

## Impact of Migrants' Remittance and its Volatility on Economic Growth in Nigeria

<sup>1</sup>Endurance, D. G.,

<sup>2</sup>Aigbedion, M. I., &

<sup>3</sup>Oniore, J. O.

<sup>1,2&3</sup>Department of Economics,  
Faculty of Social Sciences,  
Bingham University, Karu,  
Nigeria

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Corresponding Author:

Endurance, D. G.

### Abstract

Many people consider remittances to be a reliable foreign funding source for underdeveloped nations. Remittance inflows to certain developing nations, however, have demonstrated a significant level of unpredictability. Therefore, considering the significant impact remittances may have on the economy, countries that rely heavily on remittances, like Nigeria, may be susceptible to abrupt or regular fluctuations in remittance receipts. Thus, this paper investigated the impact of migrants' remittance and its volatility determinants on economic growth in Nigeria from 1986 to 2022, by employing Autoregressive Distributed Lag (ARDL) technique. The outcome showed that every variable examined had a statistically significant impact on short-term economic growth. However, none of the factors has a statistically significant longer-term impact on economic growth. Furthermore, the outcome demonstrated that the exchange rate, one period lag in remittances, volatility in remittances, one period lag in the inflation rate, interest rate at level, and two period lags in remittances are the main short-run drivers of economic growth. Conversely, interest rates and exchange rates are the long-term forces behind economic growth. In general, migrant remittances boosted economic growth in the short run. But remittance volatility seems to have a detrimental long- and short-run impact on economic growth. Since migrant remittances were growth-enhancing in the short run, the paper's findings suggested that the Federal Government create and put into effect friendly policies targeted at mobilizing remittances to productive investments. Fiscal authorities should also concentrate on boosting exports rather than relying on worker remittances as a source of foreign exchange revenues because remittance volatility appears to have a detrimental short- and long-term impact on economic growth. Furthermore, because rising inflation has negative impacts on the economy, including declining individuals' purchasing power and the value of money, the Central Bank of Nigeria should implement an appropriate monetary policy mix to restrain the rising rate of inflation in the nation. The government should ensure that credit is accessible by reducing interest rates, reducing credit access restrictions, and prolonging the period of credit advancement by the use of its monetary authority. In order to promote trade openness, which will ensure growth in exports compared to imports, boost net exports, and maintain the flow of remittances, the government should also maintain stable exchange rates.

## **Background to the Study**

Even though remittance flows and their volatility have been extensively studied from a macroeconomic perspective, particularly in developing nations, there is still a critical knowledge gap regarding the particular factors that influence remittance volatility in Nigeria and how that volatility affects the nation's economic growth. Despite the significant remittance inflows that Nigeria has experienced, the research has not sufficiently examined the underlying factors that generate fluctuations in these inflows and their subsequent implications on economic growth and stability. Without focusing on the specific implications of remittance volatility on Nigeria's economic growth, the majority of previous research has either investigated capital inflows in general or macroeconomic factors that influence remittance flows in a broad perspective.

In developing countries, remittance inflows have shown significant volatility, with Nigeria experiencing a notable increase in remittance inflows. For example, remittance inflows to Nigeria increased from US\$1.4 billion in 2000 to US\$19.7 billion in 2010. However, in 2016, Nigeria received 19.51 billion US dollars in remittances from abroad. In 2017, it reached a total of 21.80 billion US dollars, and in 2018, it reached a further 24.06 billion US dollars. But in 2019, it dropped to 23.55 billion US dollars. Due to the COVID-19 global pandemic, inward remittances significantly decreased in 2020 to 17.00 billion US dollars; in 2021, however, they recorded 19.24 billion US dollars. Remittances into Nigeria totaled US\$20.1 billion in 2022 (World Development Indicators, 2022).

Although studies like those by Adams and Page (2005) and Spatafora (2005) primarily focus on the advantages of stable remittance flows, without examining the consequences of volatility in remittance inflows, remittances are widely considered as a beneficial engine for economic growth. This disparity is especially important for Nigeria, whose remittances have changed dramatically over time, mostly as a result of major shocks to the world economy like the COVID-19 pandemic. Since remittances have been associated with welfare gains, as noted by Adelowokan *et al.* (2020) and Akobeng (2015), it is critical for policy makers to comprehend both the short- and long-term impacts of volatility on these gains.

Moreover, Amega (2018) and Bang *et al.* (2016)'s research indicates that abrupt fluctuations in remittance flows could cause instability, which could derail the long-term growth paths of nations that depend on these inflows. However, existing research do not sufficiently distinguish between short-run and long-run implications of remittance volatility. The objectives of this study's hypotheses are to close these gaps by investigating these processes and providing information about the short- and long-term economic impacts of Nigeria's remittance volatility. Therefore, the proposed hypotheses address the impact of volatility and remittance inflows on Nigeria's economic growth in both the short and long term (H01 and H02, respectively).

## **Research Questions**

The following research questions guided the paper:

- i. What is the short-run impact of remittance inflows and its volatility on economic growth in Nigeria?
- ii. How does remittance inflows and its volatility affect economic growth in the long-run in Nigeria?

### **Objectives of the Research**

The main objective of this paper is to examine the impact of remittance volatility on economic growth in Nigeria. The specific objectives are to:

- i. Assess the short-run impact of remittance inflows and its volatility on economic growth in Nigeria., and
- ii. Examine the long-run impact of remittance inflows and its volatility on economic growth in Nigeria.

### **Statement of Hypotheses**

**H<sub>01</sub>:** Remittance inflows and its volatility has no significant impact on economic growth in Nigeria in the short-run.

**H<sub>02</sub>:** Remittance inflows and its volatility has no significant impact on economic growth in Nigeria in the long-run.

Five sections make up the remainder of the paper. A brief overview of the literature is provided in the next section, which includes a theoretical examination, empirical evidence, and the concepts of economic growth and migrants' remittance. The analytical framework and the empirical findings from the data analysis are presented in Sections Three and Four. Section five concludes the paper with its conclusions and recommendations.

### **Literature Review**

#### **Conceptual Review**

Remittances are the household earnings of migrants who live and work abroad for a limited or extended length of time. Remittances are unrequited, nonmarket financial transfers between people who live in separate countries and are mostly related to migration, according to Ncube and Brixiova (2013). The theory of migration has been connected to the idea of remittances. However, its definition might be related to its intents, results, applications, type of transfer, and funding route. Any cash or in-kind gifts that migrants send home to relatives or other recipients, whether through official or unofficial means, are referred to as remittance flows (World Bank, 2005). Remittances are often defined by the International Organization for Migration (2013) as the financial flows related to migration, or, alternatively, as small cash transfers made from a migrant workers or immigrant's home country to a relative. Increased production capacity allows an economy to produce more goods and services overall, which is known as economic growth (Palmer, 2012). An increase in real gross domestic product, which indicates a rise in the value of national output, income, and expenditure, is another outcome of economic growth. An economy's size can be determined by its Gross Domestic Product (GDP), and its level of development can be determined by its GDP growth rate (Picardo, 2020).

### **Empirical Review**

Using a balanced panel data set that included 24 Sub-Saharan African nations from 2005 to 2019, Delessa *et al.* (2024) examined the hypothesis that the effect of capital inflow on economic growth differs based on the macroeconomic stability and institutional quality of the recipient countries. The slope homogeneity test indicated that the study's DOLS panel-based cointegration technique revealed diverse slope coefficients. Additionally, the cross-sectional dependence test demonstrated the panels' independence between portions. Pedroni, Kao, and Westerlund's cointegration test confirms that the variables under investigation have persistent relationships. When interacting with macroeconomic policy, the long-run predicted coefficients from the regression analysis utilizing DOLS cointegration showed a positive association between per capita income and remittance. Because macroeconomic stability and institutional quality are critical in limiting the effectiveness of remittance inflows and their influence on the region's economic growth, they must be addressed.

Using the Error Correction Model (ECM) and OLS regression, Anosike and Alfadhel (2023) investigated the impact of remittances on economic growth in Nigeria over a forty-year period. The variables of real GDP, gross fixed capital formation, inflation, and per capita GDP were found to be statistically significant in relation to the effect of remittances on economic growth, however the remaining three variables were not. The report suggested trade liberalization, more capital generation and investment by the public and private sectors to draw in capital, and tighter monetary authorities' supervision of the financial system.

Using the Autoregressive Distributive Lagged (ARDL) econometric technique, Ibrahim *et al.* (2023) examined the macroeconomic factors that influence the volatility of capital inflows into Nigeria between 1986 and 2018. Results showed that the main factor influencing the volatility of capital inflow over the long and short terms is the expansion of the global economy. The only exception is the remittance volatility, which is mostly influenced by the currency rate over both the short and long run. Official Development Assistance (ODA) volatility, however, is more vulnerable to domestic causes over both the short and long run. Consequently, the study draws the conclusion that the agency facilitating the flow determines how volatile capital inflows into Nigeria are. The public inflow of aid is determined by pull forces, whereas the private inflows are mostly determined by push ones.

The impact of remittances from Kenyans living outside on the nation's economic growth from 1988 and 2021 was assessed by Fartun and Charles (2023). The study examined the relationships between GDP and remittances as well as the relationships between poverty and remittances using the Error Correction Model and the modified Granger causality test by Toda and Yamamoto. The study discovered that Kenya's GDP, GNI, and level of absolute poverty were significantly impacted by remittances per capita. Findings showed that whereas absolute poverty and remittance per capita were not granger causes of each other, GDP and GNI per capita were granger causes of remittance per capita. The report

suggested that crucial steps be done to stabilize the currency rate and inflation in order to ensure a consistent flow of remittances into the nation's economy.

In order to support the possible effects of the COVID-19 pandemic, Awode *et al.* (2021) investigated the relationship between remittances, remittance volatility, and macroeconomic performance in a panel of seven African countries with the highest remittance–GDP ratio. This was carried out with annual secondary data from 2004 to 2018 within a fixed effects and random effects model. The findings indicate that while remittances have a positive, considerable influence on RGDP, consumption, and investment, remittance volatility has a negative, but negligible, impact on export, exchange rate, and consumption. Based on these findings, strong kinship and the selfless nature of remitting African migrants mean that, even though any COVID-19-induced volatility in remittances flow into Africa may yield negative macroeconomic consequences, it is unlikely to significantly affect the macroeconomic fundamentals of the most remittance-dependent African countries.

The Granger causal link and cointegration between remittances and economic growth in West Africa were examined by Adjei *et al.* (2020), with particular attention to Burkina Faso, Ghana, Guinea, Guinea-Bissau, Mali, Nigeria, and Togo. The study's findings, which made use of the Dynamic Panel data approach, indicated that remittances had a major and positive influence on West African economic growth. Additionally, a significant correlation was found between trade openness, investment, real effective exchange rate, and remittances in connection to economic growth. The report suggested that managing the money that migrants send home ought to be done carefully. It is anticipated that these funds would be allocated to worthwhile endeavors rather than being wasted. In order to fully profit from increased migrant remittances, West Africa needs to establish an investment environment that attracts African diasporas.

The relationship between capital inflow volatility and economic growth in Nigeria from 1986 to 2018 was investigated by Nwosa *et al.* (2020). The Auto-Regressive Distributed Lag (ARDL) approach was used in the study, and the findings indicated that capital inflow volatility had a detrimental impact on economic growth. The study's findings also demonstrated that different capital flow components had varying effects on economic growth, both significantly and substantially. The study concludes that while volatility in long-term capital flows (foreign direct investment) does not impede economic growth, it does in short-term capital flows (foreign portfolio investment and other investment flows). As a result, the study suggested that prudent management of macroeconomic policies be implemented, including efficient monetary supervision and regulation that can guarantee financial stability in the banking sector as well as the capital markets. This will boost investor confidence and lessen the volatility of capital inflows into Nigeria.

Kadozi (2019) investigated how remittance inflows affected economic growth between 1980 and 2014 in Rwanda and other countries in Sub-Saharan Africa (SSA). In order to provide a more thorough analysis of Rwanda as a case study, the report first conducted a

cross-sectional analysis of 45 SSA nations. Remittances had no statistically meaningful effect on the region's economic growth, according to a cross-sectional study of SSA countries. However, the degree of education, financial development, and national development all positively and statistically significantly influence the impact of remittance growth, whereas the quality of institutional variables has a negative impact on the impact of remittance growth in the region. On the other hand, the same results show that remittances have a considerable and positive growth influence in Rwanda. The country-level analysis's findings provide tenable evidence of long-run causality, which in Rwanda goes from remittances to GDP per capita but not the other way around. The findings show that as remittance inflows into Rwanda rise, so does the conditional marginal effect of remittances on GDP per capita in that nation. These results showed that improving the growth and development impact of remittances in the SSA countries, and Rwanda in particular, requires both the general institutional environment and that of the financial sector in particular.

The relationship between remittances, financial sector development, and economic growth in Nigeria between 1981 to 2017 was examined by Anetor (2019) using Autoregressive Distributed Lag (ARDL) technique. The findings demonstrated that remittances have a major and detrimental impact on economic growth over the long and short terms. Additionally, the study demonstrated that the development of the financial sector has a negative and considerable long- and short-term influence on economic growth. According to the report, the government should facilitate easy money transfers for citizens of the nation who live and work outside in order to encourage remittances.

The study conducted by Abdel-Halim and Bino (2019) examined the relationship between worker remittances and economic growth in Jordan, a small country characterized by unstable macroeconomic conditions. Using an Autoregressive Distributed Lag (ARDL) model, the findings demonstrated that while remittances from Jordanian workers constitute an important source of financial flows, they are not utilized by receiving households to smooth consumption and have little effect on financial development or economic growth. Rather, they cause the trade deficit and imports to rise. Therefore, a dramatic rise in the supply of skilled labor will result from reverse movement of Jordanian people, exacerbating the country's unemployment issues. Using data from 129 countries between 1980 and 2014, Docquier (2017) examined the direct and indirect effects of remittances on economic growth. The findings demonstrated that remittances directly boosted economic growth, which was strongest in areas with low levels of accumulation of both human and physical capital. Remittances are also not utilized to offset consumption. The findings thus demonstrated that remittances are a source of wealth for development and that households use them to save and invest in education. Governments should enact measures that minimize the cost of sending remittances to encourage migrants to send more of them, according to the study's recommendations.

The impact of worker remittances and their volatility on the economic growth of five South Asian nations between 1975 and 2009 was examined by Jawaid and Raza (2014).

Remittances and economic growth have a substantial positive long-term association in India, Bangladesh, Sri Lanka, and Nepal, but a significant negative link in Pakistan, according to cointegration data. On the other hand, the fluctuations in labor remittances have a negative and noteworthy impact on the economic growth of Pakistan, India, Bangladesh, and Sri Lanka, but only a little negative effect in Nepal. All nations benefit from a less erratic remittance inflow of workers' earnings. It is recommended that in order to welcome remittances into the region, policy authorities implement measures to lower transaction costs.

Macroeconomic factors influencing the volatility of remittances from a sample of 93 countries were studied by Jackman (2013). The study found, using the Fixed Effects Model, that remittance volatility is significantly impacted by a number of altruistic factors, including the age dependency ratio and standard of living; insurance motives, which are exemplified by natural disasters and economic shocks at home; portfolio variables, such as interest rate volatility and exchange rate volatility; the share of skilled migrants; and economic volatility in the sending country. Nonetheless, there are notable variations among the different nations. This could imply that average-based cross-country research can obscure regional variations in remittance behavior and possibly produce false conclusions. The study suggested that governments should be very interested in encouraging remittances and include it as a crucial component of their development strategy.

### **Theoretical Framework**

Given the persistent long-term capital inflow disparities, the critical role of remittances in fostering economic growth and sustainable development in Nigeria cannot be overstated. Considering this, comprehending the theoretical relationship is imperative, providing a robust foundation for model construction. When talking about the critical importance of remittances, it is imperative to emphasize the theoretical context. Different growth model formulations, each based on a distinct growth theory, have emerged from the development of different growth theories. This investigation used Romer's endogenous growth theory (Romer, 1986) as a theoretical framework to investigate how the volatility of migrant remittances affects Nigeria's economic growth. There are two main reasons why the endogenous growth model was selected. First of all, the model acknowledges that the endogeneity of capital—which includes human capital and research and development (R&D) activities—is crucial to the process of growth. The endogenous growth hypothesis states that growth results from "learning by doing," which promotes capital's non-diminishing marginal productivity (Mallik & Moore, 2008). This implied that remittances and other capital inflows would probably support Nigeria's economic expansion. Second, the model emphasizes how important human capital is to the process of development. Human capital is an important source of long-term growth, as suggested by Romer (1990), either as a direct contribution in research or as positive externalities (Lucas, 1988).

The underlying assumption of the endogenous growth hypothesis is that economic activity is produced by higher returns, which lays the groundwork for the empirical study that follows. The augmented Cobb-Douglas production function can be stated mathematically as follows:

$$GDPPC = f(L, K_d, K_f) = AL^\alpha K_d^\beta K_f^\delta \quad (1)$$

Where A is the total factor productivity (TFP), Kd is the domestic capital (INV) used as a measure of gross capital formation (GCF), Kf is the foreign capital captured by remittance (REM), and GDPPC is the per capita GDP. L is the labour force as measured by labour force participation (%) of total population. Nonetheless, an expanded growth model based on prior research is created to investigate the influence of migrant remittances and their volatility on economic growth. This model considers a vector of explanatory factors as potential drivers of economic growth.

### Methodology and Model Specification

The ex-post facto design is the chosen research design for this article. An empirically based study design that establishes the cause-and-effect link between the independent and dependent variables is called the ex-post facto design. The incapacity of the researcher to alter the data being studied is what distinguishes this method. The theoretical framework presented in the section before and the model used by Nwosa *et al.* (2020), who examined the relationship between capital inflow volatility and economic growth in Nigeria from 1986 to 2018, were followed in the specification of the paper's empirical model. The following is their initial model:

$$GDPPC_t = \delta_0 + \delta_1 \ln IHD_t + \delta_2 \ln LAB_t + \delta_3 \ln GFC_t + \delta_4 \ln FCF_t + \delta_5 \ln VTFC_t + \delta_6 \ln OPNX_t + \delta_7 \ln INFR_t + \mu_t \quad (2)$$

Where,

$GDPPC_t$  = Gross domestic product per capita;

$IHD_t$  = Investment in health and education;

$LAB_t$  = Labour force;

$GFC_t$  = Gross fixed capital formation;

$FCF_t$  = Net foreign capital flows;

$VTFC_t$  = Volatility in capital flows;

$OPNX_t$  = Trade openness; and

$IFR_t$  = Inflation rate.

The model was altered, though, by adding independent factors that have been demonstrated to have an impact on economic growth, such as inflation, interest rate spread, migrant remittance volatility, and currency rate. It is anticipated that each of these variables will have a major influence on economic growth. Previous research has



examined these variables from various angles, but no particular study has examined all of these variables in one model in Nigeria, where remittances play a crucial role for the country's economy overall as well as for the individuals who migrate overseas and their families back home. Thus, equation (2) can be functionally rewritten in semi-logarithm equation as:

$$\ln GDPPC_t = \beta_0 + \beta_1 REM_t + \beta_2 VREM_t + \beta_3 INFR_t + \beta_4 IRS_t + \beta_5 EXR_t + \varepsilon_t \quad (3)$$

Where,

$\ln$ : Natural logarithm;

$GDPPC_t$  = Gross domestic product per capita as proxy for economic growth;

$REM_t$  = Remittances as a percentage of GDP;

$VREM_t$  Volatility in remittances;

$INFR_t$  = Inflation rate;

$IRS_t$  = Interest rate;

$EXR_t$  = Exchange rate;

$\beta_0$  = The intercept or autonomous parameter estimate,  $\beta_1$  to  $\beta_5$  = Parameter estimate representing the coefficient of REM, VREM, INFR, IRS, and EXR respectively, and  $\varepsilon_t$  - other variables not explicitly included in the model.

Remittance inflows must be predicted to have a positive and substantial relationship with income (GDPPC) as an a priori condition. This anticipation aligns with earlier studies, like those conducted by Abbas *et al.* (2017). The a priori hypothesis is that there will be a negative link between remittance volatility and economic growth; in this scenario, the volatility of capital inflow will decrease as the economy grows and vice versa (Lee *et al.* 2013). Economic growth is anticipated to be negatively impacted by inflation, or  $INF < 0$ . This is the case because national inflation signals investment uncertainty, discouraging migrants from sending home larger sums of money to make investments. This anticipation is consistent with research like Ojapinwa (2012).

Additionally, a negative interest rate is anticipated, with remittances declining as rates rise since riskier investments, or  $IRs < 0$ , are thought to be made. Remittances and economic growth are directly correlated with the exchange rate, which is achieved through currency depreciation in the recipient country. Remittances and economic growth may be negatively impacted by strict foreign exchange rate regimes and unofficial foreign currency exchange gains in the home country. Remittances may also move from the formal to the black-market sector (McLeod *et al.*, 2003). However, volatility in remittances in the model above was measured using the Generalized Autoregressive Conditional Heteroscedasticity (GARCH). However, investigations of empirical literature utilize different indices of volatility. Standard deviation, five-year moving averages, five-year moving standard deviations, and generalized autoregressive

conditional heteroscedasticity are a few of the often-employed metrics (Geol & Ram, 2001). Bollersleve (1986) presented the GARCH (1,1), that considered two different specifications: one for the conditional mean and another for the conditional variance.

The GARCH model is specified thus:

$$REM_t = \beta_0 + \beta_1 REM_{t-1} + E_t; \quad E_t / \beta_{t-1} \sim N(0, VREM_t^2) \quad (4)$$

**Where:**

- REM<sub>t</sub>, Present focus based on past information
- REM<sub>t-1</sub>, Mean remittances based on past information
- E<sub>t</sub>, Error term in the present period
- β<sub>0</sub> and β<sub>1</sub>, Constants to be estimated

Equation (4) is the mean equation and written as a function of exogenous variables with an error term E<sub>t</sub>.

$$VREM_t^2 = \eta_0 + \eta_1 E_{t-1}^2 + \eta_2 VREM_{t-1}^2 \quad (5)$$

**Where:**

- E<sub>t-1</sub><sup>2</sup>, Error term based on past information
- VREM<sub>t-1</sub><sup>2</sup>, Variance based on past information

Useful as a proxy for volatility, VREM2t is the current predicted variance based on historical data. If η1 and η2 are the GARCH coefficients, the term conditional variance applies. The required condition of equation (5) is satisfied when (η1 + η2 > 0; but <1) is added. The sum of η1 and η2 must be positive and less than one. It suggests that volatility shocks are fairly persistent when it is extremely near to one. The measure of volatility, found in Equation (5), was utilized to confirm the connection between remittance volatility and economic growth. However, to analyze the impact of migrants' remittance and its volatility on economic growth in Nigeria, equation 3 was modified into Autoregressive Distribution Method (ARDL) by integrating volatility in remittances and other policy factors as follow:

$$y_t = \alpha_0 + \sum_{i=1}^n \alpha_i \Delta y_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta X_{t-i} + \sum_{i=0}^n \beta_{3i} X_{t-i} + \mu_t \quad (6)$$

Where y<sub>t</sub> is the remittances volatility, X<sub>t-i</sub> represent the vector of variables determining remittances volatility and its lagged? Δ distinguishes the short-run effects from the long-run effects and μ<sub>t</sub> is the idiosyncratic error term at time t. In the ARDL model framework, the paper provided policy variables as follows:

$$\Delta \ln GDPPC_t = \beta_0 + \sum_{i=1}^m \beta_{1i} \ln GDPPC_{t-i} + \sum_{j=0}^n \beta_{2j} \Delta REM_{t-j} + \sum_{k=0}^v \beta_{3k} \Delta VREM_{t-k} + \sum_{l=0}^p \beta_{4l} \Delta INFR_{t-l} + \sum_{i=0}^q \beta_{5i} \Delta IR_{t-i} + \sum_{i=0}^r \beta_{6i} \Delta EXR_{t-i} + \beta_6 \ln GDPPC_{t-1} + \beta_7 REM_{t-1} + \beta_8 VREM_{t-1} + \beta_9 INFR_{t-1} + \beta_{10} IR_{t-1} + \beta_{11} EXR_{t-1} + \varepsilon_t \quad (7)$$

The bound test involves two main stages. The research investigation initially estimates the ARDL equation to see if there is a long-term relationship between the variables. In the second step, the F-statistic is computed, and the subsequent decision rule is utilized:

The null hypothesis ( $H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ ) of no long-run relationship is rejected if the calculated F-statistic is greater than the critical value for the upper bound I(1). In this case, the alternative decision ( $H_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$ ) is accepted, the research conclude that there is cointegration or a long-run relationship. If the F-statistic is less than the critical value for the lower bound I(0), the null hypothesis cannot be rejected ( $H_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$ ), this means that no cointegration and the long-run relationship cannot be established. Ultimately, if the F-statistic lies between the upper bound I(1) and lower bound I(0), the result is inconclusive. Thus, it is possible to conduct both the long- and short-term. Lastly, the following is the series error correction:

$$\Delta \ln GDPPC_t = \beta_0 + \sum_{i=1}^m \beta_{1i} \Delta \ln GDPPC_{t-i} + \sum_{j=0}^{m-1} \beta_{2j} \Delta REM_{t-j} + \sum_{k=0}^{m-1} \beta_{3k} \Delta VREM_{t-k} + \sum_{l=0}^{m-1} \beta_{4l} \Delta INFR_{t-l} + \sum_{i=0}^{m-1} \beta_{5i} \Delta IR_{t-i} + \sum_{i=0}^r \beta_{6i} \Delta EXR_{t-i} + ECT_{t-1} + \varepsilon_t \text{-----}(8)$$

Where;

$ECT_{t-1}$  = lagged Error correction term. The ECT records the output evolution process that agents employ in response to the previous period of prediction errors.

For the following reasons, the Autoregressive Distribution Method (ARDL) estimate technique was employed. Firstly, with limited or finite sample data sizes as the current study, the ARDL approach of co-integration analysis is impartial and comparatively more efficient (Oteng-Abayie & Frimpong, 2006; Narayan & Narayan, 2003). Second, whether the regressors in the estimating model are mutually integrated, simply I(0), or purely I(1), the ARDL cointegration approach can be applied. But when there is an I(2) series, the process breaks down (Oteng-Abayie & Frimpong, 2006). Thirdly, difficulties related to missing variables and autocorrelations can be eliminated by simultaneously estimating the model's long-run and short-run components (Narayan & Narayan, 2003).

### Variables Description and Data Source

Table 1 gives specific summary of variables description, and source of data from 1986 to 2022.

**Table 1:** Variables Description and Data Source

Variables	Description	Sources
Economic Growth	In this research, economic growth is measured using real GDP per capita (constant 2015 US\$), which is the total value of goods and services produced by a country divided by its population. In the analysis, this variable is regarded as a dependent variable	NBS
Remittance	Personal remittances, received (% of GDP)	WDI
Remittances volatility	This reflects an unanticipated component of remittance inflows. The Generalized Autoregressive Conditional Heteroskedasticity Model was used to measure the oil price volatility	Author's Estimation
Inflation rate	This is used to capture the general price level.	CBN
Interest rate	This is the cost incurred by a borrower while borrowing money for transactions or company. It is a crucial factor in determining how well a nation's financial system performs	CBN
Exchange rate	This is the quantity of home currency units needed to buy a specific amount of foreign currency. Nominal currency appreciation is the term used to describe a decline in this measure	CBN

**Source:** Researchers' Compilation, 2024

**Notes:** CBN: Central Bank of Nigeria Statistical Bulletin; NBS: National Bureau of Statistics; WDI: World Development Indicators for Nigeria.

## Results

### Descriptive Statistics

Table 2 presents the descriptive statistics for the paper.

**Table 2:** Descriptive Statistics

	GDPPC	REM	VREM	INFR	IRS	EXR
Mean	1587.797	2.940174	0.860548	19.77033	9.796788	143.8677
Std. Dev.	863.1859	2.521762	2.715412	17.19534	4.170771	117.8089
Skewness	0.143098	0.253351	2.991271	1.752377	0.035091	0.815299
Kurtosis	1.775778	1.758716	11.26129	4.824264	3.151991	2.830888
Jarque-Bera	2.436802	2.771196	160.3945	24.06733	0.043208	4.143148
Probability	0.295703	0.250174	0.000000	0.000006	0.978628	0.125987
Observations	37	37	37	37	37	37

**Source:** Authors Computation, 2024 (Eviews-12)

The summary statistics in Table 2 demonstrate that all the variables have positive mean values, with GDPPC and VREM having the highest and lowest mean values, respectively.

Also, each variable's standard deviation offers a more accurate and comprehensive representation of dispersion than an outlier, which has the potential to greatly exaggerate the range of data. The greatest departure from the mean is displayed by GDPPC, while the smallest is by REM. The probability values of the Jarque–Bera statistics, with the exception of VREM and INFR, suggested the normalcy of the residual and showed that the null hypothesis is not rejected.

### Unit Root Test

Time series data often show tendencies that can be handled with differencing, mostly for the purpose of figuring out how stationary the data is. A key step in time series analysis is the Augmented Dickey-Fuller (ADF) unit root test, the results of which are displayed in Table 3 and which determines if the series is stationary.

**Table 3:** Unit Root Test Result

Variable	ADF Test Statistics		
	ADF	Critical Value	Order of Integration
GDPPC	-4.352877	-4.243644*	I(1)
REM	-6.011061	-4.243644*	I(1)
VREM	-4.448815	-4.356068*	I(1)
INFR	-4.553776	-4.243644*	I(0)
IRS	-4.043311	-3.544284**	I(0)
EXR	-3.591921	-3.562882**	I(0)

Note: \*, \*\*, \*\*\* significant at 1%, 5% and 10%

**Source:** Authors Computation, 2024 (Eviews-12)

The findings of the Augmented Dickey-Fuller (ADF) unit root test indicate that the variables are integrated in a mixed-order form, with INFR, IRS, and EXR being integrated at the level and the remaining variables being integrated at first order. I (0) and I (1) are hence the integration order.

### Cointegration Test

Table 4 presents the analysis of cointegration, using the ARDL bounds technique.

**Table 4:** Result of ARDL Bounds Test for Cointegration

Null Hypothesis: No Long-run Relationships Exist		
Test Statistic	Value	K
F-Statistic	6.423820	5
Critical Value Bounds		
Significance	Lower Bound	Upper Bound
5%	2.39	3.38

**Source:** Researcher's Computations based on E-Views 12

Table 4 unequivocally demonstrated that the null hypothesis (H0: No cointegration) is rejected at 5%, where the F-statistic is greater than the critical values at both the top and lower bounds. This indicates that the variables have a lasting relationship. As a result, it can convincingly support the notion that the analysis's variables are related over the long term.

### Autoregressive Distributed Lag Estimates

Given the cointegration of the dependent variable with the regressors and the mixed-order of integration obtained from the unit root analysis, Table 5 presented the results of the Linear ARDL estimate.

**Table 5:** ARDL Regression Results  
**Dependent Variable: DLOG(GDPPC)**

Co-integrating Estimates (ECM Estimates)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(REM)	-0.155614	0.020450	-7.609655	0.0006
D(REM(-1))	0.065980	0.010500	6.283886	0.0015
D(REM(-2))	0.137943	0.016242	8.492821	0.0004
D(VREM)	-0.142507	0.012223	-11.65932	0.0001
D(VREM(-1))	0.029327	0.013052	2.246990	0.0746
D(VREM(-2))	-0.066632	0.010817	-6.159999	0.0016
D(INFR)	0.046666	0.004397	10.61346	0.0001
D(INFR(-1))	-0.007449	0.002080	-3.580872	0.0159
D(INFR(-2))	0.037118	0.003102	11.96443	0.0001
D(IRS)	-0.118362	0.014541	-8.140034	0.0005
D(IRS(-1))	0.049120	0.007753	6.335940	0.0014
D(IRS(-2))	-0.031093	0.007610	-4.085565	0.0095
D(EXR)	-0.003247	0.000487	-6.662410	0.0011
D(EXR(-1))	-0.004576	0.001065	-4.294922	0.0078
D(EXR(-2))	0.001496	0.000866	1.728681	0.1444
CointEq(-1)*	-0.302827	0.030447	-9.946197	0.0002
R-squared	0.983049			
Adjusted R-squared	0.950689			
Durbin-Watson stat	1.936476			
Long Run				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REM	-0.051017	0.149560	-0.341115	0.7469
VREM	-1.438364	0.669465	-2.148527	0.0844
INFR	0.018313	0.030012	0.610178	0.5684
IRS	-0.363827	0.271025	-1.342409	0.2372
EXR	0.000368	0.001316	0.279307	0.7912
C	12.55545	3.357578	3.739436	0.0134

**Source:** Researcher's Computation Using EViews-12 (2024)

Based on Table 5, every variable employed in this investigation has a statistically significant impact on short-run economic growth. All of the variables do not, however, have a statistically significant long-run impact on economic growth. In addition, the

short-run a priori expectations of the article are supported by one-period lagged remittances, remittance volatility, one-period lagged inflation rate, interest rate at level, and two-period lagged exchange rate. In the long run, however, the volatility of remittances, interest rates, and the exchange rate align with the paper's a priori expectations.

The estimated ARDL regression result indicated that the one- and two-period lagged exchange rate, interest rate at level, one-period lagged remittance volatility, and one-period lagged inflation rate are the main short-run drivers of economic growth. While the long-run drivers of economic growth are interest rate and exchange rate. Moreover, the results align with earlier research. For example, Abbas *et al.* (2017) discovered a positive and significant relationship between Pakistan's GDPPC and remittance inflows. Overall, the analysis's findings are consistent with those of Delessa *et al.* (2024), Fartun and Charles (2023), and Docquier (2017), who have all demonstrated a positive and substantial relationship between remittance inflows and GDPPC, a proxy for economic growth. Comparably, the research's conclusions – which show a negative relationship between remittance volatility and economic growth over the long and short run – are consistent with earlier research by Awode *et al.* (2021), Nwosa *et al.* (2020), Anetor (2019), Abdel-Halim and Bino (2019), and Jawaid and Raza (2014). For instance, Jawaid and Raza (2014) discovered that the remittance volatility of workers significantly and negatively affects the economic growth of five South Asian nations.

### **Discussion of Findings**

The investigation started with a first pass at the data in form descriptive statistics. The result of the descriptive statistics which provided a summary of central tendency, dispersion, and shape of a dataset's distribution revealed that all the variables have positive mean values, with GDPPC and VREM having the highest and lowest mean values, respectively. Also, the greatest departure from the mean is displayed by GDPPC, while the smallest is by REM. The probability values of the Jarque–Bera statistics, with the exception of VREM and INFR, suggested the normalcy of the residual and showed that the null hypothesis is not rejected.

Since the data used are of aggregate in nature, the variables were investigated for their stochastic properties using the Augmented Dickey-Fuller (ADF) unit roots test. The results indicated that the variables are integrated in a mixed-order form, with INFR, IRS, and EXR being integrated at the level and the remaining variables being integrated at first order.  $I(0)$  and  $I(1)$  are hence the integration order. Thereafter, the ADRL-bounds testing approach was used to determine whether a long-run cointegration relationship exists between dependent and independent variables as presented in Table 4. The results indicated that the variables have a lasting relationship. As a result, it can convincingly support the notion that the analysis's variables are related over the long term. Having established that there is a long run relationship between the variables, the paper proceeded to estimate the Error Correction Model.

From the estimated ARDL regression result presented in Table 4 and on the basis of variable-by-variable analysis, the paper found. The paper found that one period lagged and two one period lagged remittances are positively related to growth rate of host countries in the short run. Consequently, one percentage increase in one period lagged remittances will lead to an increase in economic growth in Nigeria by 0.066 percent in the short run. According to this contribution ratio, migrant remittances are a significant contributor to economic growth. On the other hand, over the long term, the projected impact of remittances on economic growth is statistically insignificant and negative. Specifically, one percentage increase in remittances will lead to a decrease in economic growth in Nigeria by -0.051% in the long-run.

On the other hand, the findings indicated that volatility in remittances appears to affect economic growth negatively both in the short run and long run. Controlling for other factors, for instance, a 1 percent increase in volatility in remittances decreases economic growth by -0.143% and -1.438% respectively in the short run and long run. Similar results were reported by Awode *et al.* (2021), Nwosa *et al.* (2020), Anetor (2019), Abdel-Halim and Bino (2019) and Jawaid and Raza (2014). Also, the estimated impact of inflation rate on economic growth is positive both in the short run and long run, except one period lagged inflation that is negatively related to economic growth in the short run. By implication, one percentage change or increase in inflation rate will lead to 0.046% and 0.018% increase in economic growth both in the short-run and long-run respectively.

Furthermore, the estimated impact of interest rate on economic growth is negative both in the short run and long run, except one period lagged interest rate that is positively related to economic growth in the short run. By implication, one percentage change or increase in interest rate will lead to -0.118% and -0.363% decrease in economic growth both in the short-run and long-run respectively. This result aligns with the presumptions of the study and the findings of Anosike and Alfadhel (2023), which proposed that interest rates do not have a statistically significant impact on economic growth.

Exchange rate influences remittances negatively and significantly in the short run and positive in the long run. Put another way, a decline in the value of the Nigerian Naira eventually results in more remittance inflows and economic growth. When all other variables are held constant, for instance, a percentage point increase in the depreciation (or exchange rate) leads to a long-run 0.036 percent gain in economic growth. This outcome is consistent with Adjei *et al.* (2020) findings, which show that economic growth and the real effective exchange rate are positively correlated. At the one percent level, the Error Correction Model is highly statistically significant, negatively signed, and as expected. This provides more proof that the dependent variable and the regressors have a long-run relationship. The coefficient's absolute value, which falls between 0 and 1, shows that, in order to keep the equilibrium, yearly corrections are made to the short-run divergence from the equilibrium (long-run) position, which is roughly 30%.



Since the explanatory variables account for more than 98% of the variation in economic development, the model appears to be well-fitting, as indicated by the R-squared value of 0.983049. The model appears to be quite good even after accounting for the impact of insignificant estimators, as indicated by the adjusted R-squared value of 0.950689. On the other hand, the DW figure of 1.936476 indicates that there is no problem with serial correlation. As such, the conclusions of the paper can be trusted for developing policy recommendations.

### Post-Estimation Test Results

To evaluate the validity of the findings and the model's stability and applicability, the study ran a few diagnostic tests. The results shown in Table 6 indicated that the model did not exhibit serial correlation or heteroskedasticity during the research period. The residuals are homoscedastic, according to the heteroscedasticity tests. The data appears to be pretty well behaved, based on the outcomes of the diagnostic tests for heteroscedasticity and serial correlation. Additionally, the residues' normal distribution is indicated by the fact that the p-value for the normality test for the research period is greater than 0.05. As a result, the residuals have a uniform distribution. Consequently, the null hypothesis regarding the normal distribution was not rejected.

**Table 6:** Diagnostic Test Results

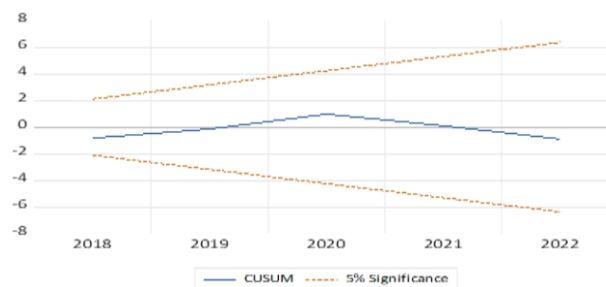
Test	Null Hypothesis	T-Statistic	Prob
Jarque-Bera	There is a normal distribution	0.614	0.71
Breusch-Godfrey LM	No serial correlation	6.613	0.07
Heteroskedasticity: Breusch-Pagan-Godfrey	No conditional heteroscedasticity	0.285	0.98

**Source:** Researcher's Computations based on E-Views 12

### Stability Test Result

Because the chart plots at the 5% significant level fall within the critical constraints, the stability test in Figure 1 demonstrated the stability of the economic growth model during the study time.

**Figure 1:** Stability Tests Result



**Source:** Researcher's Plot using E-Views 12

## Evaluation of Research Hypotheses

The results from the data analyzed were used to test the research hypotheses as follows

**H<sub>01</sub>:** **Remittance inflows and its volatility** has no significant impact on **economic growth in Nigeria in the short-run**. In testing this hypothesis, the paper depended on the results presented in Table 5 using the using the Autoregressive Distributed Lag (ARDL) technique. The result revealed that **remittance inflows and** volatility in remittances contributed significantly to economic growth in the short run during the period under review.

**H<sub>01</sub>:** **Remittance inflows and its volatility** has no significant impact on economic growth in Nigeria in the **long-run**. In testing this hypothesis, the paper depended on the results presented in Table 5 using the Autoregressive Distributed Lag (ARDL) technique. The result revealed that **remittance inflows and** volatility in remittances do not contribute significantly to economic growth in the long-run during the period under review.

## Conclusion and Recommendations

Using time series data from 1986 to 2022, the Autoregressive Distributed Lag (ARDL) technique was used to examined the influence of migrant remittances and their volatility on economic growth in Nigeria. Based on the results, it was shown that every variable had a statistically significant impact on economic growth in short-run. However, in the long run none of the variables have statistically significant impact on economic growth. Additionally, the outcome demonstrated that the one- and two-period lagged exchange rates, remittance volatility, one-period inflation rates, interest rates at level, and one-period remittances are the main short-run drivers of economic growth. While the long-run drivers of economic growth are interest rate and exchange rate. Overall, migrant remittances were economic growth-enhancing in Nigeria in the short run. However, volatility in remittances appears to affect economic growth negatively both in the short run and long run.

Therefore, the paper suggested the following recommendations based on findings:

- i. The Federal Government ought to devise and execute favorable policies with the objective of
- ii. directing remittances toward profitable ventures, given that migrant remittances have the potential to boost Nigeria's economic growth in the short run.
- iii. Rather than relying on worker remittances as a source of foreign exchange profits, Nigeria's fiscal and monetary authorities should concentrate on growing exports. This advice is appropriate because remittance volatility seems to have a detrimental short- and long-term impact on economic growth.
- iv. The Central Bank of should use the right combination of monetary policy measures to control the rate of inflation in the economy and stabilize capital inflows. These steps include keeping the inflation rate between one and two decimals in order to control the economy's spiralling inflation rate, which lowers

- the value and purchasing power of money, among other detrimental impacts.
- v. The government, through its monetary authority (CBN), should ensure that credit is made available by lowering interest rates, minimizing credit access requirements, and extending credit advancement duration in order to guarantee sufficient funds for investment and to foster the growth of gross national income, which in turn stimulates remittances into the economy.
  - vi. The government should also maintain stable currency rates to promote trade openness, which would ensure growth in exports compared to imports, boost net exports, and maintain the remittance flow.

### ***Limitations of the Research***

During the research process, several limitations were encountered. Some of these limitations are the significant volatility in key variables such as remittances received, inflation rates, and exchange rates over the period from 1986 to 2022. These fluctuations, influenced by external shocks (e.g., COVID-19 pandemic) and policy changes, may reduce the reliability of the results. Therefore, the paper findings might be sensitive to these fluctuations, potentially leading to overgeneralization of the findings. However, it is crucial to emphasize that despite these limitations, the paper and its subsequent results remain reliable and valid as a precedent for further investigations into the identified problem.

### **Suggestion for Further Studies**

Having carried out this research on the impact of migrants' remittance and its volatility on economic growth in Nigeria from 1986 to 2022, future researchers could address the limitations of the present paper by exploring how digital platforms, mobile money, and cryptocurrency adoption are influencing remittance patterns and costs, particularly in Sub-Saharan Africa, due to the rise of fintech solutions and ever-changing dynamics of remittance flows.

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