

DOES EXCHANGE RATE UNDERMINE THE EFFECT OF FORMAL REMITTANCES ON INFORMAL REMITTANCES?

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ABSTRACT

This study explores empirically, the effect of formal remittances receive and its interaction with official exchange rate on informal remittance channels in Nigeria during the period 2004-2022. Using autoregressive distributed lag (ARDL) model approach, co-integration, and bounds tests, it was revealed that in both long and short run official exchange rate interacted with personal remittances received showed positive statistical significant relationship with informal remittance. Also, access to commercial bank branches (per 100,000 adults) was found to have positive influence on informal remittances. As such to reduce informal remittance, the Nigerian government should make more effort to bridge the gap between official exchange rate and black market naira rates. Nigerian financial institutions should expand their geographical footprint by focusing on agent banking network expansion especially in areas with a low presence of financial institutions, i.e., by opening agent locations in under-served areas.

Keywords: Diaspora, Remittance, Informal Remittance, Autoregressive Distributed Lag (ARDL), Nigeria

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INTRODUCTION

The International Organization for Migration (IOM) defines diasporas as “migrants or descendants of migrants, whose identity and sense of belonging have been shaped by their migration experience and background” (IOM Glossary on Migration, 2019). While the term was originally used to describe the forced displacement of certain peoples, "diasporas" is now generally used to describe those who identify with a "homeland", but live outside of it. Definitions of "diasporas" also include not only first-generation emigrants, but also foreign-born children of these individuals, as long as they maintain some link to their parent's home country. These links – whether cultural, linguistic, historical, religious or affective – are what distinguish diaspora groups from other communities (MDP, 2020).

In 2020, total international migrants were estimated to be 281million people, that is, 3.6% of the world population out of which about 15 million is touted to be Nigerians (Aletor, 2021). In 2017 alone, about 1.3m people left Nigeria in search of greener pastures (Aletor, 2021). When migrants send home part of their earnings in the form of either cash or goods to support their families, these transfers are known as workers' or migrant remittances. They have been growing rapidly in the past few years and now represent the largest source of foreign income for many developing economies (Ratha, 2022).

In 2018, Nigerians abroad sent a total of \$25bn representing about 6.1% of GDP that year which made Nigeria second in Africa after Egypt with \$28bn (Aletor, 2021). However, recent reports from the world bank show that in 2019, it dropped to \$23.81bn; and in 2020, to \$17.21bn representing four per cent of Nigeria's Gross Domestic Product in 2020 (Aletor, 2021). India estimated Diaspora population is 17.9 million it received \$245.27bn in remittances in the three years between 2018 and 2020 while Nigeria with an estimated 15 million migrants received about \$64bn within the same period (Aletor, 2021). Bangladesh is estimated to have a Diaspora population of 7.4 million in 2020. It had a total remittance of \$55.68bn from 2018 to 2020(Aletor, 2021). There is possibility that remittances to Nigeria are much higher than have been officially captured. This is because many Nigerians abroad explore unofficial ways of sending home money in order to maximize unofficial exchange rates (Jaiyeola et al., 2021).Despite the high remittances inflow into Nigeria, inflation, unemployment (the National Bureau of Statistics (NBS) put Nigeria's unemployment rate at 23.1 percent in 2019 (Businessday.ng, 2020)), poverty (half of Nigeria's population currently live below the poverty line (\$381.75) according to the NBS report in 2019(Businessday.ng, 2020)) and inequality are still prevalent as well as proliferation of informal sector activities, especially, competing of informal sector in money transfers. According to Hart (1973), there are two types of informal activities i.e. illegitimate and legitimate activities. By legitimate activities, it means small scales economic activities who contribute to economic growth, even though at low level, like homemade production, personal services and manual labor. On the other hand, by illegitimate activities, it means, the activities whose contribution to economic development are doubtful and which are not essentially criminal activities like pick pocketing, begging, streetwalking and scavenging. According to the International Monetary Fund (IMF), the informal sector accounts for approximately 65 percent of economic activities in Nigeria (Businessday.ng, 2020).

Informality is a widespread phenomenon and poses serious social, economic, cultural and political challenges across the world; however many issues about its nature and

consequences still remain largely under-explored or unresolved. This study is aimed at empirically investigating whether exchange rate undermines the effect of formal remittance on informal activities. It is assumed that there is a direct link between exchange rate management and formal remittances. But formal remittances to Nigeria decreased from USD21 billion in 2015 to an estimated USD19 billion in 2016. A significant decline in foreign exchange revenue, caused by the fall in oil prices, resulted in tighter capital controls and a managed exchange rate policy. These changes resulted in large black-market premiums in the foreign exchange markets of 33%, diverting a large part of formal remittances to informal channels (World Bank, 2018).

The Nigerian remittance sector is governed by the central bank and is bank-led. The banking sector is one of the most dominant and regulated industries in the country and the CBN regularly interferes, especially with regard to foreign exchange controls. As Nigeria's economy is heavily reliant on oil, representing over 90% of the country's total export revenue or just under 9% of GDP, the recent collapse in world oil prices resulted in an abrupt decline in foreign currency revenues. This triggered an erosion in Nigeria's foreign currency reserves. In April 2017, the CBN introduced the investors and exporters window to boost liquidity in the foreign exchange market, trading the Naira at ₦360 to the USD. The official exchange rate was fixed at ₦305/USD1. The very prominent parallel market for foreign exchange, however, traded the USD at ₦362 - ₦364, making it more profitable to use this mechanism to exchange foreign currency. The weaker exchange, high inflation (over 15% at the end of 2017) and high interest rates negatively impacted on consumer confidence in the formal sector in Nigeria (InterMedia, 2018).

Many studies have been conducted on informal sector in Nigeria (Omisakin, 1999; Onwe, 2013; Ogbuabor et al., 2014; Oluranti et al., 2015; Ikeije et al., 2016; Patrick and Akanbi, 2017; Sakanko, M.A., and Ewugi, 2017;Yelwa and Adam, 2017; Dell'Anno and Adu, 2020; Oni-Egboma, 2020; Etim and Daramola, 2020). Similarly, several studies have been carried on exchange rate in Nigeria (Shehu, 2008; Chuku, 2009; Adeniran et al., 2014; Akinjare et al., 2016; Hassan et al., 2017; Oke and Adetan, 2018; Okoro and Charles, 2019; Okechukwu et al., 2019; Ikechi and Anthony, 2020;Ayinde and Bankole, 2021). Also, some works have done on remittance in Nigeria (Odozia et al., 2010; Nwosu, 2012; Iheke, 2012; Akinpelu et al., 2013; Akano et al., 2013; Adeagbo and Ayansola, 2014; Fayomi et al., 2015;Adeyi, 2015; Loto and Alao, 2016; Ebenezer, 2015;Egbulonu and Chukuezi, 2019; Anetor, F. O. 2019; Adeseye, 2021), apparently, from the literature, there is no study on the interaction effect of exchange rate and remittances on informal sector in Nigeria. This knowledge gap is covered by this present study. The focus is on Nigeria because it is Africa's largest economy.

This paper is organized as follows. Section two presents data and methodology. Section shows the results as well as discussions. Section four is for summary, conclusion and suggestions.

1. DATA AND METHODOLOGY

1.1 Data

This study employs time series data and covers 2004–2022. They were extracted from Index Mundi.com, the Global Economy.com,

1.2 Empirical Model Specification

In order to investigate if exchange rate undermines the effect of remittance on informal sector in Nigeria, the following equation with interactive term has been developed:

$$\begin{aligned} \log(IACT)_t = & \psi_0 + \psi_1 \log(COREM * PREM)_t + \psi_2 \log(COMB)_t + \psi_3 \log(OEXC)_t + \psi_4 \log(REMR)_t + \\ & \psi_5 \log(OEXC * REMR)_t + \psi_6 \log(FINF)_t + \Omega_t \end{aligned} \quad (1)$$

where the subscript t denotes the studied time period and Ω denotes the error-term. The parameters ψ_0 and ψ_i (1, 2, 3, 4, 5, and 6) are the intercept and the coefficients to be calculated. IACT = informal remittances or informal flows or informal transfers (proxy by Informal sector or shadow economy as percent of total annual GDP); COREM = Average transaction cost of sending remittances (%) to Nigeria is the average of the total transaction cost in percentage of the amount sent for sending USD 200 charged by each single remittance service provider (RSP) included in the Remittance Prices Worldwide (RPW) database to a specific country, e.g, Nigeria; PREM = Personal remittances, paid (current US\$) comprise personal transfers and compensation of workers who are employed in an economy where they are not resident and of residents employed by nonresident entities; COREM*PREM = denotes interactive term, i.e., the product of personal remittances, paid with average transaction cost of sending remittances; COMB= Commercial bank branches (per 100,000 adults) are retail locations of resident commercial banks and other resident banks that function as commercial banks that provide financial services to customers and are physically separated from the main office but not organized as legally separated subsidiaries; OEXC=Official exchange rate (LCU per US\$, period average) refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange market; REMR = Personal remittances, received (current US\$) in Nigeria consist of all current transfers in cash or in kind made or received by resident households to or from nonresident households; (OEXC*REMR) = interactive term, i.e., the product of personal remittances received with official exchange rate; FINF=Financial freedom index evaluates: the extent of government regulation of financial services, the degree of state intervention in banks and other financial firms through direct and indirect ownership, the extent of financial and capital market development, government influence on the allocation of credit and openness to foreign competition. Higher index values denote banking efficiency and independence from government control and interference in the financial sector. All the variables employed were first transformed into logarithms to account for non-linear properties and heteroscedasticity.

Unit root tests were used to detect the presence and form of non-stationarity of the variables. A nonstationary time series is called integrated if it can be transformed by first differencing once or a very few times into a stationary process. The order of integration is the minimum number of times the series needs to be first differenced to yield a stationary series. An integrated of order 1 time series is denoted by I(1). A stationary time series is said to be integrated of order zero, I(0).

Firstly, Augmented Dickey Fuller (ADF) test was applied. The ADF test tests the hypothesis that a time series y_t is I(1) against the alternative that it is I(0) assuming that y_t is an ARMA process (and ARMA process has both autoregressive and moving average terms). To test for a unit root using the ADF test, one estimates the following model:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 t + \sum_{i=1}^n \alpha_i \Delta y_{t-1} + u_t \quad (2)$$

Where the n lagged first differences approximate the ARMA dynamics of the time series, β_0 is a constant, and t is a trend. If the series has a unit root, $\beta_1 = 0$ and $\sum_{i=1}^n \alpha_i \Delta y_{t-1} = 1$. The ADF test is a test of the hypothesis that $\beta_1 = 0$ given n lagged first differences.

Secondly, Phillips-Perron (PP) test was deployed. To test for a unit root using the PP test, the following model is estimated:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 t \quad (3)$$

Where β_0 is a constant, and t is a trend. If the series has a unit root then $\beta_1 = 0$, and the PP test is a test of the hypothesis that $\beta_1 = 0$. The PP test differs from the ADF test insofar as the ADF test seeks to approximate the ARMA dynamics of the series at question through the use of lagged first differences in the test model (2) while the PP ignores autocorrelation in the test model (4) and instead calculates what can be thought of as the analogue of the ADF tau statistic that is robust to autocorrelation and heteroskedasticity.

The study applied a well-known approach by Pesaran et al. (2001) called the autoregressive distributed lag (ARDL) approach. The ARDL model is considered as the best econometric method compared to others in a case when the variables are stationary at $I(0)$ or integrated of order $I(1)$. The ARDL approach is appropriate for generating short-run and long-run elasticities for a small sample size.

In an auto-regressive distributed lag (ARDL) model, the variable of interest is assumed to be a function of the past values of itself (auto-regressive) and the current and past values of other variables (distributed lag). ARDL models can accommodate a variety of lag structures and include well-known models such as static regressions as special cases.

The general form is:

$$y_t = \sum_{k=1}^p p_k y_{t-k} + \sum_{j=0}^q \beta_j x_{t-j} + \varepsilon_t \quad (4)$$

where y is the dependent variable and x is an explanatory variable. The static model is the case where $p = 0$ and $q = 0$.

2. RESULTS AND DISCUSSION

The results for the unit root test are reported in Tables 1 and 2. To determine the order of integration of the variables, the Augmented Dickey-Fuller test complemented with the Philips-Perron test were implemented. The ADF was conducted with a maximum lag of 3 and Schwarz information criterion. Philips-Perron test was conducted with default (Bartlett kernel) spectral estimation method as well as with Newey-West Bandwidth automatic selection. The results in Table 1 and 2 show that the variables are stationary at $I(0)$ or integrated of order $I(1)$. Based on that, the ARDL model was considered as the best econometric method to apply compared to others in a case when the variables are stationary at $I(0)$ or integrated of order $I(1)$. Also, the ARDL approach is appropriate for generating short-run and long-run elasticities for a small sample size (in the case of this study) at the same time.

Using the bound testing approach to cointegration and error correction models, developed within an autoregressive distributed lag (ARDL) framework, it was investigate whether a

long-run equilibrium relationship exists among the variables in equation 1. The hypothesis is stated as: $H_0 =$ no cointegration equation while $H_1 = H_0$ is not true. Decision criteria for bound test is rejection at the 10%, 5% , or 1% significance level. If the calculated F-statistic is greater than the critical value of the upper bound $I(1)$, then the conclusion is that there is cointegration. That is, there is a long-run relationship. Reject the null hypothesis. If the calculated F-statistics is lower than the critical value for the lower bound $I(0)$, then the conclusion is that there is no cointegration, hence, no long-run relationship. Do not reject the nul hypothesis. If the F-statistic falls between the lower bound $I(0)$. The test is considered inconclusive. The result is presented in Table 3. It depicts that the calculated F-statistic is greater than the critical value of the upper bound $I(1)$, then the conclusion is that there is cointegration.

In order to investigate the cointegration (long run relationship), a proper lag order selection of the equation is prerequisite before applying the ARDL technique. Table 4 reports the lag selection criteria. The sequential modified LR test statistic (LR), final prediction error (FPE), Akaike information criterion (AIC), Schwarz information criterion (SC), Hannan-Quinn information criterion (HQ) all showed a lag order of 1. As such, further analysis was done based on lag 1. One lag was selected for the ARDL analysis using linear trend specification. The model selection was based on Akaike information criterion (AIC) which was automatically selected. Ordinary was selected in terms of the coefficient covariance matrix. There were no fixed regressors. ARDL(1, 1, 0, 1, 1, 1, 1) model was found to be the most suitable model. Figure 1 shows a graph of the AIC of the top twenty models. It reveals the relative superiority of the selected model against alternatives. The selected ARDL(1, 1, 0, 1, 1, 1, 1) model was only slightly better than an ARDL(1, 1, 1, 1, 1, 1, 1) model.

Table 1: Augmented Dickey-Fuller (ADF) Unit Root Test Result

Variables	With intercept		Without intercept		Order of Integration
	Levels	1 st diff	Levels	1 st diff	
LOGCOMB	-2.091125	-2.704373***	-0.046764	-2.813005*	$I(1)$
LOGCOREM	-1.863027	-4.641229*	-0.468642	-4.750599*	$I(1)$
LOGFINF	-3.132900**	-5.452590*	-1.544685		$I(0)$
LOGIACT	-1.347422	-4.363234*	-2.013440**	-3.796649*	$I(0)$
LOGOEXEC	0.182274	-2.605025	2.010643	-2.232693**	$I(1)$
LOGPREM	-1.869575	-4.255674*	0.664085	-4.345339*	$I(1)$
LOGREMR	-21.01812*	-4.423228*	1.175082	-29.73830*	$I(0)$

Note: Significance level at 1%, 5% and 10 % as *, ** and *** respectively

Source: Author's computation using Eviews 10 software

Table 2: Phillips-Perron Unit Root Test Result

Variables	With intercept		Without intercept		Order of Integration
	Levels	1 st diff	Levels	1 st diff	
LOGCOMB	-1.343420	-2.704373***	-0.289956	-2.813005*	$I(1)$
LOGCOREM	-1.829621	-5.484234*	-0.918629	-5.200439*	$I(1)$
LOGFINF	-4.414099*	-5.856631*	0.874859	-5.811897*	$I(0)$
LOGIACT	-1.267358	-4.363234*	-2.015783**	-3.790754*	$I(0)$
LOGOEXEC	0.182274	-2.622455	2.010643	-2.232693**	$I(1)$
LOGPREM	-1.896688	-4.868642*	1.858518	-4.728054*	$I(1)$
LOGREMR	-15.65655*	-82.37909*	1.175082	-32.50025*	$I(0)$

Note: Significance level at 1%, 5% and 10 % as *, ** and *** respectively

Source: Author's computation using Eviews 10 software

Table 3: F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.019803	10%	1.99	2.94
k	6	5%	2.27	3.28
		2.5%	2.55	3.61
		1%	2.88	3.99

Source: Author’s computation using Eviews 10 software

Table 4: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	31.37001	NA	0.002965	-3.046252	-2.708244	-3.028943
1	40.82148	9.451470*	0.001068*	-4.102685*	-3.716391*	-4.082904*

Note: * indicates lag order selected by the criterion; LR- sequential modified LR test statistic (each test at 5% level); FPE- Final prediction error; AIC- Akaike information criterion; SC- Schwarz information criterion; HQ- Hannan-Quinn information criterion

Source: Author’s computation using Eviews 10 software

Akaike Information Criteria (top 20 models)

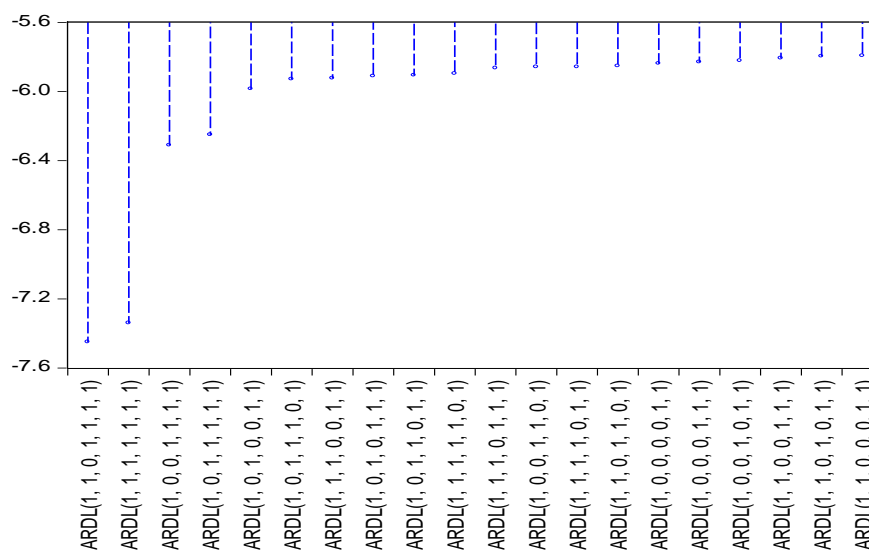


Figure 1: Akaike Information Criteria(top 20 models)

Source: Author’s computation using Eviews 10 software

2.1 Long-Run Estimates

The long-run estimates are represented in Table 5. The results show that the interactive term LOGCOREM*LOGPREM and LOGFINF are not influential in the long run because they are statistically insignificant. On the other hand, LOGCOMB, LOGOEXC, LOGREMR, and LOGOEXC*LOGREMR were shown to be statistically significant. Specifically, an increase in the interaction effects of transaction cost of sending remittances to Nigeria and personal

remittances paid by diasporas (LOGCOREM*LOGPREM) by 1% leads to a decrease in informal remittance by -0.001922% in the short-run. It indicates that the impact of personal remittances paid is not undermined by cost of formal remittance. As such, it increases the formal remittance while reducing the informal channels (such as sending cash with friends or family travelling back home, etc.). This result is contrary to Cooper and Esser (2019) that reported that the cost of remittances in some countries is likely to be a major deterrent of using the formal remittance system by Nigerians in diaspora. For instance, in the first quarter of 2019, the fee for sending US\$200 as remittance to an LMIC (low- and middle-income country) was 7%. That is 4% higher than the targeted cost specified by the UN's Sustainable Development Goals (SDGs) (Xpressmoney.com, 2020). The negative coefficient on the interactive term in this study may be because the cost of formal remittances are less expensive in some countries. However, this result is statistically insignificant, meaning that the interactive term is not a factor that influences informal remittances in Nigeria in the long run.

Nevertheless, access to commercial bank branches (LOGCOMB) depicts a direct relationship with informal remittances. The implication is that a unit increase in commercial bank branches (per 100,000 adults) will lead to 0.144252% rise in informal remittance. Statistically, this result is significant at 5% significance level. This result is not surprising given that banks are the main access point for most formal remittance senders and recipients, a lack of banking agents limits the expansion of formal remittance uptake, especially in the northern parts of Nigeria (Cooper and Esser, 2019). This could compel formal remittance senders and recipient to search for informal remittance channels.

Official exchange rate (LOGOEXC) depicts an inverse statistically significant relationship with informal remittances. In an attempt to explain this result, it should be noted that Nigeria operates a system of multiple exchange rates. These include, the official exchange rate from the Central Bank of Nigeria (CBN), an interbank rate (where banks lend to each other), another used by international money transfer companies, an Importers and Exporters (I&E) Window established in April 2017, and a black-market rate. The International Monetary Fund (IMF) has been critical noting that the absence of a single exchange rate creates confusion (Export.gov, 2019). In late 2015, CBN pegged the local currency at roughly 200 naira against the dollar until June 2016 when collapsing oil prices put pressure on the naira, forcing the bank to devalue it to about 305 naira to one U.S. dollar and introduce measures to save it from sliding further.

Some of these strategies include, barring importers of 42 product categories from accessing dollars from the CBN, restricting the amount of dollars drawn daily from foreign ATMs by Nigerians when they travel overseas, reducing dollar amounts the bank sold weekly to Bureau de Change operators, stopping sale of dollars to Nigerian students studying abroad and making the bank the exclusive conduit for all foreign capital inflows into the country (Export.gov, 2019). Though the CBN, boosted by a growing foreign reserve pot, has since relaxed some of these forex policies and injected the much-needed dollars into the system leading to relative stability in the formal foreign exchange market. This may have also reduced informal remittances as shown in the result of this study. Nevertheless, businesses still experience some difficulties buying foreign currency and processing offshore payments.

Similarly, personal remittances received (LOGREMR) showed a negative relationship with informal remittances. Statistically, this result is significant at 1% significance level. According to IMF (2016), Capital flows in general, and formal remittances in particular, have accelerated rapidly since 2005 due to the opening of the Nigerian capital market, and the country is considered to have joined the ranks of frontier markets. The formal channel commonly used for sending and receiving money within Nigeria are bank transfers.

Furthermore, the study finds the coefficient of interactive term, i.e., LOGOEXC*LOGREMR (official exchange rate * personal remittances received) is significant and positive. It indicates that the impact of personal remittances received on informal remittance is undermined by official exchange rate. Specifically, a 1% increase in the interactive term leads to 1.477835% increase in informal remittance. This result is statistically significant at 1% significance level. This suggests that the tight exchange rate policy affects formal remittance. The official naira exchange rate is well below the black market rate (informal channel). This has resulted in diverting a large part of formal remittances to informal channels (Cooper and Esser, 2019). Simply put, unfavorable foreign exchange rates influences receivers' choices of remittance channel. It actually encourages informal channel.

In the same vein, informal remittances increases by 0.048086 units of measurement following a one per cent increase in financial freedom (LOGFINF). This result suggest that frequent government regulation of financial services(for instance, Central Bank of Nigeria regularly issues changes, new guidelines and directives in the money transfer sector), tight exchange rate management and other strict measures increase the distrust of Nigerian population in the formal financial system and as such make put their trust in informal sector more than the formal system given that it meets people's needs better and offers a level of privacy(Cooper and Esser, 2019).However, despite the positive coefficient on financial freedom (LOGFINF), this result is statistically insignificant in the long run.

Table 5: Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGCOREM*LOGPREM	-0.001922	0.001443	-1.332002	0.3144
LOGCOMB	0.144252	0.019087	7.557723	0.0171**
LOGOEXC	-34.879376	1.576358	-22.126553	0.0020*
LOGREMR	-7.996355	0.364140	-21.959580	0.0021*
LOGOEXC*LOGREMR	1.477835	0.065713	22.489195	0.0020*
LOGFINF	0.048086	0.022319	2.154498	0.1640
C	192.406953	8.692553	22.134688	0.0020*
@TREND	-0.000963	0.002155	-0.446649	0.6988

Source: Author's computation using Eviews 10 software
Significance level at 1%, 5% and 10 % as *, ** and *** respectively

2.2 Short- Run Estimates

The results in Table 6 show that the interactive term LOGCOREM * LOGPREM (transaction cost of sending remittances to Nigeria and personal remittances paid by diasporas) has a positive impact on informal remittances growth in Nigeria. In the short run, keeping other things constant, a 1% increase in the interactive term (LOGCOREM * LOGPREM) will lead to an increase of 0.000631% in informal remittance. Though this result is contrasting to the

negative sign of the coefficient in the long run, however, this result is statistically insignificant just like it is in the long run estimates. In a similar manner, official exchange rate interacted with personal remittances received (LOGOEXC * LOGREMR) showed positive relationship with informal remittance. It was also found to be statistically significant at 1% significance level. Though the interactive term LOGOEXC * LOGREMR showed positive impact on informal remittances, individually, official exchange rate (LOGOEXC) and personal remittances received (LOGREMR) showed inverse relationship with informal remittances. Based on the result, a 1% increase in official exchange rate (LOGOEXC) will actually reduce informal remittance by 88.070135% and also increase in personal remittances received (LOGREMR) by 1% will reduce informal remittances by 19.995710%. Official exchange rate exhibited the highest short-run elasticity, with a negative coefficient of 88.070135 followed by personal remittances received (-19.995710). When comparing the short-term and the long-run coefficients for official exchange rate, it is observed that the short-term coefficient is larger than the long-term coefficient.

Finally, in Table 5, financial freedom index LOGFINF was also found to have negative impact on informal remittance in Nigeria in the short-run. *Ceteris paribus*, a 1% increase in financial freedom causes a 0.068% decrease in informal remittances in the short run. However, this result is statistically insignificant at any of the standard conventional levels of 1%, 5% or 10%. The coefficient for financial freedom index is not significant in both long run and short run. This indicates that financial freedom does not influence informal remittances in Nigeria during the period covered in this study.

The error correction term (ECM(-1)) is correctly signed (negative) and statistically significant at 1% significance level confirming the existence of long run relationship among the variables. It describes the rate of long-run equilibrium assimilation, i.e., how fast the dependent variable in question corrects towards its long-run equilibrium level. The coefficient implies that about 22.43% adjustment towards long run equilibrium take place in one year. To examine the stability (goodness of the model) of the short-and long run coefficients, a few diagnostic test were carried out. The Ramsey RESET test in Table 7 shows that the probability value of F-statistic (0.4451) is greater than 0.05 indicating that the null hypothesis is not to be rejected at 0.05 levels. The bottom-line is that the model estimated was correctly specified. The Breusch-Pagan-Godfrey heteroskedasticity test in Table 8 shows that the probability of the Obs*R-square (0.5864) is greater than 0.05. Based on that, the null hypothesis of homoscedasticity or constant variance of the residual cannot be rejected. Figure 2 depicts that the null hypothesis that the variables are normally distributed is to be accepted since the probability value (0.456799) of Jarque-Bera is greater than 0.05 at 5% significance level. The implication is that the variables follow normal distribution.

Table 6: Short-Run Estimates

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGCOREM *				
LOGPREM)	0.000631	0.001603	0.393900	0.7317
D(LOGCOMB)	0.323557	0.045889	7.050859	0.0195**
D(LOGOEXC)	-88.070135	6.339565	-13.892142	0.0051*
D(LOGREMR)	-19.995710	1.487644	-13.441194	0.0055*
D(LOGOEXC * LOGREMR)	3.711419	0.265594	13.974049	0.0051*
D(LOGFINF)	-0.049785	0.030206	-1.648195	0.2411
D(@TREND())	-0.002159	0.004820	-0.447983	0.6980
ECM(-1)	-2.242994	0.071454	-31.390636	0.0010*

Source: Author’s computation using Eviews 10 software
Significance level at 1%, 5% and 10 % as *, ** and *** respectively

Table 7: Ramsey RESET Test

	Value	df	Probability
t-statistic	1.189233	1	0.4451
F-statistic	1.414276	(1, 1)	0.4451

Source: Author’s computation using Eviews 10 software

Table 8: Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.368993 Prob. F(13,2)	0.8962
Obs*R-squared	11.29198 Prob. Chi-Square(13)	0.5864
Scaled explained SS	0.288176 Prob. Chi-Square(13)	1.0000

Source: Author’s computation using Eviews 10 software

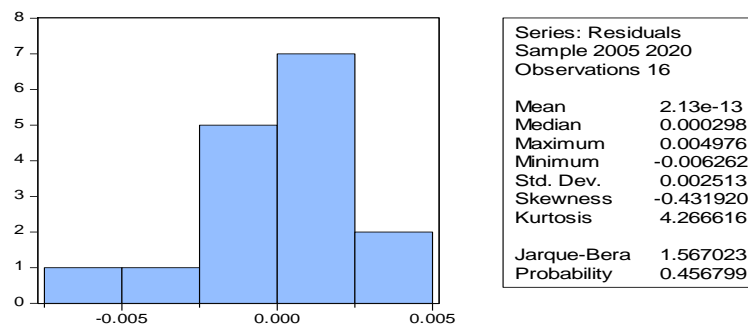


Figure 2: Histogram/Normality Test

Source: Author’s computation using Eviews 10 software

3. SUMMARY, CONCLUSION AND SUGGESTIONS

This study attempts to examine the interaction of official exchange rate with formal remittances received effect on informal remittance in Nigeria for the period 2004 to 2020. The time span was decided due to the data availability. The ADF and PP test results of selected variables were integrated of order zero(I(0)) and order one(I(1)). The results of the ARDL bound test for co-integration test connoted that the long-term equilibrium relationship

existed among the variables. In the short run, keeping other things constant, a 1% increase in the interactive term (LOGCOREM * LOGPREM) will lead to an increase of 0.000631% in informal remittance. However, this result is statistically insignificant. In a similar manner, official exchange rate interacted with personal remittances received (LOGOEXC * LOGREMR) showed positive relationship with informal remittance. It was also found to be statistically significant at 1% significance level. Individually, official exchange rate (LOGOEXC) and personal remittances received (LOGREMR) showed inverse relationship with informal remittances.

Financial freedom index LOGFINF was also found to have negative impact on informal remittance in Nigeria, though, it was statistically insignificant. The long-run estimates show that the interactive term LOGCOREM*LOGPREM and LOGFINF are not influential because they are statistically insignificant. On the other hand, LOGCOMB, LOGOEXC, LOGREMR, and LOGOEXC*LOGREMR were shown to be statistically significant. Furthermore, the results suggest that although the variables may deviate a little bit from the long-run equilibrium, their speed of adjustment to that long-run equilibrium from the short-run is at 22.43% speed.

In conclusion, official exchange rate interacting with personal remittances received showed positive statistical significant relationship with informal remittance. Also, commercial bank branches (per 100,000 adults) exhibited positive influence on informal remittances. As such to reduce informal remittance in Nigeria, the Nigerian government should make more effort to bridge the gap between official exchange rate and black market naira rates. In this regard, the Central Bank of Nigeria (CBN) should maintain a major foothold on the exchange rate through supply and demand, and also eliminate political interference. Financial institutions in Nigeria should expand their geographical footprint by focusing on agent banking network expansion especially in areas with a low presence of financial institutions, i.e., by opening agent locations in under-served areas.

Limitations

There are several ways of informal transferring of money including sending cash with friends or family travelling back home, relying on trader relationships or value transfer systems to offset import payments with remittances in Nigeria (Hernandez-Coss & Egwuagu Bun, 2006). However, little or no data exist about the aggregate volume of informal remittances. As such, the choice of using informal sector as percent of total annual GDP as proxy may be an issue in the sense that it may not capture informal remittance adequately.

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