Workers' Remittances – Economic Growth Nexus: Evidence from Nigeria, Using An Error Correction Methodology[1]

Emmanuel Uzodinma Ukeje
Director
Financial Markets Department
Central Bank of Nigeria, Abuja

Michael Emeka Obiechina
Senior Economist
Financial Markets Department
Central Bank of Nigeria, Abuja

Abstract

The paper investigates the empirical impact of the workers' remittances on economic growth in Nigeria. Using a time series data, from 1970-2010 in an error correction methodology (ECM), the long-run static model indicates that workers' remittances is significant and has positive impacts on economic growth. Furthermore, the short-run dynamic model revealed that the lagged value of workers' remittances is significant and impacts positively on economic growth. The coefficient of the error correction term (ECT) in the short-run dynamic model is statistically significant and appropriately signed. Consequently, the paper recommends the need to provide adequate infrastructure for attracting more remittances into the economy through formal financial sector channel as well as measures encouraging the recipients to channel such into productive sector or through domestic savings that would boost investment and economic growth, rather than enmeshed in non-productive activities.

Keywords: Remittance, Economic Growth, Foreign Direct Investment, Export and Foreign Exchange

JEL Classification: F24, F43, E22, F13 and F31

(1.0) Introduction

Remittances are becoming very important source of foreign financial flows, especially in developing countries, both in size and growth rate, exceeding the inflows of most forms of financial flows. The true size of remittances as well as unrecorded flows through formal and informal channels is believed to be significantly large (Gammeltoft, 2002;Ratha, 2007). Recorded remittances are more than twice as large as official aid and nearly two-thirds of foreign direct investment (FDI) flows to developing countries. The enormous upward movement in remittances payments may be attributed largely to two factors, namely; immigration between developing and developed countries has increased dramatically in the past 20 years (World Bank 2007) and decline in transaction costs as technological improvements have allowed for faster, lower cost mechanisms for the international transfer of payments between individuals (Guiliano & Ruiz-Arranz 2006).

Remittances received by developing countries rose from US$2.98 billion in 1975 to US$90.0 billion in 2003 and was estimated at US$221 billion in 2006, indicating an increase of132.0 per cent compared to 2001 figures, and 1.9% of total income in emerging economies (World Bank, 2008).In 2007, there was a sharp increase, over US$300 billion of workers' remittances were transferred worldwide through official channels, and it was likely that billions more were transferred through unofficial ones[2].

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[1]Views expressed in the paper are those of the authors and do not necessarily represent the position of the Central Bank of Nigeria (CBN).
[2]World Bank (2009)

Furthermore, the worldwide remittance flows was estimated to have exceeded US$414 billion figure in 2009, of which US$307 billion went to developing countries. In 2010, worldwide remittance flows was estimated to have exceeded US$440 billion. From that amount, developing countries received US$325 billion, which represents an increase of 6 percent from the 2009 level(World Bank, 2011). In 2011, this figure was expected to have reached US$351 billion in 2011, up by 8.0 per cent compared to the $325 billion recorded in 2010[3].

In Sub-Saharan Africa (SSA), Nigeria topped the list of remittance recipients' nations in 2010 with US$10.0 billion, followed by Sudan (US$3.2 billion), Kenya (US$1.8 billion), Senegal (US$1.2 billion), and South Africa (US$1.0 billion). This figure rose to US$11.0 billion (₦1.727 trillion) in 2011 from US$10.0 billion in 2010, and the highest for any African country[4]. Undoubtedly, foreign direct investment (FDI) and foreign Portfolio investment (FPI) dominated the foreign financial flows into Nigeria and these became very prominent after the abrogation of certain obnoxious laws and introduction of some economic reforms; the Exchange Control Act of 1962, Section 7 of the Act, stipulates that "nobody within Nigeria could make any payment to anybody outside Nigeria or make such payment on behalf of anybody resident outside Nigeria without the permission of the Minister of Finance", Companies Act of 1968, Nigerian Enterprises Promotion (NEP) Act of 1972 and their subsequent replacements with Foreign Exchange (Monitoring and Miscellaneous Provisions) Decree 17 of 1995, Nigerian Investment Promotion Council Decree No 16 of 1995 and publication of Industrial Policy for Nigeria in January, 1989 provided foreign investors enormous impetus to participate in the economy. The Company and Allied Matters Act 1990 and Nigerian Investment Promotion Commission (NIPC) decree No. 16 of 1995 (Ukeje & Obiechina, 2010). However, from1999-2010, the Workers' Remittances/GDP ratio exceeded Foreign Direct Investment/GDP ratio, except during the period, 2002-2003. Workers' remittances rose from less than US$1 million (₦0.46million)in 1970 to US$22 million (₦11.98million) a decade later. Between 1990 and 2000, the figure increased from US$10 million (₦90.01million) to US$1,618 million (₦177, 251.90million).

Despite the global financial and economic crisis that impeded private capital flows into economies, remittance flows into Nigeria has remained resilient. Between 2007 and 2011, it increased byUS$17,945.94 million (₦2,117,046.65million),US$19,200million (₦2,545,209.60million), US$18,432.00 million (₦2,757,076.99million), US$19,814.40 million (₦2,985,277.13million) and US$11 billion (₦1.727 trillion), respectively. While, it may be argued that Workers' Remittances/GDP ratio has been witnessing tremendous growth in Nigeria, it was highest in 2005, with a ratio of 13.04 per cent. However, its ratio of 11.0 per cent in 2009 is small compared to the top ten (10) countries remittance recipients in 2009 (percentage of GDP): Tajikistan (35.1percent), Tonga (27.7 percent), Lesotho (24.8 percent), Moldova (23.1percent), Nepal (22.9 percent), Lebanon (22.4 percent), Samoa (22.3percent), Honduras (19.3 percent), Guyana (17.3 percent), El Salvador(15.7 percent). In average, for the period, 1970-2010, the Workers' Remittances/GDP ratio is 8.31 per cent in Nigeria, whereas Chami et al (2008) reported that the average workers' remittances/GDP ratio for all developing countries over the period 1995-2004 is 3.6 per cent. On a country-by-country basis, workers' remittances exceeded 1% of GDP (on average) for over 60 countries during this period, and seven of these countries had average workers' remittances/GDP ratios of 15.0 per cent or higher. As the Workers' remittances continue to grow in Nigeria, the nation's export capacity progressed, driven mostly by the oil sector. The export rose from ₦885.67 million (US$1,239.91 million) in 1970 to ₦1, 4186.7 million (US$25,963.95 million) in 1980 and further ₦109, 886.10 million (US$13,671.15 million), ₦1, 945,723.30million (US$19,302.50 million) and ₦11, 035,794.50 million (US$ 73248.16million) for 1990, 2000 and 2010, respectively. Notwithstanding the increasing growth of remittances, there are divergent scholarly opinions as regards its impact on economic growth and development[5].

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[3] Report by the Development Economics (DEC) and Poverty Reduction and Economic Management (PREM) Network

[4]World Bank Report on Global Migration and Remittances titled Outlook for Remittance Flows 2012-14

[5] (Adams and Page, 2005; Acosta et al, 2008; World Bank, 2008) argued that migrant remittances impact positively on the balance of payments in many developing countries as well as enhance economic growth, via their direct implications for savings and investment in human and physical capital and, indirect effects through consumption. Conversely, (Amuedo-Dorantes & Pozo, 2004; López et al, 2007) posited that remittances, like capital flows can appreciate the real exchange rate in recipient economies and therefore generate a resource allocation from the tradable to the non-tradable sector (Acosta et al, 2007). An improved household real income could lead to growth in aggregate demand of non-tradable goods compared to exogenously given prices of tradable goods (spending effect), and thus, would cause further movement of

Nonetheless, it is important to investigate whether remittances have any long-term effects on economic growth, considering its unprecedented growing level in the current account of the Nigeria's Balance of Payment (BOP). Knowing, that remittances are essentially unrestricted private financial flows that could finance investment and consumption, an empirical inquiry into its impact on the economic growth would nevertheless avail policymakers the information of how best to formulate and implement sound policies that would maximize its overall impact on the economy. Following this introduction, section 2 presents the conceptual framework and review of relevant literature. Section 3 explains workers' remittances, foreign direct investment (FDI), Export and economic growth in Nigeria. Section 4 presents method of analysis and model specification, while Section 5 presents empirical result analysis and conclusion.

(2.0) Conceptual Framework and Empirical Literature

(2.1) Conceptual Framework

Workers' remittances are transfers from international migrants to family members in their country of origin. It represents one of the sources of financial flows to developing countries. Remittance is different from other external capital inflow like foreign direct investment, foreign loans and aids due to its stable nature, (Kapur, 2006; Shahbaz et al, 2008).Remittance can affect economic growth and development through micro and macroeconomic activities. Nonetheless, the drive for encouraging increased workers 'remittances is to promote economic growth and development. The potential channels of the positive effects of remittance inflows on the growth and development prospects of developing economies include how these remittances impact on domestic investment, balance of payments, ease domestic credit constraints, exports, diversification of economic activities, levels of employment and wages, human capital development and technological progress. Barajas et al (2009) pointed out three channels through which remittance could affect economic growth and development, using growth accounting framework. One, by directly financing an increase in capital accumulation relative to what would have been observed if the recipient economies had been forced to rely only on domestic sources of income to finance investment. Two, by labor inputs through labor force participation and third, may affect total factor productivity (TFP) growth through effects on the efficiency of domestic investment as well as the size of domestic productive sectors that generate dynamic production externalities. Furthermore, remittance could affect economic growth and development, using the Mundell-Flemming framework[6]

(2.0) Empirical Literature

There are diverse scholarly opinions to the impact ofworkers' remittances on economic growth and development. Adams and Page, (2005); Acosta et al, (2008) and World Bank, (2008) argued that migrant remittances impact positively on the balance of payments in many developing countries as well as enhance economic growth, via their direct implications for savings and investment in human and physical capital and, indirect effects through consumption. Ratha (2003) concludes that remittances increase the consumption level of rural households, which might have substantial multiplier effects, because they are more likely to be spent on domestically produced goods. Conversely, Amuedo-Dorantes & Pozo, (2004) and López et al, (2007) posited that remittances, like capital flows can appreciate the real exchange rate in recipient economies and therefore generate a resource allocation from the tradable to the non-tradable sector (Acosta et al, 2007; Rodrik, 2007). Rodrik (2007) provided evidence that real exchange rate overvaluation undermines long-term economic growth, particularly for developing countries, in that in those countries tradable goods production suffers disproportionately from weak institutions and market failures.

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resources toward this sector away from the tradable sector (resource movement effect). A rise in the relative price of non-tradable goods leads to a real exchange rate appreciation.

[6] The Mundell-Flemming model extended the IS-LM Model, provides a good alternative to analyze the short-run dynamics of international transfers on national output. Its central focus is that the effect of international transfers or remittances on national output would depend on the mobility of capital and whether or not an economy is operating a fixed or floating exchange rate regime. In the IS-LM model, the domestic interest rate is a key component in keeping both the money market and the goods market in equilibrium. Under the Mundell–Fleming framework of a small economy facing perfect capital mobility, the domestic interest rate is fixed and equilibrium in both markets can only be maintained by adjustments of the nominal exchange rate or the money supply (by international funds flows). Also, Lartey et al (2008) uses the Salter-Swan-Corden-Dornbusch paradigm as the theoretical underpinning for analyzing the impact of capital inflows on thereal exchange rate in developing economies. The model showcases the transmission mechanism by which an increase in capital inflows(remittances in this case) could cause a real exchange rate appreciation.

Lipton (1980), Ahlburg (1991) and Brown & Ahlburg (1991) argued that remittances undermine productivity and growth in low-income countries because they are readily spent on consumption likely to be dominated by foreign goods than on productive investments. The positive developmental effects of remittances focuses on the multiplier effects of consumption (Stahl and Arnold, 1986), development of the financial institutions that handle remittance payments (Aggarwal et al., 2006), use of remittances as foreign exchange (Ratha, 2005), and the role of remittances as an alternative to debt that helps alleviate individuals' credit constraints in countries where micro-financing is not widely available (Guilamo and Ruiz-Arranz 2006). Barajas et al (2009) explained that remittances are likely to expand the quantity of funds flowing through the banking system. This in turn may lead to enhanced financial development and thus to high economic growth through one or both of two channels: (1) increased economies of scale in financial intermediation, or (2) a political economy effect, whereby a larger constituency (depositors) is able to pressure the government into undertaking beneficial financial reform. Remittances provide the catalyst for financial market and monetary policy development in developing countries. Guilano and Arranz (2005) study found that remittances improve credit constraints on the poor, improve the allocation of capital, substitute for the lack of financial development and thus accelerate economic growth. Iqbal and Sattar (2005) found that in the absence of worker remittances, it was likely that exchange rate, monetary and fiscal policies will come under pressure. Nevertheless, Barajas et al (2009) pointed out that the more highly integrated an economy is with world financial markets, and the more highly developed the domestic financial system, the less likely it is that remittance receipts will stimulate investment by relaxing credit constraints.

Using, estimated dynamic simultaneous Keynesian type model for investigating the impact of remittances on consumption, investment, imports and output for eight countries including Algeria, Egypt, Greece, Jordan, Morocco, Portugal, Syria and Tunisia for the period of 1969-1993 and then further extended in the other study that is, 1969-1998,Glytsos (2002, 2005) findings for both studies pointed out that the effect of remittances on growth is partial and in several years negative impact of remittances to growth is observed. Chami and Jahjah (2003) found that migrants' remittances have negative impact on growth in per capita incomes. The study reported three stylized facts: first, that a "significant proportion, and often the majority," of remittances are spent on consumption; secondly, that a smaller part of remittance funds goes into saving or investment; and thirdly, the ways in which remittances are typically saved or invested - in housing, land and jewelry - are "not necessarily productive" to the economy as a whole. Rao and Hassan (2009) explained the effects of remittances on growth by using the Solow growth model. The study found that migrant remittances have positive but marginal effect on growth.

In Nigeria, Agu (2009) used a four-sector medium scale macro model to study the relationship between remittances flows and the macro economy in Nigeria. The study revealed a weak link between remittances and the real sector and components of aggregate demand. He pointed out that the existence of leakages of remittances proceeds through imports could be responsible for the weak nexus. Tomori and Adebiyi (2007) and Chukwuone et al(2007) using partial equilibrium framework and living standard survey in their respective studies of the effect of remittances on poverty levels argued that remittance is an important channel to alleviate poverty in developing countries. Udah (2011) showed that remittances affect economic performance in Nigeria through its interaction with human capital and technology diffusion. In addition, he argued that government capital expenditure on economic and social services is equally important in accelerating the pace of economic growth and development.
Similarly, Quartey (2005) found that remittances positively impact economic growth and reduced poverty in Ghana. In a related study of developing countries, using panel data, Natalia et al. (2006) investigated the impacts of remittances and economic growth. They found positive impact of remittances on economic growth. They also concluded that a sound institutional environment can affect the volume and efficiency of investment. Fayissa and Nsiah (2008) investigated the impact of remittances on economic growth for 37 African countries. The study showed that migrants' remittances as well as institutional variable have positive impacts on economic growth. Jongwanich (2007) investigated the impact of workers' remittances on growth and poverty reduction in developing Asia-Pacific. The results indicated that, while workers' remittances have a significant impact on poverty reduction through increasing income, smoothing consumption and easing capital constraints of the poor, but they have marginal impact on growth working through domestic investment and human capital development.

Recently, some studies on the impact of workers' remittances on growth and development applied the Bound test[7]in their analyses. Olubiyi (2009) in his study, found that workers' remittances to have a positive effect on demand deposit, liquidity and Deposit Money Bank (DMB) credit and loan in Nigeria. Kumar (2010) examined the relationship between remittance inflow and economic growth of the Philippines. He found that remittances have positively affected economic growth. Ahmed et al (2011) suggested that remittances have both the long and short-run relationship with economic growth of Pakistan. Remittances in the short and long-run stand out to be statistically significant and co-integrated to economic growth.

(3.0) Workers' Remittances, Foreign Direct Investment, Export and Economic Growth

Nigeria, like most developing countries has benefited immensely from foreign financial flows. Between 1960s and 70s, most flows into Nigeria were directed to governments in the form of overseas development assistance (ODA) or to the private sector through the banking system. This situation changed in the 1980s, and foreign flows took the form of Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI) (Obadan, 2004). Prior to 1986, Nigeria did not record any figure on portfolio investment (inflow or outflow) in her Balance of Payment (BOP) accounts[8].For decades, the FDI dominated the foreign financial flows to Nigeria, but, recently, the workers' remittances have taken the center-stage. As observed by Barajas et al, (2009), workers' remittances - transfers from international migrants to family members in their country of origin - represent one of the largest sources of financial flows to developing countries. The decline in the other external flows, such as foreign direct investment and portfolio investment could be attributed to the uncertainty in the political environment as well as the Global Financial and Economic Crises. Remittances from abroad to Nigeria have continued to grow unabated. Meanwhile, the nature of migration phenomenon in Nigeria took two different epochs after her independence in 1960. Post-independence migration periods, took the form of Nigerians moving abroad to acquire west education due to apparent dearth of manpower at home. During this period, the ultimate goal was to acquire education and relevant skill gaps that would fill the job spaces whereas the drive to remit money home was very remote. Thereafter, especially from the early 1980s, migration took different dimension. Migrants left for different reasons – and could be mostly grouped as economic migrants[9]. According to the estimates of the Presidential Committee on Brain Drain in Nigeria set up in 1988 by the Gen. Ibrahim Babangida administration, between 1986 and 1990, the country lost 10,694 professionals from tertiary institutions, whiletotal estimates, including those who left public, industrial and private organizations, are over 30,000. Ever since then, the figure has continued to grow.

While acknowledging that migration of Nigerians to abroad has been on the increase, the remittances thereof have increased tremendously. Workers' remittances rose from less than US$1 million (₦0.46million) in 1970 to US$22 million (₦11.98million), a decade later. Between 1990 and 2000, the figure increased from US$10 million (₦90.01million) to US$1,618 million (₦177, 251.90million). Between 2007 and 2011, it increased from US$17,945.94 million (₦2, 117,046.65million), US$19,200 million (₦2, 545,209.60million), US$18,432.00 million (₦2, 757,076.99million), US$19,814.40 million (₦2,985,277.13million) and US$11 billion (₦1.727 trillion), respectively. In average, from 1970-2010, the Workers' Remittances/GDP ratio was 8.31 per cent compared to 0.08 per cent for the Foreign Direct Investment/GDP ratio. As the Workers' remittances continue to grow, the nation's export capacity progressed, driven mostly by the oil sector. Prior to advent of oil as the major sources of foreign exchange earnings, the Nigeria's export was dominated by agricultural sector (Obiechina, 2007).

The export rose from ₦885.67 million (US$1,239.91 million) in 1970 to ₦1, 4186.7 million (US$25,963.95 million) in 1980 and further ₦109, 886.10 million (US$13,671.15 million), ₦1, 945,723.30 million (US$19,302.50 million) and ₦11, 035,794.50 million (US$ 73248.16 million) for 1990, 2000 and 2010, respectively. During the period, 1970, 1980, 1990, 2000 and 2010, the nominal GDP grow by ₦5,281.10 million (US$7,393.39 million), ₦49,632.30 million (US$90,835.10 million), ₦267,550 million (US$33,286.44 million), ₦4,582,127.30 million (US$45,456.89 million) and ₦29,108,670.82 million (US$193,203.72 million), respectively, whereas the real GDP grow by 1.3, 16.1, 3.6, 14.5 and 11.8 per cents for the same period.

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[7]Persaran, et al (2001) provides the Bound test as an alternative to Johansen and Juselius (1990) and Johansen (1991, 1995) co-integration testing for long-run relationship among economic variables, notwithstanding the degree of stationarity.

[8] Attributable to the non-internationalization of the country's money and capital markets as well as the non-disclosure of information on the portfolio investments of Nigerian investors in foreign capital/money markets (CBN, 1997)

[9] It is not all the migrants were economic migrants – some left for reasons of political intimidation, insecurity of lives and properties, unleveled playing grounds for citizens, actualization of their potentials etc.

(4.0) Method of Analysis and Model Specification

(4.1) Data

The data source is from the various issues of the Central Bank of Nigeria Annual Reports and Statement of Account and Statistical Bulletin as well as the International Financial Statistics (IFS), which includes nominal Gross Domestic Product (NGDP), Workers Remittances (REM), Foreign Direct Investment (FDI), Export (EXPT) and nominal Foreign Exchange (EXCH).

(4.2) Methodology

The methodological framework adopted in this paper is the Log-log specification model[10] specified in (4.3). The series used in the analysis are annual observation expressed in natural logarithms with sample period, from 1970-2010. The series were tested for unit roots[11], using the Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981) and Philip Perron (PP)due to Phillips (1987) and Phillips and Perron (1988)at one (1) and five (5) per cent significant levels, and their results were presented on Tables2a &2b, complemented with graphical analysis (Appendices 2 & 3).Thereafter, a co-integration test was conducted among the variables to determine whether there exist co-integrating vector(s)[12]. Then, the static long-run model was derived, applying the Ordinary Least Square (OLS) technique. Meanwhile, 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 residual (Figures2a & 2b). Subsequently, we proceed to use the ECM. The ECM enables us to capture both the short-run and long-run dynamics of the variables in the model. Furthermore, the robustness of the model was established, using several diagnostic tests such as Breusch-Godfrey serial correlation LM test, ARCH and White test for homoskedastic, Jacque-Bera normality test and Cusum Test for stability.

(4.3) Model Specification

In analyzing the static long-run relationship and short-run dynamic relationship among nominal Gross Domestic Product (NGDP), Workers Remittances (REM), Foreign Direct Investment (FDI), Export (EXPT) and Foreign Exchange (EXCH), we specify the model as follows;

$$NGDP_t = \alpha_0 + \alpha_1 REM_t + \sum_{i=1}^{m} \alpha_1 Z_{it} + \mu_t \text{---} (1)$$

Where, Z is a vector of other control variables that affect nominal GDP (Used as proxy for economic growth) in the model. Thus, the control variables used are Foreign Direct Investment (FDI), Export (EXPT) and Foreign Exchange (EXCH). The μ is the error term, while t is the time period from 1970-2010. The function can also be represented in a log-linear econometric form:

$$logngdp_t = \alpha_0 + \alpha_1 logrem_t + \alpha_2 logfdi_t + \alpha_3 logexpt_t + \alpha_4 logexch_t + \mu_t \text{--}(2)$$

We represent equation (2) with an error correction form that allows for inclusion of long-run information thus, the error correction model (ECM) can be formulated as follows:

$$logngdp_t = \alpha_0 + \sum_{t=1}^{n} \alpha_{1t} log\Delta fdi_{t-1} + \sum_{i-1}^{n-1} \alpha_{2t} log\Delta expt_{t-1} + \sum_{i-2}^{n-2} \alpha_{3t} log\Delta exch_{t-1} + \lambda\, ECM_{t-1} + \mu_t \text{-----------------------} (3)$$

Δ is the first difference operator and λ is the error correction coefficient and the remaining variables are as defined above.

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[10] The model provided an improvement of the responsiveness of the dependent variable to a certain percentage change in any of the independent variables. The model follows Guiliano and Ruiz-Aranz (2005), Aggarawai et al (2006) and Olubiyi (2009)

[11] The econometric software used for the various test is EViews Version 7.2.

[12] For the case of one (1) co-integrating vector, it is probably best to estimate such co-integrating vector by OLS as it should yield super-consistent estimate (Engel and Granger, 1987)

(5.0) Empirical Result Analysis and Conclusion

(5.1) Empirical Result Analysis

In all, various models were developed and variables contained therein, Gross Domestic Product (NGDP), Workers Remittances (REM), Foreign Direct Investment (FDI), Export (EXPT) and Foreign Exchange (EXCH) that are not statistically significant were removed, using various information criteria and diagnostic tests from the model results, such as probability values (p-values), redundancy and omitted variables tests.

(5.1.1) Unit Root Test for Stationarity of Series

We conducted a unit root test to know if the variables in equation (2) are stationary and to determine their orders of integration. We used both the Augmented Dickey Fuller (ADF) and Phillips-Perron (PP) tests to find the existence of unit root in each of the time series. The results of both the ADF and PP tests indicated that all the series were stationary and integrated of order one $I(1)$ as reported in Table 2a and 2b.

(5.1.2) Co-integration Test

Having confirmed the stationarity of the variables at $1(1)$, we proceed to examine the presence or non-presence of cointegration among the variables. A co-integration relationship in the model means that Gross Domestic Product (NGDP), Workers Remittances (REM), Foreign Direct Investment (FDI), Export (EXPT) and Foreign Exchange (EXCH) share a common trend and long-run equilibrium as suggested theoretically. We started the co-integration analysis by employing the Johansen and Juselius multivariate co-integration test. The Table 3 indicated that Trace statistic has two (2) co-integration equations and Maximum Eigen value statistic indicates one (1) co-integration equation at the 5 percent level of significance, suggesting that, there is co-integrating (long-run) relations between the variables tested. Thus, establishment of presence of co-integration among variables avails the econometrician the opportunity of using an error correction model (ECM) to separate long-run equilibrium relationship from the short-run dynamics.

(5.1.3) Error Correction Model (ECM)

The static long-run model results from the estimated equation, which examines nominal Gross Domestic Product (Proxy for economic growth), indicates that only changes in export (EXPT) and workers' remittances (REM) significantly and positively influence economic growth (NGDP), while changes in FDI and EXCH do not. The changes in the FDI and EXCH met the aprori expectations, though they were not significant in explaining changes in the NGDP. In accordance with apriori expectation, the EXPT and REM indicated that a percentage point increase in the former increases the NGDP by 0.79 percentage point, whereas a percentage point increase in the latter increases the NGDP by 0.08 percentage point (Table 4).Furthermore, from the long-run, the residuals of the series indicated an $I(1)$ order of integration, therefore, confirming that the variables are co-integrated and as such, dynamic models were developed with an error correction mechanism (ECM) Tables 5 & 6. While the Table 5, indicates the over-parameterized model, which was reduced through the elimination of insignificant variables and those that did not conform to economic theory to arrive at a parsimonious model as shown in Table6.

The parsimonious short-run dynamic model showed that a mix of the explanatory variables was significant at either 1.0 or 5.0 per cents level. The changes in the contemporaneous values of export (EXPT) and foreign direct investment (FDI) as well as the lagged value of workers' remittances (REM) significantly and positively affected NGDP (economic growth). Thus, indicating that one per cent change in current EXPT and FDI as well as lagged REM would result in 0.40, 0.05 and 0.04 per cents increase in NGDP, respectively. However, the exchange rate (EXCH) did not affect economic growth. The model's statistics is very plausible and robust. The coefficient of determination indicated by (R^2) shows that about 82.0 per cent of the variations in nominal GDP (economic growth) are explained within the model. The overall regression result measured by F-statistic (Prob./.000000) is significant, indicating a good fit for the model. The error correction term (ECM), which measures the speed of adjustment from the short-run dynamic equilibrium to the long-run equilibrium static state conforms to the apriori expectation and significant as required for dynamic stability. The estimated coefficient indicates that about 29 percent of the errors in the short-run are corrected in the long-run, while the Durbin-Watson statistic, which measure serial correlation, has the required property.

(5.1.4) Further Diagnostic Tests of the Model

The robustness of the model was further established, using several diagnostic tests[13] such as Breusch-Godfrey LM serial autocorrelation of residuals test (H_0: no autocorrelation), ARCH Test for autocorrelation conditional heteroscedasticity (H_0: no heteroscedasticity)and White Test for heteroscedasticity (H_0: no Heteroscedasticity), Jacque-Bera normality test for distribution of residual term (H_0: normality)and Cusum Test (Recursive OLS Estimate) stability test. Consequently, the outcomes reported are serially uncorrelated, homoskedastic,normally distributed and stable. All the tests disclosed that the model has the aspiration of econometric properties, it has a correct functional form and the model's residuals are serially uncorrelated, normally distributed (Table 7).

(5.2) Conclusion

We attempt to offer evidence on the impacts of workers' remittance and a vector on nominal gross domestic product (economic growth). The vector is foreign direct investment (FDI), export (EXPT) and exchange rate (EXCH) in Nigeria. The series used in the analysis was tested for stationarity, using Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP). The results indicated that the variables are not stationary at level, though stationary at first difference I(1). On the Johansen Co-integration test, it shows the presence of long-run relationship among the co-integrating variables. Furthermore, an error correction model (ECM) was developed from long-run static model. The error correction term in the short-run dynamic model has a statistically significant coefficient with the appropriate negative sign and this is a requirement for dynamic stability of the model (Table 6). The model indicated that all the variables are statistically significant, except the EXCH, while its potency was further confirmed by the results of the diagnostic tests.

Therefore, given the significant positive contribution of workers' remittance inflows to economic growth in view of our empirical findings, it is recommended that government should put in place, adequate infrastructure for attracting more remittances inflow into the economy through formal financial sector channel as well as encouraging the recipients to channel such funds into productive sector rather than enmeshed in non-productive activities. Furthermore, considering that financial flows are very important because of their potential effects on the macroeconomic stability, monetary and exchange rate management as well as competitiveness of the export and external sectors viability of a country, government policy should be directed at encouraging domestic savings that would boost investment and economic growth.

Figure 1: Foreign Direct Investment (FDI) Inflow, Outflow and Net Flow In Nigeria
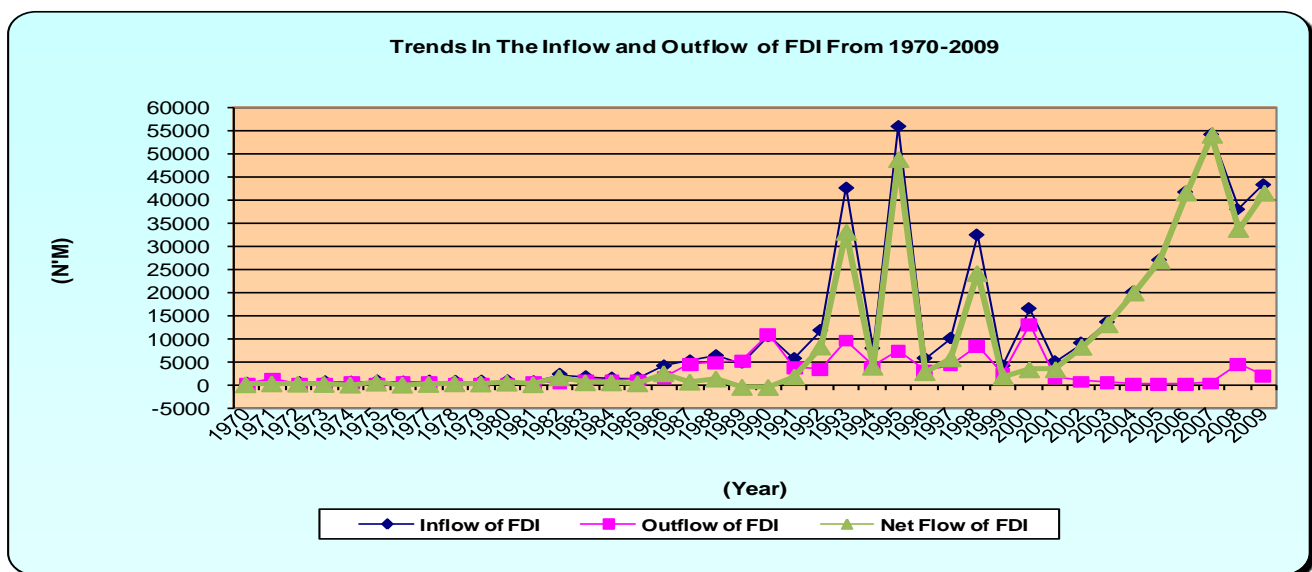
Source: Computed from various issues of the CBN Statistical Bulletin

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[13] For all the diagnostic tests, a low F-statistic value with a corresponding high probability value (P-value) greater than 5.0 per cent or (0.05) is an indication of good result.

Table 1: Gross Domestic Product, Foreign Direct Investment, Remittances andExport In Nigeria

Year	GDP at Current Market Price (N'Million)	Net Foreign Direct Investment (N'Million)	Net Foreign Direct Investment As Proportion of GDP (%)	Remittances (N'Million)	Remittances As Proportion of GDP (%)	Export (N'Million)	Export As Proportion of GDP (%)
1970	5,281.10	128.60	2.44	0.46	0.01	885.67	16.77
1971	6,650.90	142.80	2.15	1.13	0.02	1,293.40	19.45
1972	7,187.50	297.80	4.14	1.83	0.03	1,434.20	19.95
1973	8,630.50	186.30	2.16	2.53	0.03	2,278.40	26.40
1974	18,823.10	181.60	0.96	0.39	0.00	5,794.80	30.79
1975	21,475.20	253.00	1.18	1.38	0.01	4,925.50	22.94
1976	26,655.80	212.50	0.80	2.38	0.01	6,751.10	25.33
1977	31,520.30	245.50	0.78	13.03	0.04	7,630.70	24.21
1978	34,540.10	134.40	0.39	1.94	0.01	6,064.40	17.56
1979	41,974.70	184.30	0.44	4.48	0.01	10,836.80	25.82
1980	49,632.30	(404.10)	(0.81)	11.98	0.02	14,186.70	28.58
1981	47,619.70	334.70	0.70	10.19	0.02	11,023.30	23.15
1982	49,069.30	290.00	0.59	12.06	0.02	8,206.40	16.72
1983	53,107.40	264.30	0.50	10.48	0.02	7,502.50	14.13
1984	59,622.50	360.40	0.60	9.70	0.02	9,088.00	15.24
1985	67,908.60	434.10	0.64	10.00	0.01	11,720.80	17.26
1986	69,147.00	735.80	1.06	13.27	0.02	8,920.60	12.90
1987	105,222.80	2,452.80	2.33	12.42	0.01	30,360.60	28.85
1988	139,085.30	1,718.20	1.24	10.71	0.01	31,192.80	22.43
1989	216,797.50	13,877.40	6.40	76.51	0.04	57,971.20	26.74
1990	267,550.00	4,686.00	1.75	90.01	0.03	109,886.10	41.07
1991	312,139.70	6,916.10	2.22	650.89	0.21	121,535.40	38.94
1992	532,613.80	14,463.10	2.72	1,100.20	0.21	205,611.70	38.60
1993	683,869.80	29,660.30	4.34	17,352.27	2.54	218,770.10	31.99
1994	899,863.20	22,229.20	2.47	12,098.57	1.34	206,059.20	22.90
1995	1,933,211.60	75,940.60	3.93	17,596.83	0.91	950,661.40	49.18
1996	2,702,719.10	111,290.90	4.12	20,726.14	0.77	1,309,543.40	48.45
1997	2,801,972.60	110,452.70	3.94	42,021.12	1.50	1,241,662.70	44.31
1998	2,708,430.90	80,750.40	2.98	33,791.98	1.25	751,856.70	27.76
1999	3,194,015.00	92,792.50	2.91	115,757.31	3.62	1,188,969.80	37.22
2000	4,582,127.30	115,952.20	2.53	177,251.90	3.87	1,945,723.30	42.46
2001	4,725,086.00	132,433.70	2.80	139,775.63	2.96	1,867,953.85	39.53
2002	6,912,381.30	225,036.50	3.26	170,614.72	2.47	1,744,177.68	25.23
2003	8,487,031.60	258,388.60	3.04	144,922.05	1.71	3,087,886.39	36.38
2004	11,411,066.90	248,224.60	2.18	299,415.41	2.62	4,602,781.54	40.34
2005	14,572,239.10	654,193.15	4.49	1,899,619.59	13.04	6,372,052.44	43.73
2006	18,564,594.70	624,520.73	3.36	2,149,129.59	11.58	7,324,680.60	39.46
2007	20,657,317.70	759,380.43	3.68	2,235,634.32	10.82	8,309,758.30	40.23
2008	24,296,329.30	971,543.80	4.00	2,258,678.19	9.30	10,161,490.10	41.82
2009	24,712,669.90	1,273,815.80	5.15	2,710,252.52	10.97	8,356,385.60	33.81
2010	29,108,670.82	905,730.80	3.11	2,938,239.48	10.09	11,035,794.50	37.91

Source: Computed by the authors

Table 2a: Unit Root test for Stationarity at Levels

S/No	Variable	ADF (Intercept)	ADF (Trend and Intercept)	PP (Intercept)	PP (Trend and Intercept)
1	logngdp	-0.2336	-1.5824	-0.2479	-1.8238
		(-3.6056)	(-4.2050)	(- 3.6056)	(- 4.2050)
2	logfdi	-0,4016	-3.0232	-0.2003	-2.8405
		(-3.6105)	(-4.2050)	(-3.6056)	(-4.2050)
3	logexch	-0.1021	-1.5642	-0.2814	-1.8529
		(-3.6056)	(-4.2050)	(-3.6056)	(-4.2050)
4	logrem	-0.2639	-2.2981	-0.0904	-2.2007
		(-3.6056)	(-4.2050)	(-3.6056)	(-4.2050
5	logexpt	-0.5889	-2.3038	-0.5542	-2.2823
		(-3.6056)	(-4.2050)	(-3.6056)	(-4.2050)

Note: Significance at 1% level and * at 5% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.
Source: Authors estimation, using Eviews 7.2.

Table 2b: Unit Root test for Stationarity at First Difference

S/No	Variable	ADF (Intercept)	ADF (Trend and Intercept)	PP (Intercept)	PP (Trend and Intercept)
1	logngdp	-5.4411	-5.3668	-5.4359	-5.3611
		(-3.6105)	(-4.2119)	(-3.6105)	(-4.2119)
2	Logfdi	-5.7250	-5.9253	-10.1851	-10.3381
		(-3.6156)	(-4.2191)	(-3.6105)	(-4.2119)
3	logexch	-5.1948	-5.1204	-5.3436	-5.2835
		(-3.6105)	(-4.2119)	(-3.6105)	(-4.2119)
4	logrem	-7.8336	-7.7829	-7.8338	-7.8103
		(-3.6105)	(-4.2119)	(-3.6105)	(-4.2050)
5	logexpt	-6.9207	-6.8271	-7.0197	-6.9155
		(-3.6105)	(-4.2119)	(-3.6105)	(-4.2119)

Note: Significance at 1% level and * at 5% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.
Source: Authors estimation, using Eviews 7.2.

Table 3: Unrestricted Co-integration Rank Test, Trace and Maximum Eigenvalue

Date: 01/28/12   Time: 20:40
Sample (adjusted): 1974 2010
Included observations: 37 after adjustments
Trend assumption: Linear deterministic trend
Series: DLOGNGDP DLOGEXPT DLOGFDI DLOGREM DLOGEXCH
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.648040	87.81886	69.81889	0.0010
At most 1 *	0.435901	49.18205	47.85613	0.0373
At most 2	0.381840	27.99860	29.79707	0.0795
At most 3	0.158644	10.20132	15.49471	0.2656
At most 4	0.097847	3.809914	3.841466	0.0509

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.648040	38.63681	33.87687	0.0125
At most 1	0.435901	21.18345	27.58434	0.2653
At most 2	0.381840	17.79729	21.13162	0.1376
At most 3	0.158644	6.391403	14.26460	0.5635
At most 4	0.097847	3.809914	3.841466	0.0509

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4: Long-run Static Model

Dependent Variable: LOGNGDP
Method: Least Squares
Date: 01/28/12   Time: 02:13
Sample: 1970 2010
Included observations: 41

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.928241	0.691216	4.236363	0.0002
LOGEXPT	0.789591	0.068853	11.46784	0.0000
LOGFDI	0.048436	0.067273	0.719992	0.4762
LOGREM	0.082573	0.038445	2.147805	0.0385
LOGEXCH	-0.101466	0.075285	-1.347748	0.1862

R-squared	0.994027	Mean dependent var	12.88658
Adjusted R-squared	0.993364	S.D. dependent var	2.715498
S.E. of regression	0.221215	Akaike info criterion	-0.065515
Sum squared resid	1.761697	Schwarz criterion	0.143457
Log likelihood	6.343058	Hannan-Quinn criter.	0.010581
F-statistic	1497.851	Durbin-Watson stat	1.124964
Prob(F-statistic)	0.000000		

Table 5: Over-Parameterized Short-run Dynamic Model (Summary of Regression Results for the Error Correction Model)

Dependent Variable: DLOGNGDP
Method: Least Squares
Date: 03/17/12   Time: 18:00
Sample (adjusted): 1974 2010
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.162846	0.049516	3.288748	0.0046
DLOGNGDP(-1)	-0.166690	0.170635	-0.976882	0.3432
DLOGNGDP(-2)	-0.063258	0.170354	-0.370354	0.7160
DLOGNGDP(-3)	-0.254754	0.166921	-1.526194	0.1465
DLOGEXPT	0.392314	0.049770	7.882619	0.0000
DLOGEXPT(-1)	0.054459	0.113029	0.481819	0.6365
DLOGEXPT(-2)	-0.079054	0.099077	-0.797905	0.4366
DLOGEXPT(-3)	0.114634	0.098621	1.162369	0.2621
DLOGFDI	0.104406	0.042726	2.443850	0.0265
DLOGFDI(-1)	0.050038	0.053561	0.934228	0.3641
DLOGFDI(-2)	0.043104	0.050618	0.851541	0.4070
DLOGFDI(-3)	0.019437	0.038878	0.499954	0.6239
DLOGREM	-0.000894	0.020758	-0.043047	0.9662
DLOGREM(-1)	-0.013170	0.024669	-0.533887	0.6008
DLOGREM(-2)	-0.029327	0.027300	-1.074280	0.2986
DLOGREM(-3)	0.034212	0.028468	1.201773	0.2469
DLOGEXCH	0.085921	0.083106	1.033606	0.3167
DLOGEXCH(-1)	-0.091773	0.097734	-0.939014	0.3617
DLOGEXCH(-2)	0.109337	0.094541	1.156493	0.2645
DLOGEXCH(-3)	0.010163	0.095378	0.106550	0.9165
ECM(-1)	-0.467766	0.209072	-2.237340	0.0398

R-squared	0.888700	Mean dependent var	0.219554
Adjusted R-squared	0.749576	S.D. dependent var	0.189206
S.E. of regression	0.094683	Akaike info criterion	-1.579750
Sum squared resid	0.143439	Schwarz criterion	-0.665445
Log likelihood	50.22537	Hannan-Quinn criter.	-1.257414
F-statistic	6.387810	Durbin-Watson stat	1.412754
Prob(F-statistic)	0.000225		

Table 6: Parsimonious Short-run Dynamic Model (Summary of Regression Results for the Error Correction Model)

Dependent Variable: DLOGNGDP
Method: Least Squares
Date: 03/21/12   Time: 11:13
Sample (adjusted): 1974 2010
Included observations: 37 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.096130	0.019360	4.965337	0.0000
DLOGEXPT	0.393712	0.038342	10.26852	0.0000
DLOGFDI	0.048924	0.022179	2.205840	0.0349
DLOGREM(-3)	0.044671	0.016957	2.634438	0.0130
DLOGEXCH(-2)	0.050823	0.050972	0.997063	0.3265
ECM(-1)	-0.291885	0.074904	-3.896763	0.0005

R-squared	0.820877	Mean dependent var		0.219554
Adjusted R-squared	0.791987	S.D. dependent var		0.189206
S.E. of regression	0.086294	Akaike info criterion		-1.914714
Sum squared resid	0.230847	Schwarz criterion		-1.653485
Log likelihood	41.42222	Hannan-Quinn criter.		-1.822619
F-statistic	28.41314	Durbin-Watson stat		1.950634
Prob(F-statistic)	0.000000			

Figure 2a: Actual Fitted, Residual Graph of the Model
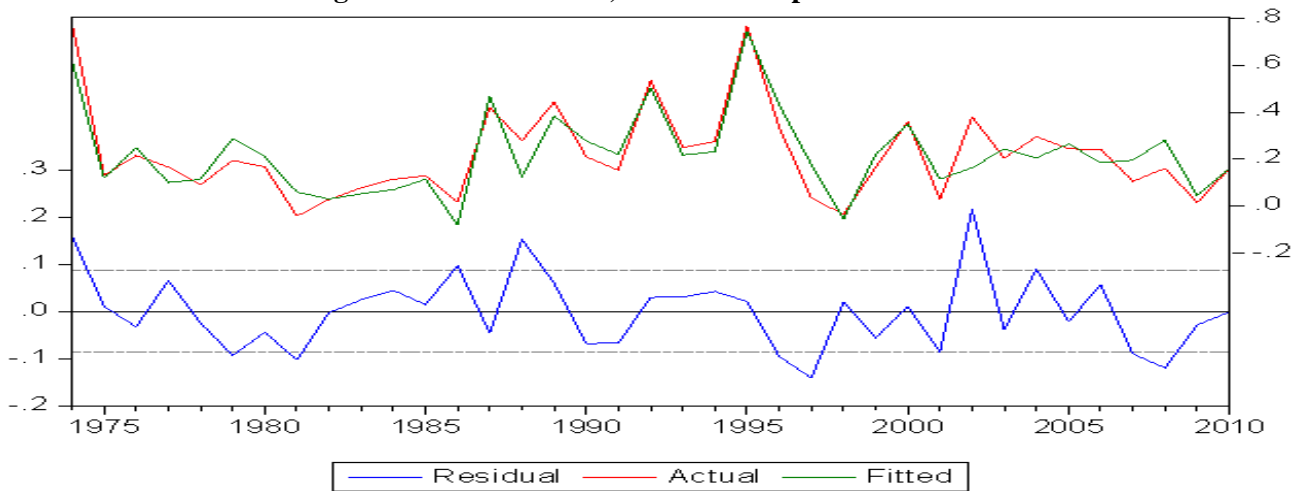
Figure 2b: Normality Test for Residuals

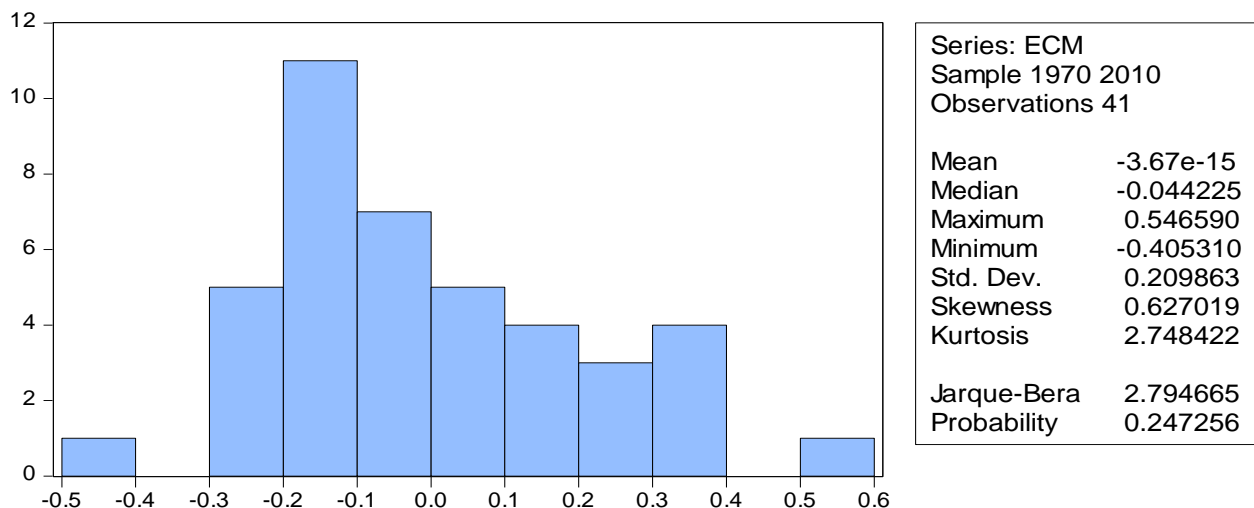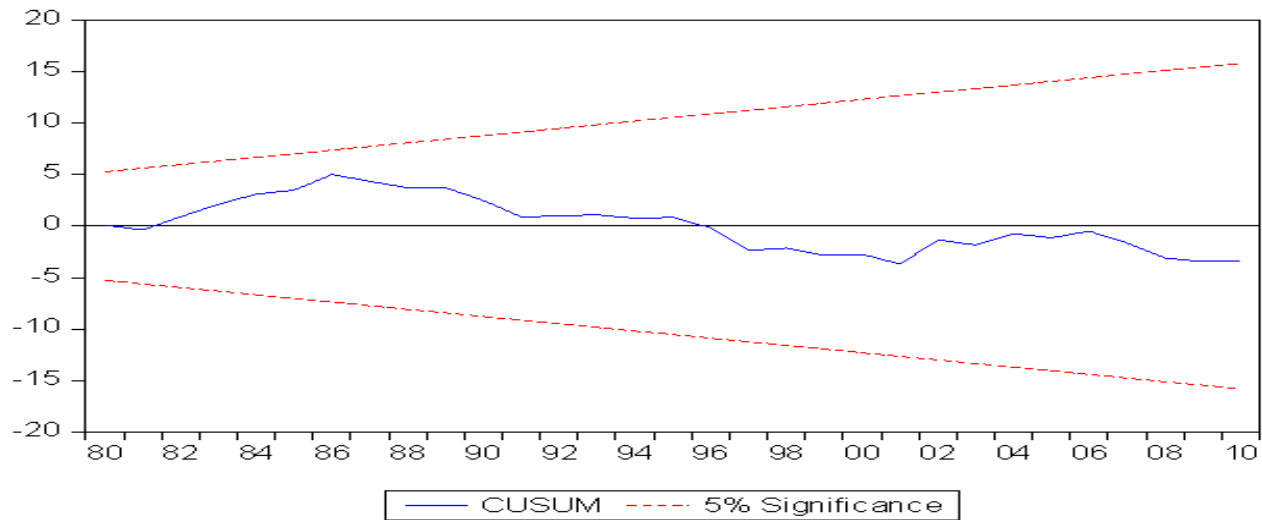| Series: ECM	
Sample 1970 2010	
Observations 41	
Mean	-3.67e-15
Median	-0.044225
Maximum	0.546590
Minimum	-0.405310
Std. Dev.	0.209863
Skewness	0.627019
Kurtosis	2.748422
Jarque-Bera	2.794665
Probability	0.247256

Figure 3: Stability Test of the Model

Note: The result of the Cusum stability test indicates that the model is structurally stable, whereas movements outside the critical lines show model instability.

Table 7: Diagnostic Test of the Model

S/N	Test	F-statistic Value	Probability Value
1	Breusch-Godfrey	0.3215	0.7276
2	Jarque-Bera	2.7947	0.2473
3	ARCH	0.302	0.5862
4	White	1.3586	0.2694

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Appendices

Appendix 1: Time Plots of Variables at Their Levels
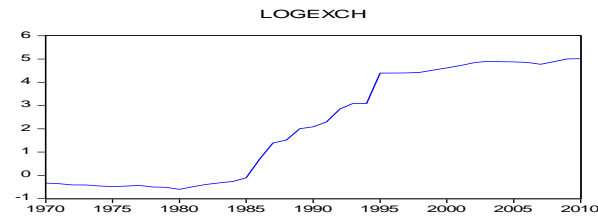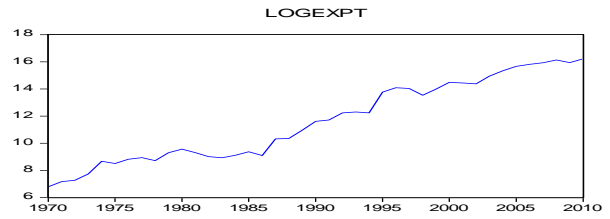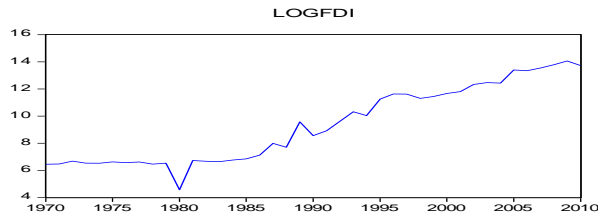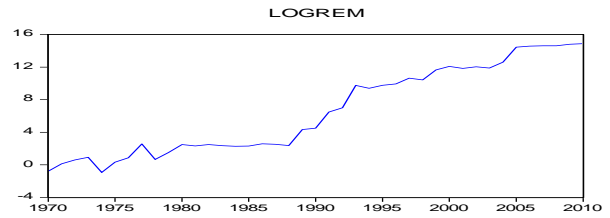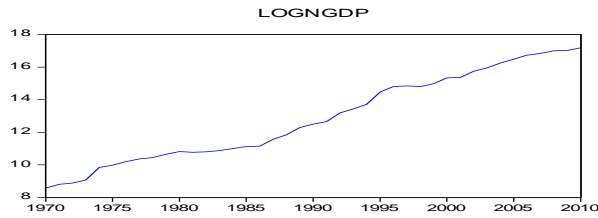
Appendix 2: Time Plots of Variables at First Difference