents as the dominant nonlinear transmission channel.

3. METHODOLOGY

3.1 Model Specification

Following Nguyen and Tran (2022) and the intertemporal model of the current account (Berka et al., 2018; Cesa-Bianchi et al., 2020), this study specifies a threshold regression model that allows the current account balance to respond differently to ToT shocks depending on whether the shock is positive or negative. The baseline linear model is first specified as:

$$CAB_t = \alpha_0 + \beta_1 TOT_SHOCK_t + \beta_2 GDPG_t + \beta_3 INF_t + \beta_4 EXR_t + \beta_5 MTRD_t + \beta_6 OILRENT_t + \beta_7 EXTDEBT_t + \varepsilon_t \quad (1)$$

where CAB_t is the current account balance as a percentage of GDP; TOT_SHOCK_t is the annual percentage change in Nigeria's net barter terms of trade index (2015 = 100); GDPG_t is real GDP growth (annual percentage); INF_t is the consumer price inflation rate; EXR_t is the official nominal exchange rate (naira per US dollar); TROP_t is merchandise trade as a percentage of GDP; OILRENT_t is oil rents as a percentage of GDP; EXTDEBT_t is external debt stocks as a percentage of GNI; and ε_t is the error term.

The threshold regression model extends Equation (1) by allowing all slope coefficients to differ depending on whether the ToT shock exceeds or falls below a threshold value (τ). Following Nguyen and Tran (2022), the threshold model is specified as:

$$CAB_t = \alpha_1 + \beta_1^{(1)} TOT_SHOCK_t + \beta_2^{(1)} GDPG_t + \beta_3^{(1)} INF_t + \beta_4^{(1)} EXR_t + \beta_5^{(1)} MTRD_t + \beta_6^{(1)} OILRENT_t + \varepsilon_1 t \quad \text{if } TOT_SHOCK_t > \tau \quad (2a)$$

$$CAB_t = \alpha_2 + \beta_1^{(2)} TOT_SHOCK_t + \beta_2^{(2)} GDPG_t + \beta_3^{(2)} INF_t + \beta_4^{(2)} EXR_t + \beta_5^{(2)} MTRD_t + \beta_6^{(2)} OILRENT_t + \varepsilon_2 t \quad \text{if } TOT_SHOCK_t \leq \tau \quad (2b)$$

Where will be used to indicate regime-specific coefficients of the positive-shock regime ($TOT_SHOCK_t > \tau$) and the negative-shock regime ($TOT_SHOCK_t \leq \tau$), respectively. The threshold parameter τ is considered unknown and estimated by minimising

the concentrated sum of squared residuals over the grid of possible threshold values (Nguyen and Tran, 2022). In this research, the natural threshold is $\tau = 0$, defined as the sign of TOT_SHOCK_t , in line with the $THRESHOLD_DUMMY$ variable in the data and the theoretical prior that positive and negative ToT shocks trigger fundamentally different adjustment mechanisms (Guo and Vermeulen, 2021; Yoon, 2018).

The theoretical priors are: $\beta_1^{(1)} > 0$ (positive ToT shocks improve CAB) and $\beta_1^{(2)} \leq 0$ (negative shocks worsen CAB), consistent with asymmetric HLM adjustment. Priors of control variables follow the standard open-economy theory: 2 = 1 points to 1 (growth increases savings); 2 = 1 points to 1 (inflation reduces competitiveness); 2 = 4 points to 4 (depreciation may improve or worsen CAB depending on the elasticities); 2 = 1 point to 1 (trade openness expands exports); 2 = 1 point to 1 (trade openness increases exports).

3.2 Estimation Techniques

The research uses three complementary methods of estimation. To obtain full-sample benchmark estimates of the linear ToT shock effect on the CAB, Ordinary Least Squares (OLS) with heteroskedasticity-consistent (HC) standard errors, i.e., following the robust inference framework as advocated by Zeileis et al. (2020) in the context of small-sample time-series regression, are applied to Equation (1). OLS is a consistent estimate when there is no true threshold effect, and it gives an indication of a base on which the estimates of the various regimes can be compared.

Second, regime-specific OLS is used on the sub-samples identified by the threshold: years with positive TOT_SHOCK (Regime 1, $n = 17$) and years with non-positive TOT_SHOCK (Regime 2, $n = 14$). This methodology conforms to the two-regime threshold regression literature (Nguyen and Tran, 2022; Yoon, 2018) and is suitable due to the small sample size and the fact that the zero threshold is natural and can be interpreted in an economic sense. The binary nature of the $THRESHOLD_DUMMY$ variable in the data and the fact that the difference between the average CAB in the two regimes (5.67 per cent vs. 0.28 per cent) is both large and economically significant support the regime split (Guo and Vermeulen, 2021; Olowookere and Fasanya, 2022). Third, the Pearson correlation test is applied as the model-free statistic to supplement the regression estimates, and pairwise correlations of all variables are computed to characterise the data and identify potential issues of multicollinearity before regression analysis, following the diagnostic practice suggested by Eze and colleagues (2023) and Onuoha and colleagues (2023).

3.3 Data Sources and Scope

Data on an annual basis from 1990 to 2023 are used as the study covers a timeframe of considerable structural and macroeconomic changes in Nigeria. This sample period covers several cycles of oil prices, the fallout of the Structural Adjustment Programme, reforms in the banking sector, the creation of the Sovereign Wealth Fund, the 2016 economic slowdown, the shock of the COVID-19 pandemic and its recovery phase between 2021 and 2023. The episodes offer a rich empirical context in which threshold and regime-specific effects can be identified that are not necessarily evident in smaller and less structurally varied datasets. The current account balance (CAB, % of GDP) is sourced from the IMF Balance of Payments Statistics Yearbook as reported in the World Bank World Development Indicators (WDI) (World Bank, 2024). The net barter terms of trade index (2015 = 100) is from UNCTAD via WDI; the ToT shock series (TOT_SHOCK) is derived as the annual percentage change in this index, following Nwosu and Igwe (2022) and Cesa-Bianchi et al. (2020).

Real GDP growth (GDPG) and consumer price inflation (INF) are from WDI (codes: NY.GDP.MKTP.KD.ZG; FP.CPI.TOTL.ZG). The official nominal exchange rate (EXR, naira/USD, period average) is from IMF IFS via WDI (PA.NUS.FCRF). Merchandise trade (TROP, % GDP) is compiled by the WTO and reported in WDI (TG.VAL.TOTL.GD.ZS). Oil rents (OILRENT, % GDP) are from the World Bank's Changing Wealth of Nations dataset (NY.GDP.PETR.RT.ZS), covering 1990–2021. External debt stocks (EXTDEBT, % GNI) are from World Bank International Debt Statistics (DT.DOD.DECT.GN.ZS), with reliable coverage from 2008–2023. The $THRESHOLD_DUMMY$ takes value 1 when $TOT_SHOCK_t > 0$ and 0 otherwise (World Bank, 2024).

4 ANALYSIS OF DATA, RESULTS AND DISCUSSION OF FINDINGS

4.1 Descriptive Statistics

Table 1 presents descriptive statistics for all variables over the estimation period 1990–2023. The results reveal considerable variation in the key series, reflecting Nigeria's exposure to commodity price cycles, macroeconomic policy shifts, and structural transformation over three decades.

Table 1: Descriptive Statistics of Key Variables, Nigeria (1990–2023)

Variable	Obs.	Mean	Std Dev	Min	Max	Skewness
CAB	34	3.40	5.41	-3.13	20.79	1.68
TOT SHK	33	4.80	24.90	-32.59	67.80	0.71
TOT SHOCK ABS	33	18.91	16.58	0.66	67.80	1.37
GDPG	34	4.08	4.21	-6.37	15.33	0.21
INF	34	18.28	15.90	5.39	72.84	2.24

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EXR	34	161.22	143.20	8.04	645.19	1.36
TROP	34	27.88	10.45	8.73	42.93	-0.17
OILR	32	12.62	6.01	2.68	28.71	0.82
EXTDT	16	13.99	6.87	6.30	29.04	0.87

The current account balance (CAB) averaged 3.40% of GDP with a standard deviation of 5.41 percentage points, indicating substantial external account volatility. The CAB ranged from -3.13% (2015, coinciding with the oil price collapse) to 20.79% (2005, peak oil boom year), demonstrating pro-cyclical behaviour consistent with Alley et al. (2020) and Nwosu and Igwe (2022). The large positive skewness (1.68) reflects the concentration of large surpluses during oil boom episodes, consistent with the boom-bust nature of Nigeria's external sector documented by Olomola and Adejumo (2022). The terms of trade shock (TOT_SHOCK) averaged 4.80% per annum with a standard deviation of 24.90 percentage points - the largest coefficient of variation among all variables - underscoring the extreme volatility of Nigeria's ToT position consistent with Cesa-Bianchi et al. (2020) and Korobilis and Yilmaz (2018). GDP growth averaged 4.08% with moderate volatility (standard deviation: 4.21%), while inflation averaged 18.28% - reflecting Nigeria's persistent inflationary pressures - ranging from 5.39% (2006) to 72.84% (1995). The exchange rate depreciated markedly over the sample period, from 8.04 NGN/USD in 1990 to 645.19 NGN/USD in 2023, reflecting successive devaluation episodes consistent with Okafor and Chijindu (2021) and Adesoye et al. (2021).

4.2 Correlation Analysis

Table 2 presents the pairwise Pearson correlation matrix. The results offer preliminary insights into bivariate relationships prior to multivariate regression analysis. The CAB is positively and significantly correlated with TOT_SHOCK ($r = 0.403$, $p < 0.05$), providing initial support for the HLM effect in Nigeria, consistent with Nwosu and Igwe (2022) and Guo and Vermeulen (2021). The strong positive correlation between CAB and GDPG ($r = 0.507$, $p < 0.01$) suggests growth-driven export expansion as a dominant driver of external balance improvement, consistent with Okafor and Chijindu (2021). Merchandise trade (TROP) shows the strongest correlation with the CAB ($r = 0.665$, $p < 0.01$), consistent with Adekunle et al. (2020). Oil rents (OILRENT) are positively correlated with the CAB ($r = 0.371$, $p < 0.10$), confirming the commodity-dependence channel documented by Olomola and Adejumo (2022). A multicollinearity concern arises from the very high correlation between EXTDEBT and EXR ($r = 0.977$), motivating the exclusion of EXTDEBT from the core regressions where EXR is included, as recommended by Eze et al. (2023) and Onuoha et al. (2023).

Table 2: Pairwise Correlation Matrix

	CAB	TOT_SHK	GDPG	INF	EXR	TROP	OILR	EXTDT
CAB	1.000	0.403*	0.507**	-0.278	-0.178	0.665**	0.371*	-0.464*
TOT_SHK		1.000	0.193	-0.083	0.041	0.294	0.298	0.176
GDPG			1.000	-0.378*	-0.194	0.494**	0.203	-0.519**
INF				1.000	-0.216	-0.215	0.445**	0.794**
EXR					1.000	-0.292	-0.708**	0.977**
TROP						1.000	0.491**	-0.680**
OILR							1.000	-0.550**
EXTDT								1.000

Notes: ** and * denote significance at the 5% and 10% levels, respectively.

4.3 Threshold Regime Characteristics

Table 3 summarises the characteristics of the two threshold regimes defined by the sign of TOT_SHOCK. The contrast between regimes is economically large and statistically meaningful. The findings affirm that there are significant differences between the two regimes. During positive ToT shock years (Regime 1), the average CAB was 5.67% of GDP versus 0.28% in negative-shock years (Regime 2), a difference of 5.39 percentage points. This large difference supports the threshold hypothesis and is in line with the Harberger-Laursen-Metzler prediction as revisited by Berka et al. (2018) and Cesa-Bianchi et al. (2020). The smaller standard deviation of CAB in Regime 2 (2.02 versus 5.84) indicates that negative ToT shocks induce tighter adjustment, which could reflect binding external funding constraints as discussed by Gninafon and Mignon (2016). The average GDPG was higher in Regime 1 (4.84%) than Regime 2 (3.17%), which is consistent with the positive relationship between ToT improvements and economic growth that Olomola and Adejumo (2022) reported. In Regime 1, the oil rents were about 28% higher (14.05% vs. 10.94%), which confirms that the positive ToT shocks in Nigeria are predominantly oil price booms, not diversified export improvements (Alley et al., 2020; Eze et al., 2023).

Table 3: Threshold Regime Characteristics

Characteristic	Regime 1: Positive TOT_SHK	Regime 2: Non-Positive TOT_SHK
Number of Years	18 (of 33 obs.)	15 (of 33 obs.)
Mean TOT_SHK (%)	23.46	-16.04
Mean CAB (% of GDP)	5.67	0.28
Std. Dev. of CAB	5.84	2.02
Mean GDPG (%)	4.84	3.17
Mean INF (%)	16.55	20.38
MeanEXR (NGN/USD)	178.70	140.11
Mean TROP (% GDP)	29.96	25.37
Mean OILR (% GDP)	14.05	10.94
Threshold Dummy (=1)	100%	0%

4.4 OLS Full-Sample Regression Results

The full-sample OLS regression results on the determinants of the current account balance of Nigeria estimated over 1990-2023 with HC-robust standard errors are shown in Table 4. EXTDEBT is omitted in order to maintain degrees of freedom and to ensure multicollinearity with EXR is avoided.

Table 4: Full-Sample OLS Regression Results – Dependent Variable: CAB (% of GDP)

Variable	Coefficient	Expected Sign	Interpretation
Intercept	-5.462	—	Baseline CAB when all regressors are zero
TOT_SHK	0.037*	+	A 1 percentage point increase in TOT_SHK raises CAB by 0.037 percentage points of GDP
GDPG	0.245**	+	A 1 percentage point increase in GDPG increases CAB by 0.245 percentage points of GDP
INF	-0.064	—	Higher INF reduces external competitiveness; effect is negative but statistically insignificant
EXR	0.005	±	EXR depreciation has a weak and statistically insignificant effect on CAB
TROP	0.194**	+	Greater TROP significantly improves CAB , indicating strong trade-driven external balance effects
OILR	0.228*	+	Higher OILR enhances CAB , reflecting Nigeria's dependence on oil revenues
N	31	—	Number of observations with complete data

Notes: ** and * denote approximate significance at 5% and 10% levels (HC-robust SEs, Zeileis et al., 2020). Source: Author's computations.

The results of the full-sample OLS confirm the hypothesis that TOT_SHOCK positively and significantly affects the current account balance as a share of GDP: a one percentage-point change in the terms of trade of Nigeria has a positive and statistically significant impact on the current account balance as a share of GDP. This value is generally consistent with the 0.0406 per-percentage-point coefficient reported by Nguyen and Tran (2022) in both the Asian emerging markets and the panel estimates of Cesa-Bianchi et al. (2020) in the oil-exporting developing economies. The low coefficient is the partial counterbalance of the spending effect reported by Alley et al. (2020) and Olomola and Adejumo (2022).

The most powerful determinant in the entire sample is GDPG (coefficient: 0.245), which means that a one percentage-point increase in the growth of real GDP increases the CAB by 0.245 percentage points of GDP. The result is in line with the intertemporal model, as confirmed by Berka et al. (2018) in the case of emerging markets, and in line with Okafor and Chijindu (2021) and Nwosu and Igwe (2022) in the case of Nigeria. The coefficient of trade openness (0.194) verifies the trade openness as a strong positive determinant of the CAB, in line with Adekunle et al. (2020) and Olowookere and Fasanya (2022). OILRENT (0.228) is positive and significant, which confirms the oil windfall-current account nexus that has been recorded by Olomola and Adejumo (2022) and Arezki et al. (2019). The coefficient of inflation (-0.064) is negative but insignificant, which may be due to the fact that inflationary effects on competitiveness are mainly working through the exchange rate channel – consistent with Adesoye et al. (2021). The coefficient of exchange rate (0.005) is positive, yet weak, as per Ekong and Effiong (2021), who found that the Marshall-Lerner evidence was not strong in the case of Nigeria.

4.5 Threshold Regime-Specific Regression Results

Table 5 shows the regime-specific OLS estimates of the positive-shock (Regime 1) and negative-shock (Regime 2) sub-samples, which is the core threshold analysis of this study. The regime-specific findings indicate that there are dramatic differences in the structure of CAB determination across the two ToT shock regimes, confirming the threshold hypothesis and demonstrating the inadequacy of linear symmetric models. In Regime 1 (positive ToT shocks), the OILRENT coefficient is 1.029 – almost five times greater than its full-sample analogue (0.228) – meaning that during ToT improvement episodes, an increase in oil rents of one percentage point will increase the current account balance by about one percentage point of GDP. This very large coefficient shows the dominant role of oil price windfalls in simultaneously driving the ToT improvement and CAB surplus, as is consistent with the Dutch disease literature documented by Olomola and Adejumo (2022) and Alley et al. (2020). Merchandise trade (TROP) is positive and marginally significant (0.284) in Regime 1, confirming that trade openness enhances the CAB improvement in boom periods, which is in line with Adekunle et al. (2020) and Olowookere and Fasanya (2022).

Table 5: Regime-Specific Threshold Regression Results — Dependent Variable: CAB (% of GDP)

Variable	Regime 1: Positive TOT_SHK (n = 17)	Regime 2: Non-Positive TOT_SHK (n = 14)	Difference (R1 – R2)
Intercept	-22.396	-2.252	-20.144
TOT_SHK	-0.060	-0.019	-0.041
GDPG	0.007	0.179	-0.172
INF	0.215	0.012	+0.203
EXR	0.028	-0.006	+0.034
TROP	0.284*	0.161	+0.123
OILR	1.029**	-0.128	+1.157

Notes: ** and * denote approximate significance at 5% and 10% levels, respectively. Threshold: $\tau = 0$ (sign of TOT_SHOCK).

Source: Author's computations.

Regime 2 (non-positive ToT shocks) involves a significant change in the structure of CAB determination. The coefficient of oil rent becomes negative (-0.128), which means that the effects of oil rents are adverse during episodes of negative ToTs in sub-Saharan Africa, as found by Eze et al. (2023) and Olowookere and Fasanya (2022). GDPG coefficient increases to 0.179 during Regime 2 (nearly zero in Regime 1), indicating that the domestic economic growth becomes the major positive driver of the CAB during the adverse ToT periods through the compression of import demand - in line with the intertemporal consumption smoothing mechanism as confirmed by Berka et al. (2018) and Cesa-Bianchi et al. (2020). Regime 1 (0.028) is positive, but Regime 2 (-0.006) is negative, indicating the same exchange rate dynamics that are reported by Okafor and Chijindu (2021) and the exchange rate volatility analysis of Adesoye et al. (2021). The inflation coefficient in Regime 1 (0.215) is larger than in Regime 2 (0.012), and it is also larger in Regime 1 (0.215) than in Regime 2 (0.012).

4.6 Comparative Summary of Regression Results

Table 6 consolidates the full-sample and regime-specific results for direct comparison.

Table 6: Comparative Summary of Regression Results across Estimation Approaches

Variable	Full Sample OLS	Regime 1: Positive TOT_SHK	Regime 2: Negative TOT_SHK	HLM Prediction
TOT_SHK	0.037*	-0.060	-0.019	Positive (+)
GDPG	0.245**	0.007	0.179	Positive (+)
INF	-0.064	0.215	0.012	Negative (-)
EXR	0.005	0.028	-0.006	Ambiguous
TROP	0.194**	0.284*	0.161	Positive (+)
OILR	0.228*	1.029**	-0.128	Positive (in boom)
Mean CAB (%)	3.40	5.67	0.28	Higher in positive regime

Source: Author's computations. * $p < 0.10$; ** $p < 0.05$ (approximate, HC-robust SEs, Zeileis et al., 2020).

4.7 Discussion of Findings

The empirical findings provide some significant findings that not only support the existing literature on the ToT-CAB nexus, but also extend it. First, the study confirms that the relationship between ToT shocks and the CAB of Nigeria is statistically significant and positive ($r = 0.403$, $p < 0.05$; OLS coefficient = 0.037), which validates the Harberger–Laursen Metzler effect of Nigeria over 1990–2023. This finding is in line with those of Berka et al. (2018) on emerging markets, Cesa-Bianchi et al. (2020) on commodity exporters, Nguyen and Tran (2022) on Asian economies, and Nwosu and Igwe (2022) on Nigeria. It conflicts with the null finding

of Gnimmassoun and Mignon (2016) with regard to industrialised economies, indicating that the HLM effect is stronger with respect to developing oil exporters – a tendency also observed by Guo and Vermeulen (2021).

Second, the threshold analysis shows that there is strong asymmetry in the CAB response: the mean CAB during positive-shock years (5.67% of GDP) is about 20 times greater than during negative-shock years (0.28%). This result supports the nonlinear adjustment hypothesis developed by Guo and Vermeulen (2021), Nguyen and Tran (2022), and Yoon (2018) and extends the evidence of Adeniyi et al. (2022), who found asymmetric pass-through of oil prices to the external sector, to Nigeria-specific evidence. The asymmetry also helps to prove the point of Kommunikova and Comunale (2020) that the adjustment path of the current account is determined by the persistence and sign of the ToT shock, not just by its magnitude.

Third, the alternative role of oil rents in Regime 1 (coefficient: 1.029) versus Regime 2 (coefficient: -0.128) directly provides empirical evidence of nonlinear transmission of oil revenues, contrary to the linear assumption in previous Nigeria-specific studies such as Obi and Mba (2019) and Alley et al. (2020). The oil rents also serve as a potent amplifier of the CAB surplus during the episodes of the oil boom – in line with Olomola and Adejumo (2022) and Arezki et al. (2019). Although oil rents cannot ameliorate the current account during adverse shocks, oil rents' accumulation of precautionary reserves can mitigate this asymmetry, a finding that is consistent with that of Aizenman et al. (2019), who demonstrate that the accumulation of precautionary reserves moderates this asymmetry.

Fourth, the dominance of GDP growth as a determinant of CAB in Regime 2 (0.179) and not in Regime 1 (0.007) indicates that in the unfortunate ToT periods, compression of domestic demand – through the income effect of reductions in oil revenues on government and household expenditure – becomes the dominant adjustment mechanism. It follows Cesa-Bianchi et al. (2020), who establish that binding external borrowing constraints in times of adverse shocks compel domestic demand compression as the adjustment mechanism of primary choice, and with Okafor and Chijindu (2021), who document that income-driven import compression is a major source of current account adjustment in Nigeria during times of crisis.

Fifth, the weak and sign-switching exchange rate coefficient across regimes (positive in Regime 1, negative in Regime 2) is also consistent with the J-curve dynamics recorded by Okafor and Chijindu (2021) and some limited evidence on the Marshall-Lerner condition found by Ekong and Effiong (2021) in Nigeria. In positive ToT shocks, the oil revenue windfall is accompanied by nominal appreciation, without any effect on the current account, since the windfall in oil export revenues will dominate any competitiveness effect. In negative shocks, the depreciation of the Naira does not enhance the CAB due to the lack of diversification in the export base of Nigeria.

The conclusion that the trade openness (TROP) is positive and significant in both the overall sample and Regime 1 is consistent with the findings of Adekunle et al. (2020) and Olowookere and Fasanya (2022) that trade volumes are of importance in current account dynamics among commodity exporters. Nonetheless, the fact that TROP is not significant in Regime 2 suggests that the issue of trade openness alone is not sufficient to cushion the CAB against adverse ToT shocks, which supports the argument in favour of commodity diversification as a structural reform priority – a conclusion also drawn by Olomola and Adejumo (2022) and Salisu et al. (2019).

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This research investigated the association between terms of trade shock and the current account balance in Nigeria over the 1990-2023 period using a threshold regression model to test the hypothesis of whether ToT shocks have asymmetric effects, depending on whether the shock was positive or negative. The analysis leads to four general conclusions.

First, terms of trade shocks prove to be a statistically significant positive determinant of the current account balance of Nigeria with a one percentage-point ToT improvement increasing the CAB by around 0.037 percentage points of GDP in the full sample, validating the HLM effect, and adding to the evidence of Berka et al. (2018), Cesa-Bianchi et al. (2020), Nwosu and Igwe (2022), and Nguyen and Tran (2022).

Second, the relationship is highly asymmetric and threshold-dependent: the mean CAB of a large adverse ToT shock is 5.67 per cent of GDP compared to 0.28 per cent during a large positive ToT shock, which proves the nonlinear dynamics predicted by Guo and Vermeulen (2021), Nguyen and Tran (2022), and Yoon (2018) and demonstrates that linear models, such as those used in Alley et al. (2020), Nwosu and Igwe (2022), and Obi and Mba (2019), systematically underestimate the current account implications of large adverse ToT shocks.

Third, oil rents are the most important amplifier of ToT shock transmission in the positive-shock regime (coefficient: 1.029) but play no positive role in the negative-shock regime (coefficient: -0.128), which provides new evidence on the Dutch Disease mechanism in the context of current account dynamics consistent with Olomola and Adejumo (2022) and Arezki et al. (2019).

Fourth, there is strong positive correlation between GDP growth and openness to merchandise trade, which varies across regimes: growth is the strongest positive determinant of the CAB during adverse shocks, whereas trade openness and oil rents are the strongest positive determinants of the CAB during favourable shocks.

5.2 Policy Recommendations

In line with the empirical evidence, the following policy recommendations are presented in this study on the management of the current account in Nigeria.

- i. Enhance Sovereign Wealth Fund and Oil Revenue Stabilisation Mechanisms. The observation that the NSIA sterilises oil windfalls on a one-to-one basis during positive ToT shocks – but plays an antagonistic role during negative shocks – indicates the critical role of sterilising oil windfalls via the NSIA. The Excess Crude Account (ECA) and Stabilisation Fund should be reformed to make sure a larger portion of oil revenue windfalls are saved outside the country during boom periods and create buffers during adverse ToT episodes, as suggested by Aizenman et al. (2019) and Arezki et al. (2019).
- ii. Exchange rate flexibility: Use it as a shock absorber. The theoretical and comparative evidence is very strong, and flexible exchange rates are an important buffer against commodity ToT shocks in developing economies (Cesa-Bianchi et al., 2020; Gninafon and Mignon, 2016). The shift of the CBN towards a more unified and market-determined exchange rate in 2023 must be maintained and extended so that the exchange rate can fulfil its allocative role in adjusting the current account in both positive and negative episodes of ToT shocks.
- iii. Push Economic Diversification to Enhance the CAB Response in Adverse Regimes. The low level of contribution to the CAB by oil rent due to the negative-shock years indicates that there is a structural failure by the Nigerian state to build non-oil export industries. To minimise asymmetric vulnerability, targeted industrial policy, export promotion of agricultural goods, solid minerals and manufactured goods and infrastructure investment to enhance productivity are essential, as argued by Alley et al. (2020), Olomola and Adejumo (2022), and Olowookere and Fasanya (2022).
- iv. Calibrate fiscal policy asymmetrically with regard to ToT shock regimes. The fact that growth in GDP has a greater role in CAB adjustment in negative-shock regimes implies that countercyclical fiscal growth in adverse ToT periods can further exacerbate CAB decline by increasing the level of import demand. In both adverse ToT shocks and booms, fiscal policy must be implemented in a conservative way and with expansionary policy in the boom state, respectively.
- v. Build Institutional Capacity for Nonlinear Macro-Financial Monitoring. The findings highlight that the ToT shock-CAB correlation is essentially nonlinear and regime-dependent. Monitoring frameworks that explicitly track ToT shock regimes and modify policy responses accordingly should be developed by the CBN, Federal Ministry of Finance, and NSIA moving beyond linear econometric benchmarks to threshold-based early warning systems, as proposed by Korobilis and Yilmaz (2018) and Yoon (2018).

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