Innovations

External Debt, Foreign Direct Investment and Economic Growth in Some Selected West Africa Countries

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Abstract: *Developing economies face persistent challenges in achieving sustainable growth due to their reliance on external debt (ExtD) and foreign direct investment (FDI). This study examines the relationship between economic growth (GDP), ExtD, and FDI in Nigeria, Ghana, and Senegal. The main objective is to evaluate the impact of external debt and FDI on GDP, identify long-run and short-run relationships, and provide policy insights. Annual time-series data from 1990 to 2022 were sourced from the World Bank and International Monetary Fund (IMF). The analysis employed the autoregressive distributed lag (ARDL) bounds testing approach. The ARDL bounds test results reveal mixed findings. In Ghana, the F-statistic for the equation with external debt as the dependent variable is 9.11, exceeding the upper critical value of 6.03 at the 1% significance level, confirming the existence of a long-run relationship among the variables. Conversely, in Nigeria and Senegal, the F-statistics for all equations fall below the lower critical value of 4.95, indicating no evidence of cointegration between GDP, ExtD, and FDI. These results suggest that while Ghana has effectively leveraged external debt and FDI for growth, Nigeria and Senegal face challenges stemming from poor governance, debt mismanagement, and undiversified economies. The study recommends that policymakers in Nigeria and Senegal focus on fiscal discipline, debt sustainability, and diversifying FDI inflows into non-resource sectors such as manufacturing and agriculture. Strengthening governance and creating an enabling investment environment are critical for achieving sustainable economic growth.*

Keywords: *Economic Growth, Foreign Direct Investment, External Debt, ARDL Model, West Africa*

1 Introduction

Public debt, Foreign Direct Investment (FDI), and economic growth are the cornerstones of shaping many developing nations' economies. In West Africa, the interaction among these factors can either drive economic progress or exacerbate existing economic challenges. When strategically managed, public debt is a

common feature in many economies, and it can fund infrastructure and social projects and foster growth. However, excessive debt burdens can constrain economic expansion and redirect resources toward debt servicing rather than development. On the other hand, foreign direct investment has widely been acknowledged as a catalyst for growth by infusing capital, technology, and employment opportunities into the host economy (Azolibe, 2022). Foreign investors can boost productivity through FDI by encouraging local firms to innovate and adopt modern production techniques to remain competitive, leading to overall economic advancement (Shittu et al., 2020).

FDI benefits host countries by boosting exports, creating jobs, and facilitating technology transfer, but its impact on growth depends on factors like governance, policies, and the regulatory environment. In West Africa, excessive debt and weak frameworks can undermine FDI's potential (Ibrahim, 2021). In Nigeria, high debt diverts funds from productive investments, while FDI is concentrated in oil, hindering diversification (Shittu & Yusuf, 2020). Effective debt management and governance are crucial for attracting diversified FDI and fostering growth (Fagbemi & Adeosun, 2021). This study aims to fill gaps in previous research by using ARDL and VECM to analyze the relationship between public debt, FDI, and economic growth in selected West African countries. The findings will offer valuable insights for policymakers on balancing debt, FDI, and economic growth in the region. The paper includes a literature review, an overview of public debt and FDI in West Africa, methodology, empirical analysis, and conclusions.

The selection of Nigeria, Ghana, and Senegal in the study is justified by their unique economic structures, levels of development, and debt-FDI dynamics. Nigeria, as Africa's largest economy, is heavily reliant on oil and provides insights into the effects of resource-dependent FDI and external debt on growth. Ghana, known for its stable governance and relatively diversified economy, serves as a contrast to resource dependency, highlighting the role of effective debt management and investment in sustainable development. Senegal, a smaller, service-oriented economy with a focus on agriculture and tourism, offers perspectives on alternative development pathways. These countries also exhibit diverse inflation trends and fiscal policies, which significantly influence their ability to manage public debt and attract FDI. For instance, Nigeria's high inflation undermines economic stability and investor confidence, while Ghana's proactive debt restructuring highlights adaptive fiscal strategies. Senegal, with its moderate inflation and relative macroeconomic stability, presents a different approach to fostering growth. This diversity enables the study to comprehensively analyze how external debt and FDI interact with GDP under varying economic and policy contexts within West Africa.

1. **Literature Review**

The effects of Foreign Direct Investment (FDI) on economic growth differ between traditional and modern economic growth models. According to neoclassical growth theory, FDI impacts the output level but does not affect the long-term growth rate. An exogenous increase in FDI can boost capital accumulation and temporarily raise per capita income, but diminishing returns limit sustained growth. Long-term growth is driven by technological advancements or labor force expansion, considered exogenous variables (Solow, 1956, 1957).

Endogenous growth theory attributes technological progress to internal factors such as investments in knowledge, human capital, and research, with FDI facilitating technology transfer (Arrow, 1962; Romer, 1986, 1990). The Debt Overhang Theory suggests high public debt deters investment due to potential fiscal instability (Krugman, 1988; Sachs, 1989), while Dependency Theory argues that FDI can reinforce economic dependency and limit local growth (Sachs, 1989). Neoclassical and endogenous growth models differ in their views on technological progress, with the former treating it as external and the latter as an outcome of investment. Policies encouraging trade, competition, and innovation are key to sustainable growth, while protectionism may hinder progress.

Recent studies highlight that FDI's impact on growth in developing economies depends on host country conditions, including governance, human capital, and technological readiness. Asongu and Odhiambo (2020) found that FDI's positive effects are stronger in countries with good governance, while Ajide and Raheem (2021) emphasized the role of transparency and political stability. Borensztein et al. (2021) showed that countries with strong human capital benefit more from FDI's technology transfer potential, though rural areas often miss out.

Research on debt overhang in sub-Saharan Africa indicates that high debt crowds out investment (Baharumshah et al., 2022), but moderate debt can finance infrastructure and attract FDI (Ahmed & Haque, 2023). FDI in resource-rich countries often exacerbates dependency, but well-regulated FDI in sectors like manufacturing can drive growth (Kose &Ohnsorge, 2023). FDI's impact on inequality varies, with some studies showing it increases inequality, while others suggest it reduces it in labor-intensive sectors. Africa's external debt reached $656 billion in 2022, with concerns about sustainability and the need for better debt management and revenue mobilization.

2.1 Public Debt, FDI, and Economic Growth Nexus in West Africa

The relationship between public debt, FDI, and economic growth in West Africa reveals that high public debt can reduce the benefits of FDI. Owusu et al. (2022) found that high debt creates investor uncertainty, with Nigeria's FDI declining by 15% in 2022 as debt exceeded 35% of GDP (UNCTAD, 2023). Adegboye and Adetunji

(2023) argue that countries with lower debt levels see more significant FDI-driven growth. Policies that reduce debt and ensure fiscal discipline are essential for attracting FDI, fostering economic expansion (IMF, 2023).

2.2 Impact of External Debt on FDI Inflows in West Africa

High external debt levels in West Africa deter FDI by raising concerns over fiscal stability. Diop et al. (2022) found that countries with debt-to-GDP ratios over 50% experienced a 10–15% drop in FDI. The Debt Overhang Theory (Krugman, 1988) explains this, as investors fear higher taxes or austerity measures. Bako and Isah (2023) suggest that better debt management could increase FDI inflows by 20%. Debt restructuring programs in Ghana and Côte d'Ivoire, such as Ghana's 2022 program, led to a 12% increase in FDI inflows (World Bank, 2023), underscoring the importance of debt management in attracting investment.

2.3 Debt Sustainability and Economic Growth in Selected West African Countries

Sustainable debt management is crucial for long-term growth in West Africa, as seen in Nigeria, Ghana, and Côte d'Ivoire. Adebayo et al. (2022) warn that Nigeria risks a debt crisis if its debt accumulation outpaces GDP growth, with its debt-to-GDP ratio rising from 27% in 2019 to 35% in 2022, leading to increased debt servicing costs that now consume over 35% of government revenue (CBN, 2023). Yeboah and Kofi (2023) highlight Ghana's fiscal constraints, where debt servicing takes up 45% of government revenue, hindering growth. In contrast, Eze et al. (2023) show that Côte d'Ivoire's sustainable debt practices, like concessional borrowing and tax revenue increases, supported an average GDP growth rate of 6% from 2015 to 2022, illustrating the benefits of sustainable debt management.

2.4 Debt-FDI Dynamics in West African Economies

The relationship between public debt and FDI varies across West African countries. Osei and Boakye (2023) and UNCTAD (2023) find that Nigeria's FDI is concentrated in the oil sector, making the economy vulnerable to price fluctuations. Meanwhile, Ghana and Benin benefit from more diversified FDI in manufacturing and services, enhancing economic resilience. Côte d'Ivoire, with sound debt management and diversified FDI in sectors like manufacturing and agribusiness, has seen consistent growth and improved credit ratings (Kouadio et al., 2023; World Bank, 2023). Research suggests that Nigeria's external debt, exceeding 35% of GDP (CBN, 2023), limits infrastructure and human capital investment, making the economy less attractive for diversified FDI. Studies by Adeyemi and Folarin (2022) and Nwosu and Eke (2023) recommend reducing debt and diversifying investments to strengthen Nigeria's economic base and foster stable growth. Côte d'Ivoire's experience shows

the benefits of balancing debt management with diverse FDI flows for sustainable growth.

2. Data Sources

This study used annual time series data on GDP, external debt, and FDI for Ghana, Nigeria, and Senegal, sourced from central bank reports, the World Development Indicators (WDI) by the World Bank, and the International Financial Statistics (IFS) Yearbook. Economic growth is measured by actual GDP values in constant U.S. dollars, representing each country's economic performance. External debt reflects the total financial obligations of each country expressed in U.S. dollars. FDI, representing net foreign investment inflows relative to GDP, indicates the extent of foreign capital's contribution to the economy.

3. Methodology

This study examines the relationship between public debt, FDI, and economic growth in Ghana, Nigeria and Senegal using the ARDL bounds testing approach. The ARDL method is suitable for time-series data with mixed integration orders (I(0) and I(1)). Data on annual GDP, external debt, and FDI were obtained from sources like the World Bank, IMF, and national agencies. Stationarity was confirmed using the ADF and PP tests. The approach evaluates both long-run and short-run dynamics, providing insights into the interaction between external debt, FDI, and economic growth in developing economies.

The ARDL (Autoregressive Distributed Lag) model for this study, focusing on the relationships between GDP, external debt (ExtD), and foreign direct investment (FDI), is structured as follows:

General ARDL Model:
The ARDL model is expressed as:
$$Y_t = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} Y_{t-i} + \sum_{j=1}^{q} \gamma_j X_{t-j} + \sum_{k=1}^{r} \delta_k Z_{t-k} + \varepsilon_t$$

ARDL Model for GDP as dependent variable:
$$\ln(GDP_t) = \alpha_0 + \sum_{i=1}^{p} \beta_{1i} \ln(GDP_{t-i}) + \sum_{j=0}^{q} \gamma_{1j} \ln(ExtD_{t-j}) + \sum_{k=0}^{r} \delta_{1i} \ln(FDI_{t-k}) + \epsilon_t$$

ARDL Model for External Debt (ExtD) as dependent variable:
$$\ln(ExtD_t) = \alpha_0 + \sum_{i=1}^{p} \beta_i \ln(ExtD_{t-i}) + \sum_{j=0}^{q} \gamma_j \ln(GDP_{t-j}) + \sum_{k=0}^{r} \delta_k \ln(FDI_{t-k}) + \epsilon_t$$

ARDL Model for Foreign Direct Investment (FDI) as dependent variable:
$$\ln(FDI_t) = \alpha_0 + \sum_{i=1}^{p} \beta_i \ln(FDI_{t-i}) + \sum_{j=0}^{q} \gamma_j \ln(GDP_{t-j}) + \sum_{k=0}^{r} \delta_k \ln(ExtD_{t-k}) + \epsilon_t$$

Cointegration Formular for ARDL:
$$\Delta \ln(Y_t) = \alpha 0 + \sum_{i=1}^{p} \beta_{1i} \Delta \ln(Y_{t-i}) + \sum_{j=0}^{q} \gamma_{1j} \Delta \ln(X_{t-ij}) + \sum_{k=0}^{r} \delta_{1k} \Delta \ln(Z_{t-k}) + \lambda_1 \ln(Y_{t-1}) + \lambda_2 \ln(X_{t-1}) + \lambda_3 \ln(Z_{t-1}) + \epsilon_t$$

When GDP is the dependent variable, the ARDL cointegration model can be written as:

$\Delta\ln(GDP_t)=\alpha0+ \sum_{i=1}^{p}\beta_{1i} \Delta\ln(GDP_{t-i})+ \sum_{j=0}^{q}\gamma_{1j} \Delta\ln(ExtD_{t-j})+ \sum_{k=0}^{r}\delta_{1k} \Delta\ln(FDI_{t-k})+\lambda_1\ln(GDP_{t-1})+\lambda_2\ln(ExtD_{t-1})+\lambda_3\ln(FDI_{t-1})+\epsilon_t$

When ExtD is the dependent variable:

$\Delta\ln(ExtD_t)=\alpha0+\sum_{i=1}^{p}\beta_i\Delta\ln(ExtD_{t-i})+\sum_{j=0}^{q}\gamma_{2i}\Delta\ln(GDP_{t-j})+\sum_{i=0}^{r}\delta_{2i}\Delta\ln(FDI_{t-i})+\lambda_1\ln(ExtD_{t-1})+\lambda_2\ln(GDP_{t-1})+\lambda_3\ln(FDI_{t-1})+\epsilon_t$

When FDI is the dependent variable:

$\Delta\ln(FDI_t)=\alpha0+ \sum_{i=1}^{p}\beta_i \Delta\ln(FDI_{t-i})+ \sum_{j=0}^{q}\gamma_{2i} \Delta\ln(GDP_{t-j})+ \sum_{i=0}^{r}\delta_{2i} \Delta\ln(ExtD_{t-i})+\lambda_1\ln(FDI_{t-1})+\lambda_2\ln(GDP_{t-1})+\lambda_3\ln(ExtD_{t-1})+\epsilon_t$

4. Data Analysis and Discussion

The descriptive statistics for GDP, external debt, and FDI across Ghana, Nigeria, and Senegal show notable differences. Ghana's GDP ranges from 4.98 billion to 79.5 billion, with a mean of 28.6 billion and high variability (SD of 25.7 billion). External debt spans from 3.13 billion to 44.8 billion, with a mean of 15.7 billion, while FDI shows a mean of 1.32 billion, indicating occasional high inflows. In Nigeria, GDP ranges from 44 billion to 574 billion, with a mean of 251 billion and high variability (SD of 173.9 billion). External debt is between 18.6 billion and 98.3 billion, averaging 40.5 billion, while FDI fluctuates between -0.19 billion and 8.84 billion, with a mean of 2.82 billion. Senegal's GDP ranges from 5.04 billion to 31 billion, with a mean of 13.5 billion and low variability (SD of 7.1 billion). External debt is between 1.94 billion and 32.1 billion, with a mean of 7.75 billion, and FDI ranges from -0.0075 billion to 2.59 billion, with a mean of 0.407 billion, reflecting low foreign investment.

Table1: Descriptive statistics

Countries	Statistics	GDP (in Billion)	ExternalDebt (in Billion)	FDI(in Billion)
Ghana	Min	4.98	3.13	0.0047
	Max	79.5	44.8	3.88
	Median	10.7	7.87	0.238
	Mean	28.6	15.7	1.32
	Standard Deviation	25.7	13.6	1.4
	1st Quarter	6.42	6.03	0.102
	3rd Quarter	54.8	28.5	2.78
Nigeria	Min	44	18.6	-0.19
	Max	574	98.3	8.84
	Median	218	33.5	1.92

	Mean	251	40.5	2.82
	Standard Deviation	173.9	19.5	2.6
	1st Quarter	73.6	29.5	0.76
	3rd Quarter	414	41.6	4.73
Senegal	Min	5.04	1.94	-0.0075
	Max	31	32.1	2.59
	Median	11	3.97	0.173
	Mean	13.5	7.75	0.407
	Standard Deviation	7.1	7.6	0.6
	1st Quarter	6.56	3.72	0.053
	3rd Quarter	18.9	32.1	0.405

5.1 Unit Root Test

The study used the ADF and PP tests to assess stationarity. The ADF test accounts for autocorrelation, while the PP test applies nonparametric corrections. Both tests check if data are stationary at the level or after differencing. The ARDL bounds test requires variables to be I(0) or I(1), as I(2) can invalidate results. Unit root tests (Table 2) show that variables for Nigeria, Ghana, and Senegal are non-stationary at the level but become stationary at first difference, confirming they are I(1), suitable for ARDL analysis.

Table2: Unit root test

Country	Variables	Adf test SIC lag	t-stat	Critical value at 5%		Variables	PP test SIC lag	t-stat	Critical value at 5%
Nigeria	In(Gdp)	0	-2.115	0.528			0	-9.450	5.281
	In(Extd)	0	0.173	0.991			0	0.832	0.990
	In(FDI)	0	-1.104	0.908			0	-3.792	0.893
Ghana	In(Gdp)	0	-1.597	0.734			0	-4.021	0.878
	In(Extd)	0	-0.998	0.924			0	-1.862	0.968
	In(FDI)	0	-1.604	0.727			0	-0.703	0.684
Senegal	In(Gdp)	0	-1.909	0.608			0	-0.341	0.9121
	In(Extd)	0	2.78	0.909			0	0.512	0.990
	In(FDI)	0	-0.641	0.964			0	3.727	0.992

5.2 Cointegration Bound Test

The ARDL bounds test examines long-run relationships between GDP, external debt, and FDI in Ghana, Nigeria, and Senegal, identifying stable long-term interactions between economic growth, debt, and investment.

Table 3: The Cointegration Bound Test

Country	Dependent variable	AIC lags	F-statistic	Decision
Ghana	$F_G(G\backslash F,E)$	2	2.91	No cointegration
	$F_F(F\backslash G,E)$	2	4.88	No cointegration
	$F_E(E\backslash G,F)$	2	9.11	Cointegration
	Lower-bound critical value at 1%	4.95		
	Upper-bound critical value at 1%	6.03		
Nigeria	$F_G(G\backslash F,E)$	2	5.20	No cointegration
	$F_F(F\backslash G,E)$	2	0.64	No cointegration
	$F_E(E\backslash G,F)$	2	1.90	No cointegration
	Lower-bound critical value at 1%	4.95		
	Upper-bound critical value at 1%	6.03		
Senegal	$F_G(G\backslash F,E)$	2	1.10	No cointegration
	$F_F(F\backslash G,E)$	2	4.08	No cointegration
	$F_E(E\backslash G,F)$	2	3.43	No cointegration
	Lower-bound critical value at 1%	4.95		
	Upper-bound critical value at 1%	6.03		

The Cointegration Bound Test showed that in Ghana, the FE(E\G,F) model had an F-statistic of 9.11, above the critical value of 6.03, indicating cointegration. Other models in Ghana, Nigeria, and Senegal had F-statistics below the critical value, showing no cointegration. Therefore, only the FE(E\G,F) model in Ghana demonstrated a long-run relationship.

5.3 Test of Hypotheses

5.3.1 Hypothesis One

Research Hypothesis One ($H_0$1): There is no significant relationship between External Debt, Foreign Direct Investment and Economic Growth in Nigeria Long-Run Equation:

$$\text{LGDP}_t = 0.033 + 0.029\text{LFDI}_{t-1} + 0.375\text{LED}_{t-1} + \epsilon_t$$

Short-Run Equation:

$$\Delta\text{LGDP}_t = c + \alpha(\text{ECT}_{t-1}) + \sum_{i=1}^{3}\beta_i\Delta\text{LGDP}_{t-i} + \sum_{j=1}^{3}\gamma_i\Delta\text{LFDI}_{t-i} + \sum_{k=1}^{3}\gamma_k\Delta\text{LED}_{t-i} + \varepsilon_t$$

Table 5.3.1: Auto regression Distributed Lag Model (ARDL)

Variable	Coefficient	Std. Error	t-Statistic	prob
NGA_LGDP(-1)	0.094	0.235	0.412	0.692
NGA_LGDP(-2)	0.171	0.237	0.724	0.478
NGA_LGDP(-3)	-0.160	0.239	-0.672	0.509
NGA_LFDI	-0.009	0.009	-0.956	0.351
NGA_LFDI(-1)	0.010	0.014	0.803	0.431
NGA_LFDI(-2)	0.019	0.014	1.409	0.174
NGA_LFDI(-3)	0.005	0.012	0.422	0.677
NGA_LED	-0.044	0.419	-0.106	0.917
NGA_LED(-1)	-0.049	0.429	-0.113	0.911
NGA_LED(-2)	0.214	0.436	0.491	0.629
NGA_LED(-3)	0.215	0.397	0.541	0.595
C	0.033	0.082	0.402	0.692

Variable	Coefficient	Std. Error	t-Statistic	prob
NGA_LFDI	0.029	0.047	0.624	0.539
NGA_LED	0.375	1.147	0.327	0.747

Diagnostic test
ARDL Bound Test @ 5%: F – stat = 2.522 (I (0) = 3.10, I (1) = 3.87
R² = 0.233   Adj.R² = -0.189F- stat = 0.552 (0.844)
$X^2_{JB} = 171.754\ (0.0); X^2_{LM} = 1.655\ (0.214); X^2_{BPG} = 0.373\ (0.952) X^2_{RR} = 2.438\ (0.135)$
Stability: Cusum

Source: Researcher's Computation (2025) from E-Views 12

Notes: SE: standard error; $X^2_{JB}; X^2_{LM}; X^2_{BPG}; X^2_{RR}$ represent Jarque-Bera normality test, LM test for serial correlation, Breusch-Pagan Godfrey test for heteroscedasticity, and Ramsey Reset test for linearity respectively. I(0) and I(1) represent lower and upper bound, respectively. While the respective probability values are in bracket; ECT: Error correction term.

Interpretation
Long-Run
The ARDL long-run analysis shows weak relationships between external debt, FDI, and economic growth in Nigeria. The FDI coefficient of 0.029 suggests a minor positive effect, but its p-value of 0.539 indicates no statistical significance, possibly due to ineffective policies or infrastructure issues. External debt shows a coefficient of 0.375, indicating a moderate positive effect, but with a p-value of 0.747, it also lacks statistical significance, likely due to mismanagement and high debt servicing costs. These results highlight systemic challenges and the need for improved policies to harness FDI and external debt for sustainable growth.

Short-Run
The ARDL short-run results show weak and inconsistent relationships between external debt, FDI, and economic growth in Nigeria. The contemporaneous coefficient for FDI is -0.009, indicating a negligible negative impact on GDP, while lagged FDI terms show mixed positive but insignificant effects. For external debt, the contemporaneous coefficient is -0.044, suggesting a weak negative relationship with GDP, with lagged terms alternating signs and lacking significance. Lagged GDP terms also have mixed, insignificant effects on current growth. Overall, both external debt and FDI have minimal, statistically insignificant impacts on economic growth, highlighting the need for reforms in debt management, FDI allocation, and governance to drive sustainable growth.

Diagnostic Tests
The diagnostic tests show the ARDL model is well-specified and reliable. The Jarque-Bera test indicates non-normal residuals (p-value = 0.0). The Breusch-Godfrey test

shows no serial correlation (p-value = 0.214), while the Breusch-Pagan-Godfrey test confirms homoscedasticity (p-value = 0.952). The Ramsey RESET test suggests correct model specification with a linear relationship (p-value = 0.135). These results indicate the model's robustness and reliability for analysis.

5.3.2 Hypothesis Two

($H_0$2): There is no significant relationship between External Debt, Foreign Direct Investment and Economic Growth in Ghana

Long-Run Equation:

$LGDP_t = 0.056 + 0.073LFDI_{t-1} - 0.043LED_{t-1} + \epsilon_t$

Short-Run Equation:

$\Delta LGDP_t = c + \alpha(ECT_{t-1}) + \sum_{i=1}^{3} \beta_i \Delta LGDP_{t-i} + \sum_{j=1}^{3} \gamma_i \Delta LFDI_{t-i} + \sum_{k=1}^{3} \gamma_k \Delta LED_{t-i} + \varepsilon_t$

Table 5.3.2: Auto regression Distributed Lag Model (ARDL)

Variable	Coefficient	Std. Error	t-Statistic	prob
GHA_LGDP(-1)	0.216	0.225	0.957	0.350
GHA_LGDP(-2)	-0.033	0.219	-0.152	0.880
GHA_LGDP(-3)	0.048	0.218	0.221	0.828
GHA_LFDI	0.065	0.072	0.912	0.372
GHA_LFDI(-1)	-0.061	0.073	-0.837	0.413
GHA_LFDI(-2)	0.009	0.072	0.124	0.902
GHA_LFDI(-3)	0.043	0.072	0.599	0.556
GHA_LED	0.055	0.323	0.169	0.867
GHA_LED(-1)	-0.141	0.318	-0.443	0.663
GHA_LED(-2)	-0.369	0.322	-1.149	0.264
GHA_LED(-3)	0.423	0.323	1.310	0.205
C	0.056	0.058	0.963	0.347

Variable	Coefficient	Std. Error	t-Statistic	prob
GHA_LFDI	0.073	0.181	0.400	0.693
GHA_LED	-0.043	0.698	-0.061	0.952

Diagnostic test
ARDL Bound Test @ 5%: F – stat   = 2.522 (I (0) = 3.10, I (1) = 3.87
R^2 = 0.233   Adj.R^2 = -0.189 F- stat = 0.552 (0.844)
X^2_{JB} = 1.092 (0.579); X^2_{LM} = 0.542(0.660); X^2_{BPG} = 1.462 (0.222)X^2_{RR} = 2.064 (0.167)
Stability: Cusum

Source: Researcher's Computation (2025) from E-Views 12

Notes: SE: standard error; X^2_{JB}; X^2_{LM}; X^2_{BPG}; X^2_{RR} represent Jarque-Bera normality test, LM test for serial correlation, Breusch-Pagan Godfrey test for heteroscedasticity, and Ramsey Reset test for linearity respectively. I(0) and I(1) represent lower and upper bound, respectively. While the respective probability values are in bracket; ECT: Error correction term.

Interpretation
Long-Run
The long-run ARDL analysis examines the relationship between economic growth (real GDP), FDI, and external debt in Ghana. The FDI coefficient is 0.073, indicating that a 1% increase in FDI corresponds to a 0.073% rise in GDP. However, a p-value of 0.693 renders this relationship statistically insignificant, showing minimal long-term impact. For external debt, the coefficient is -0.043, suggesting a 1% increase in debt reduces GDP by 0.043%. Despite this negative association, the p-value of 0.952 indicates no statistical significance. Overall, neither FDI nor external debt significantly influences Ghana's long-term economic growth, highlighting their limited contribution within the study period.

Short-Run
The short-run ARDL analysis highlights the immediate effects of FDI and external debt on Ghana's economic growth. For FDI, the coefficient is 0.065, indicating a weak positive relationship where a 1% increase in FDI corresponds to a 0.065% rise in GDP. However, the p-value of 0.372 shows this relationship is not statistically significant. Similarly, external debt has a coefficient of 0.055, suggesting a negligible positive impact, but a p-value of 0.867 confirms its statistical insignificance.

Diagnostic Tests
The diagnostic tests confirm the ARDL model's reliability. The Jarque-Bera test (p-value = 0.579) shows normal residuals, while the Breusch-Godfrey LM test (p-value = 0.660) indicates no serial correlation. The Breusch-Pagan-Godfrey test (p-value =

0.222) confirms constant variance, and the Ramsey RESET test (p-value = 0.167) affirms correct model specification with a linear relationship.

5.3.3 Hypothesis Three

Research Hypothesis ($H_0$3): There is no significant relationship between External Debt, Foreign Direct Investment and Economic Growth in Senegal

Long-Run Equation:

$LGDP_t = -0.021 + 0.086LFDI_{t-1} + 0.02LED_{t-1} + \epsilon_t$

Short-Run Equation:

$\Delta LGDP_t = c + \alpha(ECT_{t-1}) + \sum_{i=1}^{3} \beta_i \Delta LGDP_{t-i} + \sum_{j=1}^{3} \gamma_i \Delta LFDI_{t-i} + \sum_{k=1}^{3} \gamma_k \Delta LED_{t-i} + \varepsilon_t$

Table 5.3.2: Auto regression Distributed Lag Model (ARDL)

Variable	Coefficient	Std. Error	t-Statistic	prob
SEN_LGDP(-1)	0.472	0.241	1.968	0.062
SEN_LGDP(-2)	-0.284	0.217	-1.313	0.204
SEN_LGDP(-3)	0.428	0.203	2.11	0.048
SEN_LFDI	0.014	0.006	2.186	0.041
SEN_LFDI(-1)	0.009	0.007	1.353	0.191
SEN_LFDI(-2)	-0.001	0.007	-0.103	0.919
SEN_LFDI(-3)	0.011	0.005	2.145	0.044
SEN_LED	0.138	0.107	1.277	0.216
SEN_LED(-1)	-0.107	0.11	-0.978	0.34
SEN_LED(-2)	-0.097	0.11	-0.879	0.39
SEN_LED(-3)	0.075	0.114	0.65	0.523
C	0.004	0.029	0.147	0.884

Variable	Coefficient	Std. Error	t-Statistic	prob
SEN_LFDI	0.086	0.114	0.755	0.459
SEN_LED	0.02	0.468	0.043	0.966

Diagnostic test
ARDL Bound Test @ 5%: F – stat = 2.036 (I (0) = 3.10, I (1) = 3.87
R^2 = 0.483   Adj.R^2 = 0.198F- stat = 1.700 (0.147)
X^2_{JB} = 7.549 (0.023); X^2_{LM} = 0.587(0.632); X^2_{BPG} = 1.725 (0.139)X^2_{RR} = 4.880 (0.040)
Stability: Cusum

Source: Researcher's Computation (2025) from E-Views 12

Notes: SE: standard error; X^2_{JB}; X^2_{LM}; X^2_{BPG}; X^2_{RR} represent Jarque-Bera normality test, LM test for serial correlation, Breusch-Pagan Godfrey test for heteroscedasticity, and Ramsey Reset test for linearity respectively. I(0) and I(1) represent lower and upper bound, respectively. While the respective probability values are in bracket; ECT: Error correction term.

Interpretation

Long-Run The long-run analysis reveals the steady-state relationship between external debt (LED), foreign direct investment (FDI), and economic growth (GDP) in Senegal. The coefficient for FDI is 0.086, indicating that a 1% increase in FDI inflows is associated with a 0.086% rise in GDP, highlighting FDI's role as a long-term growth driver. For external debt, the coefficient is 0.02, suggesting that a 1% increase in debt results in a 0.02% GDP growth, potentially reflecting effective utilization of borrowed funds for development. The intercept of −0.021 implies that without FDI and external debt, economic growth would decline, underscoring their importance to Senegal's economy. These results suggest that both FDI and external debt contribute positively to long-term economic growth.

Short-Run Analysis The short-run analysis examines the immediate effects of FDI and external debt on Senegal's economic growth. The FDI coefficient is 0.014, statistically significant at the 5% level (p-value = 0.041), indicating that a 1% increase in FDI leads to a 0.014% rise in GDP. This highlights FDI's quick economic impact, likely driven by capital inflows, technology transfer, and expertise. Conversely, external debt coefficients lack statistical significance, suggesting that debt does not immediately influence growth, potentially due to delays in loan deployment or the time required for borrowed funds to impact productivity.

Diagnostic Tests - The diagnostic tests indicate the ARDL model's reliability with some areas for improvement. The Jarque-Bera test (p-value = 0.023) suggests non-normal residuals, potentially affecting inference precision, but the model remains robust. The Breusch-Pagan-Godfrey test (p-value = 0.139) confirms homoscedasticity, while the Breusch-Godfrey test (p-value = 0.632) shows no serial correlation. However, the Ramsey RESET test (p-value = 0.040) points to possible model misspecification, indicating a need for a nonlinear relationship or additional variables.

5.3 Residual Plot The method of testing the long-run stability of the regression model, as suggested by Brown, Durbin, and Evans (1975), was used to assess the structural stability of the estimated model for Ghana. This involves plots of the

cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squared recursive residuals (CUSUMSQ). The plots are presented in Figure 1,2 and 3.
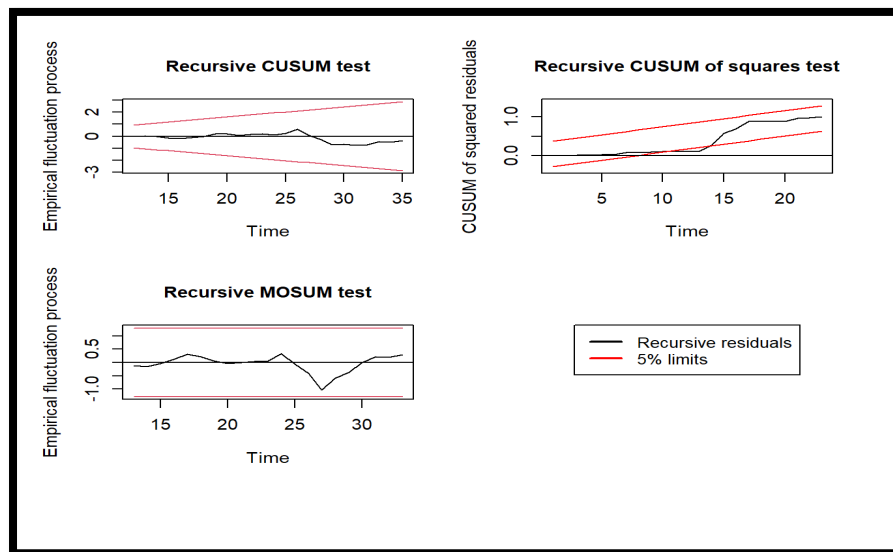
1 Nigeria
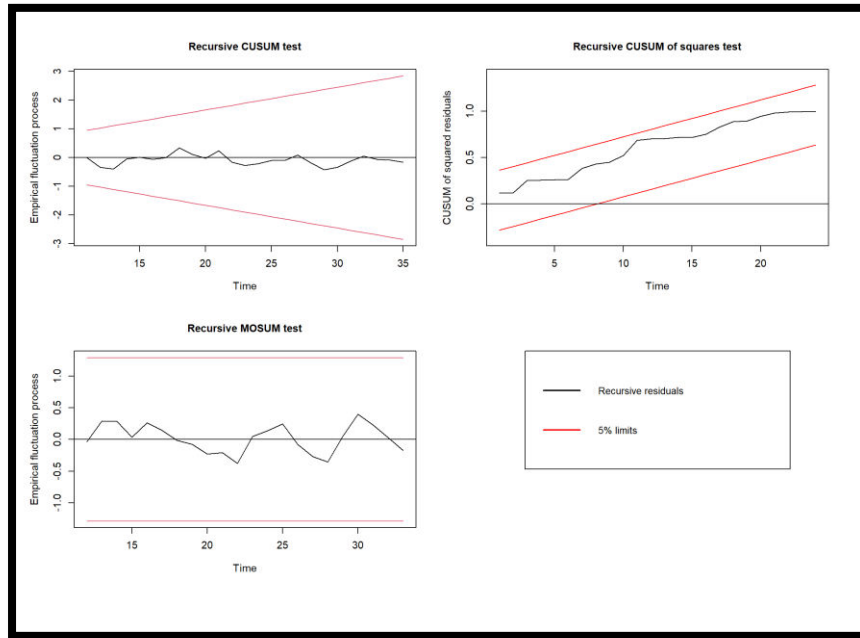
Figure 1: Residual plot for Nigeria

The residual plots for Nigeria, including the Recursive CUSUM, CUSUM of squares, and MOSUM tests, show that residuals remain within critical bounds, indicating no structural breaks, heteroscedasticity, or instability. These results confirm the model's stability and reliability for valid inference and forecasting.
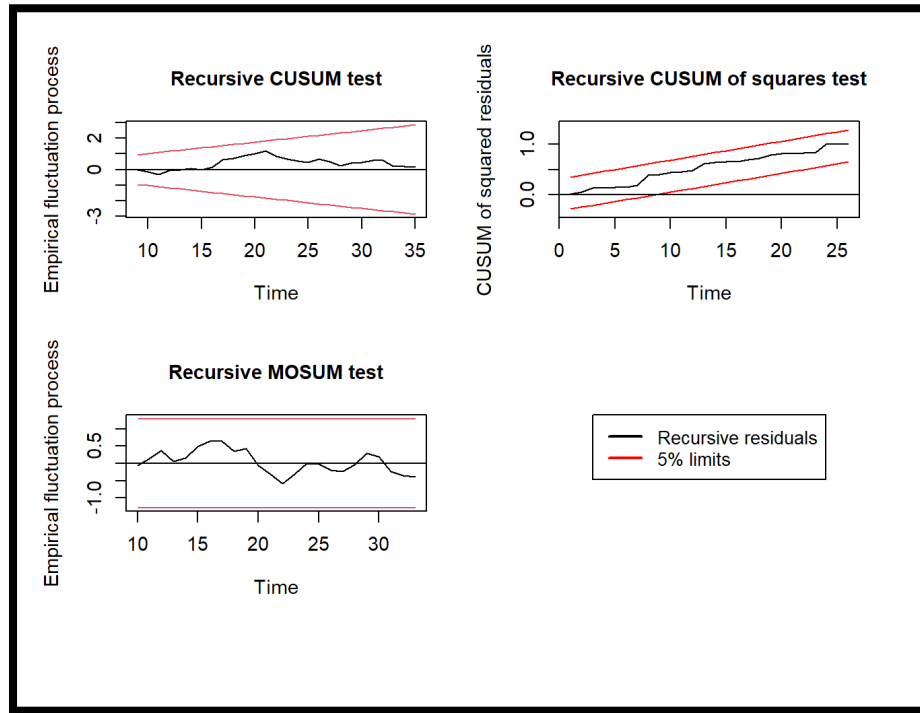
2 Ghana

Figure 2: Residual plot for Ghana

The stability of Ghana's model was assessed using the Recursive CUSUM, CUSUM of Squares, and MOSUM tests. All tests showed residuals within critical bounds, indicating no structural breaks or instability. These results confirm the model's robustness and parameter stability.

3 Senegal

Figure 3: Residual plot for Senegal

The residual plots for Senegal, including the Recursive CUSUM, CUSUM of Squares, and MOSUM tests, showed no structural breaks or instability. The Recursive CUSUM test indicated stable model dynamics, while the CUSUM of Squares confirmed robustness, with residuals within critical bounds. The MOSUM test also showed fluctuations within bounds, reinforcing model reliability. These results confirm the model's stability for valid inference and forecasting.

5. Discussion of Findings

This section discusses the findings of the study, highlighting the relationship between public debt, foreign direct investment (FDI), and economic growth in Ghana, Nigeria, and Senegal, collectively representing selected West African countries. External debt, when managed effectively, has the potential to stimulate economic growth by financing infrastructure and social programs. However, excessive debt can lead to high servicing costs, which divert resources from productive sectors and constrain economic growth. This observation aligns with

Yakubu et al. (2023), who emphasized that debt beyond manageable thresholds limits fiscal flexibility and reduces developmental impact. These findings suggest the need for fiscal discipline and the adoption of policies that prioritize concessional loans and the efficient allocation of borrowed funds to ensure sustainable growth.

The study reveals that in Ghana, external debt and FDI are positively associated with economic growth in the long run. This implies that Ghana has successfully integrated foreign borrowing and investment into its development strategy, leveraging these resources to support infrastructure development and industrial growth. Diop et al. (2022) also highlighted countries with robust fiscal policies and effective governance are better positioned to optimize the benefits of external debt and FDI. The implication of this result is that Ghana's sustained fiscal discipline and targeted investment policies can serve as a model for other West African nations. Policymakers in Ghana should continue channeling borrowed funds and foreign investments into productive sectors like manufacturing and agriculture to maintain this positive trajectory.

In Nigeria, there is no long-term relationship between GDP, external debt, and FDI. Suleiman and Ahmed (2022) noted that Nigeria's reliance on oil-based FDI exposes it to commodity market risks, while weak governance and poor infrastructure hinder effective use of debt and FDI. Reforms to diversify the economy are needed. Similarly, in Senegal, high debt limits sustainable investment, deterring FDI (Owusu et al., 2022).

Ghana's effective debt management and FDI utilization highlight its growth potential, while Nigeria and Senegal face risks from weak fiscal policies. Agyemang and Agyapong (2022) emphasized that excessive debt reduces fiscal space, deterring investment. For long-term growth, West African countries need improved debt and FDI strategies. In Nigeria, high debt servicing diverts resources from essential sectors, reducing investor confidence. Poor debt management in Senegal undermines growth, underscoring the need for governance reforms.

Ghana's success in integrating debt and FDI into growth emphasizes the need for fiscal discipline. In contrast, Nigeria and Senegal's lack of stable relationships between debt, FDI, and GDP highlights the need for reforms. Policymakers should focus on fiscal sustainability, economic diversification, and institutional strengthening. Diversifying FDI, as Ghana has done in agriculture and manufacturing (Diop et al., 2022), reduces reliance on volatile markets. Nigeria and Senegal's FDI concentration in resource sectors limits growth potential.

The study shows that excessive debt deters investment, as seen in Senegal, while Ghana's sustainable debt practices foster FDI. Agyemang and Agyapong (2022) stress the importance of balancing fiscal discipline with strategic investment. Nigeria and Senegal should prioritize debt restructuring and invest borrowed funds in productive sectors, learning from Ghana's infrastructure and industry investments.

Strong governance is essential for maximizing the benefits of FDI and public debt. Weak institutions and corruption limit FDI's long-term impact (Suleiman & Ahmed, 2022). Country-specific strategies should address challenges while leveraging regional strengths. Ghana should focus on fiscal discipline, diversification, and investments in technology and green energy to stay competitive.

In Nigeria, the lack of a long-term relationship between GDP, FDI, and debt underscores the need for structural reforms. Over-reliance on oil FDI and high debt servicing costs limit fiscal flexibility. Diversifying FDI into agriculture, manufacturing, and technology is vital for a resilient economy. Effective debt management and addressing corruption and infrastructure deficits are key to restoring investor confidence.Senegal faces high debt burdens and limited FDI but can benefit from targeted reforms in infrastructure, education, and healthcare. Strengthening governance and incentivizing investment in renewable energy, tourism, and agribusiness will help diversify the economy.

West African nations should collaborate to overcome infrastructure, trade, and political challenges. ECOWAS could foster a shared debt management framework and attract global investors. Ghana's success in integrating foreign borrowing and FDI into its development strategy demonstrates how effective debt and investment management can drive growth, aligning with Endogenous Growth Theory (Romer, 1986; Lucas, 1988).

In Nigeria and Senegal, excessive debt and FDI dependency reflect Dependency and Debt Overhang Theories, limiting growth and productivity. Neoclassical Growth Theory suggests that without technological progress and human capital, FDI's impact is limited. Weak governance hampers the effective use of debt and FDI (Asongu & Odhiambo, 2020; Ajide & Raheem, 2021). The study emphasizes the importance of sustainable debt management and governance in attracting foreign investment.

6. Conclusion

This study examined the relationships between public debt, foreign direct investment (FDI), and economic growth in Nigeria, Ghana, and Senegal, with implications for sustainable development in West Africa. The findings suggest that while public debt can drive growth through infrastructure investments, excessive debt burdens hinder economic performance due to high servicing costs. FDI can boost growth by providing capital, technology, and jobs, but its effectiveness depends on governance, debt sustainability, and the ability to absorb investments. The study highlights that high public debt reduces FDI inflows by creating economic uncertainty. Ghana's balanced debt management and diversified FDI flows contribute to more stable growth. The study calls for a strategic approach to debt

sustainability, improved governance, fiscal discipline, and human capital investment to promote sustainable and resilient economic growth in the region.

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Appendix

Ghana Gdp from (1987-2022)

Ghana External Debt from (1987-2022)

Nigeria External debt from (1987-2022)

Senegal External debt from (1987-2022)