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Notes to Contributors

Information on manuscript submission is provided on the last and inside back cover of the Review.

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The Nigeria Inter-Bank and Monetary Policy Rates Nexus: Any Discernable Long-Run Relationship?

Yusuf D. Bulus*

Inter-bank markets are among the most important in the financial system. They are the focus of central banks' implementation of monetary policy and have a significant effect on the economy. Transactions in the inter-bank funds market provide signal of what obtains in the open credit market. To provide for stability in short-term interest rates, the Monetary Policy Rate (MPR) as the 'operating instrument' serves as an indicative rate for transactions in the inter-bank money market as well as other deposit money banks' (DMBs) interest rates. It is this relationship between the inter-bank and the monetary policy rates that this paper examined. The findings indicate that the rates are cointegrated and have a long-run relationship, judging from the significance of the unit root test for the residual and the coefficient of the error correction variable in the error correction model. It is, however, the submission of this paper that much more investigation is needed on a number of issues such as the effect of liquidity hoarding in the inter-bank market spread, and the impact of possible lending relationships between banks in the market on flow of funds and the inter-bank rate, among others. These issues may provide significant insight on the behaviour of the Nigerian inter-bank rate.

Keywords: Inter-bank Rate, Monetary Policy Rate, Cointegration, Financial Stability.

JEL classification: E43, E44, E52

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I. Introduction

Interest rates play an important role in our economic lives. They are the cost of borrowing for those who need resources and reward for lending to those with savings. Higher interest rates tend to restrict the growth of credit, making it harder for businesses to get financing and for individuals to find or keep jobs. Yet, as important as interest rates are, a major concern of the monetary authority is their tendency to exhibit erratic behaviour i.e. to fluctuate too much. It is, therefore, the objective of every central bank to eliminate abrupt changes in interest rates (Bache and Barnhardsen, 2009). Though the objective could be considered a secondary goal relative to the monetary policy goals of low inflation, stable economic growth and financial stability, the reason for this hierarchy is that interest rate stability and, of course, exchange rate stability are means of achieving the ultimate goal of stabilizing the economy; they are not ends unto themselves.

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It is easy to see how interest rate volatility is a problem. First, most people respond to low interest rates by borrowing and spending more. Individuals take out loans to purchase cars, new appliances and the like, while corporations issue more bonds and use the proceeds to enlarge their operations. On the other hand, when interest rates rise, people save and spend less. So by raising expenditure when interest rates are low and reducing expenditure when interest rates are high, interest rates volatility makes output unstable.

Second, interest rates volatility means higher risk – and a higher risk premium – on long-term bonds. Risk makes financial decisions more difficult, lowering productivity and making the economy less efficient. Thus, since central banks control short-term interest rates, they are in a position to control this risk and stabilize the economy.

Prior to the reforms in the financial system and the liberalization of interest rates in Nigeria, interest rates were more or less specified or fixed by the central bank. In other words, rates were determined by fiat. But with the liberalization of interest rates, alongside other rates, (to be market determined), it became necessary that an indirect approach to influencing the movement, so as to moderate the fluctuation and, of course, the spread as a measure of the cost of intermediation, became necessary.

Among the most important players in financial markets throughout the world are central banks, which are government authorities in charge of monetary policy. Central banks' actions affect interest rates, amount of credit, money supply, output and inflation. Though history has it on record that central banks started out as the government's bank, they have over the years added various other functions. A modern central bank not only manages the government finances but, provides an array of services to deposit money banks which makes it a bankers' bank.

Discount lending policies are a critical part of a modern central bank's engagement. Central banks provide loans at a rate that is above their target interest rate, thereby guaranteeing commercial banks a supply of liquidity during times of crisis, and ensuring that the overnight inter-bank lending rates remain less than or equal to their lending rate. It is this price of funds transfer in the inter-bank fund market (mostly referred to in the analysis of cost of borrowing) and responsiveness of the rate to the central bank target rate, the monetary policy rate (*mpr*), that this paper attempts to examine. To do this, the paper is structured into six sections. Following the introduction is the theoretical and empirical issues

considered in section 2, which is followed by a brief review of monetary policy in Nigeria since 1986 in section 3. The methodology of the study is presented in section 4, while data and empirical results come up in section 5. The paper ends with some conclusions in section 6.

II. Theoretical and Empirical Issues

There are many factors that influence investment decision, but two can be considered outstanding. The first is the current level of economic activity and the outlook for the future (business confidence), such that the larger the volume of current sales and the more prosperous the future appears, the greater the incentive to expand productive capacity. The second is the cost of borrowing (i.e. the rate of interest). Naturally, the higher the rate of interest, the more likely it is that borrowing will be discouraged. Private sector demand for credit is, therefore, likely to vary inversely with the rate of interest, given the level of, and outlook of business activity.

While the economic and financial systems may be fairly stable most of the time, when left on their own, they are prone to episodes of extreme volatility. Central banks work to reduce the volatility of the economic and financial systems by pursuing five specific objectives namely; low and stable inflation; high and stable real growth, together with high employment; stable financial markets and institutions; stable interest rates; and a stable exchange rate.

Prices are central to everything that happens in a market-based economy. They provide the information individuals and firms need to ensure that resources are allocated to their most productive uses. Raising the price of a product, for instance, is a signal that demand has increased, so producing more is worthwhile. However, inflation degrades the information content of prices. When all prices are rising together, understanding the reason becomes difficult. Did consumers decide they liked an item, by shifting demand? Did the cost of producing the item rise, shifting supply? Or was inflation responsible for the jump? If the economy is to run efficiently, we must be able to tell the difference. Thus, the objective of price stability is analogous to keeping inflation low and stable.

With respect to ensuring high and stable real growth, central banks employ the tool of interest rates adjustment to moderate fluctuations in business cycles. Booms are popular but recessions are not. In recessions, people get laid off and businesses fail. Without steady income, individuals struggle to effect payments for transactions they enter into. Most times, consumers pull back, hurting businesses that rely on them to buy products as unplanned inventories grow, increasing

unused capacity, hence more and more layoffs. Thus, the use of interest rate adjustment tool is informed by the idea that there is some long-run sustainable level of production called potential output that depends on factors like technology, size of capital stock and labour force or the number of people who can work. Growth in these factors leads to growth in potential output.

There are also times when growth rises above sustainable rates, and the economy overheats. These periods may seem to bring prosperity, but they do not last forever, as they are followed by reduced spending, lower business investment and layoffs. In such periods, the policy action would be to raise interest rates and keep the economy from operating at unsustainable levels. Unstable growth creates risk for which investors need to be compensated in the form of higher interest rates. With higher interest rates, businesses borrow less, which means that they have fewer resources to invest and grow. Stability leads to higher growth in the long-run.

Financial stability is an integral part of every modern central bank's concern. As Cecchetti (2008) puts it;

"The financial system is like plumbing: when it works, we take it for granted, but when it doesn't work, watch out. If people lose faith in banks and financial markets, they will rush to low-risk alternatives, and intermediation will stop. Savers will not lend and borrowers will not be able to borrow..... When the financial system collapses, economic activities do, too". p 360

As the government's bank, the central bank occupies a privileged position. It has a monopoly of issuance of currency. The ability to print currency means that the central bank can control the availability of money and credit in the economy and this is carried out by adjusting short-term interest rates. The adjustments are undertaken under the framework of monetary policy.

Again as a bankers' bank, its day-to-day role involve; (i) providing loans during times of financial stress, (ii) managing the payment system, and (iii) oversee deposit money banks and the financial system (Cecchetti, 2008). Every country needs a secure and efficient payments system. People require ways to pay each other, and financial institutions need a cheap and reliable way to transfer funds to one another. The fact that all banks have accounts with the central bank makes it the natural place to go for these *interbank* payments to be settled. In today's world, interbank payments are extremely important.

II.1 Transactions in the Inter-Bank Funds Market

The name inter-bank funds come from the fact that the funds banks trade with are their deposit balances with the central bank. On any given day, banks target the level of reserves they would like to hold at the close of business. But as the day goes by, the normal flow of business may leave them with more or less reserves than they want to hold. This discrepancy between actual and desired reserves gives rise to a market for reserves, with some banks lending out their excess funds and others borrowing to cover a shortfall. Without this market, banks would need to hold a substantial amount of excess reserves as insurance against shortfalls.

Inter-bank funds market, as the name connotes, is a market where banks undertake funds transaction to enable them meet the cash or liquidity needs of their customers. These transactions do become necessary because an individual bank can hardly maintain an equilibrium cash or liquidity holding (that matches the demand for and supply of liquidity/cash) at any given point in time. While transactions are often made through brokers, there are bilateral agreements between banks. Since there is no collateral to fall back on in the event of non-payment, which makes such loans unsecured, the borrowing bank must be credit worthy in the eyes of the lending bank, otherwise the loan cannot be made. Policy-makers believe that the interbank funds market provides valuable information about the health of individual banks. When a bank cannot get an overnight loan from any other bank, it is the first sign of the fact that something is wrong with that particular bank. The interbank funds market transacts on overnight, or term such as 7-days, 30-days and 90-days, placement of funds.

Generally, it is theoretically posited that transactions in the inter-bank funds market provide signal of what obtains in the open credit market. The average interest rate on overnight loans is the overnight rate, which is the shortest-term market interest rate, and as such it has a crucial role in term structure models. It also lies at the heart of monetary policy (Bernanke and Blinder, 1992). However, apart from the rate of interest (cost of transaction) in the market that influences the tempo of activities in the market, other determining factors are liquidity position of the banks, and change in the demand for foreign exchange which determines the frequency with which banks access the market for funds to cover their bids at the Autonomous Foreign Exchange Market (AFEM) or Wholesale Dutch Auction System (WDAS).

II.2 Inter-bank Rate and Monetary Policy Transmission

The monetary policy rate (*mpr*) is the Monetary Policy Committee's primary policy instrument. Financial market participants are constantly speculating about the movement in this rate, and whenever the Monetary Policy Committee meets, market participants eagerly await the announcement of either an increase or decrease in the monetary policy rate. It is important to note that while the monetary policy rate is set by the Central Bank's Monetary Policy Committee, the inter-bank funds rate is the rate at which transactions between banks take place.

The inter-bank money market rate (*ir*) stands at the shortest end of the yield curve, and is the operational target for the monetary policy rate (*mpr*). Therefore, understanding the factors behind the dynamics of the *ir* is relevant not only for participants in the inter-bank market, but also for private investors and monetary authorities. Indeed, the *ir* is a key benchmark for interest rates in the short term money market and its movement may have effects on the whole term structure (Taylor and Williams, 2008). Equally important is the fact that the inter-bank market represents the first stage of the monetary transmission channel, where monetary policy actions first come in contact with the rest of the financial system. An effective monetary policy requires that the overnight interest rate remains at an average around the *mpr* (Ahumada, et al, 2009).

II.3 Lending Relationships and the Inter-bank Market Operations

Lending relationships are an important feature of the inter-bank market, and these relationships allow banks to obtain insurance against liquidity shocks (Cocco, et al. 2009). Relationships can only exist if there are frequent and repeated interactions between banks, if borrowers and lenders may set terms for the loan that depend on the identity of the counterparty, or on the ongoing relationship (Boot, 2000). This is indeed the case for direct loans in the inter-bank market. Direct loans are the result of private negotiations between borrower and lender, who agrees on the amount, interest rate and maturity of the loan.

The inter-bank market is fragmented in nature. For direct loans which account for the vast majority of lending volume, the amount and the interest rate on each loan are agreed on a one-on-one basis between borrowing and lending institutions. Other banks do not have access to the same terms, and may not even know that the loan took place.

Relationship may be an important feature of behaviour in fragmented markets, particularly given that each agent chooses whom to interact with. Again, in as much as transactions are negotiated on a one-on-one basis, agents may

condition the terms of the transaction on the identity of the counterparty (Cocco, et al. 2009). Stigum (1990), quoted in Cocco (2005), further expound on the idea of the importance of relationship in the inter-bank market when he wrote,

'To cultivate correspondents that will sell funds to them, large banks stand ready to buy whatever sums these banks offer, whether they need all these funds or not. If they get more funds than they need, they sell off the surplus...' p 25.

The study by Cocco, et al (2009) found that borrowers and lenders of fund in the Portuguese inter-bank market tend to rely, more than they usually do, on loans from, and to, banks with whom they have a close relationship when they have a larger imbalance of funds. In this way, lending relationships provide insurance against the risk of a shortage or excess of funds during the reserve maintenance period. With this, they opined that lending relationships play an important role in promoting the stability of the inter-bank market during periods of low liquidity and time of crisis.

We can identify two purposes why banks establish lending relationships in the inter-bank market;

- (i) In inter-bank markets, financial institutions engage in unsecured borrowing and lending of funds. They do so to insure against idiosyncratic liquidity shocks arising from the behaviour of retail depositors (Freixas and Jorge, 2000). When a given bank is faced with unexpectedly large number of withdrawals from its retail customers, it may borrow the funds needed to meet these withdrawals from other banks in the inter-bank market.
- (ii) Borrowing to satisfy the reserve requirements may be another purpose. Over a given time period, banks' reserves must be, at least, equal to a given proportion of their short-term liabilities. This is the reserve maintenance period or settlement period and it is a distinctive feature of the inter-bank market. This period vary from economy to economy.¹ In case a bank cannot meet its reserve requirements, it may use the discount window to borrow from the Central Bank, which acts as a lender - of - last resort. To resort to that, however, is not without costs; banks must pay an interest rate higher than the prevailing market interest rate on a loan of similar maturity, and most importantly, there are large implicit costs

¹ The reserve maintenance period for Nigeria banks was reviewed downward from 8 weeks in 2004 to 2 weeks and the computation of reserve requirement is based on each bank's total deposit liabilities.

associated with using the discount window, as the financial institution is seen by the central bank as not being able to properly manage its reserves (Stigum, 1990). For this, banks make every effort to avoid using the discount window.

Therefore, since banks must hold on average a minimum of reserves, shortages of liquidity at the end of the maintenance period will often lead to special behaviour of overnight rates during those days (Hartmann, et al. 2001), as banks that have not yet satisfied their reserve requirements will be in a weak position. This suggests that banks may wish to establish relationships for insurance purposes and, in particular, against risk of a shortage of funds at the end of the reserve maintenance period.²

II.4 Liquidity Effects on Inter-bank Rate

The liquidity of the market affects directly the amount of resources that commercial banks have at their disposal and which they will consequently be willing to lend in the inter-bank market. However, there are only scanty empirical studies that have considered the effect of daily liquidity conditions on the analysis of the *ir* (Hamilton, 1996 and Wurtz, 2003, among few). In fact, the literature generally analyzes the functioning of the inter-bank market using a general framework in which banks' reserve positions are affected by random shocks and where the inter-bank market allows banks to fulfill their monthly reserve requirement (e.g. Allen and Gale, 2000, among others).

Liquidity provision in the inter-bank market involves drainage and injection of funds through open market operations by the central bank usually at *mpr* (discretionary operations), and permanent credit lines through private depositors. An added liquidity source for the market comes through deposits from pension funds. The use of discretionary operations, instead of credit facilities, could be interpreted as a high degree of commitment of the central bank to take the *ir* close to the *mpr*, which could lead to the gap between these rates being closed faster.

The results of work by Ahumada, et al. (2009) on Chile indicates that the *ir* and the *mpr* move together very closely and, when these variables deviate from each other, the speed of convergence is around 30 percent per day. In terms of the

² Banks may also face the risk of excess of funds. This may also help explain the large trading volume observed in the interbank market. According to Lyons (1995), a large part of trading volume observed in fragmented markets is just due to borrowers acquiring funds that they do not really need and then selling them. But why do borrowers of funds accept funds they really have no need for? The answer is that borrowers of such funds accept them because they do not wish to jeopardize relationships.

explanatory variables, the calendar effects and open market operations – especially the discretionary operations - are the most relevant in explaining the dynamics of the *ir*. Regarding the relevance of market liquidity provided by the central bank, they find that the central bank played an important role during the sample period, while private depositors do not help to significantly improve the explanation of the dynamics of the *ir*. The permanent credit lines are not statistically significant and this situation could be due to the fact that this instrument is available on a daily frequency and, therefore, the market has internalized its operation in the valuation of the *ir*.

A number of other studies have confirmed that monetary policy actions have predictable effects on short-term interest rate.³ For example, the results of the study by Aziakpono, et al. (2007) show high responses of the overnight prime inter-bank lending rates (PIBR) and the three-month negotiable certificate of deposit (NCD) to monetary policy actions in South Africa between 1973 and 2004. Roley and Sellon (1995) show that short-term rates in the US follow the same trend as the federal funds rate. Dale (1993) measures the short-term response of the UK market rates to monetary policy actions by the Bank of England. The results of Dale' study show that policy actions by the Bank of England have significant positive effect on interest rates of all maturities. Nevertheless, these effects decline as maturity lengthens.

In Nigeria, there is dearth of works on the effect of monetary policy actions on interest rates. The work by Chuku (2009) only attempts to measure the effect of monetary policy innovations (both quantity and price based) on output and the general price level. While the result indicate the Minimum Rediscount Rate and Real Effective Exchange Rate as having a neutral and fleeting effect on output, the general objective of the work remain the same as those of Uchendu (1996), Nnanna (2001), Adamgbe (2004), Balogun (2007) and Omotor (2007). These studies were more concerned with the effect of monetary policy actions on growth-related variables such as output, investment, general price level and the likes.

The foregoing review has helped to explain the many characteristics of the interbank funds market and results of empirical studies on the effect of monetary policy action on money market rates.

³ Monetary policy actions could either be through quantity-based nominal anchors as in the case of using Open Market Operations (OMO) to effect changes in money supply, or through price-based nominal anchors as in the case of changing the monetary policy rate (MPR) or the effective exchange rate (EER).

III. Brief Review of Nigeria's Monetary Policy Since 1986⁴

Direct controls, pervasive government intervention in the financial system resulting in the stifling of competition and resource misallocation, necessitated the introduction of the Structural Adjustment Programme (SAP) in 1986. SAP was a comprehensive economic restructuring programme which emphasized increased reliance on market forces. In line with this orientation, financial sector reforms were initiated to enhance competition, reduce distortion in investment decisions and evolve a sound and more efficient financial system. The reforms which focused on structural changes, monetary policy, interest rate administration and foreign exchange management, encompass both financial market liberalization and institutional building in the financial sector. The broad objectives of the financial sector reform include:

- Removal of controls on interest rates to increase the level of savings and improve allocative efficiency;
- Elimination of non-price rationing of credit to reduce misdirected credit and increase competition;
- Adoption of indirect monetary management in place of the direct control regime;
- Enhancing of institutional structure and supervision;
- Strengthening the money and capital markets through policy changes and distress resolution measures; and
- Improving the linkages between formal and informal financial sectors.

The objectives of monetary policy since 1986 remained the same as in the earlier period, namely: the stimulation of output and employment, and the promotion of domestic and external stability. In line with the general philosophy of economic management under SAP, monetary policy was aimed at inducing the emergence of a market-oriented financial system for effective mobilization of financial savings and efficient resource allocation. The main instrument of the market-based framework is the open market operations. This is complemented by reserve requirements and discount window operations. The adoption of a market-based framework such as OMO in an economy that had been under direct

⁴ This section benefitted immensely from materials available on the Bank's website; www.cenbank.org/monetarypolicy/conduct.asp

control for long, required substantial improvement in the macroeconomic, legal and regulatory environment.

In order to improve macroeconomic stability, efforts were directed at the management of excess liquidity; thus a number of measures were introduced to reduce liquidity in the system. These included the reduction in the maximum ceiling on credit growth allowed for banks; the recall of the special deposits requirements against outstanding external payment arrears to CBN from banks, abolition of the use of foreign guarantees/currency deposits as collaterals for Naira loans and the withdrawal of public sector deposits from banks to the CBN. Also effective August 1990, the use of stabilization securities for the purposes of reducing the bulging size of excess liquidity in banks was re-introduced. Commercial banks' cash reserve requirements were increased in 1989, 1990, 1992, 1996 and 1999.

The rising level of fiscal deficits was identified as a major source of macroeconomic instability. Consequently, government agreed not only to reduce the size of its deficits but also to synchronize fiscal and monetary policies. By way of inducing efficiency and encouraging a good measure of flexibility in banks' credit operations, the regulatory environment has improved. Consequently, the sector-specific credit allocation targets were compressed into four sectors in 1986, and to only two in 1987. From October 1996, all mandatory credit allocation mechanisms were abolished. The commercial and merchant banks were subjected to equal treatment since their operations were found to produce similar effects on the monetary process. Areas of perceived disadvantages to merchant banks were harmonized in line with the need to create a conducive environment for their operations. The liquidity effect of large deficits financed mainly by the Bank led to an acceleration of monetary and credit aggregate in 1998, relative to stipulated targets and the performance in the preceding year. Outflow of funds through the CBN weekly foreign exchange transaction at the Autonomous Foreign Exchange Market (AFEM) and, to a lesser extent, at Open Market Operation (OMO) exerted some moderating effect.

The reintroduction of the Dutch Auction system (DAS) of foreign exchange management in July 2002 engendered relative stability, and stemmed further depletion of reserves during the second half of 2002. However, the financial system was typically marked by rapid expansion in monetary aggregates, particularly during the second half of 2000, influenced by the monetization of enhanced oil receipts. Consequently, monetary growth accelerated significantly, exceeding policy targets by substantial margins. Savings rate and the inter-bank

call rates fell generally due to the liquidity surfeit in the banking system though the spread between deposit and lending rates remained wide.

III.1 The Introduction of the Monetary Policy Rate (MPR)

Over time, the CBN has recognized that achieving stable prices would require continuous re-assessment and evaluation of its monetary policy implementation framework to enable it respond to the ever-changing economic and financial environment. It is against this background that the Bank introduced a new monetary policy implementation framework that took effect on 11th December, 2006. The ultimate goal of the new framework is to achieve a stable value of the domestic currency through stability in short-term interest rates around an "Operating Target", the interest rate, which is determined and operated by the CBN. The "Operating Target" rate i.e the "Monetary Policy Rate" (MPR), serves as an indicative rate for transaction in the inter-bank money market as well as other deposit money banks' (DMBs) interest rates.

The main operating principle guiding the new policy is to control the supply of settlement balances of banks and motivate the banking system to target zero balances at the CBN through an active inter-bank trading or transfer of balances at the CBN. This is aimed at engendering symmetric treatment of deficits and surpluses in the settlements accounts, so that for any bank, the cost of an overdraft at the Central Bank would be equal to the opportunity cost of holding a surplus with the bank.

The Central Bank intervention in the market takes the form of a standing lending facility that ensures orderly market operations or behaviour by alternating avoidable interest volatility. The standing lending facility is available as an overnight lending to banks with deficits, at a fixed interest rate, i.e the upper band of the CBN interest rate corridor. The Bank stands ready to supply any amount the banks may require at the lending rate. The Central Bank also set up a standing deposit facility that pays banks with surplus funds, a fixed interest rate in their deposit or reserves which they keep with the Bank. This arrangement allows the Bank to keep the overnight inter-bank interest rate in between the corridor with an upper and lower limit on interest rate.

MPR was set at 10 per cent, using the then rate of inflation rate and the expected inflation rate outcome of 9.0 per cent for fiscal 2006 as a guide to ensure that interest rates remain positive in real terms. There is a spread of 600 basis points around the rate, i.e 300 basis points below and 300 basis points above. This translates into a lower limit of 7 per cent, representing that rate at which CBN takes deposits from the bank.

A major advantage of the new framework is that the Central Bank is able to operate in the market daily and ensures adequate liquidity is provided to enable banks trading in the inter-bank market to complete settlement at interest rates around the MPR. Inter-bank rate is, therefore, maintained at a level between the lending and deposits rates at CBN. The maintenance of interest rates band has helped significantly to reduce the volatility in the market compared to the inter-bank rates experienced in the past.

The Wholesale Dutch Auction System (WDAS) replaced the Retail Dutch Auction System (DAS) in the first quarter of the year under review. In pursuant of further liberalization of the foreign exchange market the bureaux de change was admitted into the WDAS window during the second quarter of 2006. The admittance of the BDC's to the WDAS window led to the unification of the exchange rate between the official and parallel markets.

The objective of monetary policy in 2006 was sustaining price stability and non-inflationary growth, as enunciated in the National Economic Empowerment and Development Strategy (NEEDS). The target for single digit inflation was achieved as inflation rate stood at 8.5 per cent by December 2006.

Up to 2007, the framework for monetary policy management remained that of monetary targeting. The Central Bank of Nigeria (CBN) adopted various policy measures aimed at containing the growth of monetary aggregates in order to achieve monetary and price stability. Open Market Operations (OMO) remained the major tool of liquidity management. Other policy measures included increased issuance of treasury securities in the primary market to mop-up excess liquidity; use of deposit and lending facility to encourage inter-bank transactions as well as special sales of foreign exchange, including swap arrangements. NTBs of various tenors (91-, 182- and 364-day) were auctioned during the period.

The liquidity management efforts of the CBN yielded the expected results as the single-digit inflation rate was sustained during the year. In addition, the exit reserve money target under the Policy Support Instrument (PSI) was achieved in June 2007. Over the end-December 2006 level, provisional data indicate that broad money supply (M2) grew by 11.03 per cent in June 2007 and further by 21.3 and 25.31 per cent in September and October 2007, respectively. When annualized, the M2 grew by 28.44 and 30.25 per cent, in September and October 2007, respectively, compared with 33.3 and 39.6 per cent in the corresponding months of 2006. The growth of M2 was driven by the increase in foreign assets (net) of the banking system as well as the rapid rise in credit to the private sector

since the end of the second quarter. With the CBN's drive to contain excess liquidity in the banking system, both M2 and reserve money still remained outside the targets by the end of 2007. At the end of the second quarter, aggregate domestic credit (net) to the economy declined by 56.11 per cent, but increased by 98.99 per cent in October 2007. Also, credit to government (net) declined by 51.9 per cent in September compared to a decline of 56 per cent at the end of the second quarter. But credit to the private sector, which had maintained an upward trend for most of 2007, rose to 34.37 and 62.0 per cent in June and September, respectively.

As at November 2007, the economy achieved a commendable level of external reserves of about US\$50.0 billion that was capable of supporting approximately 23 months of current foreign exchange disbursements. This represented an increase of 18.06 per cent when compared with the level of US\$42.42 billion recorded in the corresponding period of 2006.

With the implementation of the new Monetary Policy Rate (MPR) and the adoption of the CBN standing facilities, volatility in inter-bank rates turned out to be moderate with rates hovering around the MPR. The MPR was reviewed thrice during the year. The first was in June 2007 when it was reviewed downward by 200 basis points, from 10.0 per cent to 8.0 per cent, with the width of the interest rate corridor reduced from +/- 300 to +/- 250 basis points. The second was in October 2007 when the MPR was raised by 100 basis points, from 8.0 to 9.0 per cent, with the interest rate corridor removed, in response to anticipated changes in economic and financial conditions. The MPR was then made to serve as the overnight (repo) rate. The last was in December 2007 when the MPR was increased by 50 basis points, from 9.0 to 9.5 per cent.

IV. Methodology of the study

The objective here is to estimate the deterministic relationship between the variables in line with the theoretical postulation and policy expectation. As mentioned, it is the general expectation that the monetary policy rates be the signal rate to deposit money banks' credit operations, such that when the monetary authority considers interest rates too high beyond what is judged appropriate to stimulate investment, a cut in monetary policy rate (which implies ease of accessing funds by DMBs through the Central Bank discount window) is expected to induce DMBs to lower the cost of lending. A case where a cause-effect relationship cannot be established, the implication is that changes in the MPR are exercises in futility as the credit market would have been operating outside the influencing factor of the Central Bank. In other words, such a lack of

cause-effect relationship implies that the effects of monetary policy are not transmitted to the rest of the economy. Furthermore, because we recognize the lack of sophistication in the Nigerian financial market, the paper considers it appropriate to assess the likely effect of some monetary variables on the cost of funds in the money market. Therefore, from a simple relationship of the form;

$$ir_t = \beta_0 + \beta_1 mpr_t + \beta_2 X_t + e_t. \quad (1)$$

Where ir_t is the inter-bank rate, mpr_t is the monetary policy rate, X_t represents monetary operations variables theoretically adjudged to be capable of influencing the dependent variable, and e_t is the error term that is assumed to be white noise.

From a time series perspective, modelling economic variables requires evaluating if the series are stationary. Stationary variables and integrated series, demand completely different modelling strategies. However, in order to avoid the problem of spurious results, it is necessary to test the existence of unit roots.⁵ We apply a battery of unit-root tests to both series, including the traditional Augmented Dickey-Fuller test and the Phillip-Perron tests. Once the series are found to be integrated or if the ir and the mpr move closely together and sporadically deviate from each other, we evaluate the presence of a long-run relationship between both series. Evaluating this hypothesis is equivalent to testing whether the residuals from an OLS regression between ir , mpr and X_t is non-stationary against the alternative that it is stationary. Thus, we can assess the unit root result of the residuals,

$$e_t = ir_t - \beta_0 - \beta_1 mpr_t - \beta_2 X_t \quad (2)$$

in the form;

$$\Delta e_t = \lambda_1 e_{t-1} + \lambda_2 \Delta e_{t-i} \quad (3)$$

Note that while we included one lagged term, Δe_{t-1} , in equation 3 to correct for autocorrelation, the lagged terms could also be more than one (i.e. Δe_{t-i}). The choice of the lag length is guided by the Akaike Information Criterion (AIC).

⁵ Testing for unit root in the mpr is challenging because this rate changes discretely and its increments are irregularly spaced in time. An overwhelming majority of the literature fails to reject a unit root based on the low power of unit root test when dealing with series that present infrequent changes (Hamilton and Jorda, 2002). We take one of the stands in the literature testing for the presence of unit root in the ir and the target rate.

It is the *tau* statistic with respect to the coefficient of e_{t-1} in equation 2 that would help us establish the case for or otherwise of a cointegration between the variables *ir*, *mpr* and X_t . The decision rule is that, if the *tau* statistic (τ) obtained from equation 3 is less than or equal to τ_c (i.e. $\tau < \tau_c$), we reject the null hypothesis of no cointegration. However, if $\tau > \tau_c$, we accept the null hypothesis that the series are not cointegrated.

V. Data and Empirical Results

Data used in this study were obtained from the Central Bank of Nigeria: Major Economic, Financial and Banking Indicators and Bank Analysis System, Economic and Financial Review, and the Financial Market Dealers Association – Market Update. Monthly series covering the period 1999M01 -2009M09 were used.⁶

The summary statistics of the variables used in the study are presented in table 1 in the appendix. A glance of the plot (figure1) reveals that the series are correlated positively among a number of variables. Within the sample period, the *ir* has followed the *mpr*, though not as close as would be expected, particularly between 1999 and 2001, 2005 and 2006, and from the second half of 2008 to mid-2009 (see figure 2). These periods witnessed large fluctuations in the range of +/- 10-15 basis points. Going by this, the success of the CBN in steering the short-term interest rates toward the *mpr*, coupled with variations in the *mpr* and the financial fragility that necessitated the banking consolidation exercise, has been marginal. Except for most part of 1999, 2001 and from mid-2008 through 2009 when the inter-bank rate exceeds the *mpr*, for most part of the rest of the sample period, the *ir* was below the *mpr*, an indication that the interbank fund market has, for most times in the sample period, been liquid. In terms of spread, there is considerable heterogeneity of these variables across time. For example, while the average deviation between 1999 and mid-2001 was about 1000bps, it was only about 500 bps from mid-2001 to mid-2005.

Table 3 shows unit root tests on the order of integration of the variables – dependent and independent based on the Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) classes of unit root tests.⁷ The ADF and PP test the null hypothesis for variables of interest that are non-stationary and ascertain the number of times variables need to be differenced to arrive at stationarity. As

⁶ The monthly series were obtained by interpolation of quarterly series for periods where monthly figures could not be obtained

⁷ As observed in note 4 above, the price-related variables have been found to be stationary, albeit at first difference, compared to the quantity-related variables that are stationary at levels.

shown on the table, both the ADF and the PP tests strongly support the hypotheses that growth in banking system credit (BCRTGWT), foreign exchange net flow (FOREXNTFLOW) and growth in broad money supply (M2GRWT) are stationary at levels, while the inter-bank rate (IR), monetary policy rate (MPR) and the IR-MPR spread are stationary at first differenced judging by the McKinnon critical values of rejection of the hypothesis of unit root.

Since the unit root tests reveal that BCRTGWT, FOREXNTFLOW and M2GRWT are $I(0)$, while IR, MPR and IR-MPR are $I(1)$, we went further to ascertain the possible number of cointegrating equations. Result of the unrestricted rank test in table 4 indicates that there are 4 cointegrating equations, while the Max-eigenvalue test indicates that there are 3 cointegrating equations both at 5 percent levels. From the Johansen multivariate test result, the normalized cointegration equation is;

$$ir = + 0.98irmpr + 0.98mpr + 0.03m2grwt - 0.00013forexnetflow - 0.0092bcrtgwt, \quad (4)$$

All coefficients are significant going by values of their respective standard errors. However, except for the variable d (bcrtgwt), the adjustment coefficients in the equation for other variables are insignificant.

V.1 The Long-run Static Regression Model and Cointegration Test

Having established the stationarity levels of the variables and the possibility of cointegrating equations, we therefore, tested for the possible cointegration among the variables by adopting the Engle and Granger two-step method – testing the stationarity of the residuals generated from running a static regression model in levels. A case for cointegration is established when the residuals is found to be stationary. Table 4 reports result of the static regression model, while table 5 reports the result of the cointegration test.

Given the ADF and PP critical values, variables in the co-integration regression model are said to be co-integrated. Thus, monetary policy rate, growth in broad money supply, growth in banking system credit and net flow of foreign exchange co-integrate with inter-bank rate. In other words, the results reject the null hypothesis of unit-root for the residuals, confirming the presence of a fundamental long-run relationship among the variables.

Given the non-stationary behaviour of the ir and its co-integration with the mpr and X_t , the most natural approach is an error correction model (ECM) with the

mpr as the long term anchor.⁸ This approach is not novel in the literature. In fact, it has been applied by Nautz and Offermanns (2006), and Sarno and Thornton (2002) for Euro zone and the federal funds rate in United States, respectively. The ECM we estimate is formulated as follows:

$$\Delta ir_t = \theta_1 \Delta (ir_t - mpr_t)_{t-1} + \theta_2 \Delta mpr_{t-1} + \theta_3 \Delta ir_{t-1} + \lambda \Delta X_{t-1} + \delta ECM_{t-1} + U_t \quad (5)$$

where *ir* is the inter-bank rate, *mpr* the monetary policy rate, *X* a vector of other explanatory variables, Δ is the first-difference operator. The parameter θ_1 is the rate at which the deviations of *ir* from the *mpr* are closed to each other. The vector of other explanatory variables, *X*, involves several monetary operations variables, growth of money supply (to account for the liquidity effect in the inter-bank market), growth of deposit money banks credit (to account for the non-discretionary injection and drainage of funds through open market operations) and the foreign exchange net flow (to account for the possible impact of the demand for and supply of foreign currency in the inter-bank funds market).

Table 6 below shows the results of the over-parameterized model with all the variables lagged over three periods. The estimation is in line with Engle and Granger (1987). The model performed well in terms of elementary diagnostic tests: the coefficient of determination, the F and the DW Statistics. In terms of individual variables, however, some are found to have no significant effect/contribution to the regression model, thus, necessitating the estimation of a more parsimonious model, the result of which is in table 7.

The result in table 7 is preferred to that of table 6 since it has more robust significant regressors, lower Schwarz (SC) criterion. The result also reports a better and well-defined error correction term, ECM_{t-1} , which is significant and carries the expected sign. The error correction term indicates a feedback of 159 percent of the previous month's disequilibria from the long-run regressors on the regressand (inter-bank rate).

V.2 Diagnostic Tests

To confirm the robustness of the model, we performed diagnostic tests and the results are as shown in table 8. The Jarque-Bera test for normality of residual assumption is not violated, therefore the inference is valid. The result showed that

⁸ It is worth mentioning that an error correction specification could also be obtained from a more general specification where the *ir* is just modelled as a function of its own lags, lags from the *mpr* plus other controls.

the error process could be described as normal. Similarly, the B-G serial correlation LM test indicates that the null hypothesis of no first-order autocorrelation of the error term is accepted, just as on the basis of White test there is Heteroscedasticity. The specification error (going by Ramsey Reset test) suggests the acceptance of the additive model based on the F -statistic and a P -value of 0.043440. The results suggest that the model is robust for policy analysis.

Structural stability test of the model was conducted using the Cumulative Sum (CUSUM) test and the CUSUM of squares test. This is necessary in view of the fact that stability of the model will determine the extent to which we can make forecast concerning behaviour of the variables in the model. Figure 4 shows the plot suggesting the model is correctly specified and structurally stable, since the CUSUM lies within the 5 percent significance bound. The CUSUM of squares test (see figure 5) equally shows the presence of structural stability, particularly from 2006 when the instrument of monetary policy rate was introduced by the Central Bank. This is an indication of moderation in the volatility of the interbank rate.

VI. Summary and Concluding Remarks

Inter-bank markets are among the most important in the financial system. They are the focus of central banks' implementation of monetary policy and have a significant effect on the whole economy. Transactions in the inter-bank funds market provides signal of what obtains in the open credit market. In this work, though our major concern is in examining the possibility of a cointegrating relationship between the inter-bank fund market rate and the monetary policy rate, the anchor rate for other rates in the money market, the mpr cannot be taken as the only determinant of the inter-bank rate. To that effect, a number of other monetary variables are taken into account in examining the behaviour of the inter-bank rate. In this paper, we provide a parsimonious model of inter-bank fund rate determination using monthly data. This lies at the heart of monetary policy.

Results of the estimates indicate the significance of the mpr in our inter-bank rate equation. The result - that the monetary policy rate and the Nigeria inter-bank rates are cointegrated - has major economic implications. It means that when the Central Bank implements monetary policy by changing the monetary policy rate, the inter-bank rate will also change thereby ensuring that the effects of monetary policy are transmitted to the rest of the economy. The variable measuring "spread" produced a strong and positive coefficient indicating that a rise in $ir-mpr$ increases the cost of inter-bank intermediation, reflecting the risk-

aversive disposition of market operators. Similarly, though growth in money supply is found to be significant in both current and lagged periods, it failed in carrying the expected sign in the current period and when lagged two periods. It is only when lagged three periods that the coefficients conform to the a priori expectation. The variables measuring growth in bank credit and netflow of foreign exchange are found to be significant and carry the expected signs. In all, the result is robust with the model explaining 98 percent of the behaviour of the inter-bank rate, serial correlation free and low AIC and SC.

In conclusion, while these results are preliminary, as a number of issues pertinent in the inter-bank market are not fully accounted for in this work (issues such as the implication of the change in reserve maintenance period, the impact of the banking sector reform exercise on the funds market, Central Bank intervention through REPO, financial crisis and inter-bank rate behaviour, the effect of liquidity hoarding in the inter-bank market spread, and the impact of lending relationships between banks in the market on flow of funds and the inter-bank rate, among others), they nevertheless call our attention to the need for policy pro-activeness in a way that would strengthen the anchor role of the *mpr*, in particular, and, in general, influencing the pattern of movement of the other explanatory variables. These are promising areas worthy of attention in future research.

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APPENDIX

Figure 1: Line graphs of regression variables

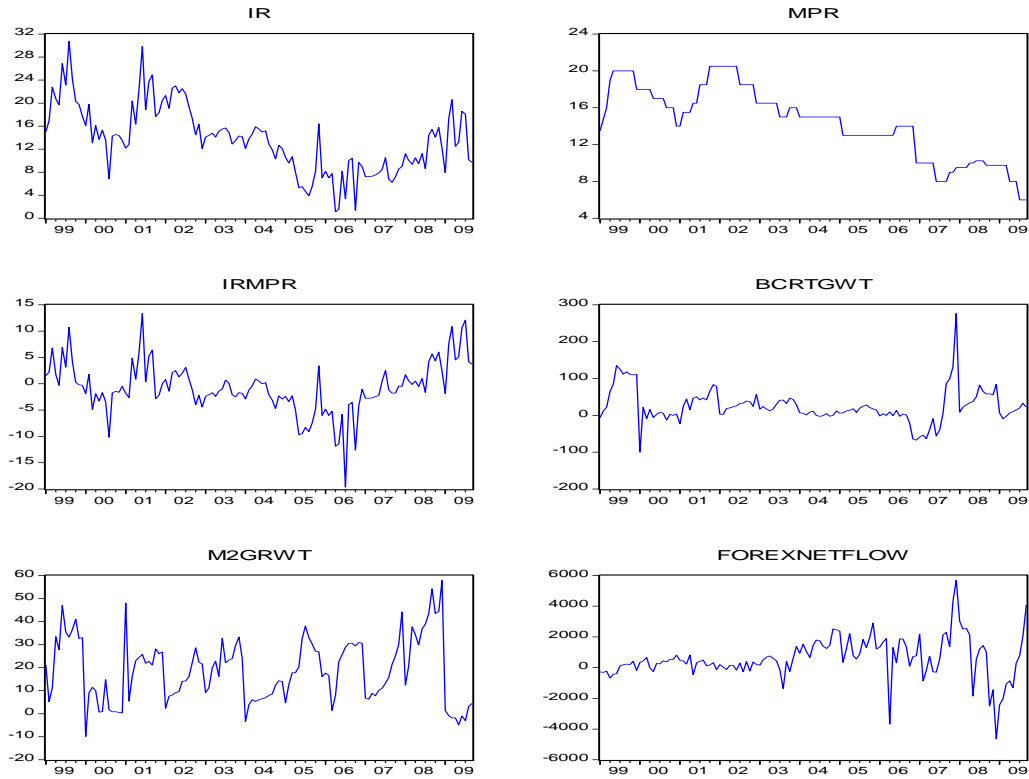


Figure2: Correlation of Explanatory Variables.

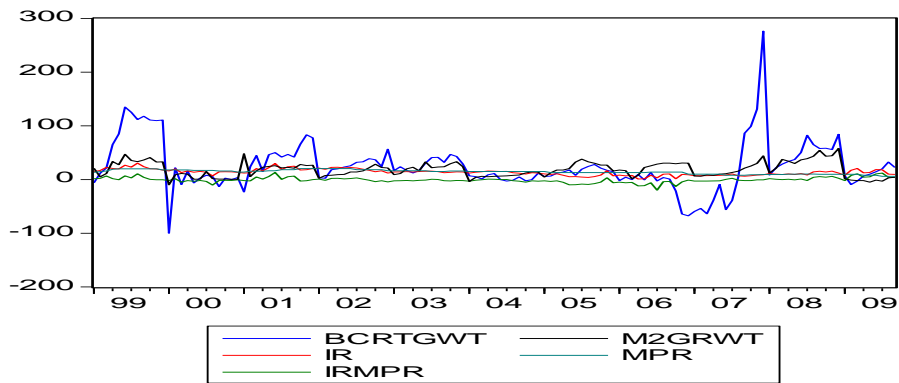


Figure 3: Nigeria Interbank rate - Monetary Policy Rate Relationship and Spread

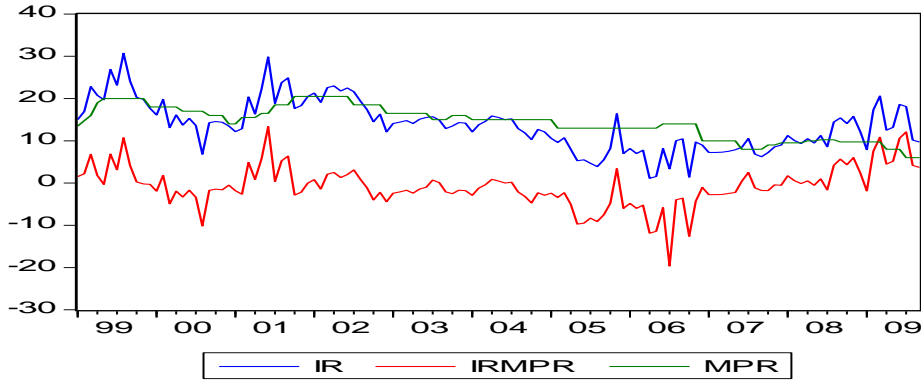


Figure 4: CUSUM Test on the Parsimonious Model

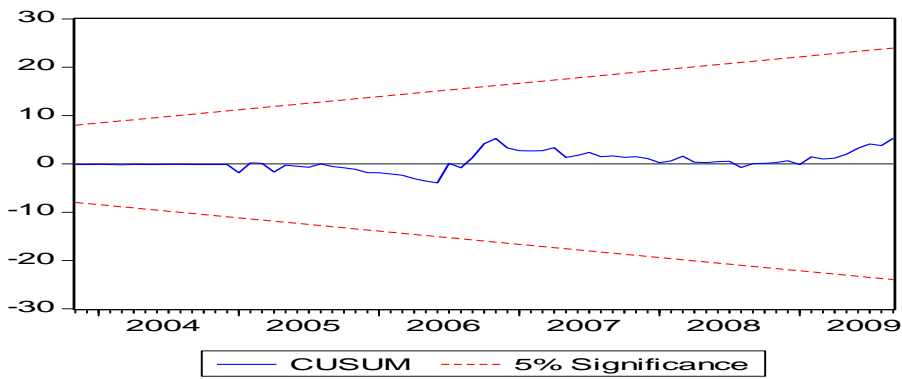


Figure 5: CUSUM of Squares test on the Parsimonious model

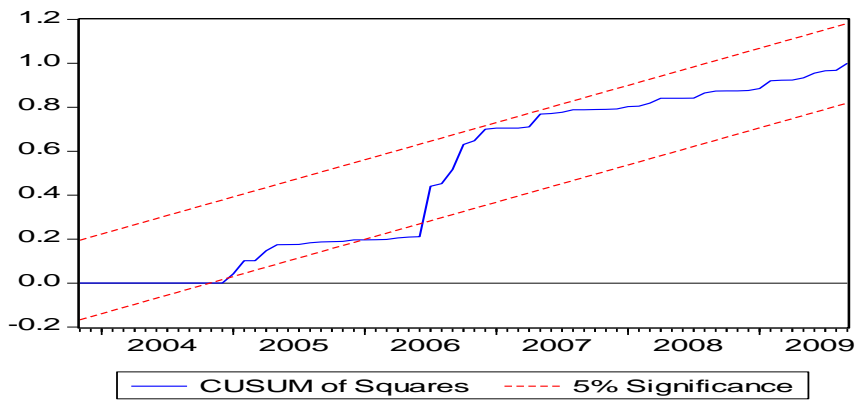


Table 1: Summary Statistics

	FOREXNET					
	IR	IR-MPR	MPR	M2GRWT	FLOW	BCRTGWT
Mean	13.73426	-0.720388	14.37016	18.78023	603.4547	24.68364
Median	13.80000	-1.200000	15.00000	17.80000	447.3000	16.80000
Maximum	30.71000	13.34000	20.50000	57.80000	5696.500	276.4000
Minimum	1.130000	-19.63000	6.000000	-9.870000	-4643.800	-99.80000
Std. Dev.	5.815001	4.860192	3.865930	13.92419	1348.643	46.19195
Skewness	0.323096	-0.145133	0.207452	0.342407	-0.104368	1.425666
Kurtosis	2.986186	5.043793	2.150971	2.535318	6.260934	9.392498
Jarque-Bera Probability	2.245432	22.90474	4.799847	3.681331	57.39027	263.3434
Sum	1771.720	-92.93000	1853.750	2422.650	77845.66	3184.190
Sum Sq.Dev	4328.223	3023.548	1913.013	24817.04	2.33E+08	273113.1
Observations	129	129	129	129	129	129

Table 2: Correlation Matrix

	IR	IR-MPR	MPR	M2GRWT	FOREXNTFLOW	BCRTGWT
IR	1	0.741926	0.613534	0.013351	-0.262277	0.332880
IR-MPR	0.741926	1	-0.056938	-0.029133	-0.176993	0.260928
MPR	0.613534	-0.056938	1	0.035284	-0.184708	0.184115
M2GRWT	0.01335	-0.029133	0.035284	1	0.003696	0.560589
FOREXNTFLOW	-0.262277	-0.176993	-0.184708	0.003696	1	0.101329
BCRTGWT	0.332880	0.260928	0.184115	0.560589	0.101329	1

Table 3: Augmented Dickey-Fuller and Phillips-Perron Unit Root Test Results

Variable	BCRTGWT	FOREXNT FLOW	IR	IR-MPR	M2GRWT	MPR
ADF statistic	-4.066	-5.428	-13.098	-14.362	-5.213	-10.252
Phillip-Perron statistic	-5.581	-5.613	-17.654	-22.644	-5.369	-10.242
Order of Integration	I(0)	I(0)	I(1)	I(1)	I(0)	I(1)

Mackinnon (1996) Critical Values: 10% = -2.579; 5% = -2.884; 1% = -3.482

Table 3a: Cointegration Test Results

Sample (adjusted): 1999M06 2009M09
 Included observations: 124 after adjustments
 Trend assumption: Linear deterministic trend
 Series: IR IRMPR MPR M2GRWT FOREXNETFLOW BCRTGWT
 Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.422408	182.2705	95.75366	0.0000
At most 1 *	0.295522	114.2085	69.81889	0.0000
At most 2 *	0.268197	70.77145	47.85613	0.0001
At most 3 *	0.141619	32.05318	29.79707	0.0270
At most 4	0.098194	13.11747	15.49471	0.1106
At most 5	0.002427	0.301357	3.841466	0.5830

Trace test indicates 4 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 *	0.422408	68.06204	40.07757	0.0000
At most 1 *	0.295522	43.43703	33.87687	0.0027
At most 2 *	0.268197	38.71827	27.58434	0.0013
At most 3	0.141619	18.93571	21.13162	0.0987
At most 4	0.098194	12.81611	14.26460	0.0836
At most 5	0.002427	0.301357	3.841466	0.5830

Max-eigenvalue test indicates 3 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 Cointegrating Coefficients (normalized by $b^*S11*b=I$):

IR	IRMPR	MPR	M2GRWT	FOREXNETFLOW	BCRTGWT
3.264719	-3.207414	-3.212641	-0.089361	0.000428	0.029978
0.987817	-0.687026	-0.818245	0.115330	0.001045	-0.022854
2.106440	-1.879749	-2.085576	0.046162	-7.22E-05	-0.031570
-					
0.443735	0.153102	0.335108	0.037252	-0.000811	0.021175
0.030842	-0.130980	-0.021050	0.022064	0.000638	-0.017088
-					
0.326844	0.237226	0.602206	0.021938	-0.000192	-0.007056

Unrestricted Adjustment Coefficients (alpha):

D(IR)	D(IRMPR)	D(MPR)	D(M2GRWT)	D(FOREXNETFLOW)	D(BCRTGWT)
-0.283233	-0.004398	-0.058953	1.337939	40.92789	-11.61777
-0.647234	-0.564991	0.092601	-2.688212	-357.2927	-3.960428
0.253119	0.629000	-0.087235	-0.909229	236.8802	7.591540
0.634219	0.709225	-0.030550	-2.658233	-2.291306	-8.559318
0.538747	0.596371	0.010022	1.393124	-153.3643	2.270617
-0.036839	-0.013545	-0.027344	-0.020892	-18.45843	-0.147107

1 Cointegrating Equation: Log likelihood -2614.439

Normalized cointegrating coefficients (standard error in parentheses)

IR	IRMPR	MPR	M2GRWT	FOREXNETFLOW	BCRTGWT
1.00000	-0.982447 (0.01498)	-0.984048 (0.01214)	-0.027372 (0.00573)	0.000131 (5.0E-05)	0.009182 (0.00205)

Adjustment coefficients (standard error in parentheses)

D(IR)	D(IRMPR)	D(MPR)	D(M2GRWT)	D(FOREXNETFLOW)	D(BCRTGWT)
-0.924678 (0.93982)	-0.014357 (1.03264)	-0.192465 (0.20270)	4.367997 (3.29496)	133.6181 (333.626)	-37.92784 (10.5905)

Table 3b: Result of Johansen multivariate cointegration test

<u>λ_{Max} Test Statistic</u>		<u>λ_{Trace} Test Statistic</u>	
$H_0: r = 0$		$H_0: r = 0$	
$H_a: r = 1$		$H_a: r > 1$	
Eigen value	= 0.422408	Eigen value	= 0.422408
Max Eigen stat.	= 68.06204	Trace stat.	= 182.2705
5% critical value	= 40.07757	5% critical value	= 95.75366

Test indicates presence of one cointegrating vector for the model. Thus, there is a long-run equilibrium relationship among the variables under consideration.

Table 4: Static Regression Model

Dependent Variable: IR

Method: Least Squares

Sample: 1999M01 2009M09

Included observations: 129

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IRMPR	0.930986	0.016063	57.95911	0.0000
MPR	0.986994	0.019338	51.03939	0.0000
M2GRWT	0.004632	0.006348	0.729718	0.4670
FOREXNETFLOW	-1.60E-05	5.57E-05	-0.287704	0.7741
BCRTGWT	0.000402	0.002068	0.194490	0.8461
C	0.134430	0.312717	0.429876	0.6680
R-squared	0.982080	Mean dependent var		13.73426
Adjusted R-squared	0.981352	S.D. dependent var		5.815001
S.E. of regression	0.794092	Akaike info criterion		2.422161
Sum squared resid	77.56164	Schwarz criterion		2.555175
Log likelihood	-150.2294	F-statistic		1348.170
Durbin-Watson stat	1.934206	Prob(F-statistic)		0.000000

Table 5: Unit Root test for the Residuals

Null Hypothesis: RESID01 has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.86161	0.0000
Test critical values: 1% level	-3.482035	
5% level	-2.884109	
10% level	-2.578884	

*MacKinnon (1996) one-sided p-values.

Table 6: Over-Parameterized Error Correction Model

Dependent Variable: D(IR,2)

Method: Least Squares

Sample (adjusted): 1999M06 2009M09

Included observations: 124 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IRMPR,2)	0.889850	0.023042	38.61792	0.0000
D(IRMPR(-1),2)	-0.005323	0.034326	-0.155079	0.8771
D(IRMPR(-2),2)	-0.197347	0.071676	-2.753303	0.0070
D(IRMPR(-3),2)	-0.109827	0.061577	-1.783571	0.0775
D(IR(-2),2)	0.195898	0.067626	2.896788	0.0046
D(IR(-3),2)	0.121228	0.064288	1.885714	0.0622
D(MPR,2)	0.932661	0.109056	8.552095	0.0000
D(MPR(-1),2)	0.092385	0.133724	0.690863	0.4913
D(MPR(-2),2)	-0.189125	0.146195	-1.293654	0.1988
D(MPR(-3),2)	-0.070582	0.119337	-0.591449	0.5556
D(M2GRWT,2)	0.014701	0.007942	1.851013	0.0671
D(M2GRWT(-1),2)	0.001612	0.011238	0.143455	0.8862
D(M2GRWT(-2),2)	0.015018	0.010915	1.375947	0.1719
D(M2GRWT(-3),2)	0.002502	0.008049	0.310848	0.7566
D(FOREXNETFLOW,2)	1.81E-05	6.77E-05	0.267779	0.7894
D(FOREXNETFLOW(-1),2)	-1.62E-05	9.57E-05	-0.169636	0.8656
D(FOREXNETFLOW(-2),2)	0.000139	9.72E-05	1.425324	0.1572
D(FOREXNETFLOW(-3),2)	-0.000136	7.92E-05	-1.715413	0.0894
D(BCRTGWT,2)	-0.002011	0.002354	-0.854437	0.3949
D(BCRTGWT(-1),2)	-0.003340	0.003314	-1.007800	0.3160
D(BCRTGWT(-2),2)	-0.003093	0.003266	-0.947055	0.3459
D(BCRTGWT(-3),2)	-0.000796	0.002263	-0.351805	0.7257
RESID01(-1)	-1.575117	0.132173	-11.91711	0.0000
C	-0.009473	0.082037	-0.115469	0.9083
R-squared	0.982114	Mean dependent var		0.004839
Adjusted R-squared	0.978000	S.D. dependent var		6.126412
S.E. of regression	0.908695	Akaike info criterion		2.818372
Sum squared resid	82.57274	Schwarz criterion		3.364233
Log likelihood	-150.7391	F-statistic		238.7343
Durbin-Watson stat	1.920743	Prob(F-statistic)		0.000000

Table 7: Parsimonious Regression Model

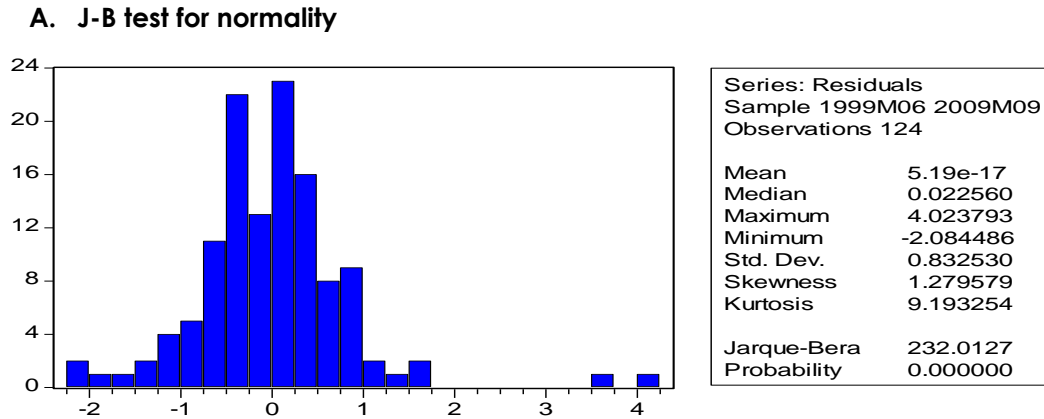
Dependent Variable: D(IR,2)

Method: Least Squares

Sample (adjusted): 1999M06 2009M09

Included observations: 124 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(IRMPR,2)	0.894147	0.013427	66.59418	0.0000
D(IRMPR(-2),2)	-0.167747	0.050470	-3.323693	0.0012
D(IRMPR(-3),2)	-0.071580	0.047186	-1.516980	0.1321
D(IR(-2),2)	0.167516	0.056554	2.962039	0.0037
D(IR(-3),2)	0.082649	0.052928	1.561555	0.1212
D(MPR,2)	0.874380	0.080656	10.84091	0.0000
D(MPR(-2),2)	-0.212318	0.085522	-2.482612	0.0145
D(M2GRWT,2)	0.014382	0.004426	3.249429	0.0015
D(M2GRWT(-2),2)	0.010392	0.004519	2.299647	0.0233
D(FOREXNETFLOW(-2),2)	0.000164	5.33E-05	3.067542	0.0027
D(FOREXNETFLOW(-3),2)	-0.000125	6.11E-05	-2.047161	0.0430
RESID01(-1)	-1.588040	0.122157	-13.00000	0.0000
C	-0.011956	0.078750	-0.151815	0.8796
R-squared	0.981533	Mean dependent var		0.004839
Adjusted R-squared	0.979537	S.D. dependent var		6.126412
S.E. of regression	0.876377	Akaike info criterion		2.672885
Sum squared resid	85.25206	Schwarz criterion		2.968560
Log likelihood	-152.7189	F-statistic		491.6538
Durbin-Watson stat	1.919135	Prob(F-statistic)		0.000000

Table 8: Results Diagnostic Tests**B. Breusch-Godfrey Serial Correlation LM Test:**

F-statistic	4.556776	Probability	0.012572
Obs*R-squared	9.567746	Probability	0.008364

C. White Heteroskedasticity Test:

F-statistic	14.26327	Probability	0.000000
Obs*R-squared	96.18336	Probability	0.000000

D. Ramsey RESET Test:

F-statistic	2.548545	Probability	0.043440
Log likelihood ratio	11.28442	Probability	0.023547

An Examination of the Relationship between Government Revenue and Government Expenditure in Nigeria: Cointegration and Causality Approach

Emelogu C. Obioma, Ph.D, and Uche M. Ozughalu*

Fiscal policy, which entails an appropriate alignment in government revenue and expenditure, is of crucial importance in promoting price stability and sustainable growth in output, income and employment. It is one of the macroeconomic policy instruments that can be used to prevent or reduce short-run fluctuations in output, income and employment in order to move an economy to its potential level. However, for sound fiscal policy, a good understanding of the relationship between government revenue and government expenditure is very important, for instance, in addressing fiscal imbalances. Thus, the causal relationship between public revenue and public expenditure has been an issue that has generated heated debates globally, over the years, among economists and policy analysts. Four major hypotheses have emanated from the debates namely: the revenue-spend hypothesis (where there is a unidirectional causality from government revenue to government expenditure); the spend-revenue hypothesis (where there is a unidirectional causality from government expenditure to government revenue); the fiscal synchronization hypothesis (where there is bidirectional causality between government revenue and government expenditure); and the institutional separation hypothesis (where there is no causality between government revenue and government expenditure).

This study makes a modest contribution to the debates by empirically analyzing the relationship between government revenue and government expenditure in Nigeria, using time series data from 1970 to 2007, obtained from the Central Bank of Nigeria (2004, 2007). In particular, the study examines the validity of the four aforementioned hypotheses to Nigeria. It employs the Engel-Granger two-step cointegration technique, the Johansen cointegration method and the Granger causality test within the Error Correction Modeling (ECM) framework. Empirical findings from the study indicate, among other things, that there is a long-run relationship between government revenue and government expenditure in Nigeria. There is also evidence of a unidirectional causality from government revenue to government expenditure. Thus, the findings support the revenue-spend hypothesis for Nigeria, indicating that changes in government revenue induce changes in government expenditure. The empirical findings suggest, among other things, that: controlling the swings in government revenue is very necessary in controlling government expenditure and avoiding unsustainable fiscal imbalances in Nigeria; and to increase government spending, efforts should be made to enhance government revenue, but efforts to enhance government revenue should be accompanied with appropriate

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public expenditure reforms in order to achieve sustainable economic growth, since higher government revenue invites higher government expenditure, while the quality of expenditure is central to achieving any meaningful growth.

Keywords: Examination, Government Revenue, Government Expenditure, Cointegration, Causality.

Jel Classification Numbers: H00, H20, H50, C22, C32, C50

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I. Introduction

The causal relationship between government revenue and government expenditure is an issue that has generated heated debate globally, over the years, among economists and policy analysts. An understanding of this relationship is critical in the formulation of a sound or excellent fiscal policy to prevent or reduce unsustainable fiscal deficits (Eita and Mbazima, 2008). Indeed, a good understanding of the relationship between public revenue and public expenditure is of crucial importance in appreciating the consequences of unsustainable fiscal deficits and in addressing such imbalances (Hondroyiannis and Papapetrou, 1996; Eita and Mbazima, 2008). It is also highly consequential in evaluating government's role in the distribution of resources (Chang, 2009). Such evaluation paves the way for sound fiscal policy formulation and implementation to achieve rapid and sustainable socio-economic growth and development, all other things remaining the same. Excellent fiscal policy - as noted by Eita and Mbazima (2008), Wolde-Rufael (2008), and Fasano and Wang (2002) - is very important in promoting price stability and sustainable growth in output, income and employment. In spite of the significance of a proper understanding of the relationship between public revenue and public expenditure in formulating sound fiscal policy, empirical study on the subject in Nigeria is very scanty.

In light of the foregoing, this study examines the relationship between federal government revenue and expenditure in Nigeria, with a view to establishing the existence or otherwise of any long-run relationship and the direction of causality among the variables. The empirical findings should help in determining appropriate policy measures to address some of the fiscal challenges facing Nigeria. As stated by Sanni (2007), Nigeria's fiscal operations over the years have resulted in varying degrees of deficit; the financing of which has had tremendous implications for the economy. The study makes a modest contribution to the body of knowledge on the nexus between government revenue and government expenditure, using Nigerian data.

Following this introduction, section two reviews some of the relevant theoretical and empirical literature on the issue, while section three discusses developments

associated with government revenue, government expenditure and budget deficit in Nigeria. Section four presents the methodology used in the study and analyzes the results. Section five concludes the study and offers some recommendations.

II. Literature Review

The analysis of the nexus between government revenue and government expenditure has featured prominently in both theoretical and empirical literature. The theoretical literature contains many hypotheses that have been proposed to describe the inter-temporal/causal relationship between public revenue and public expenditure. These hypotheses can be grouped into four namely: tax-and-spend or revenue-spend hypothesis; spend-and-tax or spend-revenue hypothesis; fiscal synchronization hypothesis; and fiscal independence or institutional separation hypothesis (Chang, 2009). The tax-and-spend hypothesis, put forward by Friedman (1978), states that changes in government revenue bring about changes in government expenditure. It is characterized by unidirectional causality running from government revenue to government expenditure. According to Friedman, increases in tax or revenue will lead to increases in public expenditure, and this may result in the inability to reduce budget deficits (Chang, 2009).

The spend-and-tax hypothesis, advanced by Peacock and Wiseman (1961, 1979), states that changes in public expenditure bring about changes in public revenue. It is characterized by unidirectional causality running from public expenditure to government revenue. As argued by Peacock and Wiseman (1961, 1979), a severe crisis that initially makes government expenditure more than tax or public revenue has the potential to change public attitudes concerning the proper size of government. The upshot is that some of the tax increases, originally justified by the crisis situation, will eventually become permanent tax policies. Put differently, Peacock and Wiseman (1961, 1979) argued that temporary increases in government expenditures due to economic and political crises can lead to permanent increases in government revenues from taxation; this is often called the "displacement effect" (Bhatia, 2003; Chang, 2009).

The fiscal synchronization hypothesis, associated with Musgrave (1966) and Meltzer and Richard (1981), is based on the belief that public revenue and public expenditure decisions are jointly determined. It is, therefore, characterized by contemporaneous feedback or bidirectional causality between government revenue and government expenditure (Chang, 2009). It is opined that voters compare the marginal costs and marginal benefits of government services when

making a decision in terms of the appropriate levels of government expenditure and government revenue.

The fiscal independence or institutional separation hypothesis, advocated by Baghestani and McNown (1994), has to do with the institutional separation of the tax and expenditure decisions of government. It is characterized by non-causality between government expenditure and government revenue (Chang, 2009). This situation implies that government expenditure and government revenue are independent of each other.

From the foregoing, three major reasons why the nature of the relationship between government revenue and government expenditure is very important can be deduced. First, if the revenue-spend hypothesis holds (that is, if government revenue causes government expenditure) then budget deficits can be eliminated or avoided by implementing policies that stimulate or increase government revenue. Second, if the spend-revenue hypothesis holds (that is, if government expenditure causes government revenue), it suggests that government's behavior is such that it spends first and raises taxes later in order to pay for the spending. This situation can bring about capital outflow as a result of the fear of consumers paying higher taxes in the future (Narayan and Narayan, 2006; Eita and Mbazima, 2008). Third, if the fiscal synchronization hypothesis does not hold (that is, if there is no bidirectional causality between government revenue and government expenditure), it implies that government expenditure decisions are made without reference to government revenue decisions and vice versa. This situation can bring about high budget deficits if government expenditure increases faster than government revenue.

Empirical literature shows that there are mixed findings on the nature of the relationship or direction of causation between government expenditure and government revenue. Different studies have come up with findings that provide support for different hypotheses for different countries. Some studies provide support for the spend-and-tax hypothesis including the studies by: Von Furstenberg, et al (1986) for the United States of America; Hondroyannis and Papapetrou (1996) for Greece; Wahid (2008) for Turkey; and Carneiro, et al (2004) for Guinea-Bissau. The studies that provide support for the tax-and-spend hypothesis include: Eita and Mbazima (2008) for Namibia; Darrat (1998) for Turkey; and Fuess, et al (2003) for Taiwan. In the study for Turkey, Wahid (2008) applied the standard Granger causality test whereas Darrat (1998) used the Granger causality test within an error correction modeling framework. With respect to the fiscal synchronization hypothesis, the studies that provide support for the

hypothesis include: Li (2001) and Chang and Ho (2002) for China; Maghyereh and Sweidan (2004) for Jordan. For the institutional separation hypothesis, the study by Barua (2005) supports the hypothesis at least in the short-run for Bangladesh.

Some researchers have examined the relationship between government revenue and government expenditure by considering a group of countries or states and also found support for different hypotheses for different countries or states. The study by Payne (1998), based on time series evidence from state budgets for forty-eight (48) contiguous states in the United States of America, supports the tax-and-spend hypothesis for twenty-four (24) states; the spend-and-tax hypothesis for eight (8) states; and the fiscal synchronization hypothesis for eleven (11) states. The remaining five (5) states were reported to have failed the diagnostic tests for error correction modeling. The study applied Granger causality test within an error-correction modeling framework. The study by Narayan (2005) for nine (9) Asian countries, using cointegration and Granger causality approach, supports the tax-and-spend hypothesis for Indonesia, Singapore and Sri Lanka in the short-run; and Nepal in both the short-run and the long-run. The results of the study also support the spend-and-tax hypothesis in the long-run for Indonesia and Sri Lanka; and show neutrality for the other countries.

The study by Narayan and Narayan (2006) for twelve (12) developing countries indicates that the tax-and-spend hypothesis is valid for Mauritius, El Salvador, Haiti, Chile, Paraguay and Venezuela; the spend-and-tax hypothesis is valid for Haiti, while there is evidence of neutrality for Peru, South Africa, Guyana, Guatemala, Uruguay and Ecuador. The study utilized the Granger causality test based on the procedure suggested by Toda and Yamamoto (1995) which allows for causal inference based on an augmented vector autoregression with integrated and cointegrated processes. Fasano and Wang (2002) examined the relationship between government spending and public revenue based on evidence from six (6) countries of the oil-dependent Gulf Cooperation Council (GCC) namely: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. The study, which used the Granger causality testing technique, showed that the tax-and-spend hypothesis is valid for Bahrain, the United Arab Emirates and Oman. The fiscal synchronization hypothesis is found to be true for Qatar, Saudi Arabia and Kuwait. For Kuwait and Saudi Arabia, however, the causality from revenue to expenditure shows higher significance than the reverse direction. Wolde-Rufael (2008) analyzed the public expenditure-public revenue nexus based on the experiences of thirteen (13) African countries. The study was carried out within a multivariate framework using Toda and Yamamoto (1995) modified version of the Granger causality test. The results of the study provided evidences supporting the

fiscal synchronization hypothesis for Mauritius, Swaziland and Zimbabwe; institutional separation hypothesis for Botswana, Burundi and Rwanda; the tax-and-spend hypothesis for Ethiopia, Ghana, Kenya, Nigeria, Mali and Zambia; and the spend-and-tax hypothesis for Burkina Faso.

From the foregoing studies, the use of time series data is found to be very popular among economic researchers/analysts in the analyses of the causal relationship between government revenue and government spending. However, pooled/panel data can also be used in analyzing the relationship. Thus, Ho and Huang (2009) used a panel data of thirty-one (31) Chinese provinces to analyze the interaction between public spending and public revenue. The results of the study based on multivariate panel error-correction models show that there is no significant causality between public revenue and public expenditure for the Chinese provinces in the short run; this supports the institutional separation hypothesis for the area. But in the long-run, there exists bidirectional causality between public revenue and public expenditure in the Chinese provinces, thus, supporting the fiscal synchronization hypothesis for the provinces over the sample period. Chang (2009) used a panel data of fifteen (15) countries in the Organization for Economic Co-operation and Development (OECD) in examining the inter-temporal relationship between government revenues and government expenditures. Among other things, the study performed panel Granger causality test and found evidence of bidirectional causality between government revenues and government expenditures, thus, validating the fiscal synchronization hypothesis for the OECD countries taken as a whole.

As observed by Narayan (2005), recent empirical literature can be categorized into two groups in terms of the methodology adopted. The first group of studies employed traditional econometric techniques based on vector autoregression (VAR). The second group of studies used modern econometric techniques based on cointegration and error correction models. As pointed out by Obioma and Ozughalu (2005), it has become fashionable in contemporary econometric analysis to consider issues of stationarity, cointegration and error correction mechanism/modeling (ECM) when dealing with models involving time series data. Stationarity assures non-spurious model estimates; cointegration captures equilibrium or long-run relationship between (co-integrating) variables; and error correction mechanism is a means of reconciling the short-run behavior of economic variables with their long-run behaviour (Gujarati and Porter, 2009). Tests for stationarity usually precede tests for cointegration; and cointegration may be said to provide the theoretical underpinning for error-correction mechanism. The concepts of stationarity, cointegration and error-correction mechanisms/models

are also applicable when panel data are used. In panel data analysis, we talk of panel stationarity, panel cointegration and panel error correction models (see Ho and Huang, 2009; Chang, 2009). As a digression, it is important to state here that tests for stationarity usually involve tests for unit root. When a variable has a unit root, it implies that it is not stationary. Economic variables are usually made stationary after differencing; and the order of integration of a variable is determined by the number of times the variable has to be differenced for it to achieve stationarity. If a variable has to be differenced d times before it becomes stationary, the variable is said to be integrated of order d . As observed by Gujarati and Porter (2009), most economic series become stationary after the first differencing. Thus, such variables are said to be integrated of order one (1). When a series is stationary without any differencing, that is, when it is stationary at level, such a variable is said to be integrated of order zero (0).

Modern econometrics has provided the platform for highly reliable and robust analyses on the causal relationship between public expenditure and public revenue. With regard to the form of the variables themselves, it is popular to work with their real values and not their nominal values (Fasano and Wang, 2002; Barua, 2005). The real values of the variables cater adequately for the problem of inflation. To get the real values, we simply deflate the nominal values by an appropriate price index such as the consumer price index (see Fasano and Wang, 2002).

III. Analysis of Movements in Real Government Revenue, Real Government Expenditure and Real Budget Deficit in Nigeria

Table 1 shows the average growth rates of real government revenue, real government expenditure and real budget deficit in Nigeria from 1971- 2007. As can be seen from the Table, real government revenue had its highest average growth rate in the period 1971-1975 followed by the period 1986-1990. These periods coincided with the early oil boom era and the structural adjustment program (SAP) era, respectively. This implies that government revenue profile in Nigeria performed best in the early oil boom era followed by the SAP era. Government revenue had its highest average decline rate in the period 1981-1985; this was the period that witnessed the collapse of the world oil market that made the Nigerian economy begin to show tremendous signs of distress; these signs were later followed by serious macroeconomic problems which initially led to the introduction of an economic stabilization package in 1981 and later to various rounds of budget-tightening austerity measures between 1982 and 1985.

Table 1: Average Growth Rates of Real Government Revenue, Real Government Expenditure and Real Budget Deficit: 1971 - 2007.

Period	Average Growth Rate of Real Government Revenue (in %)	Average Growth Rate of Real Government Expenditure (in %)	Average Growth Rate of Real Budget Surplus/Deficit (in %)
1971-1975	67.78	31.25	16.06
1976-1980	8.07	9.75	-131.08
1981-1985	-13.98	-15.21	33.77
1986-1990	26.22	11.37	-1213.77
1991-1995	-3.08	-6.31	354.30
1996-2000	-8.97	1.56	-59.98
2001-2005	10.25	5.27	18.42
2006-2007	-4.93	9.07	-11.66

Source: Computed by the Authors.

The period 1976-1980 recorded the lowest average growth rate in real government revenue while the period 1991-1995 recorded the lowest average decline rate in real government revenue. Coming to real government expenditure, the table shows that the period 1971-1975 recorded the highest average growth rate. This period coincided with the oil boom era of the 1970s and the early post-civil war period in which so much was spent on rehabilitation, reconstruction and reconciliation. The period 1981-1985 recorded the highest average decline rate in real government expenditure. With regard to real budget deficit, the table shows that the period 1991-1995 had the highest average growth rate, while the period 1986-1990 had the highest decline rate in real budget deficit.

Table 2 shows some basic descriptive statistics relating to the growth rate of real government revenue, growth rate of real government expenditure and growth rate of real budget deficit from 1970-2007. As shown in the Table, the mean growth rate of real government revenue is 8.098 per cent, the maximum is 136.363 per cent, the minimum is -99.812 per cent and the standard deviation is 43.112 per cent; the distribution is slightly positively skewed and it is leptokurtic.

Table 2: Some Basic Descriptive Statistics Relating to the Growth Rates of Real Government Revenue, Real Government Expenditure and Real Budget Deficit: 1970-2007

Descriptive Statistics	Growth Rate of Real Government Revenue (in %)	Growth Rate of Real Government Expenditure (in %)	Growth Rate of Real Budget Deficit (in %)
Mean	8.098417	5.581916	-133.3708
Median	-0.765405	1.111215	-30.93630
Maximum	136.3626	83.93903	1595.622
Minimum	-99.81220	-99.93082	-5684.519
Standard Deviation	43.11233	34.83015	1000.903
Skewness	0.627727	-0.118593	-4.624842
Kurtosis	4.378646	4.522670	27.30018
Coefficient of Variation	532.355027	623.981980	-750.466369

Source: Computed by the Authors

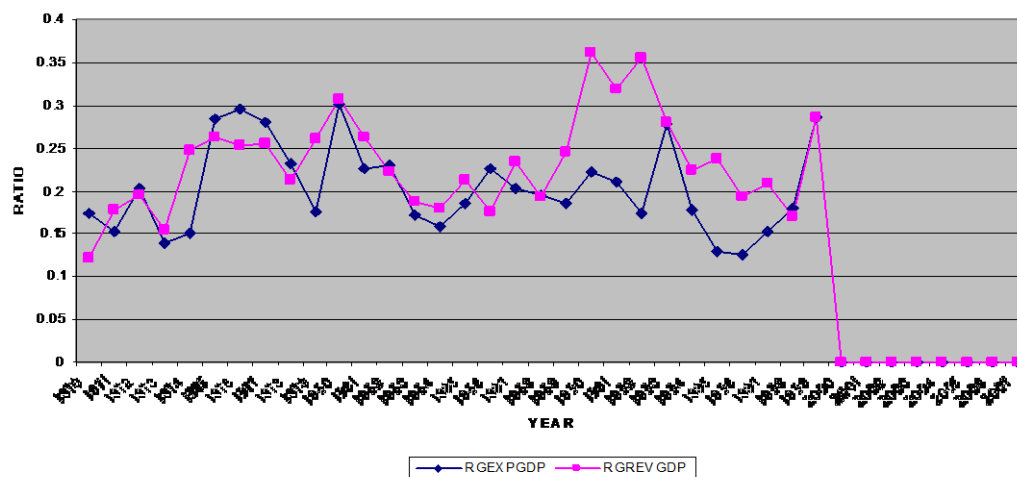
The table also shows that the mean growth rate of real government expenditure is 5.582 per cent, the maximum is 83.939 per cent, the minimum is -99.931 per cent and the standard deviation is 34.830 per cent; the distribution is slightly negatively skewed and it is leptokurtic. The table further shows that the mean growth rate of real budget deficit is -133.371 per cent, the maximum is 1595.622 per cent, the minimum is -5684.519 per cent and the standard deviation is 1000.903 per cent; the distribution is negatively skewed and it is highly leptokurtic. Looking at the three distributions, we will see that the mean growth rate of real government revenue is higher than the mean growth rate of real government expenditure. The mean growth rate of real budget deficit is highly negative. The standard deviation of the growth rate of real government revenue is higher than the standard deviation of the growth rate of real government expenditure.

The maximum growth rate of real budget deficit is the highest among the three distributions; the maximum growth rate of real government revenue is higher than the maximum growth rate of real government expenditure; the minimum growth rate of real budget deficit is the lowest among the three distributions; the minimum growth rate of real government revenue is slightly higher than the minimum growth rate of real government expenditure. The coefficient of variation associated with the growth rate of real government revenue is lower than the coefficient of variation associated with the growth rate of real government expenditure. This indicates that the growth rate of real government revenue is less

variable or more consistent, stable and homogenous than the growth rate of real government expenditure. The coefficient of variation associated with the growth rate of real budget deficit is negative.

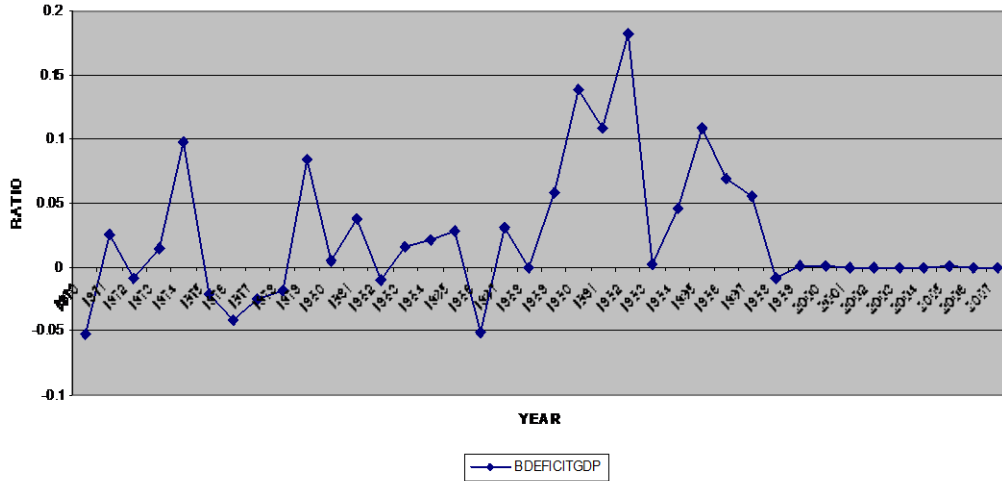
Figure 1 shows the ratios of real government expenditure and real government revenue to real gross domestic product from 1970-2007, while Figure 2 shows the ratio of real budget deficit to real gross domestic product from 1970-2007. The ratio of real government revenue to real gross domestic product was above 0.35 only in 1991 and 1993; it was below 0.35 in the other years; and from 2000 to 2007 it was below 0.05. The ratio of real government expenditure to real gross domestic product was 0.3 only in 1981; it was below 0.3 in the other years; it was far below 0.05 from 2000 to 2007. None of the two ratios was up to 0.4 in any of the years. The two ratios recorded both upward and downward swings in the period under reference. The ratio of real budget deficit to real gross domestic product was generally below 0.2 in the period under reference; the ratio was negative in some of the years in the period under reference; and the ratio recorded both upward and downward swings in the period in question.

Figure 1: Ratios of Real Government Expenditure and Real Government Revenue To Real Gross Domestic Product(1970-2007)



Note: RGEXPGDP is ratio of real government expenditure to real gross domestic product and RGREVGDP is ratio of real government revenue to real gross domestic product.

Figure 2: Ratio of Real Budget Deficit To Real Gross Domestic Product(1970-2007)



Note: BDEFICITGDP is ratio of real budget deficit to real gross domestic product.

IV. Methodology and Analysis of Results

The methodology for this study draws heavily from Fasano and Wang (2002), by using modern and robust econometric techniques based on cointegration and error correction modeling framework, and working with the real variables rather than their nominal values. Employing the Granger causality test, the initial econometric model is specified as follows:

$$RGEP_t = \alpha_0 + \alpha_1 RGREV_t + \mu_1 \tag{1}$$

$$RGREV_t = \beta_0 + \beta_1 RGEP_t + \mu_2 \tag{2}$$

where: $RGEP_t$ is real government expenditure; $RGREV_t$ is real government revenue; $\alpha_0, \alpha_1, \beta_0, \beta_1$ are parameters to be estimated; μ_1 and μ_2 are stochastic error terms. The a priori expectations are: α_0, α_1 and $\beta_0 > 0$; and $\beta_1 < or > 0$. Data on the variables (i.e. $RGEP_t$ and $RGREV_t$) were collected from Central Bank of Nigeria (2004, 2007).

In conducting stationarity tests of the variables in equations 1 and 2, we use the Augmented Dickey-Fuller (ADF) unit root test which is derived from Dickey and Fuller (1979, 1981). It is pertinent to state here that when the number of observations is relatively low, unit root tests have little power (Chebbi and

Lachaal, 2007). Thus, to complement the ADF unit root test, the KPSS stationarity test which is derived from Kwiatkowski, Phillips, Schmidt and Shin (1992) is carried out. Also, the Phillips-Perron unit root test (which comes from Phillips, 1987; Perron, 1988; and Phillips and Perron, 1988) is also used. While the Augmented Dickey-Fuller approach accounts for the autocorrelation of the first differences of a series in a parametric fashion by estimating additional nuisance parameters, the Phillips-Perron unit root test makes use of non-parametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms (Gujarati and Porter, 2009). As pointed out by Idowu (2005), due to the possibility of structural changes that might have occurred during the period covered by this study, the Augmented Dickey-Fuller test might be biased in identifying variables as being integrated. But the Phillips-Perron test is expected to correct this short-coming.

The ADF test entails estimating the following equation:

$$\Delta G_t = b_1 + b_2 t + d G_{t-1} + \sum_{i=1}^m a_i \Delta G_{t-i} + \varepsilon_t \quad (3)$$

where: G_t is the variable of interest; ε_t is a pure white noise error term; t is time trend; Δ is difference operator; b_1, b_2, d and a_i are various parameters. In the ADF approach, we test whether $d=0$ ¹

The Phillips-Perron test is based on the following statistic:

$$\tilde{t}_\alpha = t_\alpha \left(\frac{\gamma_o}{f_0} \right)^{\frac{1}{2}} - \frac{T(f_o - \gamma_o)(se(\hat{\alpha}))}{2f_o^{\frac{1}{2}}s} \quad (4)$$

where: $\hat{\alpha}$ is the estimate; \tilde{t}_α is the t-ratio of α ; $se(\hat{\alpha})$ is the coefficient standard error; T is the sample size or number of observations; s is the standard error of the test regression; γ_o is a consistent estimate of the error variance in the standard Dickey-Fuller test equation [calculated as $(T-k)s^2/T$, where k is the number of regressors]; and f_0 is an estimator of the residual spectrum at frequency zero.

¹ In the ADF test, the null hypothesis is that the variable in question has a unit root (i.e. it is not stationary).

The Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test differs from the unit root tests described above in that the series G_t is assumed to be trend stationary under the null hypothesis. The KPSS statistic is based on the residuals from the ordinary least squares (OLS) regression of G_t on the exogenous variables X_t :

$$G_t = X_t' \delta + \mu_t \quad (5)$$

The associated Lagrange Multiplier (LM) statistic is defined as:

$$LM = \sum_t S(t)^2 / (T^2 f_o) \quad (6)$$

Where f_o is an estimator of the residual spectrum at frequency zero and where $S(t)$ is a cumulative residual function:

$$S(t) = \sum_{r=1}^t \hat{\mu}_r \quad (7)$$

this is based on the residuals from equation 5.

The results of the stationarity test of the variables in equations 1 and 2 using the ADF unit root test are presented in table 3 below. The table shows that all the variables are stationary at first difference; thus they are integrated of order one.

Table 3: ADF Unit Root Test for the Variables in Equations 1 and 2

Variables	ADF Statistics (at first difference)	Order of Integration
RGEXP _t	-7.848054 (-4.234972)*	I(1)
RGREV _t	-7.949283(-4.234972)*	I(1)

Source: Computed by the Authors.

Note: (a) Mackinnon critical values for the rejection of unit root are in parentheses. (b) Tests include intercept and trend. (c) * implies 1 per cent level of significance.

The results of the Phillips-Perron (PP) test conducted to complement the ADF test are presented in Table 4 below. The table shows that all the variables are stationary at first difference and, therefore, are integrated of order one. This confirms the ADF results.

Table 4: PP Unit Root Test for the Variables in Equations 1 and 2

Variables	PP Statistics (at first difference)	Order of Integration
RGEXP _t	-10.26581(-4.234972)*	I(1)
RGREV _t	-8.126257(-4.234972)*	I(1)

Source: Computed by the Authors.

Note: (a) Mackinnon critical values for the rejection of unit root are in parentheses. (b) Tests include intercept and trend. (c) * implies 1 per cent level of significance.

The results of the KPSS stationarity test on the variables to further complement the ADF unit root test are presented in table 5 below.

Table 5: KPSS Stationarity Test for the Variables in Equations 1 and 2

Variable	KPSS Test Statistics (at first difference)	Order of Integrated
RGEXP _t	0.175472(0.216000)	I(1)
RGREV _t	0.065722(0.216000)	I(1)

Source: Computed by the Authors.

Note: (a) The figures in parentheses are the asymptotic critical values at 1 per cent. (b) Tests include intercept and trend.

The results of the KPSS Stationarity test, as shown in Table 5, indicate that the null hypothesis of stationarity for the variables cannot be rejected at first difference. Therefore, the KPSS test results further confirm the ADF unit root test results which show that the variables in question are all stationary at first difference, that is, they are integrated of order one.

Having found that all the variables are integrated of order one, cointegration tests are conducted to see if there is a long-run or equilibrium relationship between the variables. Two popular cointegration tests, namely, the Engel-Granger (EG) test and the Johansen test are used. The EG test is contained in Engel and Granger (1987) while the Johansen test is found in Johansen (1988) and Johansen and Juselius (1990). The EG test involves testing for stationarity of the residuals from equation 1 or equation 2. If the residuals is stationary at level, it implies that the variables under consideration are cointegrated. The EG approach could exhibit some degree of bias arising from the stationarity test of the residuals from the chosen equation (i.e. either equation 1 or equation 2). As pointed out by Idowu (2005), the EG test assumes one cointegrating vector in systems with more than two variables and it assumes arbitrary normalization of the

cointegrating vector. Besides, the EG test is not very powerful and robust when compared with the Johansen cointegration test. Thus, it is necessary to complement the EG test with the Johansen test. The Johansen cointegration test is a full information maximum likelihood approach; it is based on the following vector autoregressive (VAR) model of order p :

$$Y_t = A_1 Y_{t-1} + \dots + A_p Y_{t-p} + B X_t + e_t \quad (8)$$

where: Y_t is a k -vector of non-stationary $I(1)$ variables; X_t is a d -vector of deterministic variables; and e_t is a vector of innovations. One can rewrite this VAR as follows:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + B X_t + e_t \quad (9)$$

$$\text{Where: } \Pi = \sum_{i=1}^p A_i - I, \quad \Gamma_i = - \sum_{j=i+1}^p A_j \quad (10)$$

The Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank $r < k$, then there exists $k \times r$ matrices α and β , each with rank r such that $\Pi = \alpha \beta'$ and $\beta' Y_t$ is $I(0)$; r is the number of cointegrating relations (i.e. the rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the vector error correction model. The Johansen's approach is to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π .

The results of the cointegration tests of the variables in equations 1 and 2 are presented hereunder, beginning with the EG test by testing for the stationarity of the residuals from equation 1. Table 6 shows that the residuals from equation 1 are stationary at level, that is, it is integrated of order zero. Thus, the EG cointegration test indicates that the variables in question are cointegrated.

Table 6: Stationarity Test of the Residual from Equation 1

Variable	ADF Test Statistic	PP Test Statistic	KPSS Test Statistic	Order of Integration
Residual	-6.534727(-4.226815)*	-6.556312(-4.226815)*	0.084732(0.216000)**	I(0)

Source: Computed by the Authors. Notes: (a) Mackinnon critical values for the rejection of unit root are in parentheses for columns 2 and 3. For column 4, the figure in parenthesis is asymptotic critical value. (b) Tests include intercept and trend. (c) * implies that they are statistically significant at 1 per cent level of significance; ** implies that it is not statistically significant at 1 per cent level of significance.

To complement the EG test, the Johansen test is conducted. Tables 7a and 7b present the Johansen cointegration test.

Table 7a: Johansen Cointegration Test for the Variables in Equations 1 and 2: Trace Test

Hypothesized No of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**
None *	0.406173	22.81710	15.49471	0.0033
At most 1 *	0.122563	4.576257	3.841466	0.0324

Source: Computed by the Authors. Notes: (a) * indicates rejection of the hypotheses at the 5 per cent level of significance; (b) Trace test indicates 2 cointegrating equations (CEs) at 5 per cent level of significance; and (c) ** indicate Mackinnon-Haug-Michelis (1999) p-values.

Table 7b: Johansen Cointegration Test for the Variables in Equations 1 and 2: Maximum Eigenvalue Test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Prob.**
None*	0.406173	18.24084	14.26460	0.0112
At most 1*	0.122563	4.576257	3.841466	0.0324

Source: Computed by the Authors. Notes: (a) * indicate rejection of the hypotheses at 5 per cent level of significance; (b) Maximum Eigenvalue test indicates 2 cointegrating equations (CEs) at 5 per cent level of significance; and (c) ** indicates Mac Kinnon-Haug -Michelis (1999) p- values.

As can be seen from Tables 7a and 7b, the results of the Johansen cointegration tests (both the trace test and the Maximum Eigenvalue test) show that the variables in question are cointegrated, thereby, validating the results of the EG test. Therefore, we conclude that there is a long-run or equilibrium relationship between real government revenue and real government expenditure.

To carry out the Granger causality test within an error-correction modeling framework, we specify the following error-correction model equations since the variables are integrated of order one (1) and are cointegrated:

$$\Delta RGEP_t = \alpha_1 + \alpha_2 \Delta RGEP_{t-1} + \alpha_3 \Delta RGREV_{t-1} + \alpha_4 ecm1(-1) + \varepsilon_1 \quad (11)^2$$

$$\Delta RGREV_t = \beta_1 + \beta_2 \Delta RGREV_{t-1} + \beta_3 \Delta RGEP_{t-1} + \beta_4 ecm2(-1) + \varepsilon_2 \quad (12)^3$$

where $ecm1(-1)$ and $ecm2(-1)$ are one-period lagged values of the residuals from equations 1 and 2 respectively; and Δ is the operator for change.

We have used one-period lag in order to keep the model simple in obedience to Occam's razor principle⁴. Other lag lengths were tried but the one-period lag was found to be optimal based on consideration of a priori expectations vis-à-vis some statistical criteria including the Akaike Information Criterion (AIC). The estimates of equations 11 and 12 are presented in table 8 below.

Table 8: Results of the Estimates of Equations 11 and 12

$\hat{\Delta RGEP}_t = -203.2977 - 0.001740 \Delta RGEP_{t-1} - 0.100254 \Delta RGREV_{t-1} - 0.901779 ecm1(-1)$			
(1120.339)	(0.347558)	(0.300040)	(0.443442)
-0.181461*	-0.005007*	-0.334134*	-2.033588*
0.8572**	0.9960**	0.7405**	0.050**
F-Statistic=3.743867; Prob(F-Statistic)=0.020612; Durbin-Watson Statistic=1.994933			
$\hat{\Delta RGREV}_t = -307.5042 - 0.018755 \Delta RGREV_{t-1} - 0.338536 \Delta RGEXP_{t-1} - 0.180872 ecm2(-1)$			
(1359.354)	(0.293085)	(0.295402)	(0.333622)
-0.226214*	-0.063990*	-1.146019*	-0.542146*
0.8225**	0.9494**	0.2603**	0.5915**
F-Statistic=1.379011; Prob.(F-Statistic)=0.266911; Durbin-Watson Statistic=2.032279			

Source: Computed by the Authors. Notes: (a) The figures in parentheses are the various standard errors associated with the parameter estimates; (b) * are the associated t- statistics; and (c) ** are the associated probabilities

² In this equation, if α_3 or α_4 or both is/are statistically significant, it implies that real government revenue Granger-causes real government expenditure thus supporting the revenue-spend hypothesis.

³ In this equation, if β_3 or β_4 or both is/are statistically significant, it means that real government expenditure Granger-causes real government revenue thus supporting the spend-revenue hypothesis.

⁴ This is known as the principle of parsimony. It says that models/descriptions should be kept as simple as possible unless and until proved inadequate.

From the estimates of equation 11 as shown in the first segment of Table 8, only the parameter estimate associated with the error correction term is statistically significant at 5 per cent level of significance. The rest of the parameter estimates in the equation are not statistically significant at the conventional 1 per cent or 5 per cent level. The foregoing implies that real government revenue Granger-causes real government expenditure only in the long-run. From the estimates of equation 12, as presented in the second segment of Table 8, all the parameter estimates are not statistically significant at either 1 per cent or 5 per cent level. This implies that real government expenditure does not Granger-cause real government revenue.

Based on the results of the estimates of equations 11 and 12, as shown in Table 8, it is evident that there is a unidirectional causality running from real government revenue to real government expenditure. Thus, it is apparent that the revenue-spend hypothesis is the valid hypothesis for Nigeria. This is consistent with the findings of Wolde-Rufael (2008) on Nigeria. It should, however, be noted that Wolde-Rufael (2008) applied a modified version of Granger causality test developed by Toda and Yamamoto (1995) that does not require test for cointegration, whereas this current study tested for and established the existence of cointegration before applying the Granger causality test within the error correction modeling framework. Thus, in addition to identifying the direction of causality between government revenue and government expenditure, the current study established the presence of cointegration among the two variables.

V. Conclusion and Recommendations

This study has shown that there is a long-run or equilibrium relationship between government revenue and government expenditure. The direction of causation runs from government revenue to government expenditure, supporting the revenue-spend or tax-spend hypothesis for Nigeria. The findings indicate that changes in government revenue induce changes in government expenditure.

Empirical findings from this study suggest that: (i) controlling the swings in government revenue, particularly the oil revenue which constitutes over 80 per cent of government revenue, is very necessary in controlling government expenditure and avoiding unsustainable fiscal imbalances in Nigeria; (ii) to increase government spending, efforts should be made to enhance government revenue, but efforts to enhance government revenue should be accompanied with appropriate public expenditure reforms in order to achieve sustainable economic growth, since higher government revenue invites higher government expenditure while the quality of expenditure is central to achieving any

meaningful growth; and (iii) the efforts of government in protecting its spending plans from the swings in crude oil revenue, by using the Budget Benchmark price of oil that is considered to be more realistic and sustainable in the long run than the current market price of oil, are steps in the right direction. The extra revenue that is saved in the excess crude oil account when oil is sold above the Budget Benchmark price helps to sustain government spending when the price of oil falls below the Budget Benchmark price and ensures that the revenues on which spending is planned are not subject to the swings in oil prices (Budget Office of the Federation, 2009).

The plan of the Federal Government to establish a Sovereign Wealth Fund (SWF) is also commendable as that will provide a vehicle for excess crude oil revenue to be prudently invested and managed to yield returns for sustaining government expenditure in the rainy days. This will, however, require transparency, accountability and sound management of the fund. The government should go a step further in intensifying efforts at developing other sources of revenue in order to insulate the economy from the volatility associated with the oil revenue.

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Investment Climate Reform in Nigeria: Challenges and Prospects

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This paper reviews the issues, challenges and prospects of investment climate reforms in Nigeria towards achieving faster growth. Specifically it reviews issues of governance, infrastructure, human resources, international integration, access to finance, microeconomic and gender issues. The challenges to investment climate reforms in Nigeria include restraining rent-seeking, establishing credibility, fostering public trust and legitimacy, human resources, infrastructure, shallow financial markets and overwhelming dependence on oil revenue. To address these challenges, the paper recommends electoral reforms, standardization of contract execution, stronger institutions including educational institutions, the use of credit bureaux and stricter surveillance of the nation's international borders. The paper concludes that a good investment climate is key to growth and poverty reduction. Government policies and behaviours shape investment climate and in the process play out over a wide field. However, no country has a perfect investment climate and perfection is not a prerequisite for reaping the benefits of good investment climate. Firms should be the starting point of reforms as they generate incomes and employment and indeed growth.

Keywords: Investment, Economic Growth, Poverty Reduction

JEL Classification: O16, O31

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I. Introduction

Developing countries especially in Sub-Saharan Africa have launched aggressive economic reforms in a bid to revitalize their economies that have hitherto suffered from structural imbalances and inappropriate policies (Magbagbeola, 2004). These imbalances are prominently manifested in monolithic and monocultural production bases. In Nigeria, the effects of structural imbalance are typified in the total dependence on agricultural production from the 1960s to the exclusive reliance on oil and gas since the early 1970s. Thus, the national economic development aspiration has remained that of altering the structure of production and consumption activities so as to diversify the economic base, reduce dependence on oil and on imports in the bid to return the economy on the path to self-sustaining growth (Ajakaiye, 2001). Consequently, the country has pursued economic reforms from the Structural Adjustment Programme (SAP) of the mid-1980s to the 1990s to the National Economic Empowerment and Development Strategy (NEEDS) of the 2000s. The

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NEEDS, however appears the most robust of the reforms so far and its articulation and implementation are the most deliberate and concerted. This is for several reasons including the fact that it was home grown and demand-driven.

So far, positive results have been identified since the enthronement of NEEDS, but the yet observed weakness in investment levels, including foreign direct investment (FDI), has triggered concerns about the quality of the “investment climate” in Nigeria. With regard to domestic investment, the critical question relates to why most wealthy Nigerians prefer to invest outside Nigeria. For foreign direct investment, one may want to know why foreign non-oil investors prefer to invest in other countries despite the huge human and material resources in Nigeria. Answers to these questions rest in the quality of investment climate in Nigeria.

Investment climate refers to the environment in which firms of all types and sizes invest and grow. Determinants of this environment can be classified into macroeconomic factors, governance issues and infrastructure (Bangladesh Enterprise Institute and the World Bank, 2003) Given the heterogeneity of firms' behaviour, investment climate reform has also a micro dimension and so covers in addition issues critical to the growth of individual firms. These include human resources, access to finance, among others (Caves, 1998; Bartelsman and Doms, 2000; Ahn, 2000).

Investment climate reform, therefore, refers to the provisioning of the enabling environment for investment and operational competitiveness of economic agents. It is a deliberate and concerted effort at removing obstacles to investment and growth of firms. The objective of this paper, therefore, is to review the issues, challenges and prospects of investment climate reforms in Nigeria towards achieving faster growth. In particular, the issues reviewed include governance, infrastructure, human resources, international integration, microeconomic factors, gender and overreliance on the petroleum sector. The importance of the paper is further amplified by the fact that Nigeria has initiated series of reforms and an investment climate reform at this time would maximize as well as sustain the gains therefrom.

The rest of the paper is in five sections. Following the introduction, section two treats the conceptual and theoretical issues while section three reviews the relevant literature. Section four overviews the Nigerian investment climate and section five deals with the challenges and prospects of investment climate reform

in Nigeria. Section six discusses the policy implications and proffers some recommendations while section seven summarizes and concludes the paper.

II. Conceptual and Theoretical Issues

Investment climate is about the environment in which firms and entrepreneurs of all types- from farmers and micro-enterprises to local manufacturing concerns and multinationals- have opportunities and incentives to invest productively, create jobs and expand (The World Bank, 2005). It consists of location specific factors that shape the enabling environment for firms to invest productively and grow (Smith and Hallward-Driemeier, 2005).

In Keynesian terminology, investment refers to real investment which adds to capital equipment. It leads to an increase in the level of income and production by increasing the production and purchase of capital goods. Investment, thus, includes new plants and equipment, construction of public works, net foreign investment, inventories, and stock and shares of new companies. In the words of Joan Robinson, "by investment is meant an addition to capital, i.e. making an addition to the stock of goods in existence. To be more precise, investment is the production or acquisition of real capital assets during any period of time". Thus emphasis on investment used to mean advocating greater quantities of investment, under the assumption that a financing gap was a barrier to development (Bangladesh Enterprise Institute and the World Bank, 2003). Recent research, however, focuses on the quality and not the quantity of investment (Easterly 1997; Soludo, 1998; The World Bank, 2005). They focus on the institutional and policy environment that determines whether investments pay off in greater competitiveness for firms and in sustained growth for the economy. After all, higher productivity in individual firms culminates in higher rates of growth of the gross national product (GNP). Therefore, though, the policy areas covered by investment climate is broad, the performance of individual firms is at the heart of the policy and micro-level data provide useful insights into how firms assess the package of policies and government behaviours using such criteria as risks, costs and barriers to competition. At the firm level, uncertainty about the content and implementation of government policies are of important concern. In developing countries, policy inconsistency is very rampant and inefficient implementation of policies sometimes occasioned by corruption and nepotism is a common feature of government business relationship. Poor policy design and weak institutions exacerbate macroeconomic instability, arbitrary regulation and weak protection of property rights. All these cloud business opportunities and chill incentives to invest productively.

Policy-related costs constitute a high percentage of firms' operational costs. These arise from outmoded and ill-conceived regulations. In addition to these are costs associated with infrastructure failure such as power outages, poor road network, crime and corruption. Together with weak contract enforcement and onerous regulation, these costs can amount to over 25 percent of sales or more than three times what firms typically pay in taxes (Smith and Hallward-Driemeier, 2005).

Firms naturally prefer less competition to more but discriminatory incentives in favour of one firm deny opportunities to others. However, competitive pressures drive firms to innovate, improve productivity, and share the benefits of higher productivity with consumers and employees. Economies of scale, market size and openness to trade can enhance competition but government influences competitive pressure through the regulation of market entry and exit and by its reaction to monopolistic behaviours.

The on-going liberalization and globalization have entrusted the private sector with the economic role of wealth creation and employment generation. In line with this goal, one cardinal thrust of economic reforms is growing the private sector to become the engine of growth and prosperity. For the private sector to play this role effectively requires the competitiveness of enterprises. Since enterprises operate in national environments which enhance or hinder their domestic or international competitiveness, business environment is inevitably of important policy concern. Poor business environment tends to increase the cost of doing business, which in turn, retards economic competitiveness. In the same vein, bad business environment negates firm-level productivity and efficiency of resource use. Theory and evidence underscore the inverse relationship between international competitiveness of nations and domestic cost of doing business. Notwithstanding the efficiency and cost effectiveness of firms, overall performance can still be undermined by difficult operating environment (Eifert et al, 2005). Other factors held constant, countries with stable, relatively lower-cost business climate are more likely to secure competitive edge in world markets. This is why nations today strive to ease domestic conditions for business and investments through investment climate reforms.

Given the foregoing analysis, some authors (Stern, 2002; World Bank and Bangladesh Enterprise Institute and the World Bank, 2003 and World Bank, 2005) have identified the perspectives of investment climate to include macroeconomic factors, governance, infrastructure, international integration, access to finance, human resources and microeconomic factors. In developing

countries especially in Africa, the exclusion of women from most economic, commercial and legislative matters has implications for investment climate. For this reason, this study also looks at gender issues. In all these, the expectation is that the relationship between these variables and the investment climate is positive.

III. Literature Review

Literature on investment climate reform is scanty. This is mainly because it was not until recently that policymakers and multilateral organizations began to emphasize the need for sound investment climate for promoting economic growth in developing countries (Stern, 2002). Earlier on, emphasis on investment as an engine of growth focused on the quantity rather than quality of investment under the assumption that a financing gap was the barrier to growth. This view has been criticized as too simplistic (Bangladesh Enterprise Institute and the World Bank, 2003). Indeed recent research shows little correlation between investment levels and growth rates at least in the short run (Easterly, 1997). Soludo (1998), concludes that for Nigeria, investment is negatively associated with growth. Pindyck (1990) argues that if the goal is to stimulate investment, stability and credibility could be much more important than tax incentives or interest rates.

Caballero and Corbo (1988) conclude that a major cost of political and economic instability may be its depressing effect on investment. This is likely to be important for less developed countries as investment level at any point in time is reflecting past behaviour of some uncertainty variables like inflation, terms of trade, etc.,. The authors recommend that relevant authorities must strive to reduce macroeconomic policy uncertainties if private investment is to grow. Government policies and behaviours shape opportunities and incentives facing firms and investment climate reforms are about shaping government policies and behaviours.

Mallon (2004) reports that the net impact of the investment climate reforms in Vietnam was the simplification of procedures for registering new businesses, and for operating and expanding these businesses. This resulted in a dramatic increase in the number and total registered capital of new private enterprises following the enactment of the Enterprise Law in January 2000. Up until the end of 1996, only 190 joint-stock companies, 8900 limited liability companies, and 21,000 private enterprises had registered under the 1990 Company Law and Law on Private Enterprises. This increased to 524 joint stock companies, 15,310 limited liability companies, and 29,135 private enterprises under the 1990 Company Law and Law on Private Enterprise by the end of 1999. Following the enactment of the

Enterprise Law of 2000, there were more than 70,000 newly registered companies by the end of 2003 including 6,791 joint-stock companies. This reflected in an increasing contribution of private business to GDP. In a similar study focused on the Peru Urban Land Reform, Endo (2004) reports that between July 1996 when the reform implementation started, and 2002, 1.3 million titles to individuals were produced and title formalization time was reduced from 7 years to 45 days. The 2005 World Development Report, with the theme "A Better Investment Climate for Everyone", analyzing data from the World Bank Investment Climate Survey, which cover more than 26,000 firms in 53 developing countries, and the Doing Business Project, which benchmarks regulatory regimes in more than 130 countries, concludes as follows:

- that investment climate is central to growth and poverty reduction;
- that reducing unjustified costs is critical but policy-related risks and barriers to competition also need to be tackled;
- that progress requires more than changes to formal policies; and
- that investment climate improvement is a process, not an event.

Pomeleano (2000) concludes *inter alia* that there were clearly micro excesses within a disciplined and benign macro financial context. He added that his results support Krugman's hypothesis that crony capitalism, and the supportive and necessary poor policies designed to "aid and abate" poor credit decisions lead to poor investment and misallocation of resources.

Investment climate is the location specific factors that shape the opportunities and incentives for firms to invest productively create jobs and expand (World Bank, 2005). Stern 2002 defines investment climate as "the policy, institutional and behavioural environment, both present and expected that influence the returns and risks associated with investment" The author identified three perspectives of investment climate: macroeconomic factors, governance and infrastructure (Bangladesh Enterprise Institute and the World Bank, 2003). Macroeconomic factors are exemplified in fiscal, monetary, exchange policies, political stability among others. Governance refers to government interactions with business and manifests in forms of regulations and corruption both of which affect the cost of doing business, risks and competition. Infrastructure refers to the quantity and quality of physical infrastructure such as power, transport and telecommunications as well as financial infrastructure such as banking or access to finance generally. The World Bank and Bangladesh Enterprise Institute 2003 in addition to these recognized international integration and human resources as further perspectives of investment climate. The central role of individual firms in

development has turned the attention of researchers and policymakers to micro-level-evidence in articulating investment climate policies. Thus, the sixth perspective of investment climate is the microeconomic environment which refers to how individual firms are encouraged through the provision of opportunities and incentives to increase their productivity, develop, adapt, and adopt better ways of doing things and respond to consumers (World Bank, 2005). In developing countries especially in Africa, the exclusion of women from most economic, commercial and legislative matters has implications for investment climate. In view of this, this study also looks at gender issues.

There has been a lack of consensus regarding the measurement methodology of investment climate. Firms evaluating alternative investment options, governments interested in improving their investment climate and researchers seeking to understand the role of different factors in explaining economic performance- all have attempted to define and measure investment climate. These attempts have expanded the variables available. The World Bank World Development Report 2005, identified five main challenges to the measurement of investment climate as

- The multidimensional nature of the concept being measured;
- The inherently difficult measurement of some dimensions;
- Differences in perspective across firms and activities;
- Differences between locations even in one country; and
- The experience on ground does not always reflect formal policies.

IV. Overview of Investment Climate in Nigeria

Investment climate in Nigeria is dominated by yet undefined set of relationship between the pervasive public sector and the incumbent firms, as well as public sector interference in private sector activities (Shiells, 2003). Government's extensive regulation manifested in the form of business registration and certification, combined with low disposable incomes of workers, weak institutional framework, incoherent and uncoordinated government policies among the three tiers of government, multiple taxation, provide incentives for rent-seeking to public officials. In turn, barriers to entry and competition, ineffective bankruptcy laws and procedures as well as weak corporate governance and inappropriate pricing mechanisms allow inefficient incumbent enterprises to remain in business.

With this general statement, this section discusses the investment climate in Nigeria under the following sub-headings: governance, infrastructure, access to

finance, international integration, human resources, microeconomic issues and gender.

Governance: A country's general structure of governance and the institutions that govern interactions between business and government determine the burden that firms face in complying with government regulations, the quality of government services and the extent to which corruption is associated with the procurement of those services.

The military occupied power for almost 30 out of the 40 years of independence before 2000. In these years the country was a pariah state and transparency and good governance were not serious issues of policy consideration. Traditionally, military regimes lack accountability as well as checks and balances, as they are constructed on a command structure. Given the preponderance of oil resources in Nigeria, national institutions were weakened to promote corruption. The collection and allocation of oil rents was according to the caprices of a few military officers and their cronies. This created a horde of rent entrepreneurs; that is, "Big Men" without any productive source of livelihood except proximity to state power (Soludo, 2005). In the circumstance, merit suffered as there were no standards of performance and accountability.

Government grew in size as the major source of employment. Citizens expected government as the "Giver" to provide everything free for them. In the face of huge oil revenue, tax collection was downplayed and Nigerians abandoned their civic responsibilities. Government on its part became less and less accountable and transparent, while the people remained in the delusion that there was no link between their taxes and government expenditure.

The link between government and the private sector also got broken. Before the military intervention into government and the oil sector dominance of the economy, the government was under pressure to provide the enabling environment for businesses to thrive because businesses in turn provided employment and generated revenue for the government. Because of oil wealth and the lack of accountability of military governments, government did not need the private sector revenue, nor was it under pressure to please the voters.

Of course, the inevitable consequence of the foregoing scenarios was waste, weak institutions, corruption and failure of public policies. Informal interpersonal networks and relationships replaced formal institutions and rules of procedure. Arbitrariness and private interest took over at the expense of public trust and

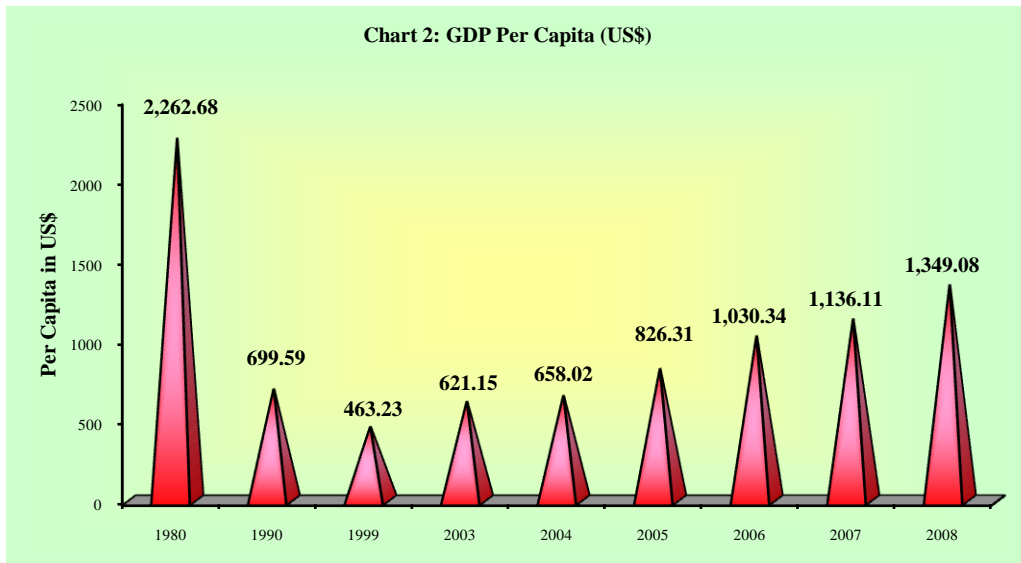
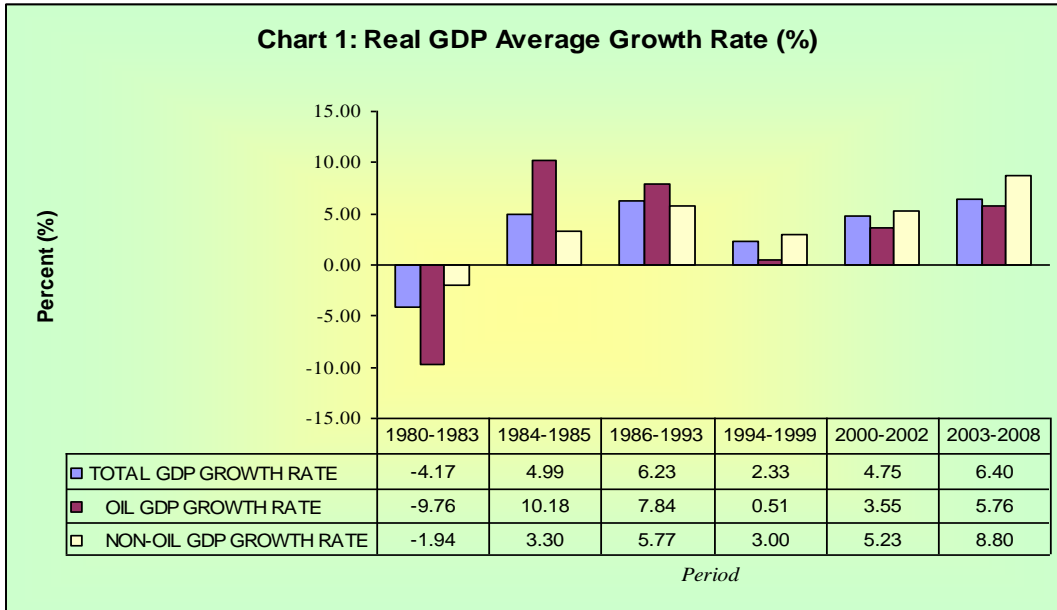
legitimacy. Corruption blossomed with resultant underdevelopment. The world looked away from Nigeria.

The return of democracy in 1999 ushered in some degree of transparency and accountability in the system. This was as a result of the many reforms undertaken by the civilian administration. The principal reforms included:

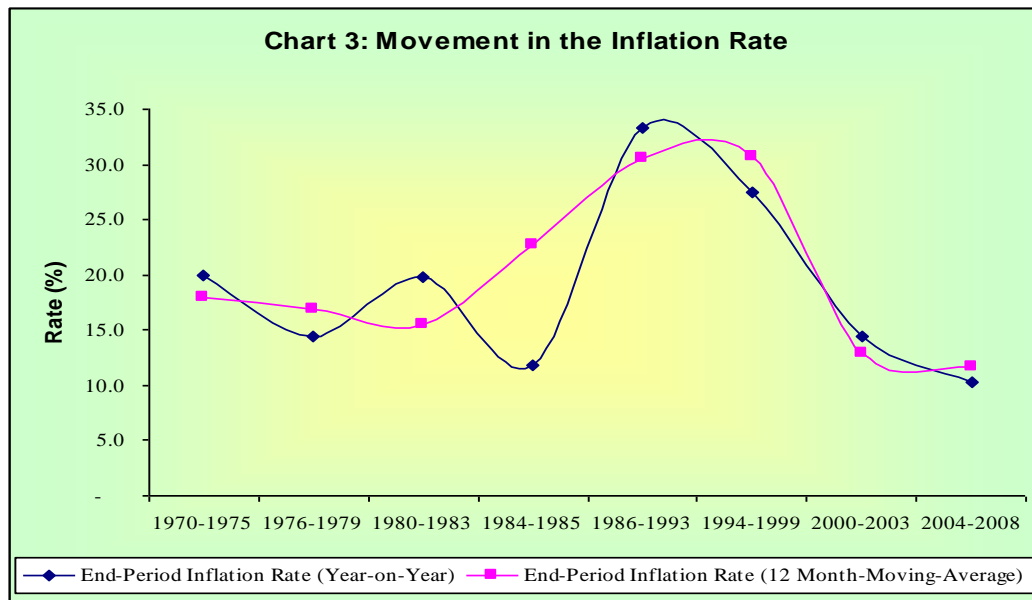
- De-militarization and reforms of the military by which the government began to remove the military from government and to refocus it to its core mandate of defending the territorial integrity of the nation.
- Re-building basic institutions of the state. The collapse of most state institutions led to the dilapidation of legal and regulatory functions of the government. The new democracy, therefore, needed strong institutions to enable it enforce its principles. Therefore the police force was strengthened by about four times. The Independent Corrupt Practices Commission and the Economic and Financial Crimes Commission were established to fight corruption. A new procurement process, emphasizing due process, was introduced to promote value for money. Democratic institutions, the legislative and judiciary were not left out.
- As the business environment also suffered in the hands of the rentier class with costs and risks of doing business rising astronomically while competitiveness dwindled, the programmes of liberalization and privatization was undertaken. The telecommunication sub-sector was liberalized and most of the ailing government enterprises were privatized. Attempts were made to rebuild the power sector, roads and airports that decayed over the years.

An Economic Team was set up to aid the government through advocacy and evidence- based advice to manage the economy. There was greater coordination of monetary and fiscal policies leading to robust macroeconomic outcomes. The banking and financial sector reforms were also undertaken, a significant phase of which was the Bank consolidation of 2004-2005. Exchange rate and foreign exchange management was also reformed. Nigeria also adopted the Common External Tariff.

Attempts were made to break up public monopolies such as the energy and telecommunication sectors.



The reforms further impacted positively on the economy resulting in higher GDP growth rates, higher GDP per capita and lower inflation rate, among others.



Despite all these, the position of Nigeria among some West African Countries with respect to some investment climate indicators remain poor as is found in the table below.

Table 1: Nigeria's Ranking on the Global Competitiveness Index 2005/6

Country	Global Competitiveness Ranking		Business Competitiveness Index	Quality of the National Business Environment
	2005	2006		
Nigeria	88(3.23)	101(3.45)	76	79
South Africa	42(4.31)	45(4.36)	28	30
Botswana	48(4.21)	81(3.79)	55	50
Mauritius	52(4.0)	55(4.20)	52	49
Ghana	59(3.82)	- -	45	47

Figures in parenthesis are scores

Source: Global Competitiveness Report 2006-2007, WEF.

Nigeria ranked 88 in 2005 and 101 in 2006 in the Global Competitiveness Ranking while Botswana ranked 48 and 81 and Mauritius 52 and 55 in the same period; Ghana ranked 59 in 2005. Ghana ranked 45 against Nigeria's 76 under the Business Competitive Index in 2005. Under quality of National Business Environment, Nigeria was ranked 79 while Ghana was ranked 47. This could

explain the departure of Dunlop and Michelin from Nigeria to Ghana in the last two years. Governance and transparency issues are still replete with poor investment climate attributes. There is yet no coordination between the three tiers of government. Most of what progress is observed in the country at this time is at the instance of the Federal government while the States and the local governments are still insensitive to the need for improved investment climate in their jurisdictions, in particular, and the nation, at large. The opaque administrative methodology especially in the two lower tiers of government still continues unabated with attendant corruption. The adverse effects of this malaise have manifested in the lack of clarity in government policies resulting in uncertainty and confusion among prospective and even incumbent investors.

Infrastructure: Infrastructure and firm performance interact in several ways. Established firms already connected to utilities are affected by the quality of the service while new firms or those hoping to expand are concerned with the difficulties in connecting to utilities. In Nigeria, infrastructure provision has been the preserve of the government until very recently. The government provides water, electricity, roads, petroleum products, telecommunications, etc. All these relied on government subvention for funding and so the disposition of the government in power was of critical importance to the performance of the various infrastructures. During the military regimes, the provision of infrastructure suffered neglect resulting in the decay of most of the facilities. For example, the Turn-Around-Maintenance of the refineries were done according to the whims and caprices of the dictators and not in line with technical prescription. When it was to be done, it was contracted to the cronies of the powers that be and not to experts. This same attitude pervaded road construction, rail construction, the power sector, indeed all facets of infrastructure. The few democratic regimes that intervened during the prolonged military era were not much different as they could not repair the damages of one military regime before another took over power. The civilians on their part given the insecurity of their tenure were highly corrupt and so had only little money left for infrastructure development. Worse still, given the low technological base of the country, most of the infrastructure was provided by foreign firms on turn-key basis with implications for local content and cost.

In the democratic dispensation since 2000, efforts have been made, therefore, to privatize the agencies saddled with the provision of infrastructure. Some success has been achieved in this regard but much still remain to be done. The telecommunications liberalization has been accomplished to the applause of many but the main gateway is yet to be privatized. This has to do with the poor

state of the facility which has limited the price offered by core investors. The refineries are also in this state. The government contemplated refurbishing them before sale but the cost of doing so was huge. It therefore decided to dispose of it as is but the next government felt the price was too low for such a facility and reversed the action with implications for credibility. Attempts were also made to unbundle the National Electric Power Authority. Thus far, this has remained inconclusive and it appears to many that the government is even going back on the programme. The attempted unbundling of the Nigerian National Petroleum Corporation (NNPC) is also yet to be completed. Road maintenance was sometime privatized through the installation of toll gates on most major roads in the country.

Overnight these gates were dismantled and the Federal Road Maintenance Agency was established. The poor power supply in Nigeria has for a long time held down industrial and, indeed, business development. It is the most critical constraint to enterprise competitiveness across Nigeria states. The African Institute of Applied Economics, (2007) shows that seven of the 36 states of the federation including the Federal Capital Territory have an average of below two hours of public electricity supply per day while 27 states have 2 to 7 hours of public electricity supply per day. Only two states have an average of 8 to 13 hours per day while no state has above 13 hours of public electricity per day. UNIDO Manufacturing Enterprise Survey 2004 found that firms have only 2.98 days of public electricity in a week. The World Bank Investment Climate survey, 2002 found that 97.4 per cent of firms have self-provisioned electricity to tide over inadequacies in the public supply. Skoup and Company survey of Industrial clusters in Eastern Nigeria reported that 92 per cent of firms in the region perceive electricity shortages as their biggest production problem.

In terms of petroleum products supply, the pricing and supply of products have haunted the energy sector particularly the transportation sub-sector. Inappropriate pricing of energy (petroleum products, electricity) serve as implicit subsidies especially to energy-intensive enterprises while at the same time corruptly enriching ordinary petrol station attendants with consequent abuse of moral values. The problem was exacerbated by the government's insistence on the removal of subsidy on the products. The government claims that it spent N1.2 trillion on petroleum products price subsidy between 2007 and 2009. Labour unions, however, perceive the matter of subsidy as a mere hoax arguing that the government has no reason not to refine sufficient products for domestic consumption - a situation that would have reduced the price of products drastically. They also argue that Nigerians have a right to subsidized consumption

of petroleum products as free gifts of nature to the country. At the micro –level, therefore, only in two of 36 states of the federation do prices conform to the official ones. In 17 states, price variation range from 1-10 per cent and in 14 states it varies from 11-20 per cent. In 3 states, the variation is above 20 per cent. In terms of availability of products, 28 states have products available 100 per cent of the time while 8 states have it only 50 per cent of the time (BECANS, 2007).

Another important challenge to both corporate and individual citizens is the inadequacy of water supply. UNIDO Manufacturing Enterprise survey in 2004, indicates that firms that rely heavily on water for their production such as food, beverages, chemicals, cosmetics and foam industries had especially reduced their dependence on public water supply. The CBN 2004 Baseline Survey of Small and Medium Enterprises found that public water supply is a big bottle neck to enterprise performance and competitiveness. The study of industrial clusters in Eastern Nigeria (Skoup and Company Ltd, in collaboration with the International Finance Corporation and the World Bank, 2003) reported that 85 per cent of the respondent firms perceive inadequate water supply as their greatest constraint and so more than 50 per cent of the studied firms had bore holes. Daily per capita water supply in Nigeria was 20 liters in 11 of 36 states, but between 14 and 20 liters in 4 states, and below 2 liters in 7 states. In 3 states of the Federation, the average price of 20 liters of private water supply was below N5 and between N5 and N7 in 7 states. It was between N8 and N10 in 15 states and above N10 in 11 states. BECANS Business Environment Reports show that in 23 states of Nigeria, there was less than 1 post office per 100,000 persons and only 12 states have between 1 and 2 post offices per 100,000 persons. In 2 states, there was 70 per cent incidence of ownership of mobile telephones, 9 states with between 31 and 50 per cent, 14 states with between 11 and 30 per cent and 11 states with between 10 per cent and below.

Access to Finance

Economic theory suggests that businesses will invest in projects where the expected benefits exceed the cost of investment. This efficient outcome, however, can be achieved only when entrepreneurs face no credit constraint unrelated to their own performance. Financial intermediation for investments especially by small and medium enterprises (SMEs) is limited by underdeveloped money and capital markets. Moreover, weak property rights, contract enforcement and bankruptcy procedures present obstacles to further strengthening of the banks. Financing of investment by the formal financial institutions is mainly restricted to very large enterprises with credible track records and not for up and starting projects no matter how viable. In Nigeria as in other

developing economies, access to formal finance is a critical constraint to business and enterprise operations and growth. However, in Nigeria, studies have shown that there is a low amount of domestic investment through loans vis-à-vis some comparator countries and the Eurozone. For example, Oyelaran-Oyeyinka, (2007) shows that in 2006 total loans as per cent of GDP was only 19.7 while it was 47.2, 54.3, 94.0 and 104.1 in Kazakh, Egypt, South Africa and Eurozone. The paper went further to show that majority of the loans were made to large corporations while the SMEs were denied facilities. Given the problems encountered by firms in obtaining finance from the formal banking sector, especially after the bank consolidation of 2005, efforts have been intensified towards providing finance outside the formal banking sector. This has led to the strengthening of some financial institutions. These include five development finance institutions (Bank of Industry, Federal Mortgage Bank of Nigeria, The Nigerian Export Import Bank, the Nigerian Agricultural, Cooperative and Rural Development Bank (now Bank of Agriculture) and the Urban Development Bank) as at 2009. There are also 709 microfinance banks, 5 discount houses, 112 finance companies, 93 primary mortgage institutions and 703 bureaux-de-change

The CBN also guarantees loans for agricultural development under the Agricultural Credit Guarantee Scheme Fund (ACGSF). As at end-2007, a cumulative 540,925 loans valued at N19, 34 billion had been guaranteed by the Bank for the development of various sub-sectors of agriculture. In addition, the Small and Medium Enterprises Equity Investment Scheme was set up in 2001 by the CBN in collaboration with the Bankers' Committee. The scheme covenants that banks in the country invest 10 per cent of their profit before tax in industries. The list of ventures covered by the scheme was later extended and further reform of the scheme made it voluntary to the banks. As at 2007, notwithstanding the dilution of the provisions of the scheme, the cumulative sum set aside by the banks stood at N42.02 billion. The cumulative investment by banks was N24.7 billion in 327 projects.

International Integration

Research has shown that countries that aggressively pursued integration with the global economy (such as Brazil, China, India, Malaysia, Mexico, the Philippines, and Thailand) grew more quickly in the 1990s than those that did not. Indeed, many studies find that openness to trade and foreign direct investment accelerates growth (Dollar and Kraay, 2001; and Frankel and Romer, 1999). Sachs and Warner (1995) find that openness is a highly significant determinant of growth and when combined with property rights, might even represent a sufficient condition for growth in poor countries. External sector reforms included the pursuit

of debt relief and exit from the Paris club, as well as the submission of the Nigerian nation to assessment by international rating agencies to promote competitiveness. Some of the efforts in this regard included: Policy Support Instrument (PSI) with the IMF, Standard and Poor/ Fitch ratings, New Partnership for African Development (NEPAD) Peer Review Mechanism. Openness measured as the ratio of total trade (imports and exports) would provide different effects if the country in question is a price taker from if it is a price giver. Nigeria is an oil exporter. It is, however, a price taker as well as a primary exporter implying that the local content of the exports is small and the measure of international integration based on ratio of trade and GDP, overestimated. Moreover, Nigeria is an import-dependent country especially of finished goods. This also adds to trade and openness. A more realistic measure of openness especially in the context of investment climate should rely on the net flow of foreign exchange into the country.

Human Resources

The availability of inputs is a critical element of the investment climate. For human resources, this implies more than just an abundant supply of workers. It also implies workers with sufficient education and technological know-how. Ezekwe, (1994) states that it is not the lack of investment in physical capital alone, which prevents poor countries from catching up with rich ones. Educational attainment and public spending on education are correlated positively with economic growth. Moreover, import of physical capital is less costly than the domestic development of human capital and technical expertise. In Nigeria, given the poor engineering and scientific-culture, most of the production processes are based on imported technology. Also, as many key projects in the past were executed on turn-key basis, most inputs and intermediate products are sourced from external supplies. The low technological base is further compounded by inappropriate science education and poor attitude to research and development (R&D) to facilitate the adoption and adaptation of ideas developed in other jurisdictions. For instance in 1980-1992 allocation to science and technology in Nigeria was 0.1 per cent of GDP while in Tanzania, Taiwan, India, South Korea, Malaysia and Japan, it was 1.5-3.5 per cent, 2.0 per cent, 2.0 per cent of GDP and 0.6-1.0 per cent of GNP and 2.8 per cent of GNP, respectively. (Ezekwe, 1994).

In Nigeria, especially from the colonial era to the early 2000s, organized human resource development was principally undertaken by the government and some religious organizations through the provision of formal education. In this era, the federal and state governments built schools from primary to tertiary levels and ran them and any person who dropped out of any such school stood the chance of

not receiving any patronage, including jobs, from the government. However, as the country grew both in population and economic activities, there was an explosion in the need for formal education to the extent that the government felt incapable of providing the services alone. More recently, therefore, private proprietors were allowed and schools of all sorts and cadres are established and run by private entities along side the government. As at 2007, of the 36 states in the country including the Federal Capital Territory, Abuja, the average pupil teacher ratio stood at 30 and below in 12 states, 31-40 in 11 states, 41-50 in 4 states and 50 and above in 9 states. With respect to funding, only six states had education share of capital budget of 20-26 per cent, 3 states had 16-20 per cent, 11 states had 11-15 per cent, 14 states had 5-10 per cent and 2 states below 5 per cent (African Institute of Applied Economics, 2007). Also only an average of 13 per cent of state's capital budgets was devoted to healthcare. Specifically, 5 states devoted between 10 and 14 per cent of their annual budgets to the health sector and 20 states between 5 and 9 per cent. Eleven states devote 5 per cent and below of their capital budgets to health. In terms of entrepreneurship promotion, policy on entrepreneurship exists only in 14 of the 36 states of the Federation and awards for deserving entrepreneurs exist in only one state. More recently, entrepreneurship promotion was undertaken by the Central Bank of Nigeria in the six geopolitical zones of the country aimed at developing entrepreneurial skills of young men and women across the country. In all of this, however, little attention is paid to vocational training. Training of artisans (bricklayers, carpenters automobile mechanics, etc) is still a private sector concern. In this regard, no enforceable standards are in place to promote high quality output. Thus, costing of jobs is difficult as standards vary and there is no difference between a master and an apprentice.

Microeconomic Issues

The Federal Government of Nigeria has made some selective interventions to the benefit of particular firms and sectors of the economy. This became necessary to complement the progress made at the macroeconomic frontier. Such initiatives focused on removing factors that limit the accelerated growth and development within the microeconomy and as such it focused on key cross-cutting areas including technology, human resource development, and access to finance for the SME subsector among others. Key input sectors such as transport, telecommunications, and energy have also been targeted to improve microeconomic competitiveness. Key microeconomic reforms to date include: the various federal government initiatives on agriculture, the establishment of microfinance banks in the country, the setting up of the Small and Medium Enterprises Equity Investment Scheme, the Agricultural Credit Guarantee Scheme

Fund, the Trust Fund Model, The Automobile Development Fund, the Development Finance Institutions and the Mass Transit Scheme, among others. In addition, the Nigeria Import Export Bank was set up to help the export subsector.

Gender Issues: The various ethnic groups in Nigeria traditionally limit the role of the women in the economy to mere water fetching and wood hewing. Though this attitude is changing across the country for the better, it is still prevalent in some parts of the country. One of the critical consequences of this is the exclusion of girl children from schools. Boys are preferred to girls as candidates for school enrolment while the girls are made ready for marriage. For example in 1996/7, literacy rate for males in the country was 58.2 per cent while for women it was 41.0 per cent. In some parts of the country it was 32.2 per cent for men and 14.7 per cent for women. In the same period, 35.2 per cent of Nigerian women married before age 15 (Federal Office of Statistics 1996/7). With this background, women were excluded from economic/commercial, contractual as well as legislative activities. A woman cannot rent a shop or a living room on her own unless she is supported by a man. A woman is cannot take a suspect on bail or stand surety or enter into a contract. She cannot buy or sell land and is not entitled to freedom of association. As abhorrent as this attitude is most women appear to have accepted it to the extent that they cannot stand on their own. They clamour for concessions even in environments as competitive as holding political offices. In work places, it is common to hear such utterances as “we need men in this office”. The law, however, fails to protect the women in any way. On marital matters, the man is absolute. Only a few women would seek legal redress in case of marital abuse. For this reason many women are intimidated and are not empowered. The society as a whole, therefore, loses the potential contribution of women to growth and development. As they cannot give what they do not have, the children are hardly brought up beyond the level of their mothers.

V. Challenges and Prospects to Investment Climate Reforms

Improvement in investment climate offers faster growth and poverty reduction. Despite the many benefits, investment climate reforms are slow and difficult. This is because of a number of challenges that countries have to face in the process of improving the investment climate. More countries are improving on their investment climate and are reaping the fruits of faster growth and less poverty despite the challenges. This is to say that there is no perfect investment climate and that perfection even on one dimension is not a prerequisite to growth and poverty reduction. It is, however, important that the concept is understood and accepted and that a deliberate and concerted effort is made in a sustainable

way towards improving the investment climate. Nigeria's prospect in investment climate reforms is bright. This section deals with some of the various challenges Nigeria faces and the prospects it can leverage on in the process of improving on the investment climate. At the government level, three challenges stand out. These include restraining rent seeking, establishing credibility and fostering public trust and legitimacy.

Restraining Rent Seeking

Rent seeking behaviour has been ingrained in the Nigerian public life. The huge petroleum rent and the prolonged military regime both nurtured the rent-seeking behaviour of the people to the extent that the challenge for the government is to restrain it in order to improve on the investment climate. On the one hand, rent seekers would fight to retain the status quo while on the other hand efforts are needed to bring about a paradigm shift from rent-seeking to productive enterprise. Already, given the length of time during which rent-seeking has thrived in Nigeria, a large proportion of Nigerians rely on it for their wealth and livelihood and this further strengthens the opposition to change. Nevertheless, the Independent Corrupt Practices Commission (ICPC) and the Economic and Financial Crimes Commission (EFCC) have been set up by the government to fight corruption and financial crimes. The government in power has also pledged to respect the rule of law. These are merely dealing with the symptoms of rent seeking and not with the root cause of it. To deal with rent seeking itself, a complete overhaul of the system is required.

Establishing credibility

While the military lasted in power, and rent seeking remained the main business formula, government lost credibility both at home and abroad. Government policies were reversed indiscriminately and even those that were not reversed were allowed through non-implementation to die off naturally. Now that the military has gone, the people need to be roused to the realization that things have changed. This is a great challenge as the people still attribute obnoxious motives to government pronouncements. Actions of government ten years after the demise of military regime are attributed to ethnic, religious, political, even cultural motivations.

Investment is forward-looking and so relies heavily on government policies which decision makers believe are certain. Therefore, policies that lack credibility are unlikely to elicit the intended investment response. But a legacy of political, economic, cultural and even religious instability undermines the credibility of policy. As democracy firms up in the polity and the electoral process becomes

more capable of producing credible law makers and executives, credibility would return gradually. This is an evolutionary process that can be engineered for greater and speedier returns.

Fostering public trust and legitimacy

Business transactions are enhanced by trust and trust among market participants nurtures productive exchange and reduces the burden on regulation and contract enforcement. In Nigeria, the lack of trust among market participants is manifested partly in the extent to which transactions are cash-based, banking is viewed with suspicion and price gains by listed companies at stock exchange are regarded as a hoax. So while the citizenry doubts the government, one government doubts another just as one political party does not believe the other and firms doubt one another. This scenario constitutes a brick wall on the way to better investment climate in Nigeria. All these have to be resolved by the government in order to attract and retain public trust and legitimacy and move forward to improve on the investment climate. Public trust can return through a reformed democratic process. The process has to be seen to persevere in doing the right things. The caliber of corporate governance especially in the organizations that hold the assets of the nation in trust is an indicator of the speed at which trust is re-established in the country. Some of these organizations include the deposit money bank, the stock exchange, insurance companies, etc.

Human Resources

Government capabilities to monitor and improve on investment climate are priority as officials should be able to improve on policy articulation and implementation. The regulatory framework also needs constant fine-tuning. But the many years during which the political class was excluded from political activities and the civil service was rendered redundant by the military have nurtured an inept civil service and a political class devoid of ideology and decorum. Thus, one critical challenge to improving the investment climate in Nigeria is the lack of necessary government capabilities to articulate and implement policies. The officials of the government are part of the decadent society and this state reflects in the performance of their duties. To succeed in improving the investment climate, this situation should be reversed and that is a great challenge to the government. The Nigerian private sector is still fragile and inexperienced. This is due to poor human capability in the sector. The challenge flows from directing the attention of the youth to vocational education as a means of leading them to successful business life. Nigeria is blessed with a huge young population that is interested in learning given the high demand for opportunities in the educational establishments. The number of the

establishments is also increasing particularly with the liberalization of the sector. The globalization process through the information and communication technology is an added advantage to the development of education and, indeed, human capacity in Nigeria. In spite of these, the challenge of quality remains.

Infrastructure

Infrastructure connects firms to their customers and suppliers and helps them to take advantage of modern production techniques. However, challenges under infrastructure flow from market power associated with economies of scale. As the number of consumers increase, supply is often drowned especially in a developing country like Nigeria, where the population growth rate often outstrips the growth rate of the economy. In Nigeria the age-long government involvement in infrastructure provision has inadvertently laid the foundation for inefficiency both in the provision and consumption of utilities as well as the unwillingness to pay service charges. Bills collection by the various government agencies responsible for infrastructure provision is lax and the people over the years come to believe that the government is a free giver. To be able to sustain infrastructure provision, there has to be a paradigm shift. How could the government change this long-standing pattern is a huge challenge. In addition to this, is the problem of corruption. Government contracts are poorly executed and in some cases are not delivered on at all. On many occasions, the perpetrators were not prosecuted and it was almost becoming the normal trend. To bring government functionaries to respect instructions of the government to the extent of religiously rendering value for money is a huge challenge. However, the successful implementation of the amnesty programme in the Niger Delta leads one to believe that the dream of 10,000 megawatts of electricity in the near term would be realized. If commensurate addition is made to the transmission and distribution infrastructure, power supply in the country would improve. The law enforcement agencies in the country as well as the judiciary have demonstrated some effectiveness and efficiency in recent times and this is expected to impact inversely on corruption thus engendering more effective contract execution.

Financial markets

When functioning well, financial markets connect firms to lenders and investors willing to fund their ventures and share some of their risks. But the underlying challenges with finance flow from information problems, which are often exacerbated by insecure property rights. Land and even houses for example, cannot easily be used as collaterals due to the insecurity of property rights. Worse

still, there is hardly unique identification of persons. Names of persons can change either by changing the sequence of the surnames with that of the forenames or vice versa. This is because there is no single way of recognizing a person. Therefore, information on persons is vague and can hardly be used for contracts. But efficient financial markets operate in a transparent environment. The challenge here, therefore, is how to ensure that both corporate and individual citizens are uniquely recognized for contractual purposes. However, the National Identity Card Programme has attempted to deal with this challenge of identification of persons and is, indeed, one of the most reliable ways to handle it. Property rights documentation is slow and that appears to discourage people from seeking to document their properties. Otherwise, the banks would accept land and houses as collaterals if the documentation and the location are acceptable.

The literature shows that big banks are more likely to lend to large firms relative to small and medium ones (Berger and Udell, 2002; Craig and Hardee, 2004). Nigeria has recently concluded a bank consolidation exercise. The challenge is that given that most firms in the country are small and medium, credit to the core private sector has since declined. The Central Bank of Nigeria proactively went ahead to promote the microfinance banks. This is working but is yet to show up in the level of credit to the targeted group. The challenge is that in the era of globalization, how firms would attract funds from banks for investment at affordable rates of interest.

Microeconomic Issues

Going beyond the basics, the government sometimes intervenes in specific sectors or firms. Success in these initiatives is dependent on the level of knowledge of the sector or firm in which the intervention is to take place. Thus, the challenge flows from the lack of adequate information on the micro entity's operational circumstances. Coupled with this are budgetary issues that touch on the choice of a particular industry or sector in preference to others. Empirical studies can be undertaken on the firms or sectors of interest and based on the results of such studies, interventions can be carried out to the benefit of all. Budgetary provisions for interventions can form part of the appropriation bill for a particular year, thus enabling the government to intervene in sectors that are in need accordingly.

International integration

This exposes the country to foreign influences and checks and balances. The challenge, however, is that policy flexibility is lost and sometimes sovereignty

appears compromised. Membership of international organizations has been of some benefit to Nigeria. What is important is that the protocols and agreements are properly examined before they are signed. This again calls for knowledgeable and dedicated civil servants. Even of greater importance is the issue of loss of policy flexibility which makes greater demand on the policy makers to avoid reversals

The overwhelming dependence on the oil revenue

The Nigerian economy has relied on the oil revenue since the 1970s and this has limited government's attention to the non-oil sector especially the individual micro-level operators. The oil revenue also has encouraged rent-seeking in the economy and, this has withheld trust and consensus among market participants. It has also exacerbated the problems of economic management in Nigeria as government agencies are not committed to best practices since the oil revenue would flow whether the domestic economy works optimally or not. The oil industry also has a negative impact on public institutions by weakening them. The challenge flows from the need to strengthen the institutions in the face of the oil industry. These and many more problems of the oil revenue must be resolved for the investment climate reform to succeed. The oil revenue, however, provides the funds for running the country and places Nigeria on the list of countries considered for foreign investment. The challenges of rent-seeking and "Dutch Disease" are consequences of bad management of oil revenue. Sustained democratic governance holds the prospects of resolving these challenges.

The exclusive regime for women

This is gradually giving way for a more inclusive one. There are still challenges that are traceable to tradition and, sometimes, religion. This is, therefore, a serious problem as the government would be very careful in dealing with religious matters in a multi-religious country like Nigeria. But the consequences of delay are huge as a delay of one year affects a generation of Nigerians. Here lies the dilemma. However, globalization and, indeed, information and communications technology have opened up the world for Nigerians to see the growth potentials of girl children. Democratic governments in the country have also seen that much depends on them to reverse the trend of girl exclusion from school and economic activities to that of inclusion. In Nigeria too, given the increasing mobility of persons from all parts of the country, cultures are gradually streamlining and the walls of extremities are caving in. Women are now members of the National Assembly and belong to various professions and work in various establishments in the country and abroad. At least those women that have the opportunity of participating in these endeavours would not let their girl children

stay out of school or after going to school not put their knowledge into practice. The prospects are, therefore, bright for women to take their pride of place in Nigeria.

The dualization of the economy into formal and informal has grave adverse implications for economic policies. Improved investment climate for informal sector firms would imply addressing the constraints they find most binding and reducing the barriers to becoming formal. Rural firms too, though may be formal, suffer from the same constraints as the informal firms. Improved investment climate would unleash the growth potential in these firms and thus integrate them into the mainstream economy. These are the firms that could locate side- by- side with the oil firms in the rural environments of the oil- producing areas and offer services to the multinational oil companies, thus, increasing the local content of the Nigerian oil industry.

Presently there are many opportunities for firms in the industrialized countries but only those firms with the appropriate investment climate can take advantage of such opportunities. The African Growth Opportunity Act (AGOA) of the United States of America is one of such opportunities. To benefit from this opportunity, a firm has to produce the required goods at competitive prices and quality and export them to US markets. Improved investment climate would enhance the competitiveness of firms and so increase their chances of benefiting from AGOA. The New Partnership for African Development (NEPAD) is another opportunity and Nigeria would benefit from these only if the investment climate is appropriate.

Nigeria is endowed with material and human resources. There is, therefore, a plethora of incentives to grow industrially. The raw materials are there and the Nigerian market is large. Nigeria also has reach advantage over the West African market. On the other hand, owing to the policy of trade liberalization, the Nigerian market can be flooded by foreign goods thus making the country a mere consuming nation. To turn the situation to Nigeria's advantage, investment climate should be persistently improved upon. Once the existing institutions are sensitized to their responsibilities regarding investment climate and the firms are carried along, competition would drive the process while the government merely regulates, monitors and fine-tunes the climate to the benefit of all.

VI. Policy Implications/Recommendations

Investment climate is critical to growth and poverty reduction. Nigerian governments have already recognized this fact and have consequently put in place several measures aimed at improving the investment climate. However, there are still challenges. For purposes of policy, the implications of our analysis include:

Rent-seeking remains the most damaging challenge in Nigeria's economic and social life. Efforts at restraining it, thus far, have only dealt with the symptoms and not yet with rent seeking itself. To tackle the problem, there is need for reforms. The Constitution needs a review to limit the powers of some functionaries that promote rent-seeking. There is need for electoral reforms, stiffer sanctions for errant persons or institutions, standardization of contract execution, among others.

In order to establish credibility, reforms have to be sustained and deepened. Government functionaries should persevere in doing the right things. Right things have to be done persistently to convince all and sundry that, that is the only way to do it.

Public trust has diffused because corporate governance was lax both in the public and private sectors of the economy. There is need, therefore, to strengthen corporate governance especially in those institutions that hold public assets in trust (the banks, the stock exchange, insurance companies, the national and state assemblies, etc).

Even if there are opportunities for every Nigerian in tertiary institutions, not all Nigerians would complete the primary and secondary education. Provision should, therefore, be made for school drop outs. School drop-outs or even those that have not attempted at all should be given vocational training supervised by the government just as is the case with formal education. Apprenticeship is a form of education and government should be involved in it to ensure that the apprentice receives standard training. The curricula should meet the skill needs of firms. Given adequate incentive, the private sector can undertake such training under government supervision.

Rent-seeking and corruption are the major challenges to infrastructure provision. Corruption thrives in opaque environments and contract awards should be more transparent than hither to. Contracts should be standardized so that a prospective contractor knows what is expected of him/her and the details of the

contract are known to the public. Roads have life span and should the road collapse before the expected time, the contractor should be called to explain.

Financial markets rely on confidence for their functions. Market participants should be easily identified and recognized. The banks for example should demonstrate good governance while the customers should be known through adequate information. The use of credit bureaus has been recommended by some but that would work if there has been in place a means of identifying persons and corporate bodies uniquely. The National Identity Card project has to be revisited to ensure that every Nigerian acquires the card. Every other thing in the economy (registration at school, issuance of driver's license, etc) should take off from it. The Nigerian borders should be put under stricter surveillance to check the movement of illegal migrants.

Government intervention in the economy is unavoidable. However, the government should know where, when and how to intervene. This is the product of a micro level evidence which firm surveys would produce. Firms, therefore, should be surveyed regularly and the results of such surveys made public. Government intervention should be funded through budgetary provisions and not through ad-hoc arrangements.

International protocols and agreements compromise policy flexibility. However, in this era of globalization, autarky appears retrogressive. The protocols should be signed only after a close study of the situation by experts. There is need for selectivity. Participation at international fora makes or mars national reputation. So participation should be efficient and effective and not by anybody but the expert on the subject matter.

Some people including Nigerians have wished that the petroleum dries up. They claim that the existence of the resource has removed the thinking ability of Nigerians. The over-reliance on petroleum makes the resource a curse rather than a blessing. There is an urgent need to diversify away from petroleum. Promote industry and agriculture through not only more funding but also more extension services and better investment climate.

There is need for social reforms that would eliminate discriminatory practices especially between men and women, between the children of the rich and those of the poor. Let there be equal opportunities for everybody. This can be guaranteed by strong institutions (the judiciary, the police, the universities, the national/state assemblies etc).

VII. Summary and Conclusion

The paper has reviewed the concept of investment climate and the challenges and prospects of improving it in Nigeria. The challenges include the basic tension of spreading resources between social and economic infrastructure, restraining rent-seeking, fostering public trust and legitimacy and establishing credibility, among others. The prospects include the fact that Nigeria already has the necessary framework for an investment climate reform, improved investment climate would integrate informal firms into the formal economy, it would also integrate rural firms into the mainstream and unleash the growth potential of smaller firms. Based on these, some recommendations were made prominent among which are an upward review of the conditions of service of civil servants, the conduct of investment climate survey on a regular basis, making the firm the starting point of reform framework and the establishment of an industrial extension team.

Investment climate is key to growth and poverty reduction. Government policies and behaviours shape investment climate and in the process play out over a wide field, from contract enforcement and business regulation to the provision of infrastructure and labour market policy. No country has a perfect investment climate neither is perfection a prerequisite for reaping the fruits of investment climate. Nigeria already has the framework but the method still appears reactive and irregular. Nigeria has initiated several reforms and investment climate reform should be part of the whole reform programme. What it takes is to make the firm the starting point of the reform programme, conduct investment climate surveys regularly and base government industrial policies on the results of such surveys. Micro evidence has advantages over macro indicators but more work and discipline is demanded of the government and its officials.

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The Quantity Theory of Money: Evidence from Nigeria

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This paper examines the modern quantity theory of money using quarterly time series data from Nigeria for the period 1990:1-2008:4. The study uses the Engle-Granger two-stage test for cointegration to examine the long-run relationship between money, prices, output and interest rate and ratio of demand deposits/time deposits (proxy for financial development) and finds convincing evidence of a long-run relationship in line with the quantity theory of money. Restrictions imposed by the quantity theory of money on real output and money supply do not hold in an absolute sense. The granger causality is also used to examine the causality between money and prices. The study establishes the existence of 'weakening' uni-directional causality from money supply to core consumer prices in Nigeria. In all, the result indicates that monetary aggregates still contain significant, albeit weakening, information about developments in core prices in Nigeria. The paper finds that inflationary pressures are dampened by improvements in real output and financial sector development.

Keywords: Modern QTM, granger causality, prices, ADF

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I. Introduction

Money plays an important role in facilitating business transactions in a modern economy. The second round effects of these on the overall growth and development of the economy is the point where monetary and fiscal policies play their roles. Conceptually, the quantum of money in the economy and its consistency with the absorptive capacity of the economy underpins the essence of monetary policy. In Nigeria, the Central Bank of Nigeria (CBN) is responsible for the design and conduct of monetary policy. Over the years, the CBN has adopted a wide range of monetary policy frameworks such as exchange rate and monetary targeting frameworks in order to achieve macroeconomic objectives of price stability, economic growth, balance of payment viability as well as employment creation in its conduct of monetary policy.

In recent times, there have been plans to transit to an inflation targeting framework as the stable relationship assumed under the quantity theory of money

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between money and prices captured by the velocity of money may no longer exist (Smith, 2002; Benbouziane and Benamar, 2004). This paper is motivated by the need to establish empirically the validity or otherwise of the quantity theory of money in Nigeria. This is especially important as a clearer picture of this relationship will aid the Central Bank of Nigeria in its quest for the most reliable and effective monetary policy framework.

Following this introduction, section II reviews briefly the literature on the subject. Section III discusses the methodology for the study. In section IV, analysis of the results and findings are discussed, while section V concludes the paper.

II. Review of existing works

The quantity theory of Money (QTM) has its roots in the 16th century during which classical economists such as Jean Boldin at that time sought to know the cause of the increases in French prices. He concluded that, among other factors, increases in gold and silver which served as currencies were responsible for the rise in the demand for French-made goods and, hence, French prices, thus linking movements in prices to movements in money stock. By the 1690s, the quantity theory was further advanced by John Locke to examine the effects of money on trade, the role of interest rate and demand for money in the economy. In particular, the role of money as a medium of exchange to facilitate trade transactions was born. Economists at the time inferred that the quantum of money needed for such transactions would depend on the velocity of money in circulation and the relationship between the demand and supply of money such that where there was excess demand over supply interest rates rose and vice versa (Cantillon, 1755; Locke 1692 as cited in Ajuzie, et al, 2008).

Modern classical economics school of thought, which has come to be known as the monetarists, continues in the same light as the early economists and is often concerned with explanations for changes in price level. To them, a stable and equilibrating relation exists between the adjustments in the quantity of money and the price level. The more orthodox monetarist assumes that a rise in the quantum or variation in money supply determines the value of money, but not necessarily changes in output. In other words, they refute any form of monetary influence on real output both in the short-and long-run. This led to the popular paradigm that, "Inflation is always and everywhere a monetary phenomenon". For the less stringent monetarist, they agree that money influences output in the short-run, but only prices in the long-run. Nevertheless, irrespective of the path of adjustment, the monetarist all seem to concur that in order to reduce or curtail

inflationary growth, money growth should be less than or equal to the growth in output.

The quantity theory of money is hinged on the Irvin Fisher equation of exchange that states that the quantum of money multiplied by the velocity of money is equal to the price level multiplied by the amount of goods sold. It is often replicated as $MV = PQ$, M is defined as the quantity of money, V is the velocity of money (the number of times in a year that a currency goes around to generate a currency worth of income), P represents the price level and Q is the quantity of real goods sold (real output). By definition, this equation is true. It becomes a theory based on the assumptions surrounding it.

The first assumption is that velocity of money is constant. This is because the factors, often technical, habitual and institutional, that would necessitate a faster movement in the velocity of money evolve slowly. Such factors include population density, mode of payment (weekly, monthly), availability of credit sources and nearness of stores to individuals. This assumption presupposes that the velocity of money is somewhat independent of changes in the stock of money or price level. However, the Keynes liquidity preference theory suggests that the speculative components of money demand affect money velocity. Friedman in his modern theory of the quantity theory of money further explores the variables that could affect the velocity of money to include human/non-human wealth, interest rate, and expected inflation.

The second assumption guiding the QTM is that factors affecting real output are exogenous to the quantity theory itself. In other words, monetary factors do not influence developments in the realeconomy. The third assumption states that causality runs from money to prices. Thus, the quantity theory of money can be represented as

$$\bar{M}\bar{V} \rightarrow \bar{P}\bar{Q}$$

In simple terms, this states that prices vary proportionally in response to changes in the quantum of money, with velocity and real output invariant.

The QTM is, however, fraught with some weaknesses. First, is its non-recognition of money as a resource that could spur production. It thus does not explain recessions or unemployment since it assumes away adjustment problems. Secondly, critics have also observed that changes in the quantum of money in

circulation are the effects of variation in business cycle, rather than the cause as opined by the monetarists.

Some of the earlier works conducting an empirical testing of the quantity theory of money include those of Friedman and Schwartz (1982), Sims (1972), Bhattacharya (1972), and Brahmananda (1977). Sims (1972) introduced the concept of Granger causality into the testing procedure. In his study, Bhattacharya (1972) specified a linear regression model to examine the relative performance of reduced form versions of the basic Keynesian model and the Quantity Theory model. He concluded that the Keynesian model explains monetized income better than the QTM. Brahmananda (1977) employing single equation econometric methods investigated the link between real national income and price level in India. He reached the conclusion that the QTM explains the developments in the price level.

Modern research on the QTM such as that of Ahmed (2003) which adopted a block causality test showed that there was a unidirectional causality from output and prices to money. That is, interest rate and money as a block do not cause output and prices, but output and price cause interest rate and money. Miyao (1996) used quarterly data for the period 1959 to 1993 to investigate the long-run relationship between money, price level, output, and interest rates in the United States and found that there was mixed evidence of a long-run relationship prior to 1990 and little or no evidence of a long-run cointegration relationship for the entire sample. A similar study by Emerson (2006) to examine the long-run relationship between money, prices, output, and interest rates in the United States using quarterly data for the period 1959 to 2004 reached the conclusion that a long-run relationship exists.

Few studies such as Anorou (2002) and Nwaobi (2002) examined such relationship in the Nigerian context. Anorou (2002) adopted the Johansen and Juselius cointegration method to establish the stability of broad money demand function in Nigeria during the structural adjustment program period. His result suggests that a long run relationship existed between M2, and real discount rate and economic activity concluding that money was a viable monetary policy instrument to stimulate economic activity in Nigeria. A similar research by Nwaobi (2002) using data from 1960-95, established that money supply, real GDP, inflation, and interest rate were cointegrated in the Nigerian case.

This paper expands upon these by using quarterly data devoid of rigidities of the monetary control era that characterized the Nigerian economy prior to the 90s.

Furthermore, the paper in line with anecdotal evidences makes an apriori assumption that the velocity of money is not constant. Thus, the paper assumes that relative to the past, the financial sector has evolved and, thus, introduces a measure of financial sector development in the quantity theory of money analysis.

III. Data, Specification and Methodology

III.1 Data

This paper employs quarterly data for the period 1990-2009 obtained from the CBN Statistical Bulletin (various issues). This is to ensure that the long-run cointegrating relationship can be estimated as well as ensure that information that would otherwise be lost when using annual data is captured.

Quarterly data on consumer prices (cpi), money supply (nm), interest rate proxied by maximum lending rate (mlr), and real output (ry) were used. The measure of money supply used is the broad definition of money supply since it reflects the underlying changes in the Nigerian monetary sector, capturing transactions and speculative needs in the form of time and other forms of deposits. Financial sector development is proxied by the ratio of demand deposits to time deposits. The measure of prices considered is the core consumer prices. This is chosen as changes in non-core (food) prices are often not attributed to monetary developments. All variables, except for rates/ratios are in their natural logarithm form.

III.2 Model specification

Drawing from the works of Emerson (2006) and Akhtaruzzaman (2008), the quantity theory of money identity is written as

$$p_t + y_t \equiv m_t + v_t \quad (1)$$

where all variables are in their natural logarithm. p is the price level, y is real output, m is money stock, and v is the velocity of money.

The modern QTM does not assume that the velocity of money is constant. Therefore, this paper assumes that financial and institutional structures have evolved over the years and specifies the velocity of money as a function of the nominal interest rate (mlr), real income (ry), inflation (inf), ratio of demand deposits to time deposits (dtd) (proxy for financial development).

$$v_t = \beta_0 + \beta_1 mlr + \beta_2 ry + \beta_3 inf + \beta_4 dtd + \mu_t \quad (2)$$

where $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$ are coefficients and μ_t is a random error.

Combining (1) and (2)

$$p_t = m_t + \beta_0 + \beta_1 mlr + \beta_2 ry + \beta_3 inf + \beta_4 dtd + \mu_t - y_t \quad (3)$$

Taking into consideration like terms and not making assumptions about the exogeneity of output and money supply, the following model is estimated:

$$p_t = \beta_0 + \beta_1 mlr + \beta_2 ry + \beta_3 dtd + \beta_4 m_t + \mu_t \quad (4)$$

This study differs from known studies in Nigeria in a number of ways. First, it uses recent and quarterly data. Second, unlike other known studies for Nigeria, it introduces a measure of financial development in the quantity theory of money analysis. Third, as opposed to the Johansen co-integration technique, it uses the Engle-Granger two-stage test for co-integration analysis.

III.3 Methodology

An initial analysis of the causal relationship, using the granger-causality test is conducted to assess the direction of causality among the variables. The Granger causality test states that a stationary variable x is said to granger-cause a stationary variable y only if y is predicted better by using the past changes of x , together with the past changes of y itself, rather than by using only the past changes of y . A bi-variate autoregressive standard Granger causality model is presented below:

$$\Delta Y_t = \alpha + \sum \alpha Y_i \Delta Y_{t-i} + \sum \alpha X_i \Delta X_{t-i} + \mu_t \quad (5)$$

Where Δ is the first-difference operator and ΔX and ΔY are difference stationary time series. In order to specify a non-spurious and appropriate model for empirical investigation, the time series properties of the variables are identified using the unit root test, which is conducted using the Augmented Dickey-Fuller (ADF)¹.

¹ The ADF test is an iterative process that starts by testing the null hypothesis that the variable(s) in their level form are non-stationary that is integrated of an order of one, $I(1)$. The rejection of the null hypothesis indicates that the variables are stationary; while non-rejection of the null hypothesis indicates they are non-stationary and would need to be differenced and subjected to further testing that the differenced series are non-stationary, that is $I(1) \rightarrow I(0)$.

Fig 1: Visual Plots of Data in Logarithm

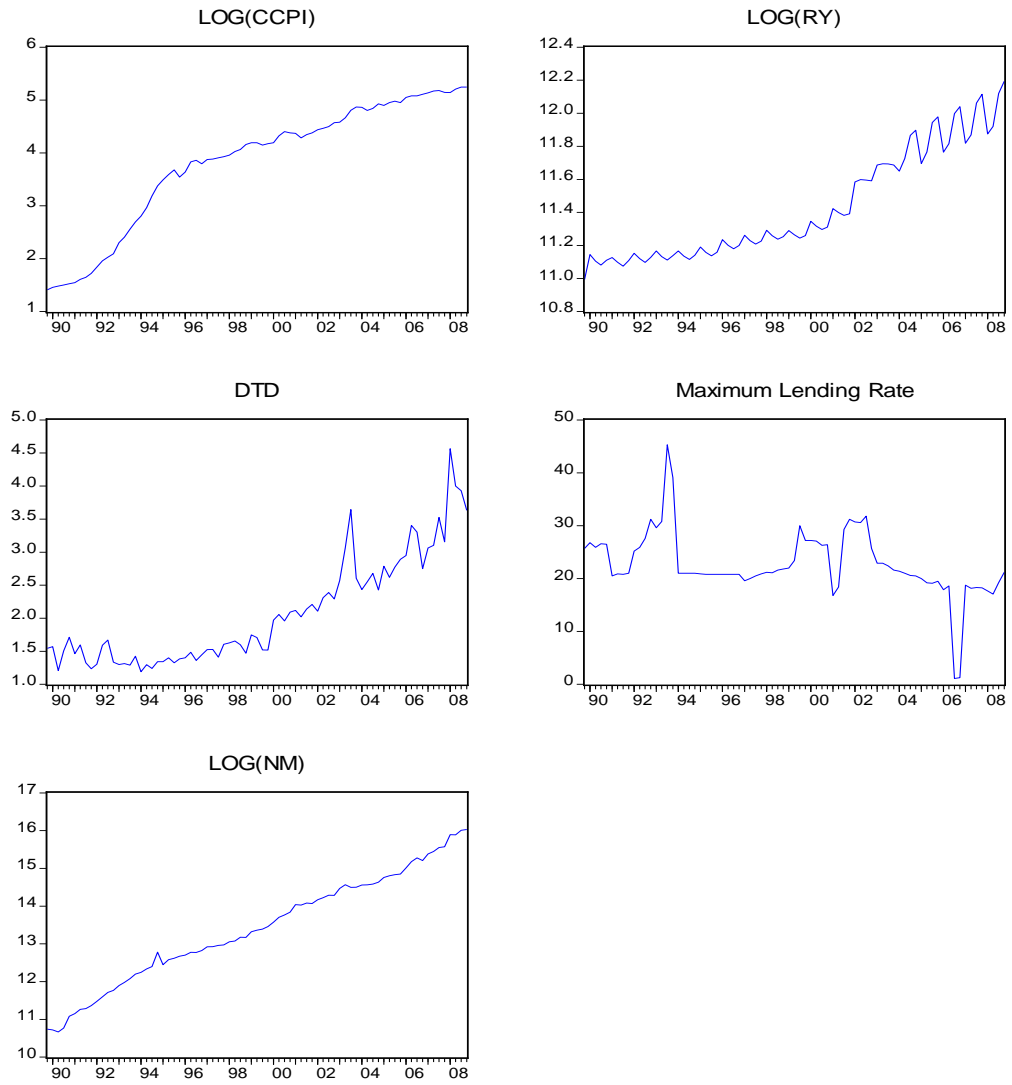
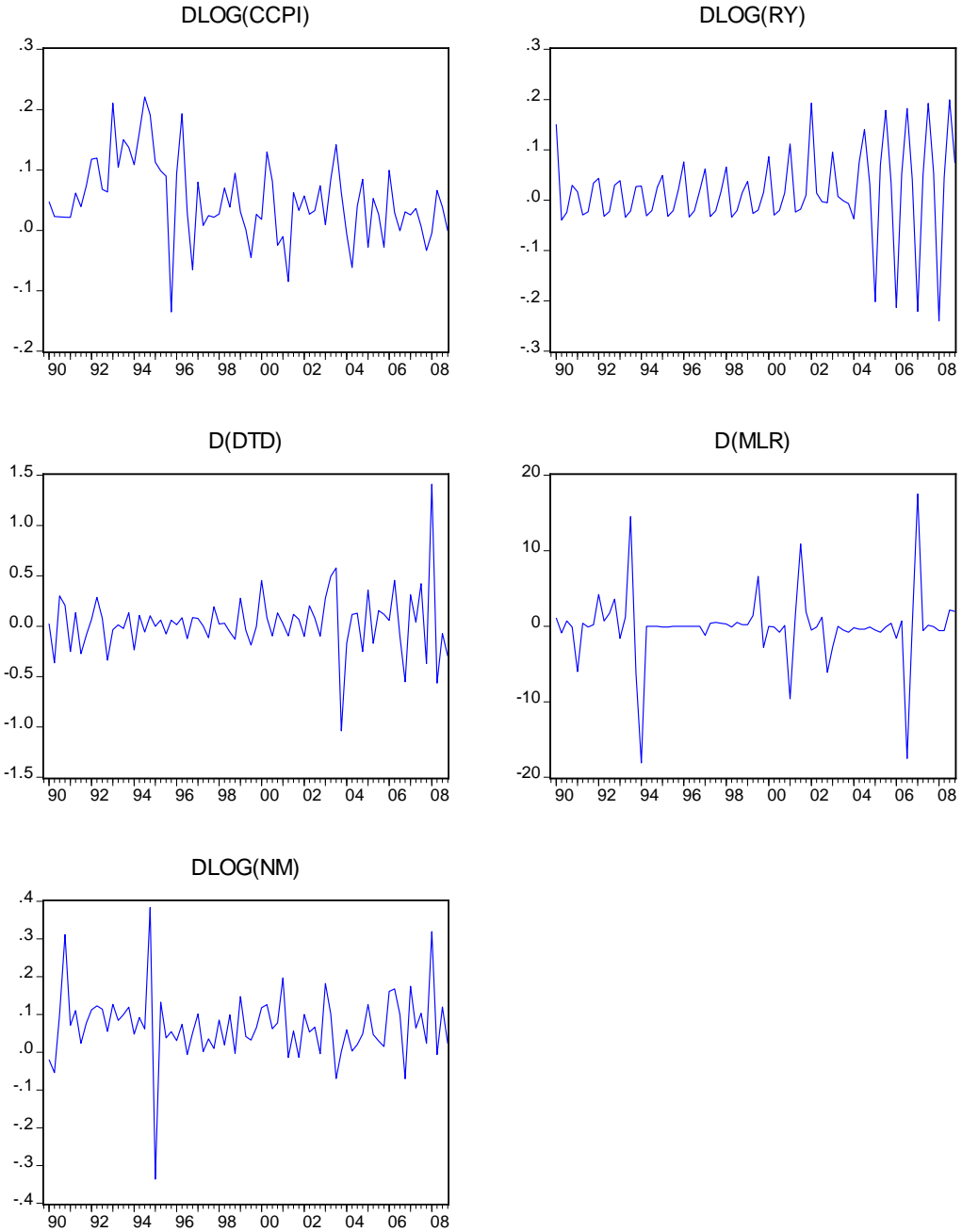


Fig 2: Visual plots of stationary variables



From the visual plots of the variables with the exception of lending rate, the appropriate test equation is that with a constant and a trend as the series appear to be wandering around a linear trend. The plot of the lending rate appears to be wandering around a non-zero mean and thus the test equation with a constant term is applied. The result of this test is presented in table 1.

Table 1: Augmented Dickey Fuller Test (Null Hypothesis: Has a Unit Root)

ADF Regression with Drift					
Series in log levels	t-stat	1%	5%	10%	log (At) ~ I(X)
Nominal Money (nm)	-0.57	-3.51	-2.90	-2.58	I (1)
Core CPI (ccpi)	-3.29	-3.51	-2.90	-2.58	I (0)
Real Output (ry)	0.82	-3.51	-2.90	-2.58	I (2)
DD/TD (dtd)	1.11	-3.51	-2.90	-2.58	I (1)
Mlr	-2.57	-3.51	-2.90	-2.58	I (1)

ADF Regression with Drift and Trend					
Series in log levels	t-stat	1%	5%	10%	log(At) ~ I(X)
Nominal Money (nm)	-2.32	-4.08	-3.47	-3.16	I (1)
Core CPI (ccpi)	-0.62	-4.08	-3.47	-3.16	I (1)
Real Output (ry)	-1.92	-4.08	-3.47	-3.16	I (2)
DD/TD (dtd)	-3.81	-4.08	-3.47	-3.16	I (0)
Mlr	-2.95	-4.08	-3.47	-3.16	I (1)

The Augmented-Dickey Fuller tests suggest that nm, ccpi, mlr and dtd are integrated of order one, I(1), while ry is integrated of order 2, I(2). Though the Phillips Peron test are not presented in this study, the test using the Bartlett Kernel with automatic Newey-West bandwidth selection, however, suggests that all variables can be treated as I (1) processes.

IV. Result

Granger-Causality Test

The results from the granger causality tests show that changes in broad money supply granger causes the core consumer price index (Table 2). Thus, the paper finds evidence that core prices are better predicted by past values of changes in broad money stock and past changes of prices itself. This is expected since monetary developments are expected to affect demand driven prices reflected in the core CPI.

Table 2: Pair-wise Granger Causality Test

Lags: 4

Null Hypothesis:	Obs	F-Statistic	Prob.
DLOG(CCPI) does not Granger Cause DLOG(NM)	72	0.09360	0.9841
DLOG(NM) does not Granger Cause DLOG(CCPI)		2.10597	0.0905

From the pair-wise tests, it can be deduced that the null hypothesis is rejected at the 10 percent level of significance.

Long-Run Static Model

Estimated results from equation 4 is found in table 3 below

Table 3: Long-Run (Static) Equation

Dependent Variable: LOG(CCPI)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.14775	3.616207	3.082719	0.0029
LOG(RY)	-1.343890	0.248314	-5.412063	0.0000
DTD	-0.443356	0.071325	-6.215964	0.0000
MLR	-0.010494	0.004135	-2.537643	0.0134
LOG(NM)	0.553826	0.155628	3.558659	0.0007
@TREND	0.046506	0.011263	4.129099	0.0001
R-squared	0.975263	Durbin-Watson stat		0.671567
Adjusted R-squared	0.973521	Akaike info criterion		-0.360090
S.E. of regression	0.194691	Schwarz criterion		-0.177456

Diagnostics of the Long-Run Equation

Figure 1: Actual, Fitted and Residual Plot of the Long-Run Equation

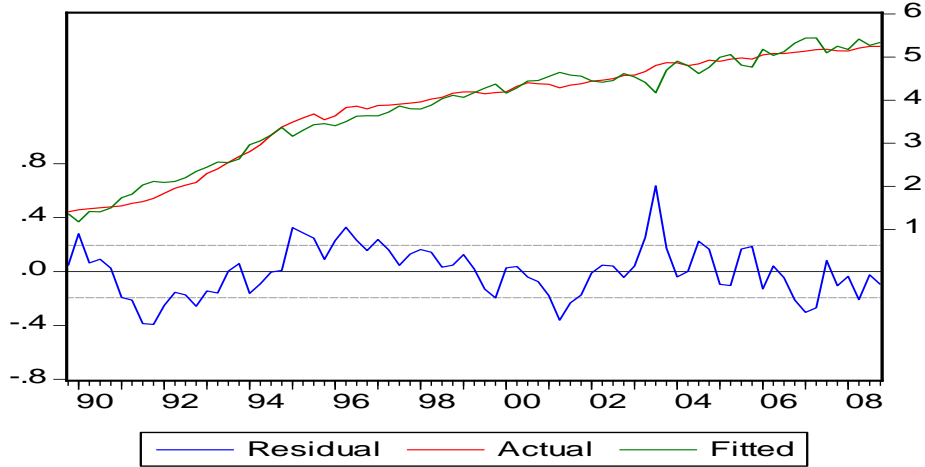
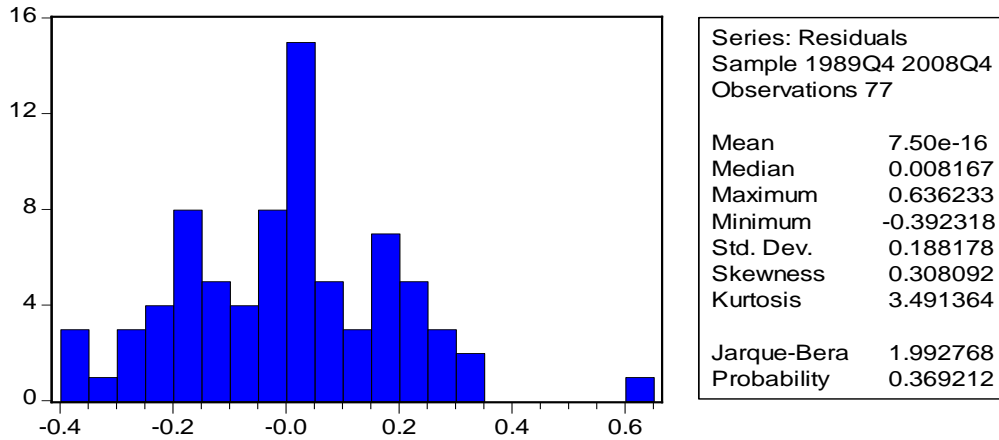


Figure 2: Histogram Normality Test for Residuals of the Long-Run Equation



From the histogram, the test for normality of the residuals shows that they are normally distributed. From table 3, the long-run equation indicates a good fit shown by the high coefficient of determination and the residual graph, but a very low Durbin – Watson statistics indicative of positive autocorrelation. Further tests using the LM test confirms that the null hypothesis of no autocorrelation is rejected. The high coefficient of determination may give a wrong indication of the presence of a long-run equilibrium relationship. Consequently, the paper goes further to test for unit root in the residuals of the long-run regression.

A co-integration test using the Augmented Dickey Fuller test procedure was conducted on the residuals from the estimated long-run equation in Table 3. In table 4 below, the tau statistics of -3.82 is less than the critical value of -3.47 and -3.16 at the 5 and 10 per cent levels of significance. Thus, the null hypothesis that the least squares residuals contain a unit root is rejected. This implies that there is a long-run co-integrating relationship among the variables, core consumer prices, lending rates, broad money, financial sector development and real output.

**Table 4: Augmented Dickey Fuller Test for Residuals
(Null Hypothesis: Has a Unit Root)**

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=11)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.852513	0.003704
Test critical values:		
1% level	-3.51	
5% level	-2.90	
10% level	-2.58	

Thus, the co-integrating regression is as follows:

$$\log(\text{ccpi}) = 11.15 - 1.34\log(\text{ry}) - 0.44\text{dtd} - 0.01\text{mlr} + 0.55\log(\text{nm}) + 0.05t \quad (6)$$

The long-run co-integrating regression in equation 6 suggests that real output, financial sector development, interest rate and money supply all have significant influence on the level of consumer prices in Nigeria. All variables, have the correct signs. Trend has a significant positive effect on core prices. A unit increase in real output reduces consumer prices by more than one unit. This implies a unit increase in real output will lower core consumer prices by 1.34 units in the same quarter. This conforms to the quantity theory that states that the coefficient of real output should be less than one since more goods and services in the hands of the public means consumers can enjoy lower prices.

The results also suggest that as transactions in the financial sector become efficient with improved payment system, use/availability of money substitutes, and technological progress, prices of core consumer goods should be lower. The results indicate that a unit increase in financial sector development variable leads

to a decline of 0.44 units in consumer prices. In conformity with the results in Mordi, et al (2007), interest rates, proxied by lending rates are significant in influencing consumer prices, but quite marginally. It meets apriori expectations, as one would expect increases in lending rates to exert a dampening effect on demand driven prices. Prices respond significantly to monetary developments. A unit increase in the quantum of money supply increases consumer prices by 0.55 units within the quarter. This is in conformity with the quantity theory that states that the coefficient of money should be significant. The results do not, however, conform with a close one to one relationship between money supply and consumer prices as opined by the theory. The results herein conform to the results reached in Mordi, et al (2007). In their long run model, it was shown that for every unit increase in money supply, core prices increased by 0.42 units. Of all the variables, real output, money supply and financial sector development exert the highest impact on consumer prices. The results provide evidence that monetary aggregates still contain highly significant and useful information about developments in prices, which may lead to the conclusion that inflation is a monetary phenomenon, even though the relationship may be weakening. However, the results tell us that positive developments in the real and financial sector can dampen continuous increase in core consumer prices. Indeed, real sector developments, rather than monetary developments exert the highest impact in reducing core consumer prices. This may be an evidence of a 'weakening' relationship between monetary aggregate and prices as one considers the non-proportionality between broad money and prices in equation 6, which seems to further validate the granger causality test, when conducted with a 'strict' level of significance.

IV.1. Testing the Implications of the Quantity Theory

After deriving the co-integrating parameters in Table 3, the paper conducts an empirical test on the joint hypothesis that coefficient of output (β_2) = -1 and coefficient of money (β_4) = 1, in order to ascertain the implications of the quantity theory from equation 4. The results is shown below

Table 5: Wald Test

Test Statistic	Value	df	Probability
F-statistic	4.238048	(2, 71)	0.0183
Chi-square	8.476095	2	0.0144

Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
1 + C(2)	-0.343890	0.248314
-1 + C(5)	-0.446174	0.155628

Restrictions are linear in coefficients.

The Wald test results show that the null hypothesis is rejected at all acceptable levels of significance. This suggests that the restrictions imposed by the QTM do not hold for the sample period. However, this does not negate that the parameters on real output and money supply are close to the values predicted by the quantity theory of money.

V. Conclusion

Within the context of the issues highlighted at the introduction of the study, this paper has established that there exists a long-run relationship among money, interest rate, prices and financial sector development in Nigeria for the sample period 1990-2008. The paper has shown that the QTM restrictions on the coefficients of real output and money supply do not hold in a strict sense. The empirical results suggest that monetary aggregate still contain significant information about core consumer prices, but a weakening relationship between money supply and prices as evidenced by the granger causality test on core consumer prices. The study reveals a direct and positive relationship between money and prices, but a non-proportional relationship between the two variables as prices increase by just a little above half when there is a unit increase in money supply, which may also suggest a 'thinning' out relationship. Further independent studies will need to be conducted to confirm this, as this may portray a threat to monetary policy in Nigeria relying only on the use of monetary aggregates as an intermediate target to affect prices. Perhaps, if the measure of monetary aggregate used is re-examined and sub-sample analysis conducted, more information may be gleaned.

An interesting aspect is the role of real output and financial sector development in influencing core consumer prices. The real output level impacts greatly and significantly on core prices in the long-run. This implies that policies targeted at core prices may be better tracked by developments in real output than by monetary aggregates in the long-run. It further indicates that inflation in Nigeria may not be entirely a monetary phenomenon. Thus, policy framework/designs should be re-evaluated and perhaps consider impacting on core prices via variables that affect real output and financial sector variables. Current efforts at developing the financial sector should be sustained as results from the study indicate that it dampens the weight of inflationary pressures on policy formulations.

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Capital-Labour Substitution and Banking Sector Performance in Nigeria (1960-2008)

Abidemi Abiola*

This study examines productivity in the banking sector by way of estimating two major production functions known in the economic literature. The result obtained from the ordinary least square (OLS) estimates shows that substitution parameters α and β (substitution parameters for capital and labour, respectively) confirms the a priori expectation that the duo of α and β are positive values of less than one. The addition of the values of α and β is greater than one, which indicates that as the banking sector doubles its inputs in terms of capital and labour, the output in terms of deposit will be more than doubled. The substitution parameters in the Constant Elasticity of Substitution Production Function were equally positive, which supports the theory. The speed of adjustment for the two models are reasonably good as any deviation from equilibrium is to be adjusted back in the long run. In the final analysis, the study supports economic theory on the specification of both Cobb-Douglas and Constant Elasticity of Substitution production functions.

Key words: Productivity, Production Function, Cobb-Douglas, Constant Elasticity of Substitution, Cointegration.

JEL Classification Code: C01, D24, E44

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I. Introduction

Capital-Labour substitution is an attempt at the estimation of production function. Estimating production function is an exercise that involves determining the productivity of a particular sector or the entire economy. Productivity is a term used to describe the contribution of factor inputs in the production process. In some sense, it is often used synonymously with performance evaluation of those inputs, especially labour. The more reason why some governments have in their structure of executive arm, the ministry of labour and productivity. The government of Nigeria even went as far as establishing a parastatal called the National Productivity Centre. This parastatal has been saddled with the responsibility of conducting productivity research into virtually all human endeavours, with the aim of advising the federal government on various policy issues that can better the lot of the nation, that is, productivity in a broader sense as it encompasses socio-political and economic activities.

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The word "productivity" is bereft of a universally accepted definition; there are several ways in which productivity can however, be understood. According to Tybout (1992), productivity is the ratio between output and input of resources. Put simply, it is the arithmetic relationship between the amount produced and the amount of resources used in the course of production. This point is buttressed by Siegel (1980), who defined productivity as a family of ratios of output quantity to input quantity". These definitions, and various others, form the basis for which this research paper is built on. Zeroing down to the main thrust of this paper, an econometric estimation of aggregate production functions of commercial banks in Nigeria, productivity will be narrowed to purely economic phenomenon. There is a vast body of literature on the estimation of production function. From the works of eminent scholars like Solow (1957), Kendrick (1961), Stigler (1958), Fisher (1969), to the new writers like Oaikhena (1997), Iyoha (2000), Ekanem and Oyefusi (2000), Ekanem (2002) and so on, productivity and production functions have been examined in various sectoral dimensions, including the manufacturing sector, the brewing industry and the banking sector.

Thus, if the level of productivity determines a nation's economic growth and development, an examination of the productivity of commercial banks in Nigeria is an exercise worthy of venturing into. This is because the financial sector of the economy plays a key role in the whole process of economic development. Moreover, it is an indisputable fact that the productivity of other sectors of the economy depends on the effectiveness and efficiency of the financial sector (Coker and Balogun, 2002). This apparent manifestation of the growing importance and influence of the banking sector in propelling the Nigerian economy elicits the need to estimate the production function of the banks.

This research paper evaluates the performance of commercial banks in Nigeria with a view to determining the factors that are giving strength to these banks and how they are able to sustain the performance in this era of stiff competitive banking environment. Efforts will be made to see what information technology has done to boost banking performance in this era of e-banking and on line services.

The specific objective of this research work is to estimate both the Cobb-Douglas and Constant Elasticity of Substitution production functions of commercial banks in Nigeria. Specifically, the paper will: first find out which of the inputs of the banks contribute more to output, and second, explain the type of returns to scale that is applicable to the commercial banks in Nigeria.

Estimating production function can be done on any sector. However, this research work concentrates on the banking sector. The period covered by the research work is 1960-2008.

II. Literature Review

Douglas (1934) and Solow (1957) in their study on capital-labour substitution concluded that labour is the single most important factor of production in a certain subtle sense. Both labour and capital are needed in production: take away capital, or alternatively all labour, and you will be left with negligible total product. But they found that a one percent increase in labour seems to increase output about three times as much as would a one percent increase in capital. This largely corresponds with the widely known fact that wages are about three-fourth of the share of property incomes.

In their own view about productivity growth, Grossman and Helpman (1989) ascertained that productivity growth is driven by private sector research and development, which results in new intermediate goods that enhance final good productivity and also contribute to public knowledge. Entrepreneurs in the research and development sector sell blueprints for income, and the rate of increase in the stock of blueprints determines the rates of productivity growth.

Tybout (1992) asserts that it is a mistake to think of productivity growth as an orderly shift in the production function of the representative plant. To him gradual processes of technological diffusion or the displacement of inefficient plant are what matters. Trade orientation may from this process pass through many channels. Exposure to increased foreign competition is found to be associated with improvement in the average level of technical efficiency, reduction in the cross-plant dispersion in technical efficiency, and reduction in plant size. However, his preliminary work suggests no clear link between trade policies and patterns of entry and exit.

Westbrook and Tybout (1993) exploited plant-level panel data from Chile to provide new evidence on the empirical significance of econometric study of manufacturing sectors. Particularly, emphasis is given to econometric problems induced by the presence of unobservable plant heterogeneity, measurement error, and selectivity. An analysis of the results suggests that estimates based on Generalized Method of Moment (GMM) estimators that pool long differences (which eliminate heterogeneity effects) are robust to measurement error in the capital stock, heterogeneity and selectivity. Returns to scale for three-digit industries are fairly distributed over the plausible range of 0.8 to 1.2 and none is

statistically significantly different from constant returns. Similar results hold for the four-digit industries for which sufficient data are available. Although general expansion of the manufacturing industry cannot be expected to yield strong plant-level scale economies, their results do not rule out scale economies from other sources such as the spreading of start-up costs and external returns to scale.

Analyzing productivity in sectors, one concept that has come to stay in the discussion on productivity is the total factor productivity (TFP). Defined as the elasticity of output with respect to time, there exists a lot of literatures on TFP. As a first step in researching the trade – productivity link, Pack (1988) writes that “comparisons of Total Factor Productivity among countries pursuing different international trade orientations do not reveal systematic differences in productivity growth in manufacturing sector”. However, Chenery, et al (1986) and Balassa (1985) have found a positive association between TFP growth and openness. Second, after reviewing studies based on within – country temporal correlations, Pack (1988) and Havrylyshyn (1990) both concluded that there is no strong evidence linking productivity and openness. Nevertheless, some studies do find a positive association between export growth and productivity (for example, Krueger and Turner (1982); Nishimizu and Robinson (1984); Nishimizu and Page (1991) find that other dimensions of policy—notably the degree of government intervention significantly influences the relation between trade and productivity.

Works on productivity and production functions in Nigeria have been going on for about five decades now. With the traces of skeletal work on the topic then, it has reached a climax of sort with the establishment of the National Productivity Center by the Buhari Administration. With the establishment of the Center, an encyclopedia of sort that comprises of various works on productivity had been prepared, with its first edition that came out in year 2002. In the Nigerian context, works on productivity include Liedholm (1964), Oaikhena (1997), Iyoha (2000), Ekanem and Oyefusi (2000), Ekanem (2000), Osagie and Odaro (1975), Ajayi (2002), Jekelle (1987), Akinnusi (1987), Uruestone (1987), Adekoya (1987), Komolafe (1987 and, Usman (1987).

Liedholm (1964) was perhaps the first work to be done on productivity in Nigeria. In the work an attempt was made at finding out between labour and capital, which input contributed more to the output of major industries in Eastern Nigeria. In the said work, it was found that labours' contribution to the output of the selected manufacturing industries was larger than that of capital. This position was confirmed by Osagie and Odaro (1975).

In a similar vein, Osakwe (1976) using time data carried out the same analysis for ten different manufacturing industries and derived estimates of labour and capital and arrived at coefficients similar to that obtained by Liedholm in 1964. For seven of the ten industries, the estimated capital elasticity (coefficients) carried negative signs contrary to a priori expectations, while for the remaining five industries whose capital coefficients were positively signed; the estimates did not pass the necessary significance test.

Oaikhena (1997) used the CES production function to obtain estimates for the Brewing Industries in Nigeria using time series data from 1975 to 1994. The industry's output and factor inputs were proxied by industry's turnover, monetary value of fixed assets and expenditures on salaries and wages, respectively. The model was estimated separately for the major brewing firms in Nigeria and then for the firms together using the OLS method. The results obtained were, however, not impressive both at the individual and aggregate levels. The results indicate the presence of positive serial correlation, the coefficients of determination were low, except for one of the firms and the distribution parameter estimate yielded extreme returns to scale and was shown to be increasing. Again, while for the individual firms the substitution parameter indicates little scope for factor substitution the scope was shown to be higher for the industries combined. Consequently, the Cobb-Douglas form of production function was estimated for the same period using the same data. Even though the estimates yielded better results the returns to scale parameters were not consistent.

Ekanem and Oyefusi (2000) estimated the Cobb-Douglas and the CES production functions for the manufacturing industry in Nigeria for the period 1980-1997, taking into consideration the phenomenon of idle capacity that has characterized the industry in recent times. The results of the models when compared with the work of Liedholm (1964) and Osagie and Odaro (1975) gave satisfactory results in terms of goodness of fit. Of the two production functions estimated, the Cobb-Douglas Production Function performs better considering all the relevant econometric test criteria. This then showed that the Cobb-Douglas Production Function gives a better explanation of the aggregate production process in the manufacturing industry in Nigeria for the period studied.

Ekanem (2002) provides estimates of Total Factor Productivity for the banking industry in Nigeria for the period 1986-2000. The methodology in the work involved the use of the Growth Accounting Model based on aggregate production functions. In the study, the most appropriate production function that describes the production process of the industry in Nigeria was found to be the Cobb-

Douglas. The parameters of the estimated Cobb-Douglas function were used to calibrate the Growth Accounting Model. The results showed that measured aggregate output grew at an average annual rate of 4.29%, while Total Factor Productivity grew at an average annual rate of 3.33%. The study analyzed that TFP provided 78% of the recorded growth in the industry during this period.

When the time span was broken into sub-periods to permit a closer look at the productivity trends in the industry, it was found out that TFP accounted for 72% of industry growth in the period 1986-1990. For the period 1991-1996 TFP accounted for 70% of the industry growth. For the final period, 1996-2000 TFP accounted for 82.5% of industry growth. The study equally shows that the banking industry in Nigeria has expanded rapidly in recent years, with TFP rising sharply since 1996. This strong aggregate performance and well-documented investment in research, manpower development and information technology gives an encouraging signal to the emergence of a sustainable growth in the industry in Nigeria.

Iyoha (2000) made an attempt to undertake a growth accounting exercise for Nigeria using data for 1960-1997. The aim of the exercise was to breakdown economic growth into components associated with changes in factor inputs (capital and labour). The paper used the standard primal growth accounting framework. Estimates of Total Factor Productivity (TFP) were obtained for the entire period and for four sub-periods namely 1961-1970, 1971-1980, 1981-1987, and 1988-1997. The average annual growth rate of real GDP for the entire period was 3.7%. Growth in factor inputs was at the rate of 2.55%, while growth in TFP was 1.1%. In effect TFP growth accounted for 30.3% of aggregate real GDP growth during the period. TFP growth was especially rapid during the first decade. Out of total real GDP growth of 5.07%, TFP growth was 4.6%. The conclusion is that during 1961-1970 period, TFP growth accounted for over 92% of average growth in real GDP. TFP performance deteriorated during 1971-1987. It recovered somewhat during the last decade when TFP growth was 2.1%, compared with an average real GDP growth of 4.7%. Thus, during the 1988-1997 period, TFP growth accounted for 43% of aggregate real GDP growth.

The paper equally made an attempt at identifying the causes or determinants of productivity growth in Nigeria. Attention was particularly centered on the last decade of the research period. It was found that the economic and market reforms undertaken under SAP which entailed deregulation of the foreign exchange system, trade policies, the financial system and agricultural policies have played a significant role in enhancing productivity performance. The study

concluded by advising that investment needs be encouraged and increased to raise the overall rate of economic growth in the years ahead.

Coker and Balogun (2002) attempt to analyze the impact of the role of the financial sector on the Nigeria economy. In their concluding remarks, they posit that in the years ahead, with increasing deregulation and globalization and the keen competition to survive, financial sector operators have to be more resourceful and sophisticated. In particular they should try to keep their institution healthy and strong by adopting prudent measure, relying increasingly on self-deregulation, applying advanced technology in providing financial services and above all developing customer-friendly strategies. They equally postulate that to stimulate and protect the intermediation role of the financial institution (operators) in Nigeria, the regulator (CBN) has to sustain a number of recent measures that have proved effective. These include enforcing compliance with regulations and ethics of financial services and providing early warning signals through effective supervision and prudential regulatory measures.

In her contribution, Ajayi (2002) examines how productivity improvement strategies and incentive schemes could act as policy instruments to the enhancement of higher productivity among individuals, organization, economic sectors and nations. The study thus, revealed that productivity levels in the national economy could be increased by various techniques of productivity improvement. Among these, motivation of employee through productivity incentive scheme is known to have a far-reaching effect on the productivity of the workforce. This is so because each productive incentive scheme takes into consideration employees' needs and potentials, circumstances of the work system as well as the level of technology applicable. The paper finally proffered some policy recommendations to be adopted in enhancing productivity growth. Principal among these recommendations is the installation of productivity improvement strategies and incentives scheme in all sectors of the economy.

Coming to the application of productivity in Nigeria, Komolafe (1987) looked at productivity as the positive contribution of the citizen to the multi-farious needs of his community, state or nation. The paper looked at, among other things, possible ways of improving productivity in a developing nation like ours. He concluded that Nigeria's means of production could only be reliable if they originate from the country. People should be mobilized to produce their own tools. Incentives should be created by stepping up measures in banning or limiting importations. Necessary financial and moral support should be given to indigenous entrepreneur. Government should honour and reward sincere and original efforts

in technology. Government should ban or limit external borrowing to the minimum so that hard earned foreign exchange can be utilized to promote the local production of our needs.

In his own attempt at examining the role of government in promoting increased productivity on Nigerian farms, Adekoya (1987) examined the concept of productivity as a measure of how well resources are brought together in a farm firm and utilized for accomplishing a set of results. The paper finally argued that government's involvement in manpower development is a means of increasing productivity on Nigerian farms; and that the Directorate for Foods, Roads and Rural Infrastructure will need to introduce community development programmes which require the active participation of women and the elderly in the implementation of such programmes.

The literature on productivity will be incomplete without mentioning the aspect of productivity and public service in Nigeria. Jekelle (1987) tries to examine the issue of productivity as it affects public service in Nigeria. He was moved by the general apathy people feel about the Nigerian civil service. The sector has been accused of corruption, ineptitude, indolence, rigidity, and general laziness, low productivity e.t.c. despite occupying a dominant position in the Nigerian economy. So the paper examines low productivity in the public service with particular reference to how employment policies relate to level of productivity.

The paper reveals that the major cause of low productivity in Nigeria has to do with selection and placement procedures. That the federal government in its characteristics manner of trying to maintain the unity of the nation brings in a lot of sentiment in the recruitment process all in the name of federal character. Though Jekelle (1987) did not find anything wrong with that except that he contends that it does not have legal backing. He, however, frowned at its implementation. Also, low productivity is prevalent in the county because rather than allow merit and qualification to be the determinants and basis for selection, it has been other factors like nepotism, tribalism, and favoritism e.t.c. The paper finally recommends, among other things, improvement of the content of selection interviews by looking beyond educational qualifications and work experience of the candidates. Interviews should be restructured to reflect real work job situation. This will lead to logical matching of men with jobs. The paper as a policy views the issues of examining the examiners by knowing the quality of products they are turning out. With this productivity as a problem would have been handled from the root.

III. Theoretical Framework

Production is the act of creating utility. This means that production is not complete until the goods produced finally reach the consumers (Mansfield, 1985). A production function is a function that specifies the output of a firm, an industry, or an entire economy for all combinations of inputs (Wikipedia). It is the technical relationship between the inputs and the outputs.

There are several ways of specifying the production function. In a general mathematical form, a production function can be expressed as:

$$Q = f(X_1, X_2, X_3, \dots, X_n) \quad (1)$$

where:

Q = quantity of output

$X_1, X_2, X_3, \dots, X_n$ = factor inputs (such as capital, labour, land or raw materials). This general form does not encompass joint production. That is, a production process, which has multiple co-products or outputs. At the advanced stage of microeconomics, all the inputs in a typical production process are subsumed into two major inputs; the fixed inputs (often denoted by K) and the variable inputs (often denoted by L). So many types of production functions are obtainable in the theoretical literature. They include the two popular ones namely the Cobb-Douglas Production Function and Constant Elasticity of Substitution production function. Other less popular ones are the Quadratic production function and Transcendental Logarithmic production function.

The Cobb–Douglas functional form of production functions is widely used to represent the relationship of an output to inputs. It was proposed by Knut Wicksell (1851–1926), and tested against statistical evidence by Charles Cobb and Paul Douglas in 1900–1928.

A typical Cobb-Douglas production function is of the form :

$$Q = AL^\alpha K^\beta, \quad (2)$$

where:

Q = total production (the monetary value of all goods produced in a year)

L = labor input

K = capital input

A = total factor productivity or efficiency parameter.

α and β are the output elasticities (substitution parameters) of labor and capital, respectively. These values are constants determined by available technology.

Output elasticity measures the responsiveness of output to a change in the levels of either labor or capital used in production, *ceteris paribus*. For example if $\alpha = 0.15$, a 1% increase in labor would lead to approximately a 0.15% increase in output.

Further, if:

$$\alpha + \beta = 1,$$

the production function has constant returns to scale. That is, if L and K are each increased by 20%, Y increases by 20%. If

$$\alpha + \beta < 1,$$

returns to scale are decreasing, and if

$$\alpha + \beta > 1$$

returns to scale are increasing. Assuming perfect competition, α and β can be shown to be labor and capital's share of output.

For Constant elasticity of substitution (CES) function: the original specification is of the form

$$Q = A[\alpha K^\rho + (1-\alpha)L^\rho]^{1/\rho} \quad (3)$$

$\rho = 0$ corresponds to a Cobb–Douglas function, $Q = AK^\alpha L^{1-\alpha}$.

The variables and the parameters are explained under Cobb-Douglas production function.

The Translog production function is a generalization of the Cobb–Douglas production function. The name Translog stands for 'transcendental logarithmic'. The three factor Translog production function is:

$$Q = f(K, L, M),$$

where L = labor, K = capital, M = materials and supplies, and Q = product.

This is specified in a general form as:

$$\ln Q = \ln(A) + \alpha_K \ln(K) + \alpha_L \ln(L) + \alpha_M \ln(M) + b_{KK} \ln(K) \ln(K) + b_{LL} \ln(L) \ln(L) + b_{MM} \ln(M) \ln(M) + b_{KL} \ln(K) \ln(L) + b_{KM} \ln(K) \ln(M) + b_{LM} \ln(L) \ln(M) \quad (4)$$

III.1 Research Methodology and Model Specification

The methodology used for this research are Cointegration and Error Correction Model. The choice of the econometric technique is borne out of the fact that the data used is time series data that is prone to autocorrelation. Once the

causal relationship between the dependent variable of output and its determinants (capital and labour) is established, then the issue of stationarity or otherwise of the data will be determined.

Two models are specified for the study, the Cobb-Douglas production function and the Constant Elasticity of Substitution production function. The general form of the Cobb-Douglas production function for two factors as applied in this study is:

$$Q = AK^{\alpha}L^{\beta} \quad (5)$$

While that of CES Production Function is of the form

$$Q = \gamma[(1-\delta)K^{-\rho} + \delta L^{-\rho}]^{-1/\rho} \quad (6)$$

Equation 5 is not a convenient form for direct estimation by least squares methods; it is therefore usually converted into a logarithmic form:

$$\log Q = \log A + \alpha \log K + \beta \log L + u \quad (7)$$

so that the residual u is added in the multiplicative form e^u .

A priori expectation suggests that both α and β are greater than zero but less than one. That is

$0 < \alpha < 1$ and $0 < \beta < 1$. In the case where constant returns to scale is present, then $\alpha + \beta = 1$. Alternatively, constant returns to scale may be imposed by putting $\beta = 1 - \alpha$ so that (5) can be rewritten as:

$$Q = AK^{\alpha}L^{1-\alpha}e^u = A(K/L)^{\alpha}Le^u$$

or
$$Q/L = A (K/L)^{\alpha} e^u$$

and taking logarithms of both sides gives

$$\log Q/L = \log A + \alpha \log(K/L) + u \quad (8)$$

This second form avoids multicollinearity between $\log K$ and $\log L$ and also reduces heteroscedasticity if the variance of K is correlated with L (Wynn and Holden 1974).

The CES function is not easy to estimate directly like that of the Cobb-Douglas function. Estimation of the CES function has, therefore, generally been limited to either examining whether the condition for profit maximization are satisfied or making some approximation to the function. In this study, we make use of Kmenta (1967) approximation to CES cited in (Wynn and Holden, 1974). The approximation with the use of Taylor's expansion series gives:

$$\text{Log}(Q/L) = \log\gamma + (u-1)\log L + u(1-\delta)\log(K/L) - 0.5u\delta\rho(1-\delta)[\log(K/L)]^2 + u \quad (9)$$

The equivalent equation for the Cobb-Douglas function is found by rewriting 3 as follows:

$$\text{Log}(Q/L) = \log A + (\beta-1+a)\log L + a\log(K/L) + u \quad (10)$$

Thus equations 9 and 10 form our structural equations and the result of the estimated equations are presented in the section that follows.

IV. Empirical Results

This section focuses on the empirical relationship between the inputs (labour and capital) and the output. The data used is for the period 1960-2008 spanning 49 years. It is a time series data that is prone to autocorrelation. To avoid that, unit root test was conducted based on Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) to test for the stationarity or otherwise of the variables in the model.

IV.1 Unit Root Test

The table below shows the result of the ADF conducted on all the variables¹. The test shows that two of the variables have unit roots i.e. the variables are non-stationary. Stationarity was however obtained by differencing the variables. The result is as tabulated.

¹ Bank deposit was used to proxy output, wages, salaries and management remuneration was used to proxy labour, while expenditure on fixed assets was used to proxy capital.

Table 1: Augmented Dickey Fuller for Unit Root Test (1960-2008)

Variables	At levels	1 st Difference	Order of Integration
Ln(Q/L)	-1.48404	-6.489555*	I(1)
Ln (L)	-0.85860	-7.390741*	I(1)
Ln (K/L)	-4.45824*	-7.08439	I(0)
Ln (K/L) ²	-3.098394**	-7.10405	I(0)

Source: Own Computation using E-Views 4.1

Critical values at 1%, 5% and 10% respectively are -3.5778, -2.9256 and -2.6005

*Significance at 1%, **Significance at 5%

From the above table, two of the variables [ln (Q/L and ln (L)] have unit roots. The variables are, however, made stationary by differencing. While the ln (K/L) and ln (K/L)² are integrated of order 0, that of ln(Q/L) and ln(L) are integrated of order one.

Table 2: Phillips-Perron for Unit Root Test (1960-2008)

Variables	At levels	1 st Difference	Order of Integration
Ln(Q/L)	-2.581751	-11.0526*	I(1)
Ln (L)	-0.9825	-7.390741*	I(1)
Ln (K/L)	-4.511247*	-11.80830	I(0)
Ln (K/L) ²	-4.528596*	-11.83654	I(0)

Source: Own Computation using E-Views 4.1

Critical values at 1%, 5% and 10% respectively are -3.5713, -2.9228 and -2.5990

*Significance at 1%, **Significance at 5%

The Phillips-Perron result in table 2 above follows the same pattern as that of the Augmented Dickey-Fuller. The PP confirms non-stationarity of two of the variables under consideration. The differenced values of the variables are as shown above. Ln (Q/L) and Ln(L) are integrated of order one, while ln(K/L) and ln (K/L)² are integrated of order 0. This goes to confirm that ADF and PP hardly gives different result when testing for unit root. The minor difference noticed however is that the I(0) of Ln(K/L)² is significant at 5% for ADF, it is significant at 1% for PP.

IV.2 Co-integration Test

Having established the existence of unit root in the variable, co-integration tests were conducted on the two models of Cobb-Douglas and CES Production

function using the Johansen co-integration test. The result shows that whereas co-integrating relationship can be established for the Cobb-Douglas Production Function, that of CES cannot be established because the relationship that exists is near singular matrix. The result of the test is as shown in the table below:

Table 3: Johansen Co-integration Test

Sample: 1960 2008

Included Observation: 47

Test Assumption: Linear Deterministic Trend in the Data

Series: Ln(Q/L) Ln(L) Ln(K/L)

Lag Interval: 1 to 1

Eigenvalue	Likelihood Ratio	5% Critical Value	1% Critical Value	Hypothesised No of CEs
0.267923	49.16507	29.68	35.65	None**
0.080267	24.507214	15.41	20.04	At most 1**
0.012152	4.574643	3.76	6.65	At most 2*

Source: Own Computation

Notes *(**) denotes the rejection of the hypothesis at 5%(1%) level of Significance

From the above result, it can be confirmed that commercial banks output and the inputs represented by labour and capital are subject to an equilibrating relationship and positively related to each other in the long run.

Table 4: Ordinary Least Square Regression Result for Cobb-Douglas Production Function

Dependent Variable is the natural logarithm of (Q/L)

Variable	Coefficient	Std Error	t- statistic	Prob
Constant	0.981865	0.444083	2.210994	0.0320
Ln (L)	0.058163	0.028564	2.036207	0.0475
Ln (K/L)	0.924686	0.124166	7.447145	0.0000
R- Squared		0.583051	Mean dependent var	4.484082
Adjusted R-Squared		0.564923	S.D. dependent var	0.853561
S.E. of regression		0.563012	Akaike info criterion	1.748238
Sum squared resid		14.58119	Schwarz criterion	1.864064
Log Likelihood		-39.83183	F-statistic	32.16267
Durbin-Watson Stat		0.277436	Prob(F-statistic)	0.000000

Source: Own Computation

The above result can be expressed in linear form based on equation 6 as follows:

$$\ln(Q/L) = 0.982 + 0.058\ln(L) + 0.92\ln(K/L) \quad (11)$$

(2.21) (2.04) (7.45)

The above equation shows a positive relationship between the output and the inputs which conforms with the a priori expectation of $0 < \alpha < 1$ and $0 < \beta < 1$. α from the result is 0.92 while β is 0.14, which confirms the existence of increasing returns to scale in the production function. The R squared which is the explanatory power of the model is reasonably high at 58%. This means that 58% of the variations in output are explained by the inputs of labour and capital. Reported in parenthesis are the t statistics of the explanatory variables which of course are significant both at 5% and 1% level of significance going by the rule of thumb that gives significance to t- statistic of greater than 2. Although the Durbin- Watson is low at 0.28, it only confirms the existence of unit root which had been taken care of in the unit root test above. The F statistic is equally good at 32.16, which suggests that all the independent variables put together belong to the model.

Table 5: Ordinary Least Square Regression Result for C.E.S. Production Function

Dependent Variable is the natural logarithm of (Q/L)

Variable	Coefficient	Std Error	t- statistic	Prob
Constant	1.058838	0.468010	2.262425	0.0285
Ln (L)	0.059943	0.028954	2.070272	0.0442
Ln (K/L)	-9.325347	18.27854	-0.510180	0.6124
Ln (K/L) ²	5.111672	9.115260	0.560782	0.5777
R- Squared		0.585945	Mean dependent var	4.484082
Adjusted R-Squared		0.558341	S.D. dependent var	0.853561
S.E. of regression		0.567254	Akaike info criterion	1.782090
Sum squared resid		14.47999	Schwarz criterion	1.936524
Log Likelihood		-39.66121	F-statistic	21.22707
Durbin-Watson Stat		0.255299	Prob(F-statistic)	0.000000

Source: Own Computation

The above result can be expressed in linear form based on equation 10 as follows:

$$\ln(Q/L) = 1.06 + 0.06\ln(L) - 9.323\ln(K/L) + 5.11\ln(K/L)$$

(12) (2.26) (2.07) (-0.51) (0.56)

The R^2 in this model is 59%, which means that 59% of the variation in output is explained by the independent variable. The estimated substitution parameters in this model are all positive

($\gamma = 1.06$, $u = 1.06$, $\delta = 9.80$ and $\rho = 0.11$) which conforms with a priori expectation. The F statistic of 21.23 has taken care of whatever inconsistencies that may have been noticed in the t-statistics.

IV.3 Error Correction Model

In order to establish the long run relationship between the dependent variable and the independent variables of the two models, equations 9 and 10 can be transformed into an econometric model under the ECM framework as follows:

$$d\text{Log}(Q/L) = \varphi_0 + \varphi_1 \sum_{i=0}^m d \log L + \varphi_2 \sum_{j=0}^m d \log(K/L) - \varphi_3 \sum_{s=0}^m d \log\left(\frac{K}{L}\right)^2 + \varphi_4 \text{ECM}(-1) + U_t \quad (13)$$

The equivalent equation for the Cobb-Douglas function is found by rewriting 7 as follows:

$$d\text{Log}(Q/L) = \Omega_0 + \Omega_1 \sum_{i=0}^m d \log L + \Omega_2 \sum_{j=0}^m d \log\left(\frac{K}{L}\right) + \Omega_3 \text{ECM}(-1) + \varepsilon_t \quad (14)$$

d in the equations stand for first differencing, while ECM is the error correction term for the ECM models. The significance of the ECM in the model is to indicate how disequilibrium in output can be adjusted in the short -run. The results of the ECM for the two models are presented in the table below:

Table 6: Parsimonious Error Correction model for Cobb-Douglas Production Function

Dependent variable is $d\text{Ln}(Q/L(-1), 2)$

Variables	Coefficient	Std Error	t-Statistic	Prob
$d\text{Ln}(L(-1), 2)$	-0.941607	0.038018	-24.76733	0.0000
$d\text{Ln}(K/L(-1))$	0.047774	0.030529	1.564863	0.1251
ECM(-1)	-0.300046	0.091669	-3.273167	0.0021
Constant	-0.000708	0.025620	-0.027619	0.9781

Source: Author's Computation

As stated earlier, the significance of ECM is to indicate how the departure from the long run disequilibrium is corrected in the short-run. To do this, the coefficient of the ECM was estimated. In the above table the coefficient of ECM is -0.30, which is a reasonably good adjustment process. The speed of adjustment which

is significant at both 5% and 1% suggests that about 30% of the disequilibrium in the previous year's shock adjusts back to the long run equilibrium in the current year.

Table 7: Parsimonious Error Correction model for C.E.S. Production Function

Dependent variable is $d\ln(Q/L(-1),2)$

Variables	Coefficient	Std Error	t-Statistic	Prob
Constant	-0.000112	0.025862	-0.004334	0.9966
$d\ln(L(-1),2)$	-0.940149	0.038459	-24.44541	0.0000
$d\ln(K/L(-1))$	-5.536681	4.774698	-1.159588	0.2529
$d\ln((K/L)^2(-1))$	2.807003	2.378962	1.179928	0.2448
ECM(-1)	-0.283357	0.097256	-2.913505	0.0058

Source: Author's Computation

Following from the same explanation, the speed of adjustment in the C.E.S. Production function is 28%. This means about 28% of the disequilibrium in the previous year's shock is adjusted back to the long run equilibrium in the current year. The ECM for this model is equally significant at both 5% and 1%.

V. Conclusion and Policy Implications

This study examined productivity in the banking sector by way of estimating two major production functions known in the economics literature. The study made use of time series data spanning forty-nine years, from 1960 to 2008, and because of serial/autocorrelation that is normally associated with time series data, co-integration econometric technique was adopted. The unit root test conducted confirms the existence of non-stationarity in some of the data. This was, however, corrected after first differencing to avoid spurious result at the end of the study.

The result obtained from the OLS estimates shows that substitution parameters, α and β support economic theory of the duo being positive values of less than one. The addition of the values of α and β is greater than one which indicates that as the banking sector doubles its inputs in terms of labour and capital, the output in terms of deposit will be more than doubled. The substitution parameters in the Constant Elasticity of Substitution Production Function were equally positive and supports economic theory. The speed of adjustment for the two models are reasonably good; any deviation from equilibrium is to be adjusted back in the long run.

Finally, the study supports economic theory in the specification of both the Cobb-Douglas and Constant Elasticity of Substitution production functions. The study, therefore, recommends for commercial bank operators that for increased productivity in terms of more deposit, more units of both labour and capital should be employed.

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The article should not be more than 30 pages on A4 size paper and should be typed double-spaced with a margin of 1.5 inches on all sides. The manuscript must be accompanied with a letter of submission written in English. Submission of a paper is assumed to imply that its contents represent original and unpublished work and is not under consideration elsewhere for publication. Normally, the review process is expected to take not more than three months. There is neither a submission charge nor page fee. A return address (postal/email) should be indicated.

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