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Macroeconomic Determinant of Remittances: Evidence from Selected Countries in Sub-Saharan Africa

[*1]ONIORE Jonathan Ojarikre [*1] EZIE Obumneke
[*1] OMORUSI Emmanuel Ufuoma
[1]*Department of Economics, Faculty of Social Sciences, Bingham University, Karu, Nigeria*

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Abstract
One of the biggest international financial resource flows is represented by remittances. Remittances are noteworthy because they occasionally surpass foreign direct investment, financial market portfolio flows, and government development assistance or international aid. This is the situation in many countries in Sub-Saharan Africa, where remittance flows continue to be a substantial source of foreign finance and are predicted to have large macroeconomic effects on the economies. Despite the upward trend, remittance inflows to Sub-Saharan Africa varied, both in absolute terms and in relation to GDP. Therefore, from 1981 to 2022, the research examined the macroeconomic factors that influence remittances to selected countries in Sub-Saharan Africa: Mozambique, Nigeria, Rwanda, Ethiopia, and Ghana. Using random effects regression estimation, the paper empirical model was estimated. All of the explanatory variables in the random effects model have the correct signs, and exchange rate, credit to the private sector, and recipient country's per capita income are the main macroeconomic factors that determine how much personal remittances are sent to the selected countries in Sub-Saharan Africa. These factors' coefficients are statistically significant at the 5% and 10% levels, respectively. Exchange rate and per capita income were found to have a significant impact on remittances across all three econometric estimating approaches; these findings are consistent with existing theoretical and empirical research. The paper recommended that in order to address some of the causes of remittance volatility, fiscal and monetary authorities in the five selected countries in Sub-Saharan Africa should concentrate on resolving macroeconomic imbalances, such as fluctuations in currency rates and inflationary pressure. This recommendation is justified since, according to the paper's findings, these two factors are crucial for attracting remittances. Also, fiscal and monetary authorities in the selected countries in Sub-Saharan Africa should strive to create environment conducive to growth, since level of income captured as per capita income seems to be an important determinant of remittances. Remittances and other foreign cash inflows will therefore rise as a result, relieving pressure on external balance financing.

Keywords: Remittances; Migrant Workers; Inflation; Exchange Rate; Panel Data
JEL Codes: F24; C23; E31; D51; and C33

I. Introduction

In the global economy, remittances represent one of the largest international flows of financial resources; as global remittance flows reached $840 billion in 2023 and projected to increase by 2.0 percent in 2024, increasing inflows by $18 billion (International Organization for Migration, 2024). Notably, remittance flows can exceed, sometimes, foreign direct investment, portfolio flows from financial markets and official development assistance or international aid. It is the case in many Sub-Saharan Africa countries, where they should be expected to have significant macroeconomic impacts on these economies. The term remittances, implies household income from migrant residing and working in a foreign country for short term or long-term period. Ncube and Brixiova (2013) defined remittances as unrequited, nonmarket financial transfers between individuals living in different countries, mostly associated with migration. While, International Organization for Migration (IOM, 2024) broadly defined remittances as the financial flows associated with migration, in other words, personal cash transfers from a migrant worker or immigrant to a relative in the country of origin.

Remittance flows remain a major source of external finance for developing countries. For example, remittance flows to Sub-Saharan Africa increased from US$30.1 billion in 2010 to US$35.1 billion in 2015 and to $39 billion in 2016. These inflows reached US $42 billion, US $49 billion and US $49 billion in 2017, 2018 and 2019 respectively. However, remittance flows to Sub-Saharan Africa

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decreased to US$43 billion in 2020 before rising to US$50 billion in 2021. The marginal decrease seen in remittance flows to Sub-Saharan Africa in 2020 could be attributed to the outbreak of COVID-19 Pandemic. Remittance flows to Sub-Saharan Africa grew by 6.1 percent in 2022, to $52.9 billion and estimated at $54 by the end of 2023. Remittance flows to Sub-Saharan Africa is projected to increase to 3.7 percent in 2024, increasing inflows by $56 billion (Migration and Development Brief 38, 2023).

While the total remittance inflows to Sub-Saharan Africa have been rising, the flows to individual countries, both in absolute terms and relative to GDP, have varied. In 2011 and 2012, two African countries were among the top ten remittance recipients globally: Nigeria ($20.6 billion and $21 billion, respectively) and Egypt ($14.3 billion and $21 billion, respectively). While, the top 10 recipients in 2016 of remittance inflows to Sub-Saharan Africa based on World Bank (2017) estimates includes: Nigeria (US$19.0bn), Ghana (US$2.0bn), Senegal (US$2.0bn), Kenya (US$1.7bn), Uganda (US$1.1bn), Mali (US$0.8bn), South Africa (US$0.7bn), Liberia (US$0.6bn), Ethiopia (US$0.6bn) and Madagascar (US$0.4bn). The 2016 estimates indicate that remittances account for more than 10 % of GDP in some African countries like Liberia (26.9%), Comoros (21.2%), the Gambia (20.4%), Lesotho (17.5%), Senegal (13.5%) and Cape Verde (13.0). In 2022, five African countries were among the highest recipients of remittance within the continent: Ghana (11.9 percent), Kenya (8.5 percent), Tanzania (25 percent), Uganda (17.3 percent), and Rwanda (21.2 percent). In 2023 remittance flows to Sub-Saharan Africa increased by about 1.9% to $54 billion, driven by strong remittance growth in Mozambique (48.5%), Rwanda (16.8%), and Ethiopia (16%). Remittances to Nigeria, accounting for 38% of remittance flows to the region, grew by about 2%, while two other major recipients, Ghana and Kenya, posted estimated gains of 5.6% and 3.8%, respectively (Migration and Development Brief 39, 2023).

However, there has been little research on macroeconomic drivers of remittances to top recipient's countries in Sub-Saharan Africa. Cross-country studies have tended to focus on low-income countries generally, possibly incorporating a dummy variable to capture the specificities of Sub-Saharan Africa countries. While using a broad sample increases the degree of freedom, it may also introduce unwanted heterogeneity if the factors that explain remittances differ across country groups. Given the rising significance of remittance flows in the top recipient's countries in Sub-Saharan Africa of Mozambique (48.5%), Nigeria (38%), Rwanda (16.8%), Ethiopia (16%), and Ghana (5.6%), it is imperative to understand their behavioural patterns and potential macroeconomic determinants from a cross-sectional data perspective. Furthermore, the global statistics show that remittances inflows to the selected top recipient's countries in Sub-Saharan Africa have become a major source of foreign earnings, surpassing foreign direct investments, foreign aid, export earnings and other private capital inflows. Thus, the paper examined empirically the macroeconomic factors behind remittance flows to top recipient's countries in Sub-Saharan Africa from 1981 to 2022.

II. Materials and Methods

Conceptual Review

The term remittances, implies household income from migrant residing and working in a foreign country for short term or long-term period. Ncube and Brixiova (2013) defined remittances as unrequited, nonmarket financial transfers between individuals living in different countries, mostly associated with migration. The concept of remittances has been linked to the theory of migration. Its definition however, can be linked to its motives, effects, uses, kind of transfer and the channel of funds transfer (International Organization for Migration, 2013).

Exchange rate is amongst the macroeconomic shown to affect migrant remittances. Exchange rate refers to the rate at which one country's currency is exchanged for another country's currency. It may also be seen as the price of one country's currency in relation to another country's currency (Anyanwu *et al.* 2017). Remittances have contributed a lot to maintain the healthy foreign exchange reserves. Among major sources of foreign exchanges, exports secured the top position followed by remittances. But if we take back-to-back imports into consideration used for exports, remittances emerge as the single largest source of foreign exchanges.

Another macroeconomic worthy of conceptualisation is inflation Rate. Inflation, expressed simply, is the term used to describe a continuous and general increase in the cost of goods and services. In the meantime, Nopirin (2016) clarifies that inflation is the ongoing process of raising the average price of goods, even though the increase in price is not necessarily proportionate. According to one school of thought domestic inflation can affect remittance flows through its impact on domestic real income and the purchasing power of worker 's family in the home country. The impact of inflation according to this view will be

positive because, in periods of high inflation the workers will remit more in order to maintain family consumption levels at home (El-Sakka & Mcnabb, 1999). However, high inflation may be interpreted as a signal of instability as well and therefore generates a decrease in remittances (Aydaş *et al.*, 2004).

Credit to private sector refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. For some countries these claims include credit to public enterprises. Well-developed financial system enhances the attractiveness of an economy to remittances. The desire to remit to the home economy is boosted by the assurance of the strength and stability of the domestic financial system. A well-developed financial sector smoothens capital inflows and serve as an impetus for a sustained economic growth in the long-run (Nyamongo, *et al*; 2012). Thus, a strong financial system also eases (facilitates) the process of remitting.

Per capita income represents the income per head of citizens. It has a high indicative power of the standard of living of the people. Per-capita has an indirect impact on sustainable development by influencing economic growth (Fagbohun & Adekoya, 2016). The paper expects a positive relationship between the level of income of source country and the amount of remittances there-from. If the economy of the source country is buoyant, remittances from there to recipient countries will be significant, all things being equal.

Empirical Review

Similar to theoretical literature the relationship between remittances and several macroeconomic variables is well presented in the local and international empirical studies. Some of the outstanding studies on the macroeconomic determinants of remittances are Fagiolo and Tommaso (2023), Ibrahim, *et al.* (2023), Ali and Murtaza (2023) and Fartun and Charles (2023)

Using data that originally covered 214 countries between 2010 and 2017, Fagiolo and Tommaso (2023) investigated the macroeconomic factors influencing bilateral remittance flows worldwide. The paper employs a gravity-model approach to explore the role played by dyadic and country-specific covariates in explaining remittances. Results indicated that remittance flows are robustly and strongly impacted by size effects (i.e., number of migrants in the host country and population at home), transaction costs, common social, political, and cultural ties, output growth rate, and financial development at home.

Ibrahim, *et al.* (2023) investigated the macroeconomic determinants of capital inflows volatilities in Nigeria between 1986 and 2018, using the Autoregressive Distributive Lagged (ARDL) technique. Findings revealed that the growth of the world economy is the core determinant of volatilities of capital inflow both in the short run and the long run. The only exception is the volatility of remittances which is mainly determined by the exchange rate, both in the short run and the long run. However, the volatility of the official Development Assistance (ODA) is more susceptible to domestic factors both in the short run and the long run. The study therefore concludes that volatilities of capital inflows into Nigeria depend on the agency mobilizing the flow. While the private inflows are largely determined by the push factors, the public inflow in form of aid is determined by pull factors.

To get a better understanding of the current situation and make-up of remittances, Ali and Murtaza (2023) examined the macroeconomic factors that influence remittances in addition to the comparative remittances of skilled and unskilled workers. The study makes use of Johansen's co-integration technique to check for the existence of long run liaison among the variables. The macroeconomic variables included in the model are also found to be significant factors determining the flow of remittances to Pakistan. The study recommended that government should design and implement policies that focused on the development of the skills of the labour force.

Fartun and Charles (2023) established the effects of remittances from Kenyans residing abroad on the country's economic growth from 1988 to 2021. The study employed Error Correction Model and the modified Granger causality test by Toda and Yamamoto. The study found that remittances per capita had a significant impact on Kenya's GDP, GNI, and degree of absolute poverty. It was discovered that GDP and GNI per capita were granger causes of remittance per capita, but neither absolute poverty nor remittance per capita were granger caused by absolute poverty. The study recommends that, in order to guarantee a steady stream of remittances into the country's economy, essential efforts be taken to stabilize the currency rate and inflation.

The important macroeconomic factors that affect the remittance flows to India were investigated by Jijin *et al.* (2022). The paper employed an ARDL approach to cointegration and found that exchange rate, oil price, and domestic GDP substantially

impact the flow of remittances. The results indicated that the migrants are more vulnerable to the oil price shocks in host countries. The overall findings of the study are that (1) remittances are not countercyclical in the Indian context (2) remittances are subject to weak investment motive as opposed to the altruistic motive. Therefore, appropriate government policies in home countries that offer better investment opportunities for emigrants can ensure the uninterrupted inflow of remittances.

Muhoni (2022) examined the macroeconomic factors that influence remittances to Malawi from 1994 to 2020. The study adopted Autoregressive Distributed Lag (ARDL) estimation technique and findings showed that the dependent and independent variables have a long-term relationship. According to the test results for short-run correlations between variables, there is no statistically significant correlation between remittances and the independent variables real gross domestic product, inflation rate, interest rate difference, and real effective exchange rate. In contrast to the inflation rate, which is strongly negatively correlated with remittances over the long term, real gross domestic product, interest rate difference, and real effective exchange rate are all significantly positively correlated with remittances. The study recommends that the originating country's government, Malawi, needs to implement urgent and significant strategic macro-economic interventions and formulate appropriate policies to encourage its diaspora citizens to remit funds back home.

Awode *et al.* (2021) explored the link between remittance, remittance volatility and macroeconomic performance to make a case for the potential impact of the COVID-19 pandemic in a panel of seven African countries with the highest remittance–GDP ratio. This was done within a fixed effects and random effects model, using annual secondary data from 2004 to 2018. Results showed that remittance volatility exerts a negative but insignificant impact on RGDP, consumption, investment, export and exchange rate; while remittances has positive significant impact on RGDP, consumption and investment. Based on these findings, while any COVID-19-induced volatility in remittances flow into Africa may yield negative macroeconomic consequences, it is not likely to significantly affect the macroeconomic fundamentals of the most remittance-dependent African countries due to strong kinsman ship and the altruistic nature of remitting African migrants.

The five nations that comprise the West Africa Monetary Zones (WAMZ) had their migrant remittance determinants examined by Omon (2021). Both descriptive statistics and Pooled Mean Group (PMG) estimator was used for the analysis. The result revealed that remittance inflow into WAMZ was influenced by unemployment rate, the level of financial sector development, exchange rate of domestic currency, real per capita income of recipient country, and the level of development of source country. However, lower migrant remittance was associated with higher per capita income and depreciation of exchange rate in recipient country. The study recommended that the government of countries in the zone should make efforts to develop their financial systems and ensure that exchange rate is market friendly to encourage migrants to remit more money home.

Adenutsi and Ahortor (2021) explored the macroeconomic factors that explain variations in migrant remittance inflows to Sub-Saharan Africa (SSA). The Blundell-Bond System GMM dynamic panel data analytical framework was adopted. The results showed that migrant remittances are largely driven by altruism, a signal that the sub-region has not been able to attract more 'self-interest remittances', probably due to unattractive investment climate arising out of implementation of unsound macroeconomic policies. The key macroeconomic determinants of remittance flows, measured as a percentage of GDP, are home-country income, host-country income, income differential, inflation, real interest rate differential, real exchange rate depreciation, private sector credit, institutional quality and remittance inflows inertia. While remittance inertia, host-country income, income differential, inflation, institutional quality, interest rate differential and real exchange rate depreciation have consistent positive individual impacts on remittance inflows, home-country income and private sector credit have negative effects on remittances. The study recommended that to attract optimal remittances – remittances that are in excess of altruistic motive – to SSA, there is need to ensure macroeconomic stability and pro-growth policies, and strategic fiscal, monetary and exchange rate policy reforms in SSA.

Between 1996 and 2019, Sikiru (2021) explored the institutional and macroeconomic factors that affected remittance inflows into Sub-Saharan Africa. The data were analysed using both descriptive and inferential analyses. Findings revealed that: (i) macroeconomic factors determine the level of remittance inflows into Sub-Saharan Africa, specifically, regulatory quality and rule of law have significant positive impact on remittance inflows in Sub-Saharan Africa; (iii) political institutions significantly determine the level of remittance

inflows into Sub-Saharan Africa. The study recommended that macroeconomic conditions, economic institutions and political institutions should be enhanced and strengthened through vital fiscal and monetary policy measures.

Yoshino *et al.* (2020) assessed the determinants of international remittances using panel data from 22 Asia-Pacific middle-income countries, most of which are well-known migrant-sending countries, using the generalized method of moments (GMM) method. The results showed that the gap in the per capita GDP growth rate between origin and destination countries, gross enrolment ratio of secondary education, and trade openness are positively associated with remittance inflow. On the other hand, net foreign direct investment (FDI) inflows are negatively correlated with remittance inflows. The remittance inflows should be highly important, especially in the early stage of economic development, as additional incomes, or investment sources for those who live in middle-income countries.

Using panel data from 1997 to 2014 and econometric estimating approaches such fixed effects, random effects, and pooled OLS, Tsaurai and Maseko (2020) examined the factors influencing remittances in transitional economies. The study found out that FDI and economic growth had a significant negative influence on remittances across all the three econometric estimation methods. Financial development and savings had a significant positive effect on remittances under the fixed and random effects and a significant negative impact on remittances under the pooled OLS approach. Another variable that was also found to have had a significant positive impact on remittances under both the fixed and random effects is inflation, consistent with available theoretical underpinnings.

A panel cointegration approach is used by Donou-Adonsou *et al* (2020) to examines the relationship between financial development and remittances in the top Sub-Saharan African remittance recipient nations. Results point to a significant and positive long-run relationship. In addition, the results support the existence of bidirectional causality between remittances and financial development in the long-run. The paper also found some evidence that remittance pricing has a negative impact on the long-run relationship between remittances and financial development. While the results suggested that remittance inflows promote financial development, migrant workers may be timing the foreign exchange market to remit.

Hor and Pheang (2017) investigated the determinant macroeconomic variables and non-economic factors influencing the migrant workers' remittances flow to the Cambodia, Laos, Myanmar, and Vietnam (CLMV) countries. This study employs fixed effect and random effect models to analyze the panel data set over the periods of 16 years (2000-2015). The results showed that the gross domestic product (GDP) per capita of origin country, the official exchange rate of the home country, and political stability index of home country are significant negative effects on remittances inflow to the CLMV countries. Higher number of migrants to the home country's population increase the remittances inflow to the home countries. Majors of most host country's GDP per capita (Japan, South Korea, and Singapore) are positive effects on the remittances, except for the Thai's GDP per capita. All dummy variables show expected results. The paper recommended that policy makers of the CLMV countries should implement the pro-growth policies and investment policies to create more jobs in the countries.

For a panel of 22 highly dependent developing nations, Tabit and Moussir (2016) evaluated the numerous macroeconomic factors that influence migrants' remittances throughout the years 1990–2014. The results underline the importance of the origin country's GDP, the host country's GDP, inflation, financial development and institutional quality as major determinants of personal remittances. However, the migrant stock, the official exchange rate and the real interest rate in the country of origin do not have a significant influence on remittances received by the panel considered. The paper recommended strategies aimed at achieving a higher and sustained rate of economic growth, improved financial market development and exchange rate stability.

Theoretical Framework

The theoretical framework adopted for this study is the Lucas and Stark (1985) motivations of remittance. Lucas and Stark (1985) developed three models for remittances viz: Pure Altruism, Pure Self-Interest and Tempered Altruism or Enlightened Self-Interest.

In the pure altruism model, the migrant sending the remittance home derives utility from the utility of the household members at home while the household utility is dependent on its per capita income. In the model, the migrant's utility is derived to be a function of his wage, his consumption, the weight of altruism attached to individual household members, household consumption per capita and the size of the household. The household consumption per capita is a function of household per capita

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income and household size. The model then derived the level of remittance r that maximizes the migrant's utility function and the household's consumption function. The equation is given as: $r = r(\mathrm{w}, \mathrm{y}, \mathrm{n})$

(1)

Where r is the remittance, w is the wages of the migrant, y is household per capita income and n is the size of the household. The model posited that

$$\frac{\partial r}{\partial w} > 0, \frac{\partial r}{\partial y} < 0, \text{and} \frac{\partial r}{\partial n} \quad (2)$$

Equation is unrestricted depending on the economies and diseconomies of scale. In the pure self-interest model, the migrants' motive for sending remittance home is purely selfish. The study highlighted three motivations in this model which are: (i) the aspiration to inherit, (ii) motivation to invest in assets back at home and ensure the assets are properly managed and (iii) the intention of returning home.

The third model – tempered altruism or enlightened self-interest – is a fusion of the first two. Here, remittance is seen as an intertemporal, mutually contractual agreement between a migrant and his household at home. This agreement is influenced by two factors: investment and risk. This stems from the cost of education of the migrant, which is largely borne by the household. Studies like Rempell and Lobdell (1978) and Johnson and Whitelaw (1974) have found a positive relationship between the migrant's level of education and the amount of remittance sent home. This is the investment factor. The risk factor is captured in the motivation for remittance being for the purpose of risk diversification. In a developing economy characterised by inefficient capital market and insurance, migration is seen as a risk diversification strategy. For risk diversification, the household may choose to sponsor some of its members for urban migration, in which both parties bear the cost and benefit from the returns.

III. Methodology

In this paper, the selected research design is the Cross-Sectional Design. Cross-sectional design provides a clear 'snapshot' of the outcome and the characteristics associated with it, at a specific point in time. Unlike an experimental design, where there is an active intervention by the researcher to produce and measure change or to create differences, cross-sectional designs focus on studying and drawing inferences from existing differences between people, subjects, or phenomena.

Model Specification

The paper empirical model specification follows the theoretical framework discussion in the preceding section and in line with the model adopted by Tsaurai and Maseko (2020) who investigated the determinants of remittances in transitional economies using panel data (1997 – 2014). Transitional economies used for this study include Argentina, Brazil, China, Colombia, Czech Republic, Greece, Hong Kong, Indonesia, India, Mexico, Malaysia, Peru, Philippines, Poland, Portugal, Republic of Korea, Russia, Thailand, Turkey and South Africa. Their original model is as follows:

$$REMIT_{it} = \beta_0 + \beta_1 \mathrm{FDI}_{it} + \beta_2 GROWTH_{it} + \beta_3 \mathrm{INFL}_{it} + \beta_4 \mathrm{OPN}_{it} + \beta_5 HCD_{it} + \beta_6 \mathrm{FIN}_{it} + \beta_7 \mathrm{SAV}_{it} + \varepsilon_{it} \quad (3)$$

Where, $REMIT_{it}$ = Remittances as a percentage of GDP in country i at time t,; FDI_{it} = Foreign direct investment as a ratio of GDP in country i at time t; $GROWTH_{it}$ = Economic growth rates in country i at time t; $INFL_{it}$ = Inflation rate in country i at time t; $OPEN_{it}$ = Trade openness in country i at time t; HCD_{it} = Human capital development in country i at time t; FIN_{it} = Financial development in country i at time t; SAV_{it} = Savings in country i at time t; ε_{it} is the error term and β_0 is the intercept. $\beta_1 to \beta_7$ are the coefficients of the explanatory variables.

However, the model was modified by including independent variables such as exchange rate, inflation rate, credit to private sector and per capita income that have been shown to affect migrant remittances. All these factors are expected to be significant determinants of remittances. Earlier studies have included these variables into the analysis with different perspectives, but no specific study can be found considering all these factors in one model in the selected top recipient's countries in Sub-Saharan Africa of Mozambique, Nigeria, Rwanda, Ethiopia, and Ghana where remittances entails an essential role not only for the economy as whole but also for the migrating individuals abroad

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and their families back home. Thus, equation (3.3) can be functionally rewritten as:

$$PRR_{it} = \beta_0 + \beta_1 EXR_{it} + \beta_2 INFR_{it} + \beta_3 CPS_{it} + \beta_4 PCI_{it} + \varepsilon_{it} \quad (4)$$

Where, PRR_{it} = Personal remittances received in country i at time t; EXR_{it} = Exchange rate in country i at time t; $INFR_{it}$ = Inflation rate in country i at time t; CPS_{it} = Credit to the private sector in country i at time t; PCI_{it} = Per capita income in country i at time t; ε_{it} is the error term and β_0 is the intercept. $\beta_1 to \beta_4$ are the coefficients of the explanatory variables.

The empirical model is estimated through fixed and random effects estimation methods. The fixed effects model is the estimator of the transformed model using deviations from individual average that eliminate the persistent differences between individuals. This method emphasizes the intra-individual variability. It also has the advantage of being able to identify and measure effects that are not directly observable in cross section. The random effects model assumes, meanwhile, that the individual-specific effects are random. In other words, the error term - which takes into account these effects- and the explanatory variables are uncorrelated. To determine whether a fixed or random effect model is most appropriate, the paper employs a simple Hausman test (Hausman, 1978) where the null hypothesis is that the random-effects model is more efficient. The random effect model can be expressed as;

$$Y_{it} = \alpha_i + \beta_1 X_{it} + + \varepsilon_{it} \quad (5)$$

Where α_i represents the unobserved time-invariant individual effect and ε_{it} represents the error term.

Prior to the estimation of the specified regression models, the variables were tested for unit root using Levin, Lin and Chu, LLC (2002) homogeneous unit root procedure. Thereafter, the cointegration test was performed to ascertain whether or not long run relationship exists among the variables of the model. For this, the paper relied on the Kao (1999) residual based cointegration tests.

Variables Description and Measurements

Table 1 gives specific summary of variables description, measurements and source of data.

Table 1: Variables Description

Variables	Description	Proxy for	Apriori signs	Source (s)
Personal remittances received	This is household income from migrant residing and working in a foreign country for short term or long-term period. It is measured as the share of private remittances in GDP	Private remittances	Not applicable	WDI, 2023
Exchange rate	It is the unit of the domestic currency that exchanges for a unit of the United States' Dollar	Cost of money transfer	±	IMF, 2023
Inflation rate	The is the term used to describe a continuous and general increase in the cost of goods and services. It is measured as the annual percentage change in consumer price index	Cost of living	+	WDI, 2023
Credit to the private sector	It is measured as the ratio of financial sector credit to the private sector as a percentage of the GDP	Financial development	+	WDI, 2023
Per capita income	It can also be referred to as the income that accrues to an individual in a country taking into consideration the Gross National	Living standard	+	WDI, 2023

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	Product and the entire population of the country			

Source: Researchers' Compilation, 2024

Notes: WDI: World Development Indicators for Nigeria and IMF: International Monetary Fund (IMF)

Results and Discussions

Descriptive Statistics

Table 2 presents the descriptive statistics for the paper.

Table 2: Descriptive Statistics

	PRR	EXR	INFR	CPS	PCI
Mean	1.530497	117.5954	14.32077	11.89867	717.3355
Std. Dev.	1.841151	217.7828	15.91195	7.193492	681.6888
Skewness	1.789435	2.344883	3.618938	1.400640	1.615463
Kurtosis	6.080953	7.884022	21.11282	7.036266	4.598204
Jarque-Bera	195.1301	401.1664	3329.035	211.2129	113.6900
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	210	210	210	210	210

Source: Authors Computation, 2024 (Eviews-12)

All of the variables have positive mean values, as can be seen from the summary statistics shown in Table 2, with per capita income (717.3355) and personal remittances received (1.530497) having the highest and lowest mean values, respectively. Also, because an outlier can significantly exaggerate the range of data, the standard deviation of each variable provides a more precise and thorough indication of dispersion. PCI shows the biggest deviation (681.6888) from the mean, whereas PRR shows the lowest (1.841151). The probability values of the Jarque–Bera statistics indicate that the null hypothesis is rejected for all variables, suggesting the residuals are not normally distributed.

Cross Sectional Dependence

There is the need to first of all perform the tests of cross sectional dependence on the paper data to ensure that the cross section in the panel data analysis are independent for consistent coefficient estimates (Pesaran, 2004). The paper adopted the cross section dependence (CD) that supports smaller cross section (N) and larger time series (T) like this study with N=5 > T=42. Both the Breusch-Pagan LM and Pesaran Scaled LM procedures were employed to check for cross-sectional dependence in the dataset. The statistic value and p-value are presented in Table 3 for both procedures in order to verify if the statistics are significant.

Table 3 Cross Sectional Dependence Tests

Tests	Statistic	P-value
Breusch-Pagan LM	3.049	0.980
Pesaran Scaled LM	-1.554	0.120

Source: Authors Computation, 2024 (Eviews-12)

The model has a statistic value of 3.049 and a p-value of 0.980 under the Breusch-Pagan LM test and a statistic value of -1.554 and a p-value of 0.129 under the Pesaran Scaled LM test technique, according to the results of the cross-sectional dependence test. Given that the null hypothesis in these tests is that there is no presence of cress-sectional dependence in the panel units, the results show that there is insufficient evidence to reject the null hypothesis in both test procedures, since their p-values are more than 0.1. (i.e. 10 percent significance level). As a result, the model has no cross-sectional dependence. Additionally, the paper proceeded to examine the stationarity of the variables as another form of pre-estimation tests.

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Panel Unit Root Test and Co-integration

The Levin-Lin-Chu unit root test results are presented in Table 4:

Table 4: Levin-Lin-Chu Panel Unit Root Test

Variable	Method	Level	First Diff.
		Stat. (Prob.)	Stat. (Prob.)
PRR	LLC	-1.79972 (0.0360)	-8.36717*(0.0000)
EXR	LLC	5.82702 (1.0000)	-3.19122**(0.0004)
INFR	LLC	-3.80689** (0.0001)	
CPS	LLC	-2.09722(0.0180)	-6.18439*(0.0000)
PCI	LLC	1.20529 (0.8860)	-4.71278*(0.0000)

Note: *, ** Indicates stationary at the 1% and 5% level.

Source: Researcher's Computations using E-Views 12

The results of the panel unit root test results in Table 4 indicated that all the variables are stationary at first difference with the exception of INFR that was stationary at level. In other words, personal remittances received, exchange rate, inflation rate, credit to the private sector and per capita income are I(1) variables. Following the unit root test, cointegration test is performed to determine if a long-run association exists among the relevant variables. Hence, the results of Kao Residual Cointegration Test - Individual Intercept is presented in Table 5.

Table 5: Kao Residual Cointegration Test - Individual Intercept

	t-Statistic	Prob
Augmented Dickey-Fuller (ADF)	-3.845621	0.0001

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

From Table 5, the null hypothesis which says that there is no long run relationship between the relevant variables is rejected at 5% level of significance, thus clearing way for main data analysis. To decide between fixed effects or random effects, the paper employs a simple Hausman test (Hausman, 1978) where the null hypothesis is that the random-effects model is more efficient. The results for the Pooled OLS, fixed and random effects estimates are shown in Table 6:

Table 6: Panel Regression Results

	(1)	(3)	(3)
Variables	Pooled OLS	Fixed Effects	Random Effects
Constant	-0.154222	-0.161709	-0.154222
	(-0.727945)	(-0.736934)	(-0.742888)
EXR	0.001109***	0.002346***	0.001109***
	(2.661230)	(3.507453)	(2.715858)
INFR	-0.008646	-0.009060	-0.008646
	(-1.529867)	(-1.441297)	(-1.561272)
CPS	0.032897***	0.014776	0.032897***
	(2.575092)	(1.018388)	(2.627953)
PCI	0.001794*	0.001910*	0.001794*
	(13.80288)	(9.830475)	(14.08622)
Observations	210	210	210
R-squared	0.54	0.56	0.54
Hausman test P-value	12.503 0.014		

Note: *,** & *** denote significant at the 1%, 5% and 10% level. t-Statistic in parentheses, * p<0.1.

Source: Researcher Computation, 2024.

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Fixed effects model and random effects model provide more or less similar results. However, the Hausman test shows that random effects model is preferable; since the p value is greater than (1%, 5% and 10% level of significance). Therefore, the random effects regression may give a better fit than the fixed effects model. Hence, interpretation of results was based on the random effects regression estimation. However, the paper report findings for the pooled OLS, fixed and random effect models for comparison purposes and to allow for robustness of results.

The random effects model show that all the explanatory variables do have the correct signs and that exchange rate, credit to private sector and per capita income of recipient country are major macroeconomic determinants of the amount of personal remittances received to the five top recipient's countries in Sub-Saharan Africa from 1981 to 2022, as the coefficients of these variables are statistically significant at 5% and 10% levels respectively. The coefficient of determination, R-squared (0.50) indicates that the explanatory variables explain 54 percent of the variation in the dependent variable, personal remittances to five top recipient's countries in Sub-Saharan Africa.

IV. Discussion of Findings

The paper started with preliminary analysis in form of simple descriptive statistics and examination of time series properties of the variables. According to the descriptive statistics, all the variables have positive mean values with per capita income (PCI) and personal remittances received (PRR) having the highest and lowest mean values, respectively. Also, the standard deviation of each variable provides a more precise and thorough indication of dispersion. PCI shows the biggest deviation from the mean, whereas PRR shows the lowest. Furthermore, the results of the panel unit root test indicated that all the variables are stationary at first difference with the exception of inflation rate variable that was stationary at level. In other words, personal remittances received, exchange rate, inflation rate, credit to the private sector and per capita income are I(1) variables.

Thereafter, the paper ascertained the existence of a long-run cointegration relationship among the relevant variables; using the Kao Residual Cointegration Test. From the cointegration result, the null hypothesis which says that there is no long run relationship between the relevant variables is rejected at 5% level of significance, thus clearing way for main data analysis. To decide between fixed effects or random effects, the paper employs a simple Hausman test (Hausman, 1978) where the null hypothesis is that the random-effects model is more efficient. However, the Hausman test shows that random effects model is preferable; since the p value is greater than (1%, 5% and 10% level of significance).

Based on random effects model, the official exchange rate significantly affect remittances received by the panel of countries selected in the paper. By implications, remittances react significantly to an appreciation of the exchange rate. Specifically, with depreciation of local currency, remitters would send less cash under the altruistic motive because of the increased purchasing power of their foreign currency—denominated remittances. They would send fewer remittances even when motivated by investment possibilities, since depreciation may reflect weaknesses in macroeconomic policies. The result is in line with the paper of Donou-Adonsou, *et al* (2020) who concluded that migrant workers may be timing the foreign exchange market to remit.

The coefficient of inflation rate is negative and insignificant. More specifically, one percentage increase in inflation rate will lead to a reduction in remittances by approximately -0.086% ceteris paribus, in the long-run. This finding is in line with the paper theoretical expectation as inflation would impact remittance flows negatively under the investment motive, as senders would be hesitant to send remittances to countries with unstable macroeconomic environments. Therefore, stable macroeconomic environment and consistent policies are thus essential for bringing in not only capital, but also remittance inflows. This finding align with Tabit and Moussir (2016) assesses the various macroeconomic determinants of migrants' remittances for a panel of 22 developing countries and found out that inflation rate is a major determinants of personal remittances. However, the paper finding is not in conformity with the findings of Adenutsi and Ahortor (2021) who reported that inflation rate is amongst the key macroeconomic determinants of migrant remittance inflows to Sub-Saharan Africa (SSA).

The coefficient associated with credit to the private sector as an index of financial development is positive and statistically significant and in line with theoretical expectation and existing studies. For the migrants of the panel considered, a developed financial system of the home country corresponds to lower costs of remittances, which will positively affect the share of transfer funds through formal channels. Thus, migrant population tends to transfer money via existing formal channels. Furthermore,

this corroborates the result from the study by Donou-Adonsou, *et al* (2020) which found that a one-percentage point increase in remittance inflows promotes financial development by more than one percentage point in Sub-Saharan Africa.

The positive and significant relationship between per capita income and remittances implies that as per capita income of recipient country increases, remittances tend to increase in the five top recipient's countries in Sub-Saharan Africa. Suffices to say that majority of remittance flows to Sub-Saharan Africa are for investment purposes rather than family support, as rising income indicates higher rates of return. This observation, to some extent corroborates the findings in Hor and Pheang (2017) who found that GDP per capita of origin country had significant effects on remittances inflow to the CLMV countries.

V. Conclusion and Recommendations

The paper investigated macroeconomic determinants of remittances in selected top recipient's countries in Sub-Saharan Africa of Mozambique, Nigeria, Rwanda, Ethiopia, and Ghana from 1981 to 2022 where remittances entails an essential role not only for the economy as whole but also for the migrating individuals abroad and their families back home. The paper empirical model was estimated through panel regression methods. However, the Hausman test shows that random effects model is preferable. Hence, interpretation of results was based on the random effects regression estimation.

The random effects model show that all the explanatory variables do have the correct signs and that exchange rate, credit to private sector and per capita income of recipient country are major macroeconomic determinants of the amount of personal remittances received to the five top recipient's countries in Sub-Saharan Africa from 1981 to 2022, as the coefficients of these variables are statistically significant at 5% and 10% levels respectively. Across all the three econometric estimation methods, exchange rate and per capita income were found not to have any significant influence on remittances, a finding which contradicts available theoretical and empirical literature. Therefore, the paper suggested the following recommendations based on findings:

i. Fiscal and monetary authorities in the selected five countries in Sub-Saharan Africa should focus on correcting macroeconomic imbalances – such as inflationary pressure and exchange rates in order to eliminate some of the sources of remittance volatility. This suggestion becomes apt since these two variables based on the paper findings plays key role in attracting remittances.

ii. Additionally, fiscal and monetary authorities in the selected five countries in Sub-Saharan Africa should strive to create environment conducive to growth, since level of income seems to be an important determinant of remittances. This will then increase inflows of remittances and other foreign capital inflows, easing the pressures on external balance financing.

iii. Considering that credit to the private sector as an index of financial development is positive and statistically significant, there is need for the governments, through their monetary authorities like Central in the selected countries in SSA to strengthen their financial system regulatory apparatus to further deepen the financial system to raise its level of development, this can be enhanced by removing bottle necks for ease of remittances at the receiving countries. This would raise migrants' confidence in the financial system of their home countries and encourage them to remit more cash to be deposited in the financial system.

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