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Do Remittance Inflows Induce Inflation in Nigeria? An Empirical Analysis

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Abstract

The aim of this study is to empirically investigate the Granger causality effect between remittance inflows and inflation in Nigeria. The motivation of the study was premised on the need to examine the nexus between remittance inflows and the rising inflation rate given the recent Central Bank of Nigeria (CBN) (2019) report of huge remittance inflows in Nigeria. The study employed pairwise Granger causality test, bound test and Autoregressive Distributed Lag (ARDL) approach to examine both the short and long-run relationships between remittance inflows and inflation using annual time series data spanning from 2000 to 2018. The result of the pairwise Granger causality test showed no causality between remittance inflows and inflation in Nigeria. The bound test result indicates a long-run co-integration among the variables estimated in this study. The results of the control variables indicate that while money supply was significant and induces inflation, capital stock exerted a negative effect. The error correction model has the expected negative and significant sign. This implies that about 64% of the errors in the short-run dynamics are corrected annually. The implication of this is that remittance inflows are not inflation inducing in Nigeria. Other determinants may be responsible for rising inflation in Nigeria. The study recommends that government needs to introduce an effective policy framework that will promote capital stock and other monetary policy transmission mechanism on the economy of Nigeria. This study has confirmed that in remittance inflows is not inflation inducing in the light of macro-economic instability in Nigeria.

1. Introduction

The flow of funds by migrants across border has increased significantly particularly in developing countries like Nigeria in recent times. According to the Central Bank of

Nigeria (CBN, 2019) report, Nigeria received about $613 billion in 2018 and this has made it become one of the top five recipients of remittance inflows globally. The World Bank (2018) records reveal that remittances in the context of Nigeria have been increasing astronomically over the last decade. Remittances by migrants increase the flow of funds from a foreign country to a home country. This shows that remittance inflows are a double-edge sword over an economy. It can stimulate or disrupt market, especially if these monies form a significant proportion of output (Matuzevicute, 2016); household income and wealth (Vacaflores, 2012). Remittances into a home country by migrants are either for consumption or investment purposes, all things being equal; investments and consumption often times tend to rise with remittances. It has the propensity to positively influence production, employment and disposable income. Besides, remittances inducing flow of foreign funds, enhancing consumption level, investment economic activities and per capita income, it contributes to increase in money supply to the domestic economy as the Central Bank exchanges domestic currency for foreign currencies in circulation. Literarily, remittances encourage money supply and money supply influences level of inflation in an economy. Nisar and Mishra (2013) posit that while remittances inflows encourage other development aid (ODA), enhances stock of money in an economy, it is however inflation inducing given the appreciation or depreciation of the exchange rate for a period. In the view of Balderas and Nath (2008), Narayan and Mishra (2011), Khan and Islam (2013) remittances are capable of inducing inflation in recipient economies.

Remittances are inflation inducing from the perspective of inflows from migrants and spending effects in the domestic economy. Rodrik (2007) posits that remittance at micro level leads to direct increase in household income. This further leads to demand for goods and services by individuals. As the demand increases, inflationary pressure sets into the economy. Rogoft (2004) study indicates that an increase in remittance inflows results to a transfer of resources from the tradable to the non-tradable sector which leads to a rise in the price level (inflation). Adigun and Ologunwa (2017) note that the inflows of large amount of foreign exchange by expatriates in the form of remittances influences the money supply of the recipient economy through the conversion of foreign exchange into the domestic currency. They opined that if the increase in money supply is not channeled towards productive sectors and capital investment, it can increase inflation by way of shifting to consumption expenditure. Additionally, remittances could drive up inflation by causing a temporary surplus demand through raising consumption expenditure which comes from a boost in real wealth. The surge in remittances inflows in developing countries like Nigeria requires critical assessments of the impacts on macroeconomic issues and monetary policy.

Prior researches concentrated on the effect of monetary policies on economic activities (see, Kapur, 2004; Babatunde and Shuaibu 2011; Ishioro, 2013; Kareem and Oyelekan,

2015; Alvinasab, 2016). However, the causality between remittances inflows and inflation is yet to receive adequate attention in the literature in the Nigeria context. Premised on this gap in literature, this study seeks to examine if remittance inflows induce inflation in Nigeria vis-a-vis. More so, inflation in Nigeria is on the high side, so efforts are currently going-on by the scholars especially in Africa to know the root cause of this epidemic situation. Therefore, the current paper will throw more light on the inflationary issue in Nigeria.

2. Literature Review

The examination of the nexus between remittances inflows and inflation is commonly linked within the new economics labour migration (NELM) theory of Stark's (1991) and Stark and Bloom (1985). The new economics labour migration theory developed by Stark (1991) is of the view that migration is a potent instrument which individuals and family members employ to enhance income and diversify other income sources. Individual family members leave home or domestic country with the intention to work, generate income and then remit the earned income later into the same home country. The new economics of labour migration theory in the light of increasing remittance inflows captures the Nigerian scenario where a household pulls resources together to send one member out of the country with an agreement/unvoiced expectation to remitting back home.

More often, a sort of contractual agreement is reached between a family and the individual migrant. The money and non-money items remitted home by the migrants are often employed by the family members for consumption and promoting viable economic activities. The intent is to promote the welfare of the family members the migrant left behind for a greener pasture. As the migrant remittance inflows increases, it is expected that the economic well-being of family members in the home country gets improved. This has the propensity to increase money supply in the domestic economy, engender buying of durable and consumable goods significantly. The aftermath of this is increase in consumption rate in the economy as well as increase the volume of cash in circulation. The tendency to invest a proportion of the remitted funds gets high, thus influencing inflation rate directly and/or indirectly in the economy.

While the association between remittances and inflation has been relatively researched (see Tun, Ly, Nhu, Thanh & Phung, 2019; Marayan, Narayan & Mishra, 2011) in varying continents of the world leading to inconclusive results on the empirical fronts. There seems to exist a research gap on the relationship between remittance inflows and inflation for the case of the recipient countries in different continents, consequently, the question of whether the relationship between remittance inflows and inflation is positive or negative or even insignificant remains unfastened (Tun et al. 2019). For instance, Tun et al. (2019) examined the impact of remittance inflows on inflation with evidence from

Asian and pacific thirty-two developing countries. The authors used annualized data from 1985 to 2013. Econometric estimation methods employed in the study to analyze the data were the ordinary least squares, two-stage least squares, panel generalized method of moment and panel Granger causality. Finding from the research indicates remittance inflows exerted significant increase in inflation. Similarly, remittance inflows had one-way Granger causality to inflation. The empirical investigation by Naraya and Mishra (2008) indicates that remittances results to high inflation particularly in the long run.

Ball, Lopez and Reyes (2012) conducted a research on the nexus between remittance and inflation using panel vector auto regression estimation method. The researchers used panel data for twenty-one emerging countries from 1980-2010 periods. The result shows that remittances demonstrated increasing impact on inflation under a fixed exchange rate regime with non- increasing effect on inflation in a flexible exchange rate regime. Termos, Naufal and Genc (2013) used the panel regression methods and Anderson–Hsiao estimations) to determine the implication of remittance inflows on inflation among six countries in the Gulf Cooperation Council (GCC) from 1972 to 2010. The study finding points out that increase in remittance outflows leads to a decrease inflation rate in GCC countries. The research by Khan and Islam (2013) employing vector autoregressive estimation method from 1970 to 2010 reveals that for every one percent increase in the remittance inflows, there is a simultaneously increase in the inflation rate at over two percent in long run but not in the short run in Bangladesh. Roy and Rahman (2014) sought to determine if remittances lead to inflation with the use of vector error correction model. The results indicate that remittances cause both general inflation and food inflation. Additionally, study revealed that remittances lead to increase in food inflation by 2.5 times as against general inflation. Iqbal, Nosheen and Javed (2013) examined if remittances and inflation are related in Pakistan in the period 1980 to 2012. The finding evidenced that remittances exerted significant positive effect on inflation. It can be observed that these myriad researches were undertaken in non-African continents countries.

In economic literature, remittance is not a standalone causative factor of inflation. Monetary policy transmission mechanisms like monetary policy rate money supply and capital stock induce the level of inflation in an economy. For instance, Adodo, Akindutire and Ogunyemi (2018) investigated monetary policy and control of inflation in Nigeria in the period 1985 to 2016. The authors used the error correction mechanism and Johansen co-integration to analyze the data. The result of the study indicates that both money supply and interest rate are statistically significant in explaining variation in Inflation. The study concluded that monetary policy is partially effective in checkmating inflation rate in Nigeria. Iya and Aminu (2014) examined factors determining inflation in Nigeria between 1980 and 2012 using the ordinary least square method. The result revealed that

money supply and interest rate influenced inflation positively. Hossain and Islam (2013) examined the determinants of inflation rate using data from 1990 to 2010 in Bangledesh with the ordinary least square method. The empirical result showed that money supply, one year lagged value of interest rate positively and significantly affect inflation rate. There exists a theoretical relationship between the rate of inflation and the size of the capital stock in an economy (Crosby & Otto, 2000). Crosby and Otto (2000) empirically examined inflation and the capital stock in 34 countries using structural vector autoregressive model. The study found there is no statistically significant relationship between capital stock and inflation in majority of the countries' economy in the long run. The authors concluded that the long run level of the capital stock is invariant to permanent changes in the inflation rate. From the foregoing, the nexus between certain remittance inflows and inflation is inconclusive in developing countries, hence this study in undertaken with a view to contributing to literature specifically in the Nigeria clime.

3. Methodology

The annual time series data set used in this study covered the 2000-2018 period and was collected from the World Development Bank Indicators (WDI). The analysis was done using the Engle and Granger (1987) two-step method of cointegration. The Engle and Granger (1987) test is a two-step method of cointegration suitable for estimating only two variables in a model. This test is based on testing the residuals of the time series data. But this method has two major limitations; (1) it is only suitable when the time series model involves only two variables; (2) it is a single equation model that is not applicable for dynamic and multiple equations. Meanwhile, Johansen cointegration test is another method of testing cointegration between non-stationary time series data. However, Johansen test is subject to asymptotic properties, that is, it can only be used when there is large sample size, and the variables in the series are expected to have the same order of integration before the long run relationship among the variables can be determined.

In the light of these limitations, this study employs the ARDL cointegration method suggested by Pesaran, *et. al.*, (2001) for the following reasons: (1) it permits the testing of both the short-run and the long-run cointegration among the macro-economic variables; (2) it is useful when some of the explanatory variables in the model are endogenous; (3) it is relevant when the variables in the model are integration of mixture of level I(0) and first difference I(I); and lastly, it cater for estimating data with sample size like in the current study.

Model specifications

Adopting the bound test procedure of Pesaran, *et. al.*, (2001), we estimated the ARDL equations as follows:

$$INF_t = \alpha_0 + \beta_1 INF_{t-1} + \beta_2 REM_{t-1} + \beta_3 MS_{t-1} + \beta_4 INT_{t-1} + \beta_5 KS_{t-1} + \sum_{t=1}^{\rho} \alpha_{1i} \Delta INF + \sum_{t=0}^{\rho} \alpha_{2i} \Delta REM_{t-1} +$$

$$\sum_{t=0}^{\rho} \alpha_{3i} \Delta MS_{t-1} + \sum_{t=0}^{\rho} \alpha_{4i} \Delta INT_{t-1} + \sum_{t=0}^{\rho} \alpha_{5i} \Delta KS_{t-1} + \varphi ECT_{t-1} + \varepsilon_{1t} \qquad [1]$$

Where Δ is the first difference operator, INF is the inflation rate, REM indicates remittances inflows, MS is the money supply, INT is interest rate and KS is the capital stock for Nigeria. φ is the speed of adjustment coefficient; the ECT is the error correction term and ε_{1t} is the stochastic term. The result of the coefficient φ is expected to be negative and statistically significant to adjust the speed of equilibrium from the short run with the long run.

The co-integration test only considers the associations among variables without examine the cause and effect the macroeconomic variables may exact on each other. Hence, issue of causality is very germane to this study. Therefore, we examine the empirical analysis between Remittance inflows (REM) and Inflation (INF) by employing the Granger-causality test which help the study to determine the status of Granger-causality between the duo variables, that is, remittance inflows (REM) and inflation (INF). To test whether remittances inflows Granger cause inflation, we employ the model below as follows:

$$INF = \beta_1 + \sum_j^\alpha INF_{i-j} + \sum_k^\theta REM_{i-k} + v_t \qquad [2]$$

As stated below, equation [2] is also used to test whether inflation Granger cause remittances inflows

$$REM = \beta_1 + \sum_j^\alpha REM_{i-j} + \sum_k^\theta INF_{i-k} + v_t \qquad [3]$$

The selection of relevant variables to examine the causality between remittance inflows and inflation in this study is based on the previous works in the economic literature (see Balderas, 2009 and Ball and Lopez and Reyes, 2012). As part of the innovation of the study, we added capital stock in this current study to allow us see clearly the economic relationship between monetary policy instruments and remittances.

4.   Results and Discussion

As a standard practice in economic literature, empirical test of macroeconomic data analysis begins with the test of stationarity of variables using the appropriate unit root test procedures. This study employs the Augmented Dickey-Fuller (ADF) test to perform the unit root test in all the series of the model and examine their order of integration. Automatic lag length selection recommended by *E-Views 10* statistical software using a Schwarz Information Criterion (SIC) was used. The advantage of Schwarz Information Criterion (SIC) is that it caters for small number of observations like this study. The results of the ADF unit root test statistics in both level and first difference are presented in Table-1 below:

Table 1
ADF statistics unit root tests

Variables	ADF Test Statistics at Level		ADF Test Statistics at 1st Difference	
	t-ADF	P- value	t-ADF	P- value
INF	-6.8046	0.0000*	–	–
REM	-0.7231	0.8271	-4.7565	0.0000*
KS	-4.6700	0.0000*	–	–
INT	-3.1474	0.0000*	–	–
MS	-3.4740	0.0152*	–	–

Source: Source: *Extract from E-view 10 output*

At 5 per cent significance level, the results of the ADF unit-root tests provide very strong evidence of stationarity at level for inflation, capital stock, interest rate and money supply while evidence of non-stationarity was shown for remittances inflows at level. But at first difference, remittances inflows displayed a stationarity result which implied that all the five series are integration to degree zero I (0) and I (1). When this situation of mixture of order of integration to degree zero I (0) and I $(1$ occurs, the best suitable estimation technique to test the short-run and the long-run relationships among the variables in this study is the Autoregressive Distributed Lags (ARDL) model as recommended by Pesaran, *et. al.,* (2001).

Bound Test Result

Table 2 shows the F-Statistic result of 6.21 that is greater than 3.16 and 4.21 of lower bound value I(0) and upper value of I(1). The result indicates that there is a long-run co-integration for the variables estimated in this study, this implies that, in the long-run, the macroeconomic variables tested using bound test can move together, hence, this result does not reject Ho that says: There is co-integration, if the F-statistic value is greater than the Pesaran, *et. al.,* (2001) critical upper bound value at 5 percent significance level. Otherwise, there is no co-integration.

Table 2
Bound test result

F-statistic value	6.21
Test Statistic at 5% significance	
Lower Bound (I0)	3.16
Upper Bound (I1)	4.21

Source: *Extract from E-view 10 output*

Error Correction Term (ECT)
From the results in Table 3 below, it is expected that the error correction term (ECT) coefficient is negative and significant, in line with 5 percent significance level, the ECTs is -0.64, this implies that about 64 percent error in the short-run are corrected in the long-run accordingly. This implies that the long-run result is expected to be more significant because of the adjustment already made in the short-run.

Table 3
ARDL co-integrating and long-run results

Variable	Coefficient	Prob.
D(REM)	5.1949	0.87
D(INT)	1.15	2.12
D(MS)	0.14	0.71
D(KS)	-1.15	2.12
ECT	-0.64	0.01*
Long-run coefficients		
REM	1.51	0.67
INT	8.51	0.18
MS	0.83	0.02*
KS	-6.82	0.01*

Source: *Extract from E-view 10 output*
Note: The values in asterisks are the probabilities of the variables that are significance at 5 percent level.

Table 3 indicates both the short-run and long-run results. In the short-run for instance, the values of remittances inflows of 5.1949 with probability value of 0.87 at 5 percent significant level shows an insignificant effect on the rate of inflation in Nigeria. This result implies that remittances inflows from abroad do not responsible for increase in the prices of goods and services in Nigeria. Money supply resulted to a positive and significant result in the long run but insignificant in the short run. This indicates that 1 percent increase in money supply will lead to 14 percent decrease in the inflationary rate. This result implies that, when increase in the money supply in Nigeria with corresponding increase in the output will decrease the rate of inflation. Hence, the result is divergent from the popular monetary hypothesis that the general price levels of goods and services is directly proportional to the amount of money supply which might leads to an increase in the price level vis-à-vis inflation (see Tule, Obioma, Okpananchi, & Olaoye, 2015). The result is also in line with some of the speculations made by a few Nigerians that the outrageous in the inflationary rate in Nigeria was in part due to different policies of the government (money supply) recently introduced to reduce economic hardship in the country, examples are, the bail out (payment of outstanding salaries) provided by the Federal Government of Nigeria to many state governors; the

recent Central Bank of Nigeria directive that all commercial banks should maintain 60 percent minimum loan-to-deposit ratio (LDR); small and medium term loan policies introduce by the Federal Government through Bank of Industry (BOI) and so on. All these monetary policies are geared towards increasing the money supply in the country.

Capital stock displayed a negative and significant result in the long-run. This implies that 1 percent increase in the capital stock will increase the rate of inflation by 6.82 percent. This result implies that when Nigerian government is keeping excess capital, the implication is that inflation will be on the high side.

Causality between Inflation and Remittance Inflows

This study examines the relationships between inflation and remittance flows in Nigeria. Using a Pairwise Granger causality tests for over the period 2000-2018 on Table 4, the results show that the F-statistics does not reject the hypothesis of both REM does not Granger cause INF and the hypothesis of INF does not Granger cause INF at 5% level of significance. This indicates that there is no causality from remittances inflows to the inflation rate and inflation rate to remittances inflows in Nigeria. Hence, the amount of remittances inflows in Nigeria was not the cause of the current inflation figure of 11.61 as of October, 2019 according to the Central Bank of Nigeria (CBN) online report, 2019.

Table 4
Pairwise Granger causality test result

Null Hypothesis	F-Statistics	Prob. Values
Remittances inflows does not Granger Cause inflation	1.7725	0.2116
Inflation does not Granger Cause Remittances inflows	1.5164	0.2587

Source: *Extract from E-view 10 output*

Diagnostic Tests

From the diagnostic tests results indicated in Table 5, it is evidence that the autoregressive distributed lags model employed in the analysis is suitable for the study. For instance, the values of 0.79(0.68) and 0.35(0.15) show that the model is free from heteroscedasticity and autocorrelation issues. More so, Figure 1 displayed that the model is stable to give a well robust empirical result.

Table 5
Heteroscedasticity and serial correlation LM test results

Heteroscedasticity Test: Breusch-Godfrey

F-statistic	0.79 (0.68)
Ho: The variance of the residuals is homogenous	
H1: The variance of the residuals is not homogenous	

Autocorrelation LM Test: Breusch-Godfrey

Ho: The errors are uncorrelated between the explanatory variables	
H1: The errors are correlated between the explanatory variables	
F-statistic	0.35(0.15)

Source: *Extract from E-view 10 output*

Figure 1
Stability test

CUSUM of Squares ----- 5% Significance
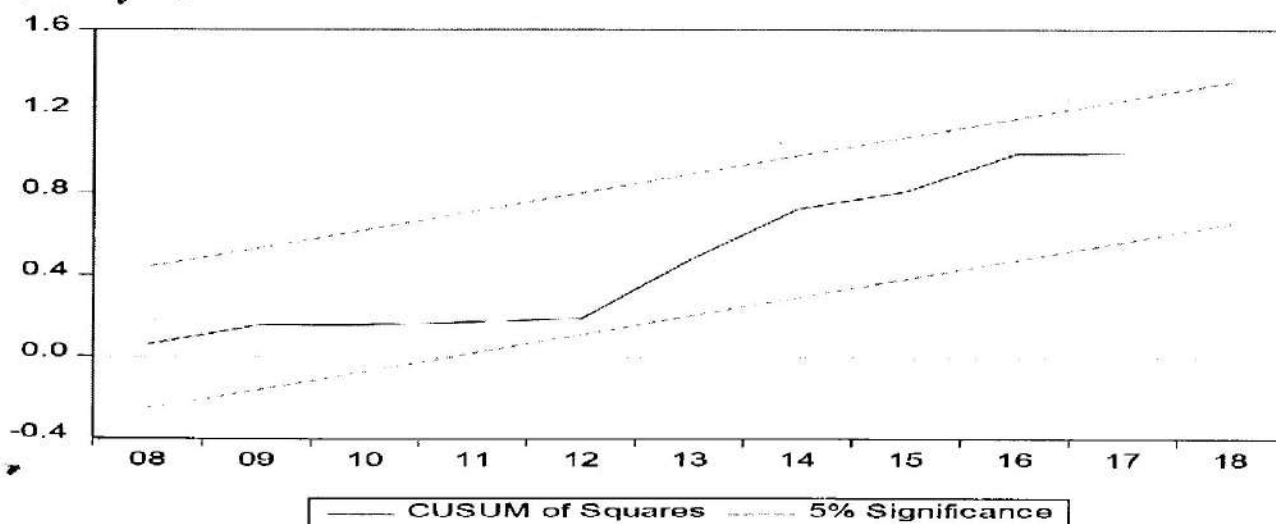
5. Conclusion and Recommendations

Over the last decade, workers' remittances played a crucial role in the economic growth and development of many countries across the globe through viable investment activities. However, when huge remittances inflows failed to commensurate with output of a country, this leads to inflation. In the light of this, a study is taken to explore the issue using a time series data set of Nigeria over the period 2000-2008. The empirical result suggests that, there is no significant relationship between remittances inflows and inflation. Money supply has a positive and significant effect on inflationary rate trend in Nigeria. The implication of this result is that, when there is growth in the money supply,

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inflation tends to reduce in Nigeria. Capital stock indicates a negative effect on inflation. This implies that decrease in the capital stock leads to increase in inflation. Hence, expending the capital that supposed to be in stock by the government promotes inflation in Nigeria. Interestingly, the error correct term result further shows that any shock in the short-run adjusted very fast to the long-run equilibrium.

To cushion the effect of Inflation in Nigeria, this study recommends that the policy monetary authority (CBN) needs to come up with a policy framework that can increase the country's money supply in the circulation that will also boost productivity and output. A policy framework also needs to be introduced to increase the stock of capital of the country. These recommendations will contribute to macro-economic price stability both in the short and long run when implemented.

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