Inward Remittances, Financial Sector Development and Economic Growth in Nigeria: ECM Approach

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Abstract

This study sought to empirically examine the relationship between inward remittances and economic growth in Nigeria. Annual time series data covering 38 years were sourced from World Development Indicators (2016) for the period 1977-2016 to analyse the estimates of the short-run adjustment using error correction mechanism. The result showed that the coefficient of error correction mechanism (ECM$_{t-1}$) carried the expected negative sign and was statistically significant at 5 per cent. Moreover, the ECM indicated a feedback of about 54 per cent of the previous year disequilibrium from the long-run elasticity of remittances, population, openness and banking sector development. It was, therefore, recommended, among others, that Nigeria's monetary authorities should expand remittance channels to include bureaux de change and capable microfinance banks to undertake remittance transfers.

Introduction

Inward remittances are now global phenomenon and there has been considerable debate on the impact of inward remittances on banking sector development, saving, investment, consumption, inequality, poverty reduction and human capital development. However, there are concerns as to whether or not remittances could have significant and positive impact on economic growth in Nigeria. Empirical evidence on the impact of inward remittances on economic growth in Nigeria is scanty and provides mixed results. Few studies have been carried out to examine whether inward remittances affect economic growth. Some suggested that remittances affect economic growth through exports or financial development processes of the recipient country. There has been an upsurge in remittances inflow into the Nigerian economy since 2005. According to World Bank (2013), Nigeria is the sixth largest recipient of remittances worldwide and first in sub-Saharan Africa. Inward remittance is now the largest source of external finance both in absolute term and as percentage of gross domestic product. Available data from the World Bank and Central Bank of Nigeria (2013) indicate that Nigeria has received about $20bn on average in the last ten years, while foreign direct investment averaged $7bn in the corresponding period.

Despite these revealing features, FDI and official development assistance (ODA) have received much more research attention, while studies on inward remittances are sobering. However, a few microeconomic studies have proved that remittances remain an important source of income to lift households out of poverty (Adams, 2005; Shabaz, Jamshaid and Waqar, 2008; Abdih, Chami, Dagher and Montiel, 2012). The same may not be true for the whole economy. Based on these arguments and given the importance policymakers and financial economists increasingly place on inward remittances as a potential source of development finance, it is imperative to empirically ascertain whether this optimism is truly warranted. A systematic analysis of how inward remittances could affect growth, followed by robust empirical evaluation of this relationship would provide a better foundation for development policy, especially if inward remittances are found not to have a positive impact (or any impact) on banking system, investment and economic growth in Nigeria. In this case, policymakers will need to refocus on two key areas: Finding ways to channel remittances into productive uses that enhance economic growth and promoting other activities that facilitate economic development. These constitute the research problems that needed to be addressed in this study.

Stylized Facts about Remittance Inflows to Nigeria

In 2013, official remittance inflows to Nigeria reached an unprecedented level of $20 billion, making Nigeria the fifth largest recipient country of remittances in the world and the first sub-Sahara Africa. Remittances are more than three times larger than official development assistance (ODA) and twice larger than foreign direct investment. Nigeria was the fifth largest recipient of officially recorded remittances in the world in 2013 after India ($71 billion), China ($60 billion), the Philippines ($26 billion) and Mexico ($22 billion). Figure 1 displays the evolution of Nigerian remittances inflows during the period 1977-2016, when remittance inflows increased substantially from $1.6bn in 1981 to $20 billion in 2013. In the late 1980s and mid-1990s, remittance inflows increased steadily. This was driven by an increase in demand for Nigerian workers in the European region which accompanied the increase in oil prices. In 1999, remittance inflows reached over $13 billion and amounted to 3.62% of Nigeria's GDP.
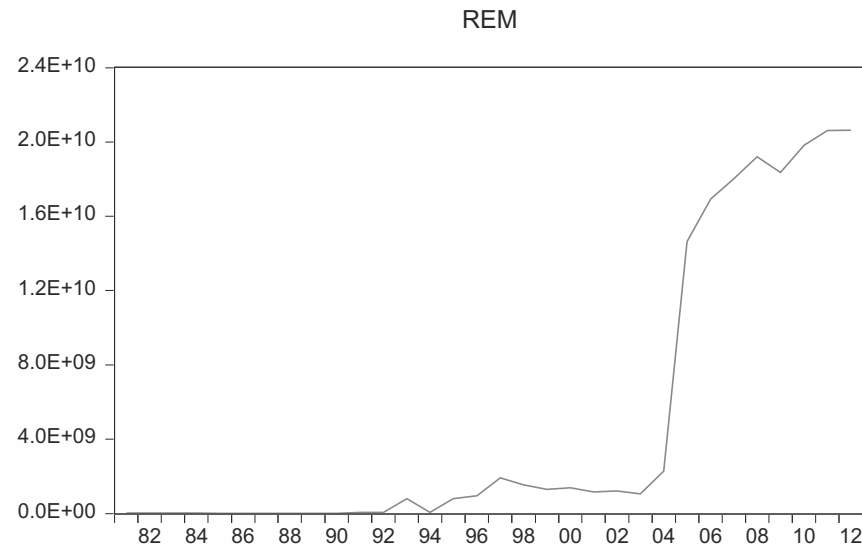
Figure 1: Trend remittance flows to Nigeria
Source: Author's compilation from World Development Indicators (2016)

Similar to other capital inflows, remittances to Nigeria experienced some fluctuations following international political and economic conditions. They increased dramatically in 2005, after the return to civilian rule in 1999, to over $14.6 billion in real terms, representing the highest over proportion of GDP of about 13.04. Despite the global financial and economic crisis that hampered foreign capital flows like FDI and ODA into economies between 2007 and 2011, remittance flows into Nigeria remained resilient: it increased to $18 billion in 2008, $19 billion in 2009 and $20.6 billion in 2011. While it may be argued that remittances/GDP ratio has been witnessing accelerated growth in Nigeria, it recorded the highest inflow in 2005, with a ratio of 13.04 per cent. In average, for the period 1981-2012, remittances /GDP ratio was 8.31 per cent in Nigeria, whereas the World Bank (2014) reported that the average remittance/GDP ratio was 3.6 for developing countries over the period 1995-2004. As remittances continued to grow in Nigeria, the country's export capacity also increased, though driven largely by the oil sector. A major feature of remittance inflows to Nigeria is that they are concentrated in a few source countries with about two-thirds coming from the US and the Gulf countries. Notwithstanding the increasing growth of remittances, there are divergent scholarly opinions as regards its impact on economic growth and development.

Literature Review
There have been debates and controversies on the impact of remittances on economic growth in both cross-country and country-specific studies. Fayissa and Nsiah(2008),

Jawaid and Raza (2012), Sami and Mohamed (2012), Atanda and Ogboi (2014), Kanu and Ozurumba (2013), among others, did cross-country studies on the impact of remittances on economic growth in Asia and sub-Saharan Africa. Country-specific studies that have focused on Africa, Asia and recently on Nigeria include Akinpelu, Ogunbi, Bada and Omojola (2013), Mahedi (2014), Sharaf (2014) and Oyejide (2016). Overall, the empirical evidence is inconclusive. This has been attributed to the cross-country nature of most studies in the light of data measurement problems, as well methodology adopted by several authors.

Glystsos (2005) did an extensive work aimed at providing a comprehensive analysis of dynamic effect of migrant remittances on growth for Mediterranean countries. Two stages least square technique was employed. The result of the study suggested that inter-temporal induced output differentiation is generated by the relative weight of remittances in the economy and the speed of change in volume of remittances. It also found that rising remittances are relatively less powerful to generating output, as falling remittances are powerful to reducing output. Igbal and Satter (2005) examined the contribution of workers remittances on economic growth in Pakistan, using regression analysis on macroeconomic variables, such as real GDP growth, GDP at current price, public investment, private investment, inflation and external debt. The results suggested that right policies can channel remittance flows into more productive investment activities.

Guiliano and Ruiz-Arranz (2005), using OLS and SGMM, examined the impact of remittances on financial development in 73 developing countries over the period 1975-2002. They found strong evidence of a negative interaction between remittances and financial depth. The findings suggested that the marginal impact of remittances have contributed to promoting economic growth in countries with shallow financial systems.

Bettin and Zazzaro (2012) used OLS and SGMM to examine whether remittances substitute or complement financial development in economic growth process of a nation. They used GDP growth per capita as proxy for economic growth, while the explanatory variables (remittances, M2 as a ratio of GDP, domestic credit as a ratio of GDP) were quantitative indicators of financial development. They, however, departed from previous studies by using qualitative indicators (ratio of operating expenses to the sum of net interest and other income) as additional indicators of bank efficiency. The control variables used included population growth, trade openness, gross fixed capita formation as share of GDP, government expenditure as ratio of GDP and inflation. The findings suggested that an efficient banking system complements the positive effect of remittances on GDP. They concluded that remittances not only relax liquidity constraint and guarantee access to credit but can also contribute, when mediated by an efficient banking system, to funding growth-enhancing projects.

In a similar vein, Mundaca (2009) examined the relationship between remittances and financial market development in Latin American and Caribbean. The study found,

among others, that remittances significantly affect growth; for when the financial market indicators jointly enter into growth equation, the corresponding parameter of financial intermediation becomes more statistically significant. It concluded that remittances enhance growth only if financial market is well-developed and these two variables can accelerate growth and remove financial constraints. Moreover, to examine the link between workers' remittances and growth through physical and human capital channels, Ziesemer (2007) used the generalized method of moment with heteroscedasticity correlation (GMM-HAC) to provide empirical evidence. The study examined the effects of gross national product as share of gross domestic product, savings as share of GDP interest rate, gross capital formation as a ratio of GDP, primary school enrolment, literacy and remittances as a ratio of GDP on gross domestic product per capital. It found that countries with per capita income below $1200 benefit most from remittances in the long run because they have the largest impact of remittances on savings. The study also examined the relationship between government consumption, openness and inflation on GDP per capital. It reported that remittances have a positive but marginal impact on economic growth in Asia and the pacific countries through domestic investment and human capital. Similarly, Fayissah and Nsiah (2008) in a survey of African countries used unbalanced panel data to examine the impact of remittances on economic growth and development. It found that remittances boost growth in countries where the financial systems are less-developed by providing an alternative way to finance investment and help overcome liquidity constraints.

Barajas, Chami, Fullenkamp, Gapen and Montiel (2009) examined whether workers remittances promote economic growth. They used ordinary least square technique (OLS) to analyse macroeconomic variables, such as remittances, broad money supply as a share of GDP, average growth and trade pattern. The study found an intriguing result that decades of private income transfers have contributed little to economic growth in remittance-receiving economies and may even retard growth. Sufian (2009) used data for Middle East and North American (MENA) countries to examine the relationship between workers remittances and growth. The dependent variable was proxied as GDP per capita, while the explanatory variables were remittances as a ratio of GDP, gross capital formation as a ratio of GDP, human capita, government consumption and inflation. The results were mixed. Remittances were positively and significantly correlated with growth; and remittances had more positive impact on growth in countries with less access to credit.

Raju, Markus and Kyun-woo (2010) used regression analysis to examine the determinants and macroeconomic impact of remittances on sub-Saharan Africa. The findings suggested that the size and location of the Diaspora are important determinants of remittances with regard to their impact on economic growth; and that there is a negative coefficient of remittances on output growth. It concluded that countries with well-functioning domestic institutions were better at unlocking the potential of

remittances to contributing to faster economic growth; this conclusion lends credence to the complementary role of remittance to growth. More so, Abdullaev (2011) investigated the responsiveness of per capita GDP growth to workers' remittances along with traditional sources of economic growth using OLS and GMM. The results indicated that countries with higher initial level of per capita income tend to grow faster than those with low levels of initial per capital income.

Das and Chowdhury (2011) pooled cross-section and time series data to examine the dynamics of remittances and GDP in eleven developing countries using panel cointegration and PMG techniques. The results from the unit root tests and panel cointegration suggested a long-run cointegrating relationship among the variables. Also, the result from the pooled mean group (PMG) suggested little impact of remittances on growth in the selected countries.

In the same vein, Sami and Mohamed (2012) analysed the growth effect of remittances and the channels through which remittances may affect economic growth in MENA countries. Drawing from previous empirical literature, the study identified three main channels that remittance could impact on growth. It found, for example, that credits to private sector and government spending have no significant effect on economic growth. Remittances exert positive and significant effect on economic growth, even though the effect is weak compared to investment and human capital effect. The SGMM result of investment and consumption model indicated that remittances produce positive and significant effect in both models; however, remittance effect on consumption is much stronger, with the coefficient of remittance on investment at 0.132, as against that of consumption at 1.554. On a country by country analysis, the SGMM result showed that the effects of investment, population growth, human capital and financial development on growth were consistent with the theory for each country group. The implication of this is that remittances produce a positive and significant effect on growth for the high correlation group.

Shimul (2013) also employed Engle–Granger two-step procedure and autoregressive distributed lag model (ARDL) to determine the impact of remittances on economic development in Bangladesh. The study found that remittances are not significant contributing factor to GDP both in the short and long run.

Akinpelu, Ogunbi, Bada and Omojola (2013), in their own study of the effect of remittances inflows on economic growth in Nigeria, found a long-run equilibrium relationship between GDP and remittances inflow, exchange rate, foreign direct investment, openness and capital formation. The result also showed unidirectional causality from GDP to remittance inflows. In addition, Kanu and Ozurumba (2013) studied sub-Saharan Africa, using real per capita GDP as dependent variable and migrant remittances, openness, labour force, exchange rate and inflation as explanatory variables. The study found migrant remittances to be positively correlated to economic growth in Nigeria, Ghana and South Africa. However, the order of high impact was

South Africa, Ghana and then Nigeria. In terms of causality, remittances granger-caused economic growth in South Africa and Ghana; but in Nigeria, output growth granger-caused remittances.

Atanda and Ogboi (2014) investigated the impact of remittances on economic growth in sub Saharan Africa, looking specifically at the financial development and investment channels. The study estimated two panel data models: fixed effect and random effect. Empirical evidence from the study indicated that: (i) remittances promote growth in both models, and (ii) financial infrastructure of sub-1977 to 2012 (using autoregressive distributed lag bound test for cointegration along Saharan Africa countries) motivated migrants to remit part of their income home. Also, Sharaf (2014) examined the long-run causal link between remittances and output in Egypt. The study used vector error correction model to estimate the short and long-run parameters of equilibrium dynamics. It found that remittances and GDP were cointegrated; that positive casualty existed between remittances and output growth; and that output was not a long-run forcing factor of remittances in Egypt.

Mahedi (2014) noted that despite the huge inflow of remittance into Bangladesh economy, its impact on economic growth and financial development remained inconclusive. In an attempt to resolve the debate, he conducted a twofold analysis: to analyse the impact of remittance on economic growth; and to investigate the interaction of inward remittances with the financial development of Bangladesh in a liberalized regime spanning from 1981 to 2013. The findings, based on vector error correction model (VECM) and Granger causality test, revealed that: a long-run positive relationship existed between remittances and gross domestic product; remittances had a significant positive effect on financial development; economic growth granger-caused remittance; and bidirectional relationship was found between remittance and bank deposit and remittance – money supply running from remittance to bank deposit and money supply.

In a very recent study, Oyejide (2016) analysed the impact of remittances on economic growth and poverty level in Nigeria using various econometric techniques, such as: Johansen cointegration test (to establish long-run relationship among the variables), Granger causality test (to examine pairwise causality), and two stage least square technique (to estimate the impact among variables). The results confirmed that remittances exert positive and significant impact on consumption and economic growth, while GDP is negatively related and significant to consumption.

Theoretical Framework

The new economics of labour migration (NELM)

The NELM approach, as pioneered by Stark and Bloom (1985) and Stark (1991), models migration as risk-sharing behaviour of households. The decision to emigrate is anchored on the need to overcome economically difficult situations arising from financial market failures. It is acknowledged in extant literature that credits are grossly unavailable and, where available, are very expensive. Therefore, in the absence of efficient and accessible insurance and credit systems arising from financial market failures, households emigrate in order to diversify household income shocks. For NELM, the uncertainty of household income is the main reason for migration. In order to diversify the risk of insufficient household income, households send their members abroad in search of 'greener pastures,' who, in turn, send remittances to their relatives left behind. The theory of NELM states that remittances produce positive effect on macroeconomic development of labour-sending countries.

Taylor (1999) observed that there is no consensus yet on the developmental perspective of inward remittances. He stated that if there is labour outflow and remittance inflow volatility, then the labour-sending country would experience output growth volatility and Dutch disease syndrome. In their review, Adelman and Taylor (1990) made some critical observations:

i.   For every dollar remittance inflow to Mexico by migrants, GNP increases by \$2.6 - \$3.17.
ii. Remittance produces robust effect when channelled into rural households, whose consumption and expenditure patterns favour tradable goods. But when migrant remittances flow to urban households, larger proportion of the fund leaks out of the recipient country in the form of import demand.
iii. Many of the benefits of remittance inflow impact on recipient and non-remittance recipient households.

The new economics of labour migration theory was developed in line with certain historical context of Mexican migration in the United States, and this is precisely the basis for which it is often criticized.

Methodology

Model specification

In order to determine the short-run dynamic relationship among the series, a residual series of the long-run model was developed and, subsequently, a test of stationarity was conducted on the residuals. Since the residuals generated were stationary at level, the next step was to estimate the short-run dynamics within an error correction model (ECM) in order to capture the speed of adjustment to equilibrium in the case of independent variables. The model of the series to be estimated was:

$$D LGDPCAP_t = b_0 + \sum b_i D LGDPCAP_{t-1} + \sum a_i D LREMM2_{t-1} + \sum p_i\, D LOPEN + \sum \mathcal{E}_i D LPOP_{t-1} + \sum K\, D INV_{t-2} + {}_1 + W ECM_{t-1}\, 1\, e \quad\quad\quad (1)$$

Where LGDPCAP = natural logarithm of GDP per capita; LGDPCAPt-$_1$ = natural logarithm of one period lag of economic growth per capita; LREMM2 = natural logarithm of interaction of remittances and money supply; LPOP= natural logarithm of population growth rate;; LINV= natural logarithm of productive investment; LOPEN= natural logarithm of trade openness; denotes the first difference of a series b0, b1 , a1, Æl, hI, dI, and Ware the parameters to be estimated; 'I' is the number of lags included for the first difference of both the dependent and independent variables.

Error correction mechanism (ECM)

To estimate the model represented in equation 1, the study initially tested for the stationarity of respective variables. This was necessary, given the recent innovation in econometric modelling, which has indicated that many macroeconomic time series are not stationary in their levels and that many time series are most adequately represented by first difference (Dickey, Jensen and Thornton, 1991). A variable that is integrated of order 1 is denoted a 1(1) series, or such variable is said to be of unit root. To test for the existence of unit root in data series, this study employed the Augmented Dickey Fuller (ADF). The choice of ADF test statistics was informed by the fact that both tests control for higher order autocorrelation.

After the unit root tests, the optimal lag length was determined using both the Akaike information criterion (AIC), and Schwarz information criterion (SIC). In determining the appropriate lag length, the criterion with minimum test statistic was selected. To draw information on the stationarity of variables and the appropriate lag length, a cointegration test was also carried out. Although various approaches for testing cointegration exist, a more robust multivariate approach proposed by Johansen (1988) and Johansen and Juselius (1990) was adopted in this study. Under this approach two likelihood ratio test statistics (that is, trace test and maximum Eigen value test) were used to test the null hypothesis of the cointegrating vectors, in which *r* is less than or equal to *k* (where k = 0, 1 or 2). In each case, the null hypothesis was tested against the general alternative. The maximum eigenvalue statistics, test for the null hypothesis, $k = 0$ against the alternative that $k = 1$; $k = 1$ was tested against the alternative $k = 2$. After performing the unit root and cointegration tests, the time series properties of the variables employed were investigated. Where the variables were 1(1) and 1(0) and cointegrated, an error correction model (ECM) technique was used for the estimation. If two time series *yt* and *xt* were both integrated of order 1 (ie, 1(1)), then any linear combination of the two series were also 1(1), (ie, the residuals generated on regressing *yt* and *xt* were 1(1)). The economic interpretation of cointegration is that if two or more series are linked to form an equilibrium relationship in the long run, even though the series themselves may be nonstationary, their long-run relationship is the equilibrium to which the system converges over time, and the disturbance term can be interpreted as the disequilibrium error or the distance by which the system is away from equilibrium at

time *t*. In order to estimate the long-run relationship between *yt* and *xt*, it was necessary to estimate the static model:

$$yt = bx_t + e_t \qquad\text{----------------------------- (2)}$$

Although the equilibrium long run-relationship can be estimated directly, it is also important to consider the short-run dynamics of the study variables, since the system may not always be in equilibrium. A simple dynamic model of short-run adjustment can be written as:

$$yt = a_{0} + a_1 X_t + a_2 X_{t-1} + b_3 y_{t-1} + \mu t \text{ ---------------- (3)}$$

Rearranging the parameters gives the error correction formulation (ECM):

$$\text{D}yt = a_1 \text{D}xt - (1 - a_1) [y_{t-1} - a_1 - a_0 X_{t-y}] + \mu t \text{----------- (4)}$$

The ECM incorporates both short and long-run effects, when equilibrium holds that:

$$y_{t-1} - a_1 - a_0 X_{t-1}] = 0.$$

But in the short run, when disequilibrium exists, this term is non-zero and measures the distance by which the system is away from equilibrium during time *t*. Thus, (1-$_1$) provides an estimate of the speed of adjustments of the variable *yt*. For instance, if $[y_{t-1} - a_1 - a_0 X_{t-1}] < 0$, that is, *yt*-1 has moved below its equilibrium level, since $1-(1-a_1)$ is negative, it will boost *yt*, thereby forcing it back to its long-run path. In order to ensure that the results were robust, the Johansen/Juselius (1990) multivariate cointegration method was adopted to find the appropriate economic growth function and analyse its behaviour both in the short and long run. The deviations from the long-run path were captured at the second stage. When the coefficient of the lagged residual terms from the first stage was negative, the system came back to the long-run path to adjust. Therefore, there exists an error correction mechanism that returns the system to equilibrium.

Unit root tests results

To examine the existence of stochastic nonstationarity in the series, this study established the order of integration of individual time series through unit root tests. The test of stationarity of the variables adopted were Augmented Dickey Fuller (ADF) and Phillips-Perron (PP), which are stated in generic form as:

Augmented Dickey Fuller (ADF) specification for unit root

This involves the estimation of one of the following three equations (Seddighi, Lawler and Katos, 2000):

$$\Delta X_t = bX_{t-1} + \sum \delta_, \Delta X_{t-j} + a \qquad \ldots\ldots (5)$$

$$\Delta X_t = a_0 + bX_{t-1} + \sum \delta_j, \Delta X_{t-j} + a \qquad \ldots\ldots (6)$$

$$\Delta X_t = a_0 + a_l t + bX_{t-1} + \sum \delta_j, \Delta X_{t-j} + a \qquad \ldots\ldots (7)$$

The additional lagged terms were included to ensure that the error terms were uncorrelated. The maximum lag length begins with 8 lags and proceeds down to the appropriate lag by examining the Akaike information criterion (AIC) and Schwarz information criterion (SIC). The null hypothesis was that variable X_t was a nonstationary series (Ho: $b = 0$) and was rejected when b was significantly negative (H$_1$: $b < 0$). If the calculated ADF statistic were higher than McKinnon's critical values, then the null hypothesis (Ho) was not rejected and the series was nonstatitionary or not integrated of order zero 1(0). Alternatively, rejection of the null hypothesis implies stationarity. Failure to reject the null hypothesis led to the conduct of the test on difference of the series, so further differencing is conducted until stationarity was reached and the null hypothesis rejected.

Table 1: ADF unit root test results

Variables		ADF	
	Level	1st Difference	Remarks
LOGGDPCAP	-0.3858	4.8830***	1(1)
LOGINV	-2.0339	6.1004***	1(1)
LOG POP	-1.7815	4.3308***	1(1)
LOGFDI	-2.2409	-10.2967	1(1)
LOGREMM$_2$	-1.1468	7.0870***	1(1)
LOGOPEN	-1.8455	6.4028***	1(1)

Results and Discussion

The static long-run results show that the variables in the economic growth model in equations 1 tend to move together in the long run, as predicted by economic theory. In the short run, however, deviations from this relationship could occur due to shocks to any of the variables. Besides, the dynamics governing the short run behaviour of economic growth could be different from those in the long run.

Therefore, the short run interactions and the adjustments to long-run equilibrium become necessary because of policy implications. According to Engle and Granger (1987), if co integration exists between nonstationary variables, then an error correction representation of the type specified by equation 1 exists for the variables. Given the fact that the variables of the economic growth equation are cointegrated, the next step is the

estimation of the short-run dynamics with an ECM in order to capture the speed of adjustments to equilibrium in the case of any shocks to any of the independent variables.

Table 2: Over-parameterised estimates

Dependent variable: DLOGGDPCAP
Method: Least squares
Date: 04/11/18 Time: 19:11
Sample (adjusted): 1980 2012
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.008119	0.014909	0.544573	0.5931
DLOGGDPCAP(-1)	0.575051	0.223303	2.575204	0.0197
DLOGGDPCAP(-2)	-0.199154	0.266284	-0.747901	0.4647
DLOGREM*M2	0.026625	0.017809	1.495036	0.1532
DLOGREM*M2(-1)	-0.013775	0.016578	-0.830949	0.4175
DLOGREM*M2(-2)	-0.002059	0.016830	-0.122314	0.9041
DLOGINV	0.002648	0.067064	0.039490	0.9690
DLOGINV(-1)	-0.018706	0.070317	-0.266020	0.7934
DLOGINV(-2)	0.022233	0.060916	0.364983	0.7196
DLOGPOP	2.441646	0.733729	3.327723	0.0040
DLOGPOP(-1)	-1.774703	0.864572	-2.052696	0.0558
DLOGPOP(-2)	1.183961	1.191782	0.993437	0.3344
DLOGOPEN	-0.115089	0.078644	-1.463420	0.1616
DLOGOPEN(-1)	0.043370	0.080776	0.536919	0.5983
DLOGOPEN(-2)	-0.012423	0.088792	-0.139917	0.8904
ECM(-1)	-0.203546	0.423121	-0.481059	0.6366
R-squared	0.656605	Mean dependent var		0.013533
Adjusted R-squared	0.353609	S.D. dependent var		0.084906
S.E. of regression	0.068263	Akaike info criterion		-2.224494
Sum squared resid	0.079217	Schwarz criterion		-1.498914
Log likelihood	52.70414	Hannan-Quinn criter.		-1.980358
F-statistic	2.167043	Durbin-Watson stat		2.462868
Prob(F-statistic)	0.063752			

SOURCE: Author's computation from e-view 2018

The result of the estimates of over-parameterized error correction model for economic growth seems fairly well-estimated. However, it cannot be interpreted in its present form. As it is in the tradition, the over-parameterized model was reduced to achieve a parsimonious model, which is data-admissible, theory-consistent and interpretable. Parsimony maximizes the goodness of fit of the model with a minimum number of explanatory variables. The reduction process is mostly guided by statistical considerations, economic theory and interpretability of the estimates (Adam, 1992).

Thus, the parsimonious reduction process made use of a stepwise regression procedure (through the elimination of variables and their lags that are not significant). Table 3 presents the parsimonious error correction model of inward remittances. A discussion on the parameter estimates of the model would be useful for policy implications and conclusion.

Table 3; Parsimonious short-run estimates

Included observations: 34 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.008767	0.012506	0.701059	0.4891
DLOGGDPCAP(-1)	0.364506**	0.147796	2.466283	0.0200
DLOGPOP	2.041988***	0.603427	3.383983	0.0021
DLOGOPEN	-0.107620**	0.051126	-2.104988	0.0444
DLOGREM*M2	0.039982**	0.014730	2.714383	0.0112
ECM(-1)	-0.543872**	0.250699	-2.169420	0.0387
R-squared	0.511003	Mean dependent var		0.019821
Adjusted R-squared	0.423682	S.D. dependent var		0.091296
S.E. of regression	0.069308	Akaike info criterion		-2.341739
Sum squared resid	0.134499	Schwarz criterion		-2.072381
Log likelihood	45.80956	Hannan-Quinn criter.		-2.249880
F-statistic	5.852016	Durbin-Watson stat		1.400333
Prob(F-statistic)	0.000803			

Note: ***, **, * denotes 1%, 5% and 10% level of significance respectively

A careful observation of the overall fit of the model shows that the parsimonious model have better fit, as indicated by the probability of F-statistic (0.0000) and is significant at 99 per cent confidence level. The most interesting finding here is that the interaction that captures the logical channel of transmissions to economic growth (hence, the focal variable (REMM2)) remains significant in both the over-parameterized and parsimonious models. The relationship between economic growth and remittances (table 3) indicates that inflow of remittances spurs growth in the short term. This is in line with the findings of Ogboi and Mustapha (2014) and Ogboi (2016). The present result is an improvement on the findings of Ogboi and Mustapha (2014) as it relates remittances with financial sector development. Again, the positive sign observed in the interaction of remittances and financial development variable lend credence to previous studies, that remittances complement the deepening of the Nigerian financial market.

The implication, therefore, is that policies on international capital flows and fund transfer should be remittance-promoting so as to increase remittance contributions to output growth. The coefficient is highly significant at 95 per cent confidence level. This shows the alternative hypothesis that inward remittances promote economic growth using Nigeria data is acceptable. The result also suggests that inward remittances and money supply (REMM2) has the correct signs. A unit change in inward remittances will lead to an increase of 0.039 unit change in economic growth in the short run.
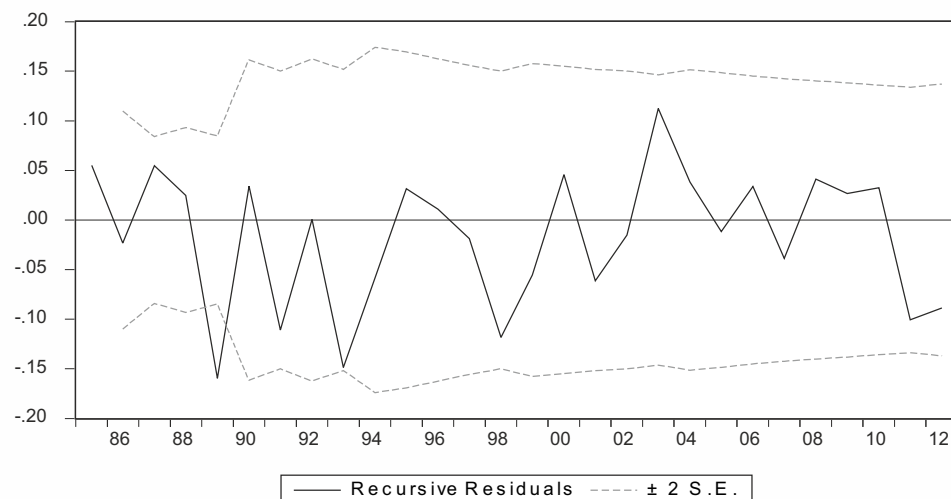
In the analysis of the estimates of the short-run elasticities, as well as the error correction mechanism, it can be observed that the coefficient of ECM (-1) carries the expected negative sign and it is highly significant at the 5.0 per cent level. The significance of ECM supports cointegration and suggests the short-term steady–state equilibrium between economic growth and inward remittances, investment, population growth rate, trade openness, final consumption expenditure, lending rate and banking sector development. In fact, the ECM indicates a feedback of about 54 per cent of the previous years' disequilibrium from the short-run elasticity of inward remittances (REM), money supply, and trade openness (OPEN). The error correction term which measures the speed at which economic growth adjusts to changes in foreign capital inflow, financial sector development, investment openness in order to achieve short-term equilibrium is moderate.

The parsimonious model indicates that economic growth in a particular year is determined by first year lags of GDP per capita, population POP, trade openness and the interaction of remittances and money supply. The R-squared of 0.51 indicates that about 51 per cent of variation in economic growth is explained by the final variables that entered the parsimonious model. This F-test statistic of 5.85 shows that the overall fit is significant at 1.0 percent.

In the same vein, one unit change in population growth will lead to a rise of 2.04 unit change in economic growth in the short-run and the coefficient will be wrongly signed at 5.0 per cent level of significance. The result further showed that in the short-run, a unit change in trade openness will retard growth in the current period and will be statistically significant at 1.0 per cent level of significance.
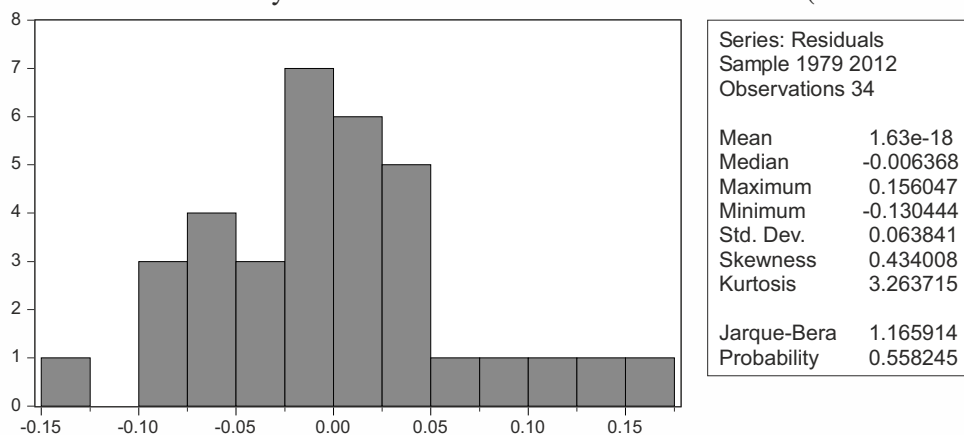
Table 4; Robustness checks

Breusch-Godfrey serial correlation LM test		
F-statistic	1.228170 Prob. F(2,26)	0.3093
Obs*R-squared	2.934867 Prob. Chi-Square(2)	0.2305

Source: Authors computation from e-views 2018

The robustness of the model was further established, using several diagnostic tests, such as Breusch–Godfrey LM serial autocorrelation of residuals test (H:

no autocorrelation), ARCH Jacque–Bera- normality test for distribution of residual term (Ho: normality) and Cusum (recursive OLS estimate) stability test. Consequently, the outcomes reported were serially uncorrelated, stable and normally distributed (parameter estimates were free from outliers). The Durbin-Watson statistic, which measure serial correlation, showed the presence of positive autocorrelation. However, the study did not take cognizance of the result, as the model specification violated a critical assumption of Durbin-Watson theoretical framework. The use of Durbin 'h' test was provided as alternative measure.

Conclusion and Recommendations

This study has examined the relationship between inward remittances, financial sector development and economic growth in Nigeria. The econometric analysis showed that inward remittances complement the financial system to spur output growth in Nigeria. This is indicated by the positive relationship observed for the coefficient of the interaction between remittances and money supply. This result is quite robust and explains why monetary policies towards channelling remittance inflow into productive investment are imperative. Based on the findings and conclusion, the following recommendations are made:

1.   The positive relationship between inward remittances/financial sector development and output growth implies that inward remittance through the official channels has the potential to promoting economic growth in Nigeria, just like other foreign capital flows, such as foreign direct investment. The monetary authorities should therefore formulate policies to expand remitting channels. The inclusion of MFI/MFBs and Bureau de Change (BDCs) in remitting channel could afford remittance recipient households, especially rural dwellers, the avenue to assess their remittance receipts with ease without having to travel to the urban areas in search of deposit money banks.

2.   The recently established Diaspora bonds by federal government are a step in the right direction in harnessing these inflows. However, deposit money banks should develop and market remittance-related products to remittance recipient households. This will go a long way in making loanable funds available to entrepreneurs to embark on profitable businesses even at reduced interest rates.

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