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Impact of foreign direct investment and remittances on Nigeria's economic performance: An empirical investigation

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Abstract: This study investigates the impact of foreign direct investment (FDI) and remittance inflows on Nigeria's economic performance, measured by GDP per capita, from 1985 to 2023. The research uses both Autoregressive Distributed Lag (ARDL) and Nonlinear ARDL (NARDL) models to capture both symmetric and asymmetric effects in the long and short run. The ARDL model reveals that remittances have a statistically significant long-run positive effect on GDP per capita, with a 1% increase in remittances leading to approximately 0.087% growth. FDI, however, is not significant in the linear long-run model. The NARDL results show stronger and more nuanced findings: positive changes in remittances and FDI significantly increase GDP per capita by 0.096% and 0.245%, respectively, while even negative shocks in both variables yield positive long-run effects of 0.345% for remittances and 0.205% for FDI. In the short run, remittances are insignificant, whereas negative FDI shocks have a significant negative effect, highlighting the economy's sensitivity to FDI volatility. The results support the extended Solow-Swan growth model, emphasizing the importance of capital inflows. Policymakers should focus on stabilizing FDI, enhancing remittance channels, and reducing external shock vulnerability, as both flows are critical to Nigeria's long-term economic development.

Keywords: *ARDL, FDI, GDP per Capita, Nigeria, Nonlinear ARDL, Remittances.*

1. Introduction

Nigeria, the most populous country in Africa with over 223.8 million people World Bank [1] continues to grapple with deep-rooted structural economic challenges despite its vast natural resources and large diaspora population. With a GDP per capita of US$2449.59 in 2022, Nigeria ranked 154th globally regarding economic output per person [2]. Alarmingly, approximately 84 million Nigerians live below the poverty line, placing the country second only to India in the global poverty ranking [3]. Compounding this situation are persistent issues such as high unemployment, inflation, and growing insecurity, all of which underscore the urgent need for alternative sources of financing to support inclusive growth and economic resilience. In this context, foreign direct investment (FDI) and diaspora remittances have gained increased relevance. FDI contributes to growth through capital accumulation, technological diffusion, and job creation, while remittances support household consumption, education, healthcare, and microenterprise development. Nigeria, which received nearly $20 billion in remittances in 2022—representing about 40% of total inflows into Sub-Saharan Africa [4]—faces fluctuating FDI levels, particularly since 2017, due to policy uncertainty and macroeconomic instability.

Foreign direct investment and remittances have thus become vital components of development finance strategies for Nigeria, a country where domestic savings and public investment remain insufficient to drive long-term growth. Over the past few decades, Nigeria has attracted substantial inflows from both sources, making them important levers for macroeconomic management and

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structural transformation. While FDI has historically targeted the oil and gas sector, remittances have become more broadly distributed, directly impacting households and small-scale enterprises. According to the World Bank, Nigeria remains the highest remittance-receiving country in Sub-Saharan Africa, reflecting the strong financial ties between its diaspora and the domestic economy. Numerous empirical studies have explored the economic implications of these financial flows, often finding positive effects on GDP, investment, and poverty reduction [5-7]. However, the consistency and magnitude of these impacts remain subject to debate, largely due to Nigeria's weak institutional framework, volatile macroeconomic environment, and the absence of effective policy mechanisms for leveraging these inflows [8]. These challenges necessitate a deeper, context-specific empirical investigation.

Despite the relevance of FDI and remittances in financing development, the empirical findings on their impact in Nigeria have been mixed and often inconclusive. While some studies report a significant positive relationship between these variables and economic growth [9, 10]. Others argue that such benefits are contingent upon the quality of institutions, financial development, and policy frameworks [11, 12]. Moreover, many existing studies adopt linear econometric models that may not fully capture the asymmetric effects or threshold dynamics in the relationship between these financial inflows and economic performance. These models often overlook the possibility that positive and negative changes in FDI and remittances may impact macroeconomic indicators differently. Additionally, previous research tends to focus on short-term periods, failing to incorporate long-term structural transformations in the Nigerian economy, such as the impacts of the Structural Adjustment Program, democratic transitions, oil price shocks, and the COVID-19 pandemic. As a result, the literature lacks a comprehensive, context-specific analysis that fully addresses the dynamic and nonlinear nature of these relationships in the Nigerian setting.

This study aims to fill these gaps by empirically investigating the impact of FDI and remittances on Nigeria's economic performance from 1985 to 2023, using both Autoregressive Distributed Lag (ARDL) and Nonlinear ARDL (NARDL) models. The objectives are to examine the short-run and long-run effects of FDI and remittances on economic growth and assess whether the effects of positive and negative changes in these inflows are asymmetric. By adopting more robust econometric techniques and a broader temporal scope, this study offers a more nuanced and robust understanding of how external capital flows shape economic performance in Nigeria. It also accounts for structural breaks and policy shifts that may have influenced the behaviour of remittance and FDI flows over time. Through this, the research aims to offer evidence-based recommendations for policymakers seeking to optimise the developmental benefits of these inflows.

This study contributes to the literature by addressing methodological and empirical gaps that have limited the policy relevance of earlier works. It builds on existing studies such as those by Oladipo [5]; Nwaogu and Ryan [6] and Issahaku, et al. [8] while enhancing analytical rigour through the application of nonlinear estimation techniques. Unlike most existing research that treats the effects of remittances and FDI as linear and symmetric, this study employs the NARDL model to uncover potential asymmetries and varying marginal effects. It also integrates institutional and macroeconomic dimensions to better understand how FDI and remittances influence economic performance. This comprehensive approach enables the identification of policy levers that can be used to maximise the impact of these flows, particularly in resource-constrained and institutionally weak environments like Nigeria. Furthermore, by spanning the period from 1985 to 2023, the study captures major economic shifts and disruptions that are often excluded in shorter-period analyses [13, 14]. Thereby improving the relevance and applicability of its findings.

The selected period of 1985 to 2023 is deliberate and strategic, as it encompasses key phases in Nigeria's economic history, including liberalisation under the Structural Adjustment Program, the return to democratic governance in 1999, multiple oil price booms and busts, the global financial crisis, and the economic shocks triggered by the COVID-19 pandemic. These events have significantly influenced the trends and effectiveness of FDI and remittance inflows, thereby making examining their

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impacts over a long horizon essential. By analysing this extended timeframe, the study can better identify cyclical and structural relationships that shorter-term studies may overlook [15, 16]. Moreover, incorporating ARDL and NARDL approaches allows the study to account for potential nonlinearity and structural breaks in the data, improving the accuracy and policy relevance of the findings. In addition, GDP per capita is employed as the measure of economic growth due to its ability to reflect the average economic wellbeing of individuals, adjusting for population size. This is particularly relevant in Nigeria, where population growth may mask actual improvements in welfare. Using GDP per capita thus enables the study to assess whether FDI and remittances translate into inclusive, tangible economic progress for the population [2, 5].

2. Literature Review

The Solow-Swan Growth Model, developed in the 1950s by Robert Solow and Trevor Swan, is a foundational neoclassical theory that explains economic growth through capital accumulation, labour input, and technological progress [17, 18]. It is particularly relevant to studying the impact of foreign direct investment (FDI) and remittances on Nigeria's economic performance, as it provides a framework for examining how these external financial inflows influence long-term GDP per capita. In the extended version of the model, key variables such as FDI and remittances represent capital inflows that enhance savings and investment, while trade openness facilitates technology transfer and productivity gains [19]. Labour force participation, another core component of the model, reflects the availability of human resources for production. Since GDP per capita is the central focus of the Solow model, this framework aligns well with the study's objective of assessing how external and internal factors jointly drive economic growth in Nigeria [5, 7].

Several empirical studies have explored the relationship between foreign direct investment (FDI), remittances, and economic performance in Nigeria. Oladipo [5] conducted a time series analysis on Nigeria, finding a statistically significant positive effect of remittances on real GDP in the short and long term. Nwaogu and Ryan [6] in a broader study covering African and Latin American countries, showed that while FDI significantly influenced economic growth in Africa, remittances played a more dominant role in Latin America, suggesting regional disparities in the effects of these capital flows. Tahir, et al. [9] using data from 1977 to 2013, established that both remittances and FDI had a significant positive impact on economic growth in Pakistan, drawing parallels with Nigeria's experience in similar developing contexts. Nyamongo, et al. [20] supported this by showing that in Africa, remittances not only enhanced growth but also complemented financial development. Song, et al. [21] extended the analysis to 20 developing economies and found that while FDI and remittances boosted income, they also contributed to income inequality, highlighting the complex implications of these inflows. Issahaku, et al. [8] focused on institutional quality, emphasising that the positive effect of remittances on growth in low-income countries like Nigeria is stronger when institutions are weak due to a compensatory mechanism in resource allocation.

Broader regional studies also provide insights relevant to Nigeria's economic context. Comes, et al. [10] examining Central and Eastern Europe, observed a strong positive relationship between FDI, remittances, and GDP growth, with FDI showing a more dominant influence. Similarly, Das and Sethi [22] analysing India and Sri Lanka, used vector error correction models and Granger causality tests to demonstrate significant short- and long-term impacts of both FDI and remittances on economic growth, suggesting that these external flows are vital for economic stability. Azam, et al. [7] conducted a panel data study on Europe and Central Asia, which confirmed that both FDI and remittances significantly influence GDP per capita, reinforcing the importance of these flows in emerging markets. Jushi, et al. [15] applied a VAR model in the Balkan region to show that while remittances were largely insignificant, FDI remained a critical driver of economic growth. Catrinescu, et al. [11] further contended that the impact of remittances is strongly conditioned by institutional quality, arguing that in

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countries with stronger policies and governance structures, remittances are more likely to support long-term growth.

Chowdhury [12] examined the interaction between financial development and remittances across 33 top remittance-receiving developing countries, including Nigeria. The findings revealed that while remittances promote growth, financial development neither enhances nor substitutes their impact, highlighting the need for more efficient financial systems to leverage remittance inflows. Makun [13] in a study on Fiji, utilised the ARDL model and found that both FDI and remittances positively affected economic growth, while imports had a negative long-term impact—results that are comparable to Nigeria's situation due to shared characteristics of small, open developing economies. Golitsis, et al. [23] focusing on Albania, used a vector error correction model and found that remittances positively influenced economic growth and inflation in both the short and long run, but no significant link was established with capital formation. Using Croatian data, Depken, et al. [14] applied Granger causality tests and identified a unidirectional causal link from remittances to economic growth, aligning with similar findings from Nigeria.

Further studies emphasise the nuanced effects of external financial flows on development. Goschin [24] analysing Central and Eastern Europe, observed that remittances significantly enhanced GDP growth both in absolute and relative terms when treated as capital flows. Tabash, et al. [25] demonstrated that in selected Asian economies, remittances and FDI, alongside tourism, significantly contributed to GDP growth, showcasing the multifaceted nature of external capital inflows. Bucevska and Naumoski [26] investigated South-East Europe and discovered a bidirectional causality between remittances and economic growth, stressing the dynamic interplay of macroeconomic variables. Matuzeviciute and Butkus [27] explored how remittances impact long-run economic growth across 116 countries, concluding that the effects vary depending on development level and remittance abundance. Moslares García and Ekanayake [16] studying 21 Latin American countries, found that while remittances had a positive long-run impact on growth and poverty reduction, their short-run effects were mixed, suggesting context-specific factors. These findings collectively underscore the diverse empirical evidence surrounding the influence of remittances and FDI on economic growth, providing a solid framework for assessing their roles in Nigeria's economic performance.

Despite the extensive body of empirical literature on the impact of foreign direct investment (FDI) and remittances on economic performance, significant research gaps remain, particularly in the context of Nigeria. Many existing studies (e.g., [5, 6, 9]) have relied primarily on linear econometric models, often overlooking potential asymmetries and threshold effects in the relationship between external financial inflows and economic growth. The application of more robust methodologies such as the Autoregressive Distributed Lag (ARDL) and, more importantly, the Nonlinear ARDL (NARDL) models, which are capable of capturing both short- and long-run dynamics as well as asymmetric effects, is still scarce in country-specific studies on Nigeria [12, 13]. Additionally, much of the existing literature focuses on data that ends before the mid-2010s, excluding recent macroeconomic developments such as the economic recessions of 2016 and 2020, changes in remittance inflows post-COVID-19, and Nigeria's evolving foreign investment policies. A broader temporal scope spanning 1985 to 2023 would encapsulate critical structural shifts such as the Structural Adjustment Program (SAP), oil price volatilities, and institutional reforms, offering a more comprehensive understanding of the dynamic impact of FDI and remittances [8, 10]. Therefore, a study that adopts ARDL and NARDL approaches within this extended timeframe would fill a vital gap in the literature and offer more policy-relevant insights.

3. Methodology

3.1. Model Specification

In evaluating the impact of remittances and FDI on economic growth in Makun [13] used the following econometric model:

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$$GDP_t = \beta_0 + \beta_1 IMP_t + \beta_3 REM_t + \beta_3 FDI_t + \mu_t \quad (1)$$

Where, GDP_t represent the real GDP at a time, IMP_t stand for import at time, REM_t is inward remittances and FDI_t represents inward FDI. For this research, equation 1 is augmented as follows:

$$GDPC_t = \beta_0 + \beta_1 LAB_t + \beta_3 REM_t + \beta_3 FDI_t + \beta_4 TOP_t + \mu_t \quad (2)$$

Equation 2 is an augmented version of Makun [13] model, adapted to better suit the objectives of this study, which examines the impact of foreign direct investment (FDI) and remittances on Nigeria's economic performance. While the original model assessed real GDP using imports, remittances, and FDI, this study replaces real GDP with GDP per Capita ($GDPC_t$) to provide a more accurate reflection of individual economic wellbeing in a rapidly growing population. The model introduces the labour force participation rate (LAB_t) as a core input based on the extended Solow-Swan growth theory, which emphasises the role of labour in output generation. Remittance inflow (REM_t) and inward FDI (FDI_t) remain as essential external financial flows influencing capital accumulation. Additionally, trade openness (TOP_t) is included to capture the productivity-enhancing effects of global market integration and technology diffusion. This specification strengthens the model's relevance in explaining both structural and macroeconomic determinants of growth in Nigeria.

Table 1.
Variables and Sources.

Variables	Expectation	Source
GDP per Capita ($GDPC_t$)	Dependent	World Bank (WDI)
Labour Participation Rate (LAB_t)	+ve	World Bank (WDI)
Remittance Inflow (REM_t)	+ve	World Bank (WDI)
Inflow FDI (FDI_t)	+ve	World Bank (WDI)
Trade Openness (TOP_t)	+ve	World Bank (WDI)

Source: Compiled by the author

3.2. Estimation Technique

Econometric techniques commonly used to examine long-run cointegration among variables include the Engle and Granger [28] test, the Fully Modified OLS (FMOLS) by Phillips [29] and Phillips and Hansen [30] and the Johansen [31] and Johansen and Juselius [32] approaches. Although Johansen's method is favoured for identifying multiple cointegration relationships, it requires all variables to be integrated in the same order, which is a key limitation. To overcome this, the study adopts the Autoregressive Distributed Lag (ARDL) model, which estimates short- and long-run coefficients within a single equation. Pesaran and Smith [33] and Pesaran, et al. [34] highlight ARDL's strength in addressing serial correlation and endogeneity, even when variables are integrated at different levels, I(0) or I(1). Nuhu, et al. [35] and Klimakova and Azu [36] also support its use in small samples. Cointegration is confirmed when the F-statistic exceeds critical bounds or when the error correction term is negative and statistically significant.

$$\Delta GDPC_t = \theta_i[\Delta GDPC_{t-1} - \phi_i'(lnLAB_t + lnREM_t + lnFDI_t + lnTOP_t)] + \sum_{j=1}^{p-1} \lambda_j \Delta GDPC_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnLAB_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnREM_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnFDI_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnTOP_{t-j} + \alpha_i + \varepsilon_{it} \quad (3)$$

Notes: $\theta_i =$ coefficient for speed of adjustment to equilibrium, which is expected to be less than 0. ϕ_i' = Coefficients of long-run relationships. $ECT = \theta_i[\Delta GDPC_{t-1} - \phi_i'(lnLAB_t + lnREM_t + lnFDI_t + lnTOP_t)]$ represent the error correction term to be estimated. λ_{ij} , φ_{ij}' represent the short-run dynamic coefficients.

We applied the nonlinear ARDL model by Shin, et al. [37] to capture asymmetries, decomposing independent variables into positive and negative changes. This approach, supported by Qamruzzaman

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and Jianguo [38] improves traditional models assuming symmetric, linear relationships in cointegration analysis.

$$\begin{cases} POS(REM)_t = \sum_{L=1}^{t} lnREM_L^+ = \sum_{L=1}^{T} MAX(\Delta lnREM_L, 0) \\ NEG(REM)_t = \sum_{L=1}^{t} lnREM_k^- = \sum_{L=1}^{T} MIN(\Delta lnREM_L, 0) \end{cases} \quad (4)$$

$$\begin{cases} POS(FDI)_t = \sum_{L=1}^{t} lnFDI_L^+ = \sum_{L=1}^{T} MAX(\Delta lnFDI_L, 0) \\ NEG(FDI)_t = \sum_{L=1}^{t} lnFDI_k^- = \sum_{L=1}^{T} MIN(\Delta lnFDI_L, 0) \end{cases} \quad (5)$$

Equation (3) is rewritten in nonlinear form by incorporating a series of positive and negative changes, as follows:

$$\Delta GDPC_t = \theta_i[\Delta GDPC_{t-1} - \phi_i'(lnLAB_t + lnPOS(REM)_t + lnNEG(REM)_t + lnPOS(FDI)_t + lnNEG(FDI)_t + lnTOP_t] + \sum_{j=1}^{p-1} \lambda_j \Delta GDPC_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnLAB_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnPOS(REM)_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnNEG(REM)_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnPOS(FDI)_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnNEG(FDI)_{t-j} + \sum_{j=0}^{q-1} \varphi_j' \Delta lnTOP_{t-j} + +\alpha_i + \varepsilon_{it} \quad (6)$$

Notes: θ_i remain the coefficient for speed of adjustment to equilibrium, which is expected to be less than 0. ϕ_i' is Coefficients of long-run relationships. $\theta_i[\Delta GDPC_{t-1} - \phi_i'(lnLAB_t + lnPOS(REM)_t + lnNEG(REM)_t + lnPOS(FDI)_t + lnNEG(FDI)_t + lnTOP_t]$ represent the error correction term to be estimated. λ_{ij} , φ_{ij}' represent the short-run dynamic coefficients.

4. Results and Discussion

The descriptive statistics in Panel A provide insights into the distribution and characteristics of the variables used in the study over 39 observations. The mean of the log of GDP per capita is approximately 7.11, with a standard deviation of 0.62, indicating moderate variation in economic performance across the period studied. Labour force participation has a high mean of 4.42 with minimal variation (standard deviation of 0.01), suggesting stability in labour market participation. Remittance inflows and foreign direct investment have means of 21.15 and 20.89, respectively, with wider standard deviations of 3.03 and 2.52, indicating substantial variation in these inflows. Trade openness has a mean of -1.28 and shows the highest variability among the variables (standard deviation of 0.68), with values ranging from -3.50 to -0.67. This spread reflects fluctuations in Nigeria's integration with global markets during the study period.

Table 2.
Descriptive Statistics and Correlation Matrix.

Panel A Descriptive Statistics					
Variable	$\boldsymbol{lnGDPC_t}$	$\boldsymbol{lnLAB_t}$	$\boldsymbol{lnREM_t}$	$\boldsymbol{lnFDI_t}$	$\boldsymbol{lnTOP_t}$
Obs	39	39	39	39	39
Mean	7.1139	4.4197	21.155	20.888	-1.2822
Std. Dev.	0.6244	0.0107	3.0266	2.5234	0.6839
Min	6.1431	4.4036	14.701	6.9078	-3.4963
Max	8.0355	4.4344	23.914	22.903	-0.6730
Panel B Correlation Matrix					
Variable	$lnGDPC_t$	$lnLAB_t$	$lnREM_t$	$lnFDI_t$	$lnTOP_t$
$lnGDPC_t$	1				
$lnLAB_t$	-0.7552	1			
$lnREM_t$	0.7797	-0.6396	1		
$lnFDI_t$	0.0973	-0.1044	0.1911	1	
$lnTOP_t$	-0.1694	-0.3218	0.2372	0.2093	1

The correlation matrix in Panel B reveals the strength and direction of linear relationships between the variables. GDP per capita positively correlates with remittances (0.7797), indicating that higher

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remittance inflows are associated with better economic performance. However, it shows a strong negative correlation with labour participation (-0.7552), which may suggest inefficiencies or underemployment within the labour force. Interestingly, the correlation between GDP per capita and FDI (0.0973) is weak and positive, implying a minimal linear relationship, while trade openness is negatively correlated with GDP per capita (-0.1694), hinting at potential trade imbalances or ineffective trade policies. Among the independent variables, remittances and labour force participation are negatively correlated (-0.6396), while remittances and trade openness show a modest positive relationship (0.2372). These correlations help identify potential multicollinearity and guide further regression analysis.

Table 3.
Augmented Dickey-Fuller (ADF) Unit Root Test.

Variables	Level (t-statistics)	1st difference (t-statistics)	Remarks
$lnGDPC_t$	-1.756	-3.6943***	I(1)
$lnLAB_t$	-1.278	-3.142**	I(1)
$lnREM_t$	-2.071	-3.921***	I(1)
$lnFDI_t$	-1.018	-3.094**	I(1)
$lnTOP_t$	-2.688*	-3.981***	I(0)
Critical Values	1%	5%	10%
Level	-3.668	-2.966	-2.616
Ist Difference	-3.675	-2.969	-3.617

Note: * indicates stationery at 10 %, ** means stationery at 5% and *** means stationery at 1%. Unit root test was based on Augmented Dickey-Fuller (ADF) Using Stata 14.

4.1. Unit Root and Cointegration Tests

Table 3 presents the results of the Augmented Dickey-Fuller (ADF) unit root test used to determine the stationarity of each variable. The results indicate that all variables, except trade openness, are non-stationary at level but become stationary after first differencing, meaning they are integrated of order one, I(1). Specifically, GDP per capita, labour force participation, remittances, and foreign direct investment are all stationary at first difference, with t-statistics exceeding the 1% or 5% critical values. However, trade openness is stationary at the 10% significance level, indicating it is integrated of order zero, I(0). These mixed orders of integration justify the use of the Autoregressive Distributed Lag (ARDL) model, which accommodates variables that are either I(0), I(1), or a combination of both, making it suitable for the next stage of the analysis.

Table 4.
Cointegration Bound Tests Result.

F-statistic (A)	**3.663**	**EC_{M-1}**	**-0.5016*** **	**(-3.19)**
F-statistic (B)	3.953	EC_{M-1}	-1.0133***	(-4.52)
Significant level		10%	5%	1%
F-Bounds Test (A)	Lower bound	2.45	2.86	3.74
	Upper bound	3.52	4.01	5.06
F-Bounds Test (B)	Lower bound	2.12	2.45	3.15
	Upper bound	3.23	3.61	4.43

Note: the number in parenthesis represents t-statistics, *** signifies a 1% level of significance, F-statistics is determined with restricted constant and no trend; A-Linear ARDL Model and B-Nonlinear ARDL Model.

Table 4 presents the results of the cointegration bound tests for both the linear (Model A) and nonlinear (Model B) ARDL models. In both cases, the calculated F-statistics—3.663 for the linear model and 3.953 for the nonlinear model—fall between the lower and upper bounds at the 5% significance level, suggesting the existence of a long-run relationship among the variables. Additionally, both models' error correction terms (ECM-1) are negative and statistically significant at the 1% level,

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with values of -0.5016 and -1.0133, respectively. This confirms the presence of cointegration and indicates a stable adjustment back to equilibrium following short-term shocks.

4.2. Short Run and Long Run Determination

Table 5 presents both linear (ARDL) and nonlinear (NARDL) estimations of the long-run and short-run relationships between GDP per capita and its determinants, with a focus on remittances (REM) and foreign direct investment (FDI). In the long run, the linear ARDL model shows that remittances have a positive and statistically significant effect on GDP per capita, with a coefficient of 0.0865 significant at the 1% level. This suggests that a 1% increase in remittance inflows is associated with approximately a 0.087% rise in GDP per capita. However, FDI's coefficient (0.165) is not statistically significant, implying that FDI does not have a robust long-term impact on economic performance under the symmetric assumption.

In contrast, the NARDL model, which accounts for asymmetry, reveals a more nuanced effect. Positive changes in remittances (POS(REM)) remain statistically significant and positively affect GDP per capita (0.0964 at 5%), similar in direction but slightly higher than the ARDL estimate. Interestingly, negative shocks in remittances (NEG(REM)) also show a statistically significant positive effect (0.345 at 5%), suggesting a counter-cyclical nature, where remittances increase in response to economic downturns, possibly acting as a financial buffer for households. This supports the notion that remittances in Nigeria not only fuel consumption but also serve as a stabilising force during economic stress.

Table 5.
Long Run and Short Run Estimation Results for ARDL and NARDL.

ARDL Model		**NARDL Model**	
Long Run	**Coefficient**	**Long Run**	**Coefficient**
$lnLAB_t$	-20.15**(9.001)	$lnLAB_t$	-30.12***(4.620)
$lnREM_t$	0.0865***(0.028)	$lnPOS(REM_t)$	0.0964**(0.041)
$lnFDI_t$	0.165 (0.099)	$lnNEG(REM_t)$	0.345**(0.139)
$lnTOP_t$	-0.343***(0.101)	$lnPOS(FDI_t)$	0.245**(0.102)
-	-	$lnNEG(FDI_t)$	0.205***(0.059)
-	-	$lnTOP_t$	-0.613***(0.071)
Short Run	Coefficient	Short Run	Coefficient
ECT	-0.493*** (0.174)	ECT	-1.013*** (0.224)
$\Delta(lnGDPC_{t-1})$	0.382** (0.172)	$\Delta(lnGDPC_{t-1})$	0.382** (0.172)
$\Delta(lnLAB_t)$	-9.014 (14.68)	$\Delta(lnLAB_t)$	-53.28**(23.59)
$\Delta(lnREM_t)$	-0.0187 (0.04)	$\Delta(lnPOS(REM_t))$	-0.0238(0.054)
$\Delta(lnFDI_t)$	-0.0853(0.053)	$\Delta(lnNEG(REM_t))$	-0.0977(0.247)
$\Delta(lnFDI_{t-1})$	-0.0865*(0.046)	$\Delta(lnPOS(FDI_t))$	-0.143 (0.095)
$\Delta(lnTOP_t)$	-0.241**(0.094)	$\Delta(lnPOS(FDI_{t-1}))$	0.113 (0.086)
-	-	$\Delta(lnNEG(FDI_t))$	-0.207***(0.07)
-	-	$\Delta(lnNEG(FDI_{t-1}))$	-0.183**(0.069)
-	-	$\Delta(lnTOP_t)$	0.156 (0.170)
-	-	$\Delta(lnTOP_{t-1})$	0.193*(0.105)
Constant	44.58(30.40)	Constant	140.9***(40.28)
Observations	37	Observations	37
R-squared	0.820	R-squared	0.909

Note: Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.

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For FDI, the NARDL model captures both positive and negative components. Positive changes in FDI (POS(FDI)) have a significant positive effect on GDP per capita (0.245 at 5%), indicating that when FDI inflows rise, they contribute meaningfully to long-term economic performance. Negative changes in FDI (NEG(FDI)) are also positively signed (0.205) and statistically significant at the 1% level, which might seem counterintuitive. However, this could imply that the withdrawal or decline of FDI may trigger domestic adjustments or policy responses that buffer the economy, or it may reflect the inertia of prior FDI investments still influencing growth. These asymmetric results suggest that treating FDI changes separately provides deeper insights than linear models.

In the short run, remittances are statistically insignificant in the ARDL model, indicating a weak immediate effect on GDP per capita. However, FDI shows significance at the 10% level in its first lag, suggesting that previous-period FDI inflows exert a delayed but measurable negative impact on short-term economic performance. This highlights the importance of FDI continuity, as its benefits may take time to materialise. In the NARDL model, the negative component of FDI (NEG(FDI)) is highly significant and negative in both the current and lagged periods, indicating that abrupt declines in FDI have adverse short-term effects on growth. Although negative in the current period, the positive component of FDI turns positive in the lagged term but remains statistically insignificant. Both positive and negative remittance components in the NARDL model are also statistically insignificant in the short run. These findings suggest that while FDI and remittances play more significant roles in the long run, FDI volatility—particularly negative shocks—has immediate short-term consequences, emphasising the need for policies that attract and sustain stable investment inflows.

4.3. Diagnostic Test

Table 6 presents the diagnostic test results for both the ARDL and NARDL models, confirming their robustness and reliability. The R-squared values are high for both models—0.962 for ARDL and 0.972 for NARDL—indicating that over 96% and 97% of the variation in GDP per capita is explained by the independent variables in each model, respectively. The Breusch-Godfrey test for serial correlation shows no significant autocorrelation in the residuals, as the p-values (0.085 for ARDL and 0.2919 for NARDL) are above the conventional 5% significance level. Similarly, the Breusch-Pagan test for heteroscedasticity confirms the presence of homoscedastic residuals with high p-values (0.80 for ARDL and 0.6232 for NARDL). These results indicate that both models are well-specified, free from serial correlation and heteroscedasticity, and thus statistically valid for inference. The slightly better performance of the NARDL model also supports the presence of nonlinear relationships in the data.

Table 6.
Diagnostic Test.

Statistics	ARDL Model	NARDL Model
R-Square	0.962	0.972
Serial Correlation	7.809(0.085)	2.932(0.2919)
Heteroscedasticity Test	0.3702(0.80)	0.24(0.6232)

Note: Probabilities are in parentheses. Serial correlation is with the Breusch-Godfrey LM test; the Heteroscedasticity test is with the Breusch-Pagan test. All were done using Stata 18.

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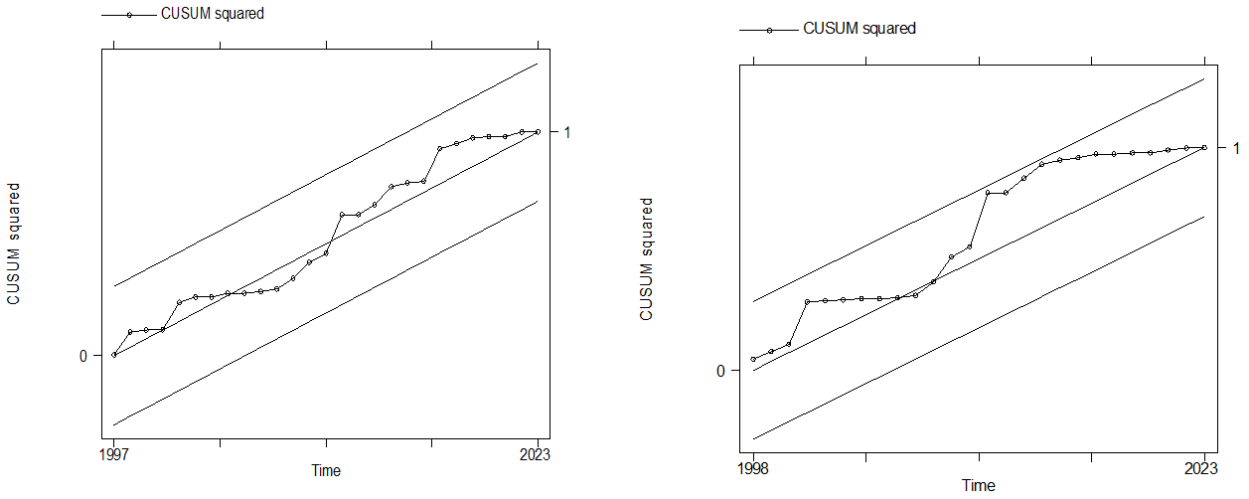

Figrue 1.
CUSUM Squared For ARDL And Nardl.

4.4. Discussion of Findings

The findings from Table 5 align partially with earlier empirical literature and provide nuanced insights into the relationship between remittances, FDI, and economic growth in Nigeria. The statistically significant long-run impact of remittances on GDP per capita in both ARDL and NARDL models is consistent with the works of Oladipo [5] and Azam, et al. [7] who found that remittances significantly boost economic performance in Nigeria and other developing economies. The results also reinforce the Solow-Swan growth theory, particularly in its extended form, which views capital inflows—such as remittances—as contributors to capital accumulation and, by extension, economic growth. The NARDL model's confirmation of both positive and negative remittance changes influencing growth also supports the argument by Catrinescu, et al. [11] that remittances can act as a stabilising force in countries with underdeveloped institutions and economic shocks.

The nonlinear behaviour of remittances, particularly the counter-cyclical effect of negative shocks, offers a deeper understanding of their role in economic resilience. This finding diverges from symmetric models like the one used by Makun [13] where remittances were treated uniformly. The significant positive impact of both positive and negative remittance changes in the NARDL model suggests that remittances serve as a growth enhancer and as a form of insurance during downturns. This aligns with Chowdhury [12] who emphasised the need for dynamic models to capture the true effect of remittance flows, especially in economies facing recurrent instability. The evidence supports policies that enhance financial inclusion, reduce remittance costs, and improve remittance-receiving mechanisms to maximise their developmental impact.

In the case of FDI, the asymmetric long-run results in the NARDL model are particularly insightful. While positive FDI flows significantly enhance GDP per capita, the surprising positive effect of negative FDI shocks may reflect delayed impacts of previous investments or the triggering of domestic policy responses that stabilise output. This contrasts with the insignificant FDI result in the linear ARDL model, underscoring the importance of nonlinear modelling in capturing the complex dynamics of FDI. Earlier studies such as Nwaogu and Ryan [6] and Comes, et al. [10] found mixed or region-specific results on FDI-growth linkages, depending on institutional quality and macroeconomic conditions. The findings suggest that Nigeria's response to FDI volatility—through perhaps regulatory or monetary adjustments—may play a role in buffering adverse shocks, a perspective compatible with

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the extended Solow-Swan model, which allows for capital-driven output changes moderated by external conditions.

Short-run dynamics further support the idea that remittances and FDI are more effective as long-term growth instruments. The significance of FDI at the 10% level in the ARDL model's first lag implies a delayed and possibly transient influence, which is often observed in investment-related flows that take time to translate into tangible economic output. More notably, the negative short-run effects of declining FDI in the NARDL model confirm findings by Tabash, et al. [25] and Depken, et al. [14] who warned about the destabilising effect of sudden capital withdrawal. These results indicate the need for policies that ensure consistent and stable FDI inflows while creating buffers against capital flight. Additionally, the insignificant short-run effects of remittances suggest that their developmental utility may lie more in consumption smoothing than immediate GDP growth, further supporting long-run-focused remittance policies. Overall, the study's findings enrich the existing literature by demonstrating the value of asymmetric modelling in revealing the true dynamics between external financial flows and economic growth.

5. Conclusions

The findings of this study reveal that both remittances and foreign direct investment (FDI) significantly influence Nigeria's economic performance in the long run, with stronger evidence of impact under the nonlinear ARDL model. Remittances demonstrate a consistent positive effect on GDP per capita, suggesting their dual role in enhancing household welfare and acting as a stabilising force during economic downturns. FDI also contributes positively, though its impact is more pronounced when accounting for asymmetric effects, with both increases and decreases having significant long-term implications. However, in the short run, the effects of remittances are largely insignificant, while negative FDI shocks exert a notable adverse influence. These results underscore the importance of modelling financial flows in a nonlinear framework to capture their true economic effects, as linear models may underestimate or obscure these relationships.

Based on these findings, the study recommends that policymakers prioritise strategies to sustain and maximise the benefits of remittance inflows by reducing transaction costs, improving financial infrastructure, and strengthening diaspora engagement policies. Additionally, measures should be taken to attract stable and long-term FDI through improved macroeconomic stability, policy consistency, and investor-friendly regulatory frameworks. Given the short-run vulnerability to negative FDI shocks, contingency measures such as investment insurance schemes, political risk reduction strategies, and domestic investment stimulation are also crucial. A balanced policy approach that secures both remittance inflows and FDI while minimising volatility will support Nigeria's long-term economic growth and resilience.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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