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THE DYNAMIC INTERPLAY BETWEEN FISCAL DEFICITS AND ECONOMIC DEVELOPMENT IN NIGERIA USING AUTOREGRESSIVE DISTRIBUTED LAG MODEL

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ABSTRACT

This study examined the dynamic interplay between fiscal deficits and economic development in Nigeria using the Autoregressive Distributed Lag (ARDL) model. Annual time-series data spanning 1990–2023 were obtained from the Central Bank of Nigeria Statistical Bulletin, World Development Indicators, and Transparency International. Economic development was proxied by GDP growth, while fiscal deficit, GDP per capita growth, human capital development, inflation, infrastructure, institutional quality, natural resource dependence, population growth, and trade openness served as explanatory variables. The Augmented Dickey-Fuller (ADF) unit root test confirmed a mixture of I(0) and I(1) variables, justifying the use of the ARDL framework. The ARDL Bounds Test established the existence of a long-run relationship among the variables. Empirical results revealed that fiscal deficits exerted a negative but statistically insignificant effect on economic development. GDP per capita growth and population growth positively influenced economic development, while inflation and natural resource dependence adversely affected development outcomes. The error correction mechanism confirmed rapid convergence to long-run equilibrium. Diagnostic tests showed that the estimated model was stable, normally distributed, free from serial correlation, and homoscedastic. The study concludes that fiscal deficits do not automatically translate into economic development and recommends prudent fiscal management, productive public expenditure, revenue diversification, and stronger institutional frameworks.

Key words: *Fiscal Deficit; Economic Development; ARDL; Cointegration; Nigeria*

INTRODUCTION

Fiscal deficit has remained one of the major macroeconomic issues confronting developing economies, especially Nigeria (Jhingan, 2010). A fiscal deficit occurs when government expenditure exceeds government revenue within a particular fiscal year (Dwivedi, 2010). In most developing countries, governments usually experience fiscal deficits because public expenditure on infrastructure, education, healthcare, security, and other social services often surpasses the revenue generated from taxation and other sources. As a result, governments frequently resort to deficit financing through borrowing, taxation, or monetary expansion in

order to meet developmental needs and stabilize the economy (Musgrave & Musgrave, 2004). Fiscal deficits are therefore considered an important fiscal policy instrument used by governments to stimulate economic activities, especially during periods of economic downturn or recession.

Nigeria's economy has experienced significant macroeconomic fluctuations characterized by oil price volatility, rising public debt, inflationary pressures, and weak revenue mobilization (World Bank, 2023; Central Bank of Nigeria, 2023). These challenges have intensified concerns regarding the developmental implications of persistent fiscal deficits. Consequently, understanding the relationship between fiscal deficits and economic development remains critical for policy formulation (International Monetary Fund, 2023; World Bank, 2023). Most previous studies concentrated on the relationship between fiscal deficits and economic growth, inflation, or public debt individually (Easterly William & Sergio Rebelo, 1993; N. Gregory Mankiw, 2019). However, limited attention has been given to the broader developmental consequences of fiscal deficits using a comprehensive framework that captures both short-run and long-run dynamics. This study therefore investigates the dynamic interplay between fiscal deficits and economic development in Nigeria using the ARDL approach.

Objectives

The main aim of this study is to examine the effect of fiscal deficits on economic development in Nigeria. The specific objectives are to:

1. determine the short-run relationship between fiscal deficits and economic development in Nigeria.
2. investigate the long-run relationship between fiscal deficits and economic development in Nigeria
3. evaluate the speed of adjustment from short-run disequilibrium to long-run equilibrium using the Error Correction Mechanism (ECM).

LITERATURE REVIEW

In this chapter, existing literature capturing the works done by other researcher are reviewed in order to discover the research gap that would be resolved in this study. In view of this, Abeng and Alehile (2012) examined the behaviour of fiscal deficits in Nigeria using a Vector Error Correction Model (VECM) to capture both the short-run dynamics and long-run relationships between fiscal deficits and key macroeconomic variables. Their study was

motivated by the need to understand how fiscal imbalances evolve over time and how they respond to macroeconomic conditions within the Nigerian economy.

Dickey and Fuller (1979) developed the foundational unit root testing framework, which has become a cornerstone in time series econometrics. Their work introduced a statistical method for determining whether a time series variable is stationary or contains a unit root, meaning it follows a non-stationary process. This development was particularly important because many macroeconomic time series variables exhibit trends over time, and failing to account for non-stationarity can lead to misleading or spurious regression results.

Ekpo, Akpan, and Ekaetor (2024) conducted an empirical investigation into the relationship between fiscal deficits and economic growth in Nigeria by applying the Autoregressive Distributed Lag (ARDL) bounds testing approach, which is suitable for analyzing both short-run and long-run dynamics among variables that may be integrated at different orders.
Opayinka (2025) examined the interplay between fiscal policy, inflation, and economic growth in Nigeria using the Autoregressive Distributed Lag (ARDL) approach, which enables the analysis of both short-run dynamics and long-run relationships among macroeconomic variables. The study was motivated by the need to understand how fiscal policy actions interact with inflationary pressures to influence economic performance in a developing economy like Nigeria.

Yusuf and Mohd (2021) investigated the impact of government debt on economic growth in Nigeria using the Autoregressive Distributed Lag (ARDL) approach, which allows for the analysis of both short-run dynamics and long-run equilibrium relationships among macroeconomic variables. Their study was motivated by the rising debt profile of Nigeria and the need to understand how different components of public debt influence economic performance over time.

The reviewed literature indicates mixed findings, suggesting that the impact of fiscal deficits depends on fiscal discipline, expenditure quality, debt sustainability, and institutional effectiveness. This study therefore seeks to fill these gaps by examining the dynamic interplay between fiscal deficits and economic development in Nigeria using the Autoregressive Distributed Lag (ARDL) model, thereby providing more comprehensive and current evidence on the developmental implications of fiscal deficits in the Nigerian economy.

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METHODOLOGY

This study utilized annual secondary time series data covering the period from 1990–2023. The data were sourced from the Central Bank of Nigeria Statistical Bulletin (2023), World Development Indicators, and Transparency International.

Model Specification

The functional relationship is expressed as:

$$GDPG = f(FD, GDPPCG, HCAP, INF, INFRA, IQUAL, NRD, POPG, TOP)$$

The econometric model is:

$$GDPG_t = \beta_0 + \beta_1 FD_t + \beta_2 GDPPCG_t + \beta_3 HCAP_t + \beta_4 INF_t + \beta_5 INFRA_t + \beta_6 IQUAL_t + \beta_7 NRD_t \beta_8 POPG_t + \beta_9 TOP_t + \varepsilon_t$$

where

GDPG = Economic Development (GDP Growth)

FD = Fiscal Deficit

GDPPCG = GDP Per Capita Growth

HCAP = Human Capital Development

INF = Inflation Rate

INFRA = Infrastructure Development

IQUAL = Institutional Quality

NRD = Natural Resource Dependence

POPG = Population Growth

TOP = Trade Openness

ε_t = Stochastic (error) term

The general ARDL model for one dependent variable Y_t and a set of independent variables $X_1, X_2, ..., X_\tau$, denoted by $ARDL(p_0, p_1, p_2, ..., p_\tau)$

For this study, the ARDL is specified as follows:

$$\Delta \ln(GDPG_t) = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \Delta \ln(GDPG_{t-i}) + \sum_{i=0}^{q_1} \beta_{2i} \Delta \ln(FD_{t-i})$$

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$$+\sum_{i=0}^{q_2}\beta_{3i}\Delta ln(GDPPCG_{t-i})+\sum_{i=0}^{q_3}\beta_{4i}\Delta\, ln(HCAP_{t-i})\ +\sum_{i=0}^{q_4}\beta_{5i}\Delta\, ln(INF_{t-i})$$
$$+\sum_{i=0}^{q_5}\beta_{6i}\Delta\, ln(INFRA_{t-i})\ +\sum_{i=0}^{q_6}\beta_{7i}\Delta\, ln(IQUAL_{t-i})$$
$$+\sum_{i=0}^{q_7}\beta_{8i}\Delta\, ln(NRD_{t-i})\ +\sum_{i=0}^{q_8}\beta_{9i}\Delta\, ln(POPG_{t-i})\ +\sum_{i=0}^{q_9}\beta_{10i}\Delta\, ln(TOP_{t-i})$$
$$+\ \varepsilon t$$

Unit Root Test

The Augmented Dickey-Fuller (ADF) procedure was employed to determine stationarity properties of the variables.

ARDL Model

The ARDL approach was adopted because it accommodates variables integrated at different orders I(0) and I(1).

Bounds Test for Cointegration

The Pesaran et al. (2001) Bounds Testing procedure was utilized to determine the existence of long-run equilibrium relationships among the variables.

Error Correction Model

Following confirmation of cointegration, an Error Correction Model (ECM) was estimated to capture short-run dynamics and speed of adjustment toward long-run equilibrium.

RESULTS AND DISCUSSIONS

Descriptive Statistics

Table 1: Descriptive Statistics of Variables (1990-2023)

	GDPG	FD	GDPPCG	HCAP	INF	INFRA	IQUAL	NRD	POPG	TOP
Mean	4.081669	-2.7062	1.4182	49.5996	18.2781	48.0708	20.8053	18.2559	2.5879	35.76382
Median	4.274445	-2.7270	1.7136	50.1285	12.9418	49.0000	19.1604	17.3244	2.6418	35.2600
Maximum	15. 3291	-1.0855	12.2104	54.4620	72.8355	61.2000	34.4190	29.7675	2.8028	53.2800
Minimum	-6. 36889	-4.9191	-8.3424	45.4830	5.3880	27.3000	10.1174	10.3758	2.0928	20.7200
Std. Dev.	4.214166	1.10232	3.9929	2.9680	15.9020	8.4105	7.5147	5.3759	0.2246	9.0593
Skewness	0.104604	-0.4217	0.1188	-0.0942	2.1804	-0.3904	0.2575	0.3721	-1.2509	0.1198
Kurtosis	3.713300	2.2749	3.7825	1.5472	6.8551	2.4242	1.8436	2.0609	3.2511	2.1814
Jarque-Bera	0.782799	1.7526	0.9473	3.0402	47.9940	1.3333	2.2700	2.0338	8.9574	1.0305
Probability	0.676110	0.4163	0.6227	0.2187	0.0000	0.5134	0.3214	0.3617	0.0113	0.5974
Sum	138.7768	-92.012	48.2192	1686.386	621.4536	1634.407	707.3788	620.7014	87.9904	1215.970
Sum Sq. Dev.	586.0535	40.0992	526.1292	290.6985	8344.851	2334.314	1863.531	953.7133	1.6651	2708.352
Observations	34	34	34	34	34	34	34	34	34	34

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Source: *Author's Computation using EViews 12*

The descriptive statistics indicate that average GDP growth during the study period was approximately 4.1 percent, while the average fiscal deficit stood at –2.71 percent. Inflation averaged 18.28 percent, suggesting substantial macroeconomic instability during the study period. Human capital development averaged 49.60, while trade openness averaged 35.76 percent.

Unit Root Test Results

Table 2: Augmented Dickey-Fuller Unit Root Test

Variable	ADF at Level	ADF at First Difference	t-Statistic	Prob.	Order of Integration
GDPG	-2.954021		-3.729542	0.0081	I(0)
FD	-2.954021		-5.463447	0.0001	I(0)
GDPPCG	-2.954021		-3.864055	0.0058	I(0)
HCAP	-3.580622		-5.076639	0.0017	I(0)
INF		-2.971853	-6.173243	0.0000	I(1)
INFRA	-3.552973		-6.752313	0.0000	I(0)
IQUAL	-2.954021		-7.979183	0.0000	I(0)
NRD	-2.954021		-5.932430	0.0000	I(0)
POPG	-2.971853		-3.044335	0.0429	I(0)
TOP	-2.967767		-4.288300	0.0022	I(0)

Note that the significance level was set at 5%.
Source: *Author's Computation using EViews 12*

The ADF results revealed that the variables were integrated at mixed orders I(0) and I(1), validating the use of the ARDL methodology. None of the variables was integrated at order two, I(2).

ARDL Bounds Test

Table 3: Bounds Test

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	505866.4	10%	3.8	3.8
K	0	5%	4.6	4.6
		2.5%	5.39	5.39
		1%	6.44	6.44
Actual Sample Size	30		Finite Sample: n=30	

Source: *Author's Computation using EViews 12*

The Bounds Test result shows that the F-statistic value of 505866.4 is far greater than the critical upper bound values at 10 percent, 5 percent, 2.5 percent, and 1 percent significance levels. Since the calculated F-statistic exceeds all the critical values, indicating cointegration among the variables.

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Long-Run Results

Table 4: Long Run Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.189277	0.152375	-1.242181	0.22321
GDPG(-1)*	-1.000817	0.001786	-560.2940	0.0000
D(GDPG(-1))	0.000352	0.001430	0.246298	0.8086
D(GDPG(-2))	0.001364	0.001196	1.140636	0.2708
D(GDPG(-3)	0.001316	0.000765	1.719524	0.1048
FD	-0.001539	0.001775	-0.867003	0.3988
GDPPCG	1.026114	0.000632	1623.655	0.0000
HCAP	0.004113	0.002426	1.695432	0.1094
INF	-0.000128	0.000156	-0.818020	0.4254
INFRA	-0.001385	0.000840	-1.648994	0.1186
IQUAL	0.000460	0.000288	1.596037	0.1300
NRD	-0.000282	0.000380	-0.741296	0.4693
POPG	1.031647	0.030066	34.31292	0.0000
TOP	0.000196	0.000293	0.667009	0.5143

Source: *Author's Computation using EViews 12*

The long-run estimates revealed that: Fiscal deficit had a negative but statistically insignificant effect on economic development; GDP per capita growth exerted a positive and significant influence on economic development; Human capital development positively influenced economic performance; Inflation negatively affected economic development; Natural resource dependence adversely affected development outcomes; Trade openness and institutional quality were positive but statistically insignificant.

Error Correction Model Results

Table 5: Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(GDPG(-1))	0.000352	0.000767	0.459127	0.6523
D(GDPG(-2))	0.001364	0.000705	1.933244	0.0711
D(GDPG(-3))	0.001316	0.000563	2.336769	0.0328
FD	-0.001539	0.001511	-1.018370	0.3237
GDPPCG	1.026114	0.000582	1761.676	0.0000
HCAP	0.004113	0.001321	3.113722	0.0067
INF	-0.000128	0.000151	-0.843234	0.4115
INFRA	-0.001385	0.000781	-1.771991	0.0954
IQUAL	0.000460	0.000279	1.649037	0.1186
NRD	-0.000282	0.000363	0.775879	0.4491
POPG	1.031647	0.014176	72.77291	0.0000
TOP	0.000196	0.000281	0.695846	0.4965
CointEq(-1)*	-1.000817	0.000965	-1036.806	0.0000

Source: *Author's Computation using EViews 12*

The error correction term, CointEq(-1), has a negative coefficient of -1.000817 and is highly statistically significant with a probability value of 0.0000. The negative and significant coefficient confirms the existence of a long-run equilibrium relationship among the variables

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in the model. The coefficient indicates that approximately 100 percent of short-run disequilibrium is corrected within one year. This means that deviations from long-run equilibrium are adjusted very quickly, showing a strong speed of adjustment toward equilibrium.

Diagnostic Tests

Several diagnostic tests were conducted to determine the reliability, validity, and econometric soundness of the estimated ARDL model.

Serial Correlation LM Test

Table 6: Serial Correlation

F-statistic	2.814876	Prob. F(2, 14)	0.0939
Obs*R-squared	8.603907	Prob. Chi-Square(2)	0.0135

Source: *Author's Computation using EViews 12*

The Breusch-Godfrey Serial Correlation LM Test was conducted to examine whether the residuals are serially correlated. The result shows that the probability value of the F-statistic is 0.0939, which is greater than 0.05. Therefore, the null hypothesis of no serial correlation cannot be rejected. This indicates that the residuals are independent over time and that the model does not suffer from serious serial correlation problems.

Heteroskedasticity Test

Table 7: Breusch–Pagan Heteroskedasticity Test Results

F-statistic	2.405118	Prob. F(13, 16)	0.0494
Obs*R-squared	19.84482	Prob. Chi-Square(13)	0.0991

Source: *Author's Computation using EViews 12*

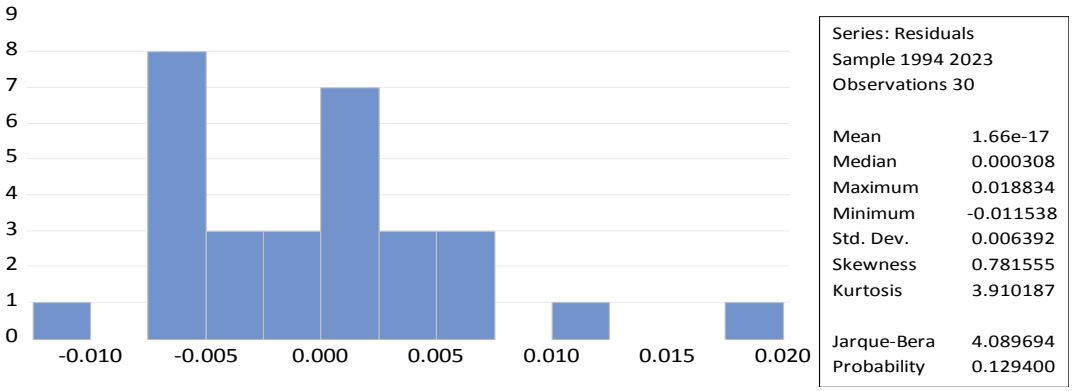
The Breusch-Pagan-Godfrey Heteroskedasticity Test was used to determine whether the variance of the residuals is constant.

The Chi-square probability value of 0.0991 is greater than 0.05, implying that the residuals are homoskedastic. Therefore, the model satisfies the assumption of constant variance and is free from serious heteroskedasticity problems.

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Normality Test

Figure 1: Jarque-Bera Normality Test



Source: *Author's Computation using EViews 12*

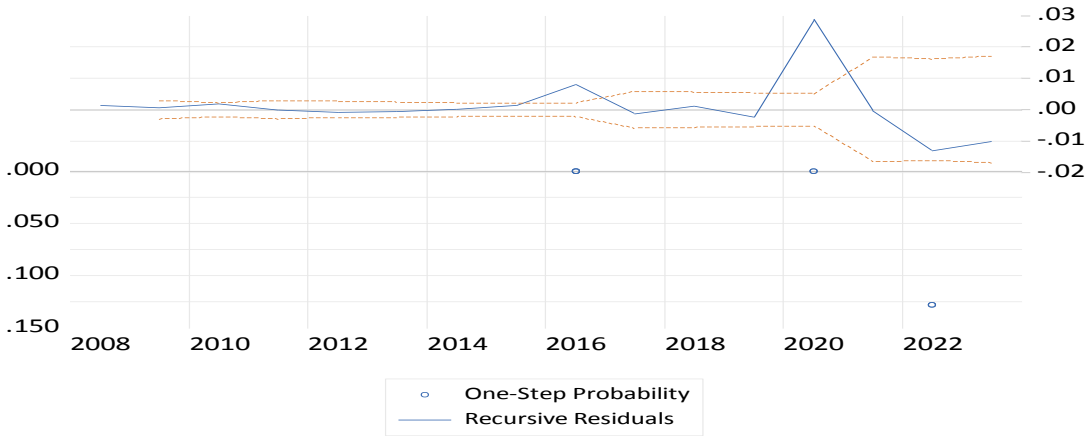
Figure 1 presents the Jarque-Bera normality graph with a probability of **0.1294** ($p > 0.05$), indicating that the residuals are normally distributed. This suggests that the model satisfies the normality assumption and that the estimated coefficients are reliable for inference and hypothesis testing. Overall, the diagnostic tests confirm that the estimated ARDL model is econometrically reliable and suitable for analysis.

Stability Tests

Stability tests were conducted to determine whether the estimated model remains stable throughout the study period.

One-Step Forecast Test

Figure 2: One-Step



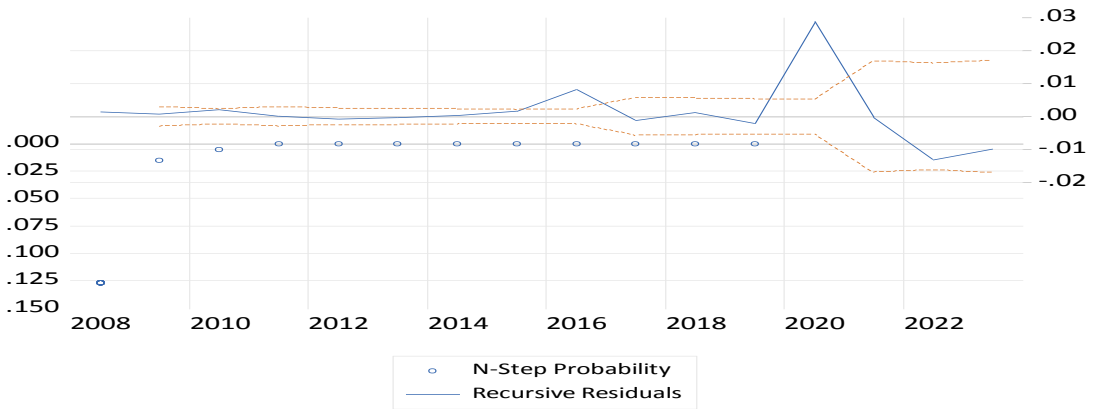
Source: *Author's Computation using EViews 12*

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The One-Step Forecast Test shows that the recursive residuals remain within acceptable probability limits, indicating that the model has good short-run forecasting ability and predictive reliability.

N-Step Forecast Test

Figure 3: N-Step



Source: *Author's Computation using EViews 12*

The N-Step Forecast Test shows that the model's predicted values fall within the confidence bands throughout the sample period. This indicates that the model is stable and has good forecasting ability, meaning its predictions are reliable over time.

Discussion of Findings

The negative but insignificant effect of fiscal deficits suggests that deficit financing alone does not guarantee development. This finding supports studies that argue the effectiveness of fiscal deficits depends on expenditure quality and resource allocation efficiency.

The positive effect of GDP per capita growth and human capital development is consistent with endogenous growth theory, which emphasizes the importance of productivity improvements and human capital accumulation.

The adverse impact of inflation supports the argument that macroeconomic instability constrains economic development by reducing investment and weakening purchasing power.

CONCLUSION AND RECOMMENDATIONS

This study examined the dynamic interplay between fiscal deficits and economic development in Nigeria using the ARDL framework. The findings established a long-run equilibrium relationship among fiscal deficits and development indicators. Fiscal deficits exerted a

negative but insignificant effect on economic development, while GDP per capita growth and human capital development positively influenced development outcomes. Inflation and natural resource dependence adversely affected economic development.

The following recommendations were therefore made.

i. Government should strengthen fiscal discipline and reduce persistent budget deficits.
ii. Borrowed funds should be directed toward productive investments such as infrastructure, education, and healthcare.
iii. Revenue diversification should be prioritized to reduce dependence on oil revenue.
iv. Institutional quality and transparency should be strengthened to improve fiscal efficiency.
v. Inflation-control policies should be pursued to ensure macroeconomic stability.
vi. Human capital development should remain a major policy priority.

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