ARDL Analysis of Remittance and Per Capita Growth Nexus in Oil Dependent Economy: The Nigeria's Experience

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ARTICLE INFO	ABSTRACT
	Purpose: Remittance is essential to economic wellbeing. Realising this fact, this study examined, within the optimist theoretical framework, whether international remittances significantly impact per capita economic growth in Nigeria. **Design/methodology/approach:** Employing annual time series data spanning 1980-2020, the study adopted the Pesaran, Shin, and Smith ARDL bounds estimating model to examine the type of relationships between remittances and Nigeria's per capita growth. **Finding:** The study reveals a statistically significant positive nexus in the long-run and short-run among the variables. Specifically, it found that higher remittances inflow enhances per capita growth both in long-run and short-run in Nigeria. Furthermore, the study found that remittances are sources of external financing and eventually, it is a means to economic growth and also may help to fill fiscal deficit gap. **Research limitations/implications:** This study recommends that government should, through sound policy option, encourage remittances influx. This could be realised by creating viable relationship among international communities that largely account for remittance inflow into Nigeria. It further suggests a prudent and optimal management of remittances inflow through the appropriate monetary authority. This may include formulating policy that will ease remittance inflow and remove unnecessary barriers to inflow of remittances. **Originality/value:** The study contributes to literature by examining whether international remittances within the optimist theoretical framework significantly impact per capita economic growth (PCEG) in Nigeria.

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1. Introduction

Remittance may simply be referred to as earnings by migrant workers into their home nation. In the literature, workers' remittances are defined by the International Monetary Fund (IMF) as amount of monetary transfers sent by those workers who have been resident abroad for over a year to their country homes, and they are documented in various segments of balance of payments (Sutradhar, 2020). It is believed that remittances impact economic activity, especially in the developing nations. For instance, Sutradhar (2020) argued that, for developing nations, remittances constitute an increasingly significant mechanism for the resource transfers from the first world nations to the developing nations, and workers' remittances, in term of volume, are the 2nd-largest source, next to foreign direct investment (FDI) and external funding (Russell 1986; Sander and Maimbo, 2005; Buch and Kuckulenz, 2010; Sutradhar, 2020; Karagoz, 2009).

Buttressing the claim that remittances may impact economic growth, various studies have argued that remittances, over the current decades, are veritable, consistent, and safe source of foreign/external finances inflow among the developing countries (Rao and Hassan, 2011; Kudaisi et al., 2021; Adenusi, 2011; Giuliano and Ruiz-Arranz, 2009). Consequently, while a few researches have attempted to consider the economic growth and remittances nexus in the short-run, the analysis of the remittances and economic growth nexus in the long-run has not received much attention (Tolcha and Rao, 2016; Mwangi and Mwenda, 2015). Specifically, causal linkages in remittances and economic growth have received negligible attention in the developing countries, leaving the doubt of whether remittances would, in the long-run, be impactful to economic growth (Jouini et al., 2021; Bettin et al., 2014). Furthermore, economic growth nexus and remittances, in the case of oil dependent nation like Nigeria, having a remarkable portion of its population abroad, may differ from earlier findings. Buttressing this assertion, Wadood and Hossain (2015) allude that the issue of the remittances and economic growth nexus of recipient economy has remained contentious. The perceived impact of international remittances on economic growth of recipient economy has remained debateable among academics. This results to sluggishness in decision making and imbalances in balance of payment. The conflicting academics are the optimists, pessimists, and the liberals. The optimists avow that the overseas remittance has positive influence on the economic growth of the recipient economy, thus, leading to increase in investments and development of human capital (Wadood and Hossain, 2015; Garcia-Fuentes et al., 2009; Mwangi and Mwenda, 2015).

The pessimists, on the other hand, claim that overseas remittances unfavourably influence economic growth of the recipient economy exerted by poor orientation and inflationary pressure which emanate from insufficient labour supply (Karagoz, 2009; Chami et al., 2005; Davis and Carr, 2010). The liberal academics are indifferent. They contend that overseas remittances don't impact economic growth of the recipient economy (Shimul, 2013). Following the inconclusiveness on the issues of overseas remittances and economic growth nexus, there is a need for empirical investigation which this study undertakes. This study primarily examines overseas remittances and on per capita growth nexus.

Several studies have examined economic growth and remittances nexus in Nigeria. Some of these studies have shown that remittances significantly and statistically impact economic growth both in long-run as well as short-run (Oshota and Badejo, 2014). Similarly, study like Adarkwa (2015) employed OLS regression model and the study revealed that remittances impact economic growth. These findings contravene Kumar (2011) who found that remittances have significant negative and positive impact on economic growth. Furthermore, the study argued that the negative impact of remittances in the short-run is associated with the fact that beneficiaries of remittances keep money idle by saving it in short-run, while the positive effect in long-run is connected to the fact that the money saved is economically employed in the long-run to bankroll capital projects.

Earlier research on economic growth and remittances nexus have provided evidence on the connection between remittances and various economic growth indicators such as GDP and RGDP. The favourable and unfavourable pull and push effect of remittances on economic growth motivates this study. While the earlier studies on remittances have emphasized the motive and advantages of worker remittances, the manner in which remittances per capital income remains inconclusive in the literature. This could have offered a better explanation on how remittances could impact economic growth. In addition, such explanations could have examined, with regards to the long-run and short-run, the effect of remittances on per capita income. The study also seeks to determine the causal linkages between per capital income and remittances. This study is informed by the literature which shows that previous study on remittances-economic growth nexus have largely employed panel data to examine emerging countries, thus, making it problematic to consider country particular issues (Sutradhar, 2020; Fayissa and Nsiah, 2010; Feeny et al., 2014; Nyeadi et al., 2014). This study, among other things, contributes to the literature by examining whether international remittances, within the optimist theoretical framework, significantly impact PCEG in Nigeria.

The remainder of the study, following the introduction, is arranged as follow. Section 2 gives overview of remittances. Section 3 reviews literature, section 4 presents the methodology to the study, section 5 discusses findings from the study and section 6 concludes the study and offers relevant recommendations.

2. Overview of remittances
This section gives a general overview of remittances and this is cascaded down to the Nigerian context.

### 2.1 Remittances: *A Global Overview*
Globally, about twenty percent of the primary research involve an interaction stretch between remittances and one independent variable or the other (Cazachevici et al., 2020; Konte, 2018; Kratou and Gazdar, 2016; Tsaurai, 2015). The study observes that development in the financial sector is the commonest taming factor that is used in interaction terms. Supporting this claim, Mundaca (2009) notes that remittance has a positive long-run impact on economic growth, but financial inclusions could further improve the positive connection. Contrary to this view, Mohamed and Sidiropoulos (2010) opine that remittance positively impact economic growth with and without financial development and interacting remittances. Nonetheless, Bettin and Zazzaro (2012) reveal that remittances would exhibit a positive impact on economic growth in nations that have an efficient internal banking sector that could serve as an efficient intermediary in channelling remittances to growth-improving projects.

Clemens and McKenzie (2018) carried out study on selected global developing countries and note that nations where remittances constitute a large proportion of their GDP haven't experienced remarkably higher growth over a twenty-year period than nations which receive much lesser remittances. This study revealed that nations vary from one another in a numerous of characteristics, and this has necessitated various empirical works to either implicitly or explicitly ask if variations in remittances could lead to economic growth. The study also observes that striking growth in projected remittances hasn't been supplemented by palpable variations in economic growth for the nations that receive them. Buttressing this submission, Imad (2017) shows that while it is evident that institutions contribute to economic growth, evidence on direct relation on economic growth and remittances nexus is not well documented in the literature. Although, Ball et al., 2013 advocates that remittances spur inflation and this is a component of growth in nominal GDP. While several studies have attempted to understand the economic growth and remittances nexus, the relationship between the duo in developing oil exporting countries, assumed to be attractive to significant remittances inflow, appears to be unattended to. Hence, the need for this study:

Cazachevici et al. (2020) opine that the remittance of expatriate workers constitutes a vital source of finance to middle- and low-income nations, yet there is no agreement, that has emerged on remittances and economic growth nexus. In their study for instance, where a survey of 538 samples was reported in ninety-five studies, the study reveals that nearly 40 percent of the studies has a positive impact, 40 percent reveals no impact, and 20 percent reveals a negative impact. These findings indicate a bias in favour of positive impacts. Despite needful corrections to the bias, employing recently developed methods, the findings reveal that the mean impact remains positive but economically little. Yet, their findings unveiled remarkable differences in the regions. For instance, they found that remittance is growth-improving in the Asian nations but otherwise in Africa.

2.2 Remittances in Nigeria: *An Overview*
Nigeria is a middle-income nation with expanding financial and manufacturing sectors. It ranks the largest economy in Africa and 27th largest globally, in terms of nominal gross domestic products. Oil resources constitute the main stay of the Nigerian economy. The sector contributes about 60% of its revenues. Oil alone contributes nearly 9% of the GDP. It produces only nearly 2.7% of the global oil supply (OPEC, 2020). Though, the petroleum sector is vital as government revenues, yet, Nigeria is one of the countries regarded as the largest recipient amongst remittances recipient nations. Over time the international remittance to Nigeria has steadily improved and the remittances have become a major share of the financial inflows to the country (see Figure 1).

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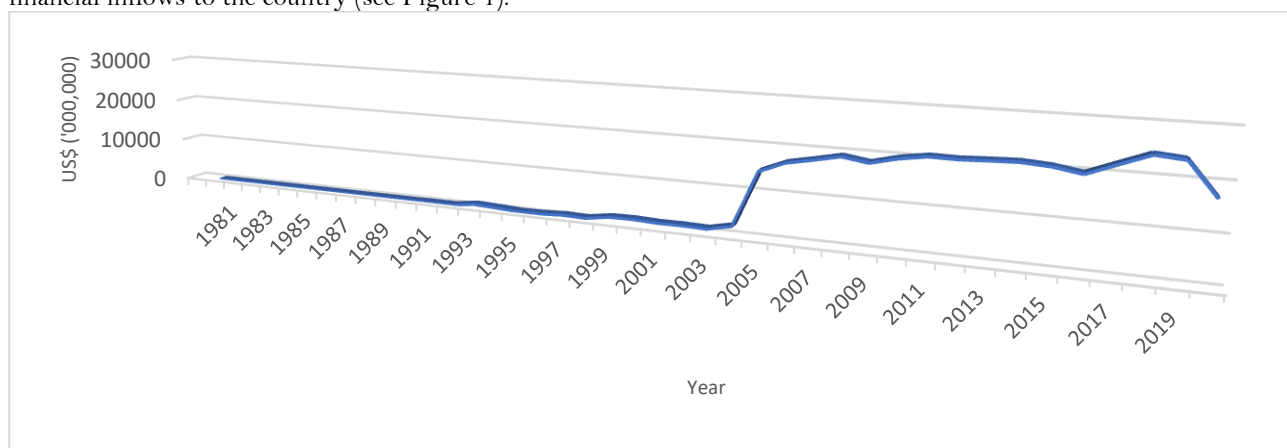
Figure 1: Remittance inflow to Nigeria
Source: computed by the authors from the data obtained from World Bank (2020).

In Africa, Nigeria is the 5th largest recipient of international remittances followed by Senegal. Nigeria received the sum of US$21 billion remittances in 2013. Undeniably, Nigeria emerged the leading recipient of remittances in SSA in 1990, and from 2006, it has been the leading recipient of remittances in Africa, including North Africa (Laniran and Adeniyi, 2015; Nyamongo et al., 2012). The rise in the international remittances to Nigeria may not be unconnected with increase in the population of her resident living abroad. For instance, at $23.8 billion, Nigeria received nearly half of the remittances sent to sub-Saharan Africa (SSA) in 2019. South Sudan, however, is estimated to have the highest remittance flow as a percentage of GDP in 2019 (34.4%). In 2020, it received about $16.9 billion in international remittance flows compared to $23.4 billion in 2019 (World Bank, 2020).

According to Constantinescu and Schiff (2014), rise in international migration leading to increase in remittances is a vital factor propelling the growth of global remittances, Nigeria inclusive. Nigeria has the largest population in Africa, and seventh largest in the world, having over 200 million people (World Bank, 2020). The population of the country accounts for approximately 25% of the sub-Sahara African population. Following World Bank (2020), the projected remittances receipt for Nigeria for 2014 was US$22.3 billion. This constitutes an amount which is US$14.4 billion greater than the collective amount received by the other leading ten largest receivers of remittances in sub-Saharan Africa (SSA). Senegal is next to Nigeria among the SSA nations, receiving a total of US$1.7 billion international remittance, about 7.6% of the overall remittances to Nigeria. This assumed position by Nigerian stands Nigeria out in the literature discourse among the sub-Saharan African nations.

Between 1980 and 2004, remittance averagely constituted about 0.67% of the GDP, peaked at 8.31% in 2005 and began to decline steadily. Though, the contribution of remittance to GDP from 2007 to 2020 averaging 5.27% is remarkable compared with 1980-2004. The steadily decline in the proportion of remittance to GDP may have its impact on economic. The extent of this could be empirically verified.

3. Review of Literature
This section presents the literature review to the study. There are several debates on international remittances and economic growth nexus among academics, researchers, and policymakers. These debates have continued to be equivocal within the context of both theoretical and empirical views. Theoretical views on remittances differ, but the conformist insight submits that a large magnitude of remittances in a country, especially the developing country accounts for economic growth of the country (Garcia-Fuentes et al., 2009; Mwangi and Mwenda, 2015; Wadood and Hossain, 2015). A few empirical studies have divergent to the conventional view. For instance, Kumar (2011) argued that remittances have significant positive and negative effect on economic growth in the long-run and short-run respectively.

3.1. Theoretical Review
Several theories underpin remittances and economic growth relationship. The remarkable preoccupation of these theories is whether remittances impact economic growth, how and to what extent it affects it. Therefore, these theories advocate those remittances speed up economic growth. From viewpoint, a few people would disagree with the fact that remittance has positive impact on the economy of the recipient countries. Among various theories on remittances and economic growth nexus, this study considers the optimist (*Developmentalist/Neo-Classical), and Structuralist/Dependency in* De Haas (2010) and Adarkwa (2015) to ascertain how remittances impact economic growth. They are suitable to examine remittance-economic growth nexus.

3.1.1 The Optimist View
This is also known as developmentalist or Neo-Classical view. It evolved in the fifties with the supposition that, through transfer of capital, adoption of western culture and industrialisation, developing nations could accelerate their developmental process (Adarkwa, 2015). According to the study, this period experienced underdevelopment and the underdevelopment was ascribed to internal factors in developing nations. Accordingly, the study avows that if developing nations were willing to develop, the developing nations needed to refrain from their norms as well as cultural and traditional way of doing things and embrace modernity from the western world (Coetzee, 2001).

Furthermore, the prominent scholars of this theory among which include and Massey (2020), Beijer, (1970) as cited in Olayungbo and Quadri (2019). Todaro (1969) argue that migration would lead to transmission of capital investment through remittances. The procedure exposes primitive/traditional cultures to a more liberal, democratic and rational ideas such that will aid development (De Haas, 2010). Accordingly, labour migrations are perceived as core portions of transformation and it is assumed that the impacts of migration on growth and development could be viewed via the inflow of remittances which can help to enhance incomes and productivity (Massey, 2020). In view of this, migrants' remittances

are vital because they cause variation in household incomes, stimulate innovations and investments, and largely aid the overall economy of the migrants' nation of origin in its economic take-off (Olayungbo and Quadri (2019).

3.1.2. Pessimists Views

Contrary to the optimist view, the pessimists view, also referred to as structure and dependency theory, advocates that remittances and migration lead to underdevelopment in the country home of migrants (Adarkwa, 2015). Prominent scholars linked with this theory are Binford (2003) and Rubenstein (1992). Furthermore, the theory argues that different from making receivers of remittances reliant on the senders, international remittances cause the receiving nations to be dependent on the countries sending remittances (Adarkwa, 2015; Binford, 2003). Buttressing this claim, De Haas (2010) avow that migration is a conduit through which human capacities of communities are drained, hence, leading to passive development, in addition to making the receiving countries remittance-dependent. Consequently, Lipton (1980) cited in Nyasha (2019) and Oluwafemi and Ayandibu (2014) concludes that remittances would lead to imbalances rather than promoting economic growth Lipton (1980), because in most cases, remittances received are usually used to procure conspicuous items like houses, vehicles, fashions rather than exploring investment opportunities. This may further worsen income inequalities among individuals in the remittance receiving countries between remittance receiving households and those that don't receive any (Oluwafemi and Ayandibu, 2014; De Haas, 2010), hence, leading to inflation in the remittent recipient countries.

3.2 Previous studies

The literature reveals that various researches has studied economic growth and remittances nexus among the recipient nations. Specifically, the studies investigated the impact of remittances on economic growth among the receiving countries.

The literature reveals that remittances largely and positively contribute to household welbeign in the receiving counties (Nyeadi et al., 2014; Adams 2010). For Instance, Lopez et al. (2007) find that, in Latin American and Caribbean, remittances have remarkably assisted to lessen poverty, inequality, and have improved economic growth. They established that remittances have become sources of income among the poor individuals in developing nations. Nonetheless, the effect of remittances on economic growth, it is still contentious. A few studies have argued that causal relationship between growth and remittances might not be completely fathomable employing instrumental variables while the remittances effect on some economic variables is not evident in the short term (Nyeadi et al., 2014; Adams 2010).

Sutradhar (2020) employed balanced panel data, for four South Asian developing nations, covering 1977-2016 to examine the effect of workers' remittances on economic growth. The study shows a negative link in economic growth and remittances in Sri Lanka, Pakistan, Bangladesh, but a positive link between economic growth and remittances in India. In addition, it reveals a joint negative but significant economic growth and remittances nexus in four countries.

Oshota and Badejo (2014) investigate remittances relationship with economic growth in Nigeria. Employing an Error Correction Model on data covering 1981-2011, the study finds that remittance has positive effect on economic growth in Nigeria. Furthermore, the study reveals that a 1 per cent increase in remittances would lead to a 0.19% increase in real GDP in the long-run, but a significant negative relationship with the real GDP in short-run. Jebran et al., (2016) investigate the impact of remittances on per capita economic growth in Pakistan for 1976 to 2013. Employing Auto Regressive Distributed Lag (ARDL) Bounds testing model, the study investigates both long and short-runs liaison of remittances with per capita economic growth. The study reveals a statistically significant positive long-run and short-run impact of remittances on per capita economic growth.

4. Methodology

The methodology to the study is discussed in this section. This study examines the effect of international remittances on per capita growth in Nigeria. Unambiguously, the study analyses short-run and long-run nexus in remittances and per capita growth in Nigeria, investigating whether remittances in the long-run could impact per capita growth in Nigeria. To appropriately model the data employed in this study to extract both the short-run and long-run relationships in accomplishing the objective of the study, the study among other things considers unit roots test and cointegration relationship with the data to choose a suitable methodology. This procedure is in line with Kutu and Ngalawa (2016) and Giles (2013) who enumerated the four situations below which are involved in deciding the methodology that is appropriate for a data set:

i. Ordinary Least Square (OLS) applies, if variables are stationary at I (0).

ii. Vector auto regressive (VAR) applies, if variables are stationary at I (1), but they are not cointegrated.

iii. When variables cointegrated and also integrated of the same order, two types of regression models suggested are OLS regression model using the variable at levels, which provides the long-run equilibrium association between the variables and an Error Correction Model (ECM).

iv. When some variables are stationary at I (1), and I (0), resulting to ambiguity when compared with (i)-(iii) above, ARDL is suggested

This study employs annual data which is line with earlier studies (Kudaisi et al., 2021; Bettin et al., 2014 ; Jouini et al., 2021; Tolcha and Rao, 2016; Mwangi and Mwenda, 2015). The data covers 1990-2021. The choice of data points is informed by data availability and how recent is the data. Furthermore, the decision for variables is formed on the bases of theory and earlier studies (Kudaisi et al., 2021; Bettin et al., 2014).

4.1 Data and data sources
Consequently, this study used are per capital growth (ζ), international remittance (IREM), exchange rates (ER), oil price (OP), and investment (INV). They have been obtained from the World Development Indicators (WDI) and statistical Bulletin of the Central Bank of Nigeria. Theory and previous study informed this choice.

4.2 Estimating Technique
This study adopted ARDL estimating technique, following Pesaran et al., 2001). It evaluates whether there is shortrun and longrun relationship between remittances and per capita growth in Nigeria. Furthering the choice for this technique, varying from the fact that it is appropriate for combining the I(1) and I(0) series which implies that variables that are integrated of I(1) and I(0) can be estimated in one regression; ARDL model can mutually cointegrate variables, ignoring their order of integration but not order I(2) (Katircioglu, 2009). It makes ARDL model a more superior technique to other techniques used to investigate shortrun and longrun nexus. Furthermore, beside the fact that variables employed in an ARDL model could be assigned dissimilar lags, it is appropriate for both large and small sample sizes (Giles, 2013). The ARDL could synchronously estimate the long-run as well as shortrun parameters (Shin et al., 2014), and it contains a single-equation structure, thus, making it easy to apply and interpret (Giles, 2013).

4.3 Unit Root Tests
Bornhorst and Baum (2006) emphasises unit root tests. The study argues that the characteristics of the variables should be examined before they are used to conduct an ARDL analysis to avoid wrong specification of a model, which subsequently may result into loss of vital information about the data sets, and by extension a misleading value of R-square, F and t-statistics, and spurious results (Hamid and Shabri, 2017). A unit root test helps to produce consistent parameter estimates notwithstanding whether the time series are integrated or not, making it produce a more robust result. Following Bornhorst and Baum (2006) the study, used Augmented Dickey Fuller, Dickey Fuller, and Philip-Perron to test for stationarity of the variables. The choice of the multiple criteria to test for stationarity is dictated by the need to authenticate the consistency, reliability and validity of results (Frimpong and Oteng-Abayie, 2006).

4.4 Lag length
To select a suitable lag length, this study follows the conventional criteria available in the literature which states that lag with least criterion be given consideration (Lutkepohl, 2006). To permit adjustments in the model therefore, and achieve reliable and well-behaved residuals, lag order is chosen using robust criteria consisting AIC, HQIC, FPE, and SIC.

4.5 Diagnostic Tests
Alquist and Kilian (2010) argue favourably on the need to conduct basic diagnostic tests to investigate the consistency of the ARDL. Consequently, this study conducts diagnostic tests, heteroscedasticity, serial correlation, stability and normality tests to authenticate the appropriateness, reliability and robustness of the model.

Accordingly, this research work tests for both the null and alternative hypotheses of heteroscedasticity, serial correlation, and and normality are hypothesized as:

Null Hypothesis: $H_0: \xi = 0$, there is no heteroskedasticity, no serial correlation; and residuals are normally distributed.
Alternative Hypothesis: $H_0: \xi \neq 0$, there is heteroskedasticity, serial correlation; and residuals are not normally distributed.

As the name implies, the stability test examines the stability if the model. The stability test is rooted on the recursive chow test. This submits that for a model to be reliable, there must be stability over time. The stability test uses the graphical CUSUM to decide stability of the model. The benchmark specifications of hypotheses are as follow:

Null Hypothesis$H_0 : \delta = 0$, the model is stable
Alternate Hypothesis$H_0 : \delta \neq 0$, the model is not stable

4.6 Model Specification
The model employed to determine the remittance and per capita growth nexus is expressed in (1):

$$\zeta = f(\text{IREM}, \text{ER}, \text{OP}, \text{INV}) \tag{1}$$

Where ζ represents per capita growth, IREM is remittances, ER is exchange rates, OP is oil price, and INV means investment proxy gross fixed capital formation.

Log linearising (1), with the exemption of ζ, the equation becomes:

$$\zeta_t = \eta_0 + \eta_1 \text{IREM} + \eta_2 \text{ER} + \eta_3 \text{OP} + \eta_4 \text{INV} + \xi_t \tag{2}$$

Where $\eta_0, \eta_1, \eta_2, \eta_3,$ and η_4 are parameters and ξ_t is the error term of the model. The a priori of the coefficients in the model are such that $\eta_1, \eta_2, \eta_3, \eta_4 > 0$.

Following earlier studies (Kutu and Ngalawa, 2016; Pesaran, et al., 2001; Giles, 2013), that argued in favour of ARDL to be employed if variables are integrated of both I(1) and I(0) combined, this study is analysed using the ARDL model. Beside the fact that earlier studies suggested ARDL for the combination of I(1) and I(0) order of integrations, ARDL model is an advanced econometric technique that is appropriate for time-series data (Jebran, Abdullah et al., 2016). In addition, the ARDL model is appropriate for very small sample (Jebran et al., 2016; Pesaran et al., 2001). Thus, the sample of the study fits into the acceptable range to employ ARDL. The ARDL also includes Bounds testing carried out first to decide long relationship among the variables used. Furthermore, the ARDL models automatically ascribe appropriate lag length to a particular variable contained in a model. This is done to obtain necessary results in a specific. Following the process that it is essential to estimate a vector autoregressive (VAR) model of order p denoted as VAR (p) for the growth equation, equation 3 presents the VAR model for the variables.

$$Y_t = \vartheta + \sum_{j=1}^{k} \varphi j Y_{t-j} + \varepsilon_t \tag{3}$$

Where Y_t represents vector of the variables (ζ, IREM, ER, OP, and INV), the constant term is represented with ϑ, φj is a matrix of VAR considerations for lag j, and ε_t is the error term. It is expected that the explained variable is integrated of I(1), while the rest variables are integrated of I(o) and I(1) combined. Consequently, the vector error correction (VEC) model is expressed as:

$$Y_t = \vartheta + Y_{t-1} + \psi \sum_{j=1}^{k-1} \psi_j \Delta Y_{t-j} + \varepsilon_t \tag{4}$$

Where Δ is the first difference and ψ is the longrun multiplier such that:

$$\begin{bmatrix} \psi_{yy} & \psi_{yx} \\ \psi_{xy} & \psi_{xx} \end{bmatrix}$$

Furthering this analysis, the study carries out the F-statistic or Wald test to decide the joint significance of the variables in the long-run. Consequently, using bound testing procedure, the null hypothesis and alternative hypothesis for the long-run relationship among variables are specified as:

$$\eta_0 = \eta_1 = \eta_2 = \eta_3 = \eta_4 = 0$$
$$\eta_0 \neq \eta_1 \neq \eta_2 \neq \eta_3 \neq \eta_4 \neq 0$$

To compute the F-statistic, the procedure requires a comparison of estimated F-test value against the tabulated critical values (Pesaran et al., 2001). This is proposition is premised on the yardstick that the variables employed for the study

should be a combination of I(1) and I(0) as revealed in Tables 2a and 2b. However, decision formation on F-statistic is that, reject null hypothesis, if the estimated value of F-statistic is more than the upper bound. This suggests that there is stable long-run relationship in the employed variables. Inversely, the null hypothesis is accepted, if the estimated value of F-Statistic is less than the lower bound, suggesting that there is no long-run relationship among the variables. Consequently, decision formation will be based on estimation from the short-run. Having found a long-run relationship among the variables, it is essential to estimate the ARDL model and long-run coefficient between remittances and per capita growth as specified below:

$$\zeta_t = \eta_0 + \eta_1\zeta_{t-1} + \eta_2 IREM_{t-1} + \eta_3 ER_{t-1} + \eta_4 OP_{t-1} + \eta_5 INV_{t-1} + \xi_t \tag{5}$$

Where $\eta_0, \ \eta_1, \eta_2, \eta_3, \eta_4,$ and η_5 are parameters and ξ_t is the error of the model. The a priori of the coefficients in the model are such that $\eta_0 > 0, \eta_1 > 0, \eta_2 > 0, \eta_3 > 0, \eta_4 > 0,$ and $\eta_5 > 0$.
From (5), the ECM is derived as presented in (6) which is used to obtain the short-run relationship.

$$\zeta_t = \eta_0 + \eta_i \sum_{i=1}^{p} \Delta \zeta_{t-1} + \eta_j \sum_{j=1}^{q} \Delta IREM_{t-j} + \eta_k \sum_{k=1}^{q} \Delta ER_{t-k} + \eta_l \sum_{l=1}^{q} \Delta OP_{t-l} + \eta_m \sum_{m=1}^{p} \Delta INV_{t-m} + \varphi ECM_{t-1} + \xi_t \tag{6}$$

Where $\eta_i, \eta_j, \eta_k, \eta_l,$ and η_m are short-run coefficients, Δ is the first difference of the used variables, and φECM_{t-1} is the error correction term. The error correction term accounts for the disequilibrium adjusted in the long-run.

5. Results
This section presents findings from the study. The study examined, using time series data, the impact of remittances on per capital growth in Nigeria. Consequently, the results are presented in this section. Table 1 presents the descriptive statistics of the time series variables used in the study. According to the table, the average per capital (ζ) oil price (OP), international remittances (IREM), investments (INV) and exchange rates (ER) are 1329.24, 43.02, 8.90, 35.74 and 106.92. This study majorly focuses on remittances and per capita growth because they constitute core variables in this study. The average value of ζ lies nearby the upper end of the distribution. Furthermore, it reveals the standard deviations of ζ, OP, IREM, INV, and ER from their respective average values yearly standing at 876.17, 29.84, 1.38, 19.18, and 98.94.

Table 1: Descriptive statistics

	EXR	INV	IREM	OP	Z
Mean	106.9272	35.74121	8.902552	43.02352	1329.246
Median	106.4643	32.04361	9.074669	29.31750	955.0451
Maximum	380.2556	89.38613	10.38580	111.9596	3098.986
Minimum	0.617708	14.16873	6.384627	12.71917	270.2240
Std. Dev.	98.94459	19.18636	1.387377	29.84654	876.1759
Skewness	0.928562	1.062168	-0.430168	1.086645	0.446371
Kurtosis	3.368702	3.822823	1.736621	3.019278	1.739752
Jarque-Bera	5.974757	8.649741	3.893843	7.872598	3.975355
Probability	0.050419	0.013235	0.142713	0.019520	0.137013
Sum	4277.088	1429.648	356.1021	1720.941	53169.82
Sum Sq. Dev.	381811.2	14356.54	75.06774	34741.83	29939684
Observations	40	40	40	40	40

Source: Authors' construct (2022), from data obtained from WDI.

Time series data comprising per capital growth, remittances, exchange rates, oil prices, and investments have been used in this study. Following the understanding that time series data are usually associated with unit root, the study carried out stationarity tests to avoid the possibility of generating spurious analysis. Using the two (the Augmented Dickey Fuller (ADF) and Phillips and Perron (PP) methods frequently used in the literature, the study first checked for stationarity of the data used (see Table 2a and 2b). As presented in Table 2a and 2b, the results reveal that the variables are stationary in I (0) and I (1) and no one in I (2). Considering the mixture of I (0) and I (1) coupled with small sample size of data accounts for the use of ARDL model.

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Table 2a: Augmented Dickey Fuller (ADF)

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	ADF (individual intercept)			ADF (individual intercept and trend)			
Variable	Order of integration		t * statistics	P-value	Order of integration	t * statistics	P-value
Z	I(1)		-7.037708	0.0000***	I(0)	-3.83875	0.0248**
EXR	I(1)		-0.400592	0.0408**	I(1)	-4.575810	0.0040***
INV	I(0)		-3.726546	0.0074**	I(0)	-3.610453	0.0412**
IREM	I(1)		-6.44285	0.0000***	I(1)	-6.36127	0.0000***
OP	I(0)		-3.454601	0.0162**	I(0)	-4.189538	0.0144**

Note: ***, ** and *, respectively, represent statistical sign at 1, 5 and 10%.
Source: Authors' construct (2022), from data obtained from WDI.

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Table 2b: Phillip Peron (PP)

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	ADF (individual intercept)			ADF (individual intercept and trend)			
Variable	Order of integration		t * statistics	P-value	Order of integration	t * statistics	P-value
Z	I(1)		-6.640747	0.0000***	I(1)	-6.93611	0.0000***
EXR	I(1)		-3.663743	0.0395**	I(1)	-4.534358	0.0495**
INV	I(0)		-3.726546	0.0074**	I(0)	-3.137851	0.0481**
IREM	I(1)		-6.44285	0.0000***	I(1)	-6.36127	0.0000***
OP	I(0)		-3.454601	0.0162**	I(0)	-4.446863	0.0498**

Note: ***, ** and *, respectively, represent statistical sign at 1, 5 and 10%.
Source: Authors' construct (2022), from data obtained from WDI.

Selecting a suitable lag length for the ARDL model, the study considers the recognised criteria in the literature, the Schwartz-Bayesian information criterion (SIC) and Akaike information criterion (AIC). These criteria are normally used to determine optimal lag, in a single variable, having distributed lag model (Rotimi et al., 2021; Rotimi, Ngalawa, Adebayo, 2019). The criteria for the lag selection submit that the lag with the least criterion be given consideration. The order of lag criteria includes Hannan Quinn information criterion (HQ), Akaike information criterion (AIC), Schwarz information criterion (SC) and final prediction error (FPE). For this model, optimal lag 1 is the most preferred by each criterion (see Table 3). It is specified using asterisks.

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Table 3: Optimal lag length selection criteria

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Lag	LogL	LR	FPE	AIC	SC	HQ
0	-795.4301	NA	4.25e+12	43.26649	43.48418	43.34324
1	-599.4349	328.4243*	4.17e+08*	34.02351*	35.32966*	34.48399*
2	-576.5213	32.20285	5.05e+08	34.13629	36.53090	34.98050
3	-549.5041	30.66819	5.59e+08	34.02725	37.51032	35.25519

Source: Authors' construct (2022), from data obtained from WDI.

The Bound test is conducted to determine whether the selected variables (per capita growth, international remittances, exchange rates, oil price and investments) exhibit relationship in the long-run. The result is presented in Table 4. It is revealed from the results that estimated F-statistic value is greater than the tabulated upper bound values, suggesting a stable long-run relationship amongst variables. Hence, null hypothesis is rejected.

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Table 4: Bounds Test

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Country	Variable	F-statistic value	Lag length	Significance level	Bound Critical Values	
					I(0)	I(1)
Nigeria	Per capita growth	5.3628	1	1%	4.3811	4.5312
				5%	3.9432	4.1345
				10%	2.9912	3.4239

Source: Authors' construct (2022), from data obtained from WDI.

Finding from the bound test reveals long-run relationship in the variables. So, the study proceeds to estimate the long-run relationship among the selected variables. The empirical finding showing the long-run relationship is depicted in Table 5. The findings show a positive relationship between remittances and per capita growth. This shows that an increase in the volume on international remittances lead to a favourable impact on per capita growth and vice versa. In addition, the results reveal a positive relationship between remittances and investments. This suggest that as remittances increase, investments are encouraged which in turn favourably impact output and per capita growth. This result is in line with Jebran et al., (2016) and several other recent studies (Kudaisi et al., 2021; Bettin et al., 2014; Jouini et al., 2021). In addition, oil prices reveal a positive and statistically significant relationship with per capita.

Table 5: Long-run equation (ARDL)

Variable	Coefficient	Standard Error	t-Statistic	Prob.*
EXR(-1)	1.114603	0.394047	2.828604	0.0000
INV	0.532389	0.361227	1.473501	0.0468
IREM	2.514828	2.653259	0.947826	0.0331
OP	0.756384	0.364218	2.076734	0.0001

Source: Authors' construct (2022), from data obtained from WDI.

Following the long-run relationship results, the study estimates the short-run relationship among the variables, using an error correction model (ECM) through ARDL to estimate error correction term to know the speed of adjustment as in the long-run as presented in Table 6. The finding reveals a short-run relationship between remittances and per capital growth. It indicates that remittances and per capita growth are related positively. The results also reveal that exchange rates, oil price and investment are positively related with per capita GDP in the short-run. The relationship among the variables (exchange rates, investment, oil price and remittances) with per capita growth is statistically significant. This finding implies that, as exchange rates, investment, oil price and remittances increase by one unit each, cause per capita growth to increase by 111%, 53%, 251% and 75% respectively. This is in line with theory and early studies (Jebran et al., 2016; Kudaisi et al., 2021; Bettin et al., 2014; Jouini et al., 2021). Furthermore, the results show that $\varphi ECT(-1)$ is significantly negative, confirming that there is a stable long-run relationship among the selected variables. The speed of adjustment as revealed by $\varphi ECT(-1)$ shows that the adjustment made over the long-run, annually is 28.83%.

Table 6: Short-run equation (ARDL)

Variable	Coefficient	Standard Error	t-Statistic	Prob.*
EXR(-1)	1.003686	0.047493	21.13356	0.0000
INV	0.389575	0.227936	1.709141	0.0468
IREM	3.528863	3.592465	0.982296	0.0331
OP	0.846567	0.187336	4.518968	0.0001
Z	0.009518	0.010153	0.937457	0.0355
ζ (-1)	0.012317	0.006700	1.838323	0.0750
C	-0.583918	34.10379	-0.017122	0.0864
ECT(-1)	-0.288319	0.791232	-0.364392	0.0464

Source: Authors' construct (2022), from data obtained from WDI.

The study, assessing the strength of the model selection criteria, shows the strength of the AIC model selection compared with other models which consists of the Schwarz and HQIC criterion us d in the ARDL model. It establishes the short-run relationship of ARDL model. The study employs a criteria graph to decide the topmost sixteen ARDL models. Subsequent to the prevalent model benchmark analysis, the smaller the AIC value, the better the ARDL model (Bakar et al., 2013; Giles, 2013). Hence, the ARDL criteria graph with ARDL (1, 0, 0, 0, 1)) and 7.83 AIC value is the most preferred because it has the least value. Equally, the ARDL criteria graph with (1, 1, 1, 1, 0) and 8.12 AIC value is the minimum preferred because it has the maximum AIC value.

Akaike Information Criteria
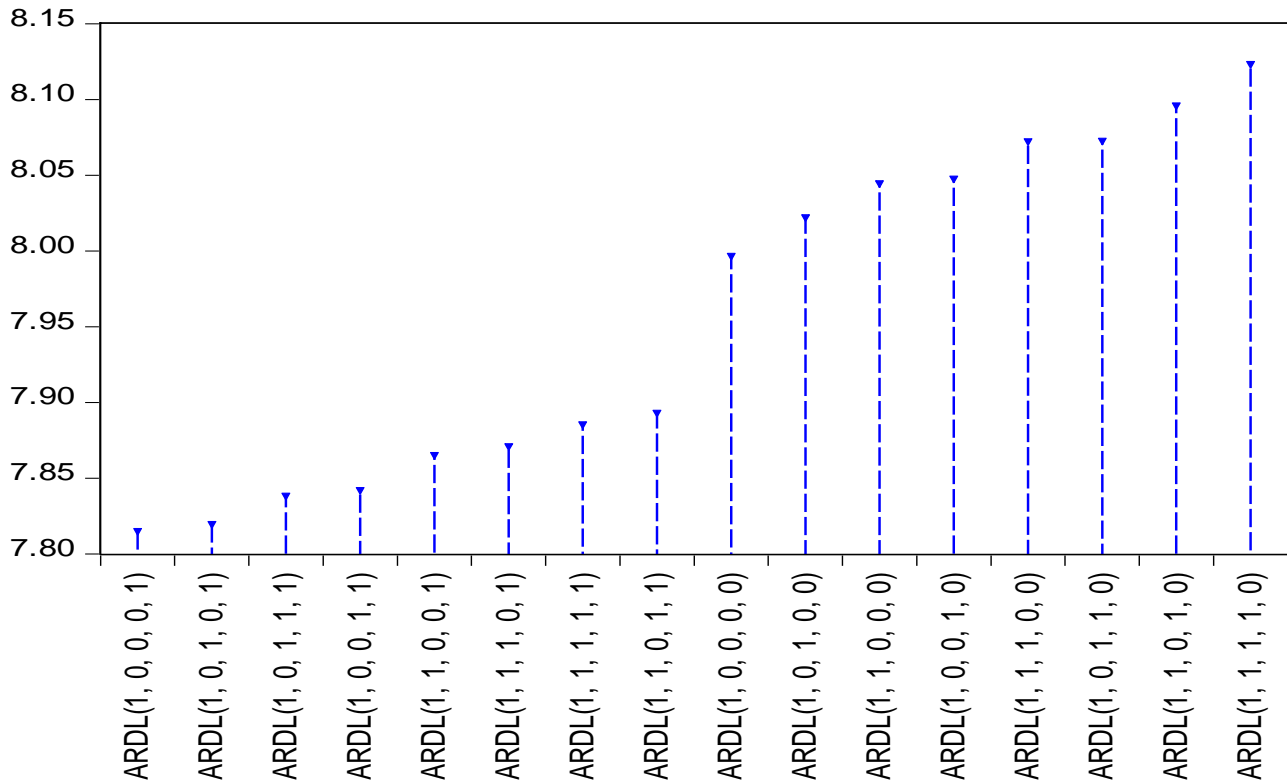
Figure 2: ARDL Model Selection Strength
Source: Authors' construct (2022), from data obtained from WDI.

The serial correlation test is carried out to investigate problem of serial correlation in the model. As depicted in Table 7, there is no evidence of serial correlation since the probability of the F-statistics is 0.1, greater than the 0.5 benchmark. Hence, the null hypothesis should be accepted. In another word, it means that the parameter estimates in the model have no autocorrelation problem.

Table 7: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.036359	Prob. F (1,32)	0.8500
Obs*R-squared	0.045397	Prob. Chi-Square (1)	0.8313

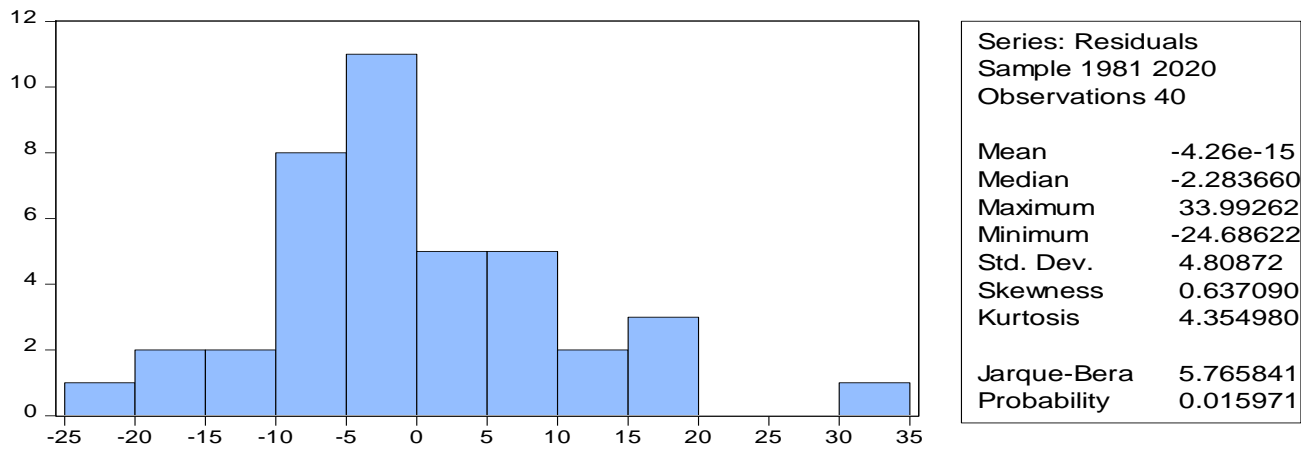Source: Authors' construct (2022), from data obtained from WDI.

Table 8 presents the heteroskedasticity results. It shows that the F-statistics and chi square are insignificant at 5%. This means that there is no heteroskedasticity in the model. It could therefore be concluded that the model is reliable and valid.

Table 8: Heteroskedasticity Result

F-statistic	10.67566	Prob. F (6,33)	0.4201
Obs*R-squared	26.39931	Prob. Chi-Square (6)	0.2102
Scaled explained SS	30.14120	Prob. Chi-Square (6)	0.0000

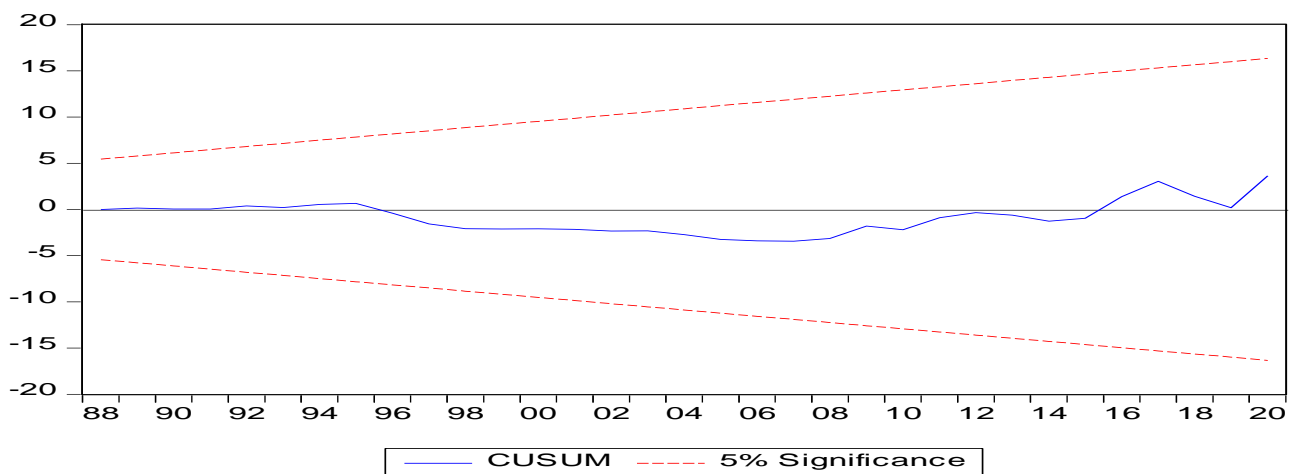Source: Authors' construct (2022), from data obtained from WDI.

The normality result presented in Figure 4.31 indicates normality in the distribution. This is evident in the Jarque-Bera statistics revealing a statistically insignificant value, 5 per cent (that is, 5.765841). This is buttressed with probability value estimated as 0.015. Residuals are normally distributed suggesting that the data sets are modelled appropriately.

Figure 3: Result of Normality Test

Source: Authors' construct (2022), from data obtained from WDI.

Figure 4 presents the result of the CUSUM stability test for the model. It reveals stability in the model because the line that captures our data falls between the 5 per cent significant level.

Figure 4: CUSUM Test

Source: Authors' construct (2022), from data obtained from WDI.

6. Conclusions and Recommendations

This study unpacks the international remittances and per capital growth nexus in Nigeria from 1980 to 2020. Specifically, the study seeks to make provisions for further underpinnings on the relationship between remittances and per capital growth both in the short-run and long-run. The study carried out the ARDL bounds testing model to ascertain the short-run and long-run relationship between per capital growth and other variables (exchange rates, investment, oil price and remittances). Findings reveal statistically significant positive short-run and long-run relationship among the variables. Specifically, various results support positively strong remittances and per capita growth nexus in Nigeria. This further suggests that higher international remittances enhance per capita growth both in the short-run and long-run in Nigeria. Various diagnostic tests support the reliability and appropriateness of the model employed. This suggests that remittances are sources of external financing and eventually, it is a means to economic growth and also may also help to fill fiscal deficit gap. In addition, the normality test results indicate that the model is normal. In view of these findings and the relevance of remittances as established in this study, the study recommends that government should, through sound policy option, encourage remittances influx. This could be realised by creating viable relationship among international communities that largely account for remittance inflow into Nigeria. Prudent and optimal management of remittances inflow through the appropriate monetary authority is recommended. This may include formulating policy that will ease remittance inflow and remove unnecessary barriers to inflow of remittances. Without mincing words, profitable

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investment of remittances is strongly recommended. Further study is suggested to study the impact of remittances on consumption.

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