



## **MARKET, EXCHANGE RATE HARMONIZATION AND INFLATION: THE NIGERIAN EXPERIENCE**

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### **Abstract**

This paper seeks to illustrate the trade-off effect between the benefits of harmonization for resource allocation and its costs for inflation. From the analytical perspective of this paper, two issues are of interest; first, given the level of real government spending, one would expect harmonization to reduce inflation as the fiscal burden of rents since floating of the naira has become a centerpiece of economic restructuring programme predicated on market incentives price signals. Secondly, there is some debate about what the actual Naira-dollar rate should emerge from the float. Since the official dollar exchange was much lower than what it is currently. To conclude from this paper, we opines that it is incorrect for a developing country to ever float its currency. This decision should depend on the credibility of accompanying fiscal reform and the initial size of the premium.

**Key Words:** economic, Banking, developing country, Market

### **1. Introduction**

World Bank and IMF programs favour harmonization of financial and parallel market exchange rate on the argument that multiple rates create misallocation resources. No doubt such policy advises sometimes overlooks an important consideration and that is when multiple rates are a means of taxation (as is well known in interest rate on multiple rate Dornbusch, [1]. The widening deficit from harmonization increase inflation. Drawing heavily from Brain [2] we shall in this paper sue the experience of Nigeria to illustrate the trade-off effect between the benefits of harmonization for resource allocation and its costs for inflation.

In Nigeria, exchange rate overvaluation has created import license rents, a heavy tax on exports, and a bustling parallel market in forex with a black market exchange rate which has levels several hundred percent over the official rates. Recent exchange rate reforms in Nigeria has thus

emphasis the harmonization of official and parallel exchange rate with the explicit goal of bringing down the black market and reducing the black market premium on forex. In Sierra Leone and Zambia, inflation surged with attempt to unify official and parallel market rates. The welfare and political costs are higher undermining the credibility of reform and leading to policy reversal. This calls to question the trade-off between the benefit of harmonization for resources allocation and its cost for inflation, the focus of this paper with Nigeria as a case in point is because of four recent and enduring experience.

Without any contradiction, a dual regime of official and black market rate is conceptually similar to multiple exchange rates with few differences. Firstly, the fiscal effort from a dual regime arises because the government forex transaction are made at an official price of forex that is usually for lower than the market clearing rate, not because forex is bought and sold at multiple official rate. The fiscal effect of harmonization depends on whether the government sell dollars to the private sector. For the net seller, harmonization will eliminate the subsidy on forex to the private sector, improving the deficit while for the net buyer, substantial revenues from the cheap purchase of export earnings could be lost, thereby worsening the deficit.

Secondly, the tax revenue from purchase of undervalued export earnings are not obvious in the fiscal accounts. Instead, these accounts are implicit- they reduce the government need to print money to cover the gap between spending and revenues. In effect, the premium of the free market rate over the official rate provides an alternative to using inflation (the tax on domestic money to finance the fiscal deficit).

Thirdly, unlike other taxes such as an import tariff, the premium is not arbitrarily fixed but it's endogenously determined by the general equilibrium of asset and goods price in the economy. To examine the effects of harmonization of the two rates, it is imperative we identify the determinants of the premium. The analytical framework of this paper will unfold in five stages. (1) Discuss the nature of the exchange rate regime, (2) develop the demand for domestic money in a currency substitution context Calvo and Rodriguez [3], (3) integrate the exchange rate regime and demand for money function with monetary financing of the fiscal deficit to present the trade-off between the parallel market premium and inflation, (4) briefly discuss the real exchange rate and (5) summarize the determinant of the premium.

## **2. Theoretical Conceptualization**

### **The Nature of Exchange Rate Regime in Nigeria 2010-2017**

Since foreign exchange is rationed, its marginal cost is determined in a black market where the currency float freely. The black market rate is higher than the official rate. Domestic price adjust fully to the black market rate because all import rate are sold at the black market rate, with the premium accruing to the importer. Consequently, there are close link between currency depreciation in the parallel market and domestic inflation: with the black market rate adjusting to the equilibrate demand and supply in the forex market as a whole.

Exporters either smuggle their export out, thereby earning black market rate or surrounding them to the authorities at it official rate. Since this paper is focused on the tax and inflation trade off associated with the black market premium, we may have to ignore the social costs of smuggling and highlight the private costs of smuggling, and the bribes paid to various officials.

## Demand For Money

Domestic residents hold two non-interest rate bearing assets in their portfolios: Naira (N) and Dollar (F). private sector financial wealth is  $W = (N + bF)$ , with dollars converted to naira at the relevant rate  $b$ . consideration of portfolio balance determine the desired shares of M and F in W. let  $M - \lambda W$  the desired fraction of naira. The variable  $\lambda$  depends on the differential rate of returns between naira and dollars. In the absence of interest rate, this becomes the expected black market rate of depreciation. Assuming perfect foresight, so that the expected rate of depreciation in the parallel market equals the actual rate,  $b/b$ , and assuming instantaneous clearing in the asset market, the equation for M can be written as;

$$M = \lambda(b/b)(M + bF), \lambda < 0 \text{ -----(1)}$$

In short, the desired share of naira goes down as the rate of currency depreciation and domestic inflation goes up.

## Financing Of the Fiscal Deficit.

For simplicity, it is assumed that the government spend only on imported goods and interest payment on foreign debt which remains constant. The government buyers' dollar from exporters at the official rate  $e$ , with the export proceeds coming from officially declared exports and the balance of exports being smuggled. After setting aside the dollars required for its needs, the government returns the remainder of the declared export earnings to the private sector through auctioning or import license, also at the official rate  $e$ . the dollars the government retained are paid for partly by tax receipt and partly by issuing debt instrument with zero or negative real interest rate, treasury bills or currency. Inflation thus provide a revenue Gain to the government at the expense of holders of its outstanding liabilities. The policy question addressed in this paper is the trade-off between financing the deficit through inflation (printing naira in this model) relative to purchasing export proceeds at the lower official rate  $e$ . therefore, the exchange regime thus amount to the redistribution within the private sector through auctioning of the dollar coupled with an implicit tax transfer to the government.

If  $G$  denote government spending and  $T$  taxes, the naira deficit  $e(G - T)$  is financed by printing, the naira. Since official reserve are denominated in dollars, it follows that the change in the stock of naira in private portfolio is

$$M = e(G - T) \text{ -----(2)}$$

$M$  thus depends both on the budget and on official exchange rate policy. Budget equation (2) can be rewritten as  $M/e = (G - T)$ .

Multiplying and dividing by  $M/b$  and rearranging gives:

$$(M/M)(M/b)(b/e) = (G - T) \text{ -----(3)}$$

Equation (3) simply says that the proceeds from the inflation tax must equals the deficit,  $(G - T)$ . Note that equation (3) is always true, both in and out of steady state. The expression  $M/M$  (the growth rate of nominal money can be interpreted as the rate of the inflation tax, and  $(M/b)$ , the real money stock as the base of the tax. The expression  $b/e$ , the bank market premium. If we let  $Q = b/e$  denote equation (3) can be rearranged to give

$$G/Q = T/Q + (M/M)(M/b) \text{ -----(4)}$$

Suppose that  $G = \$200$ ,  $b = \#8/\$$ , and  $e = \#6/\$$ . Then  $G/Q = \$75$ . But the government actually spend \$100. The \$25 balance now become the implicit tax on exporters, given by  $G - G/Q = G[(b - e)/b]$ . The tax is occasioned by the fact that government can purchase dollar at  $\#6/\$$  rather than at the marginal cost of  $\#8/\$$ . As a result, government prints less money, thereby relying less on inflation than it would have to if  $b = e$ . incorporating this hidden tax on exporters, budget equation (4) can be unravelled to give the complete fiscal account thus

$$G = T/Q + (M/M)(M/b) + G(1 - 1/Q) \text{ -----(5)}$$

Where the tax on exporters through the premium is shown explicitly as the last term on the RHS. If  $Q > 2$ , that is, if the parallel market premium exceeds 100% as it is in Nigeria and most Africa countries, the implicit tax on exporters finances a huge proportion of government spending on imports and foreign interest payments.

### **Trade-Off between Inflation and the Premium**

In equation (5) is the trade-off between inflation and the premium. Recall that the power to choose the official rate of depreciation  $e/e$  is in government. Assume this to be given and the system to be in steady state. That is,  $M/M = b/b = e/e$  (by definition), it means that inflation equals the growth rate of money and the rate of depreciation in the parallel market so that the real domestic money stock and premium are constant at their steady state values. From equation 1, it is clear that the level of dollars,  $F$ , should also be at its steady state level, where the state variables are,  $Q$ ,  $M/b$  and Lozondo [4] and Pinto [5]. If  $\pi = e/e$  the steady state rate of inflation, equation (5) can be rewritten as

$$G = T/Q + (M/b) \pi + G(1 - 1/Q) \text{ .....(6)}$$

Suppose the depreciation in the official market is accelerated (meaning that the government raises  $\pi$ ). One might argues that depreciating the naira faster in the official market would tend to make  $e$  catch up with the parallel rate  $b$ , lowering the premium. Alternatively, equation (1) would implies that since the steady state differential return on dollars is going up ( $b/b = \pi$ ), dollars would become more attractive, raising the premium.

Back to equation 6, suppose  $\pi$  is increased permanently, the proceed from the inflation tax  $(M/b) \pi$  will rise if the elasticity of naira demand is less than one because money demand (equation 1) falls off less than the rise in inflation. In this case,  $Q$  will fall for given  $G$  and  $T$ , restoring equation 6 in the new steady state. Under these circumstances, accelerating the rate of crawl will raise inflation but, lower the premium, creating a trade-off between the two. If however, the elasticity of inflation exceeds one such that there is a market propensity to shift into dollars to avoid further losses from inflation, proceeds from the inflation tax will fall and  $Q$  must rise to compensate.

In this case, both inflation and the premium will rise. A trade-off between inflation and the premium is no longer possible.

### **Export and Home Goods: The Real Exchange Rate.**

The real exchange rate, the ratio of the price of exports, and domestic goods varies investing with the parallel market premium. The relation follows from the following facts. Firstly, that the

premium is an explicit tax on exports as discussed earlier. Secondly, the domestic goods includes intermediate imports proceeds at their managerial cost, the parallel ratio. Therefore, the higher the premium, the lower the “post tax” export earnings and the higher the price of imported inputs, the premium must be lowered.

Not that the capacity to import is eventually a function of the volume of exports. Taxing exports through the premium and thereby creating disincentive to produce export ultimately lowers the ability to import intermediate goods, leading to “import compression” and its debilitating effects on capacity utilization and unemployment common in African countries.

**Determinants of the Premium**

The foregoing discussion reveals that the premium depends on the following parameters:

Demand for domestic money captured by equation 1-  $\lambda$  (.), b/b and W; the financing of the deficit and rate of inflation G, T, e/e, and the terms of trade, or ratio of price of exports to import Px. Recall the terms of the trade enter the steady state determination of (F) via the current account. This steady-state dependence can be summarised as:

$$Q^* = [ G, T, P_x, e/e, \lambda(*)] \dots \dots \dots (7)$$

Where Q\* denote the premium in steady state, the function  $\lambda(*)$  summarises money and demand preferences, and the sign below each determinant shows the direction of the relationship. A rise in the fiscal deficit will tend to raise the premium as dollars become relatively more attractive. A terms of trade improvement (a rise in Px) will have the opposite effect as the supply of dollars case, and as we already noted, an acceleration in the rate of depreciation, e/e, has ambiguous effects.

The determinants of the premium in equation 7 do not include the level of official exchange rate e, which implies that a series of discrete, single devaluations under taken at interval (e.g every few months) will reduced the premium only temporarily but not affect its steady-state value (see Dornbusch [1], Pioto [5] and Lozondo [4]. Devaluation will permanently reduce the premium only in the case where government runs a balanced budget. i.e (G=T). However, devaluation are valuable when they accompany reductions in the real deficit or signal the intent to introduce more rate policy.

**Nigerian Experience**

By 1981, oil had become the main real income of the government of Nigeria, terms of trade, credit worthiness and government revenues accounting for 22 percent of GDP, 81% of revenue, and 96% of export. Inthe present state of the economy, the situation has not change as terms of trade, credit worthiness and government revenues accounting for 52 percent of GDP, 91% of revenue, and 98.1% of export World Bank record [6]. Between the early 60’s to late 80’s, the quantum of agricultural revenue contributed to GDP was on the increase. The discovery of oil lead to the reduction of agricultural revenue contribution to GDP which lead to Dutch diseases. The rehabilitation of the present administration through her diversification agenda has played a crux role in reshaping the state of the economy. On the aggregate, government revenue in Nigeria increased to #1049.38 billion in the first quarter of 2017 from #805.05 billion in the

fourth quarter of 2016. Government revenue in Nigeria averaged #811.52 billion from 2010 until 2017, reaching an all-time high of #1091.75 billion in the third quarter of 2011 and a record low of #498.54 billion in the second quarter of 2015.

Between late 1981 and 1986, events in the foreign market were dominated by the collapse of international oil price as we are currently witnessing in 2017. Starting from the inception of the current administration in 2015. An excellent account of the oil boom and its aftermath is in “SAP”, July 1986- June 1988 a Nigeria government document presented to the London club in June 1986. This document discuss key corrective measures in trades and exchange rate policy, public investment, agriculture and external debt. But here, we concentrate on the unification of the parallel and official rate. The key change in the determinant of the parallel market premium has been the fall indollar oil prices. This has directly reduced government revenues, since oil dollars accrue solely to the government in the first instance. In addition, because the Nigerian government is a net seller of dollars, any rise in the parallel market premium means a bigger real transfer from the public to the public to the private sector through the import rationing and licensing system. The government has consistently added to the fiscal burdens as the premium rose 50 that the reliance on inflation increased. The question then is, is there any scope for trade? The real fiscal deficit therefore depend on the parallel market premium, while at the same time, the taxation and disincentive effects of the premium applied to non-oil exports and the traded goods sector, notably agriculture.

### **Oil Price, Fiscal, Monetary and Exchange Rate Indicators 2010-2017**

This section analysis the Macroeconomic situation as oil earning falls and the government subsequent response since 2015 to 2017.

Having enjoyed the gracious years of robust and mounting price of oil, the Nigerian economy between the periods 2015 and 2017 severed recession resulting from the mismanagement of the government generated revenue in the time of surplus and inability to prepare for the unforeseen contingency by the leaders of the nation. The economy woes haphazardly kick started from the petroleum sector which appears to be the major source of fund in the nation.

This recession crises was orchestrated by the Sharpe fall in the price of crude in the world market, alongside the Niger delta crisis which finally resulted into drastic fall in the government generated revenue. The economic situation and the reaction of the macroeconomic variables to this abnormalities was corrosive to growth of any economy. the due problems of low oil price and insignificant level of output resulted into lower foreign exchange earnings, downturn the country’s revenue, and thus pose a threat of currency devaluation following the recommendation of IMF in the strive for survival. This however affect negatively prices of commodities in the nation

Prior to the massive hike in price, inflation rate was on the increase, following the inflationary pressure, trade and industrial activities dropped sporadically as it was difficult to maintain their staffs and to maintain operation cost. This further resulted into workers layoff which stimulated the percentage of unemployment rate in the country (13.9%) while the GPD figure decline for more than two quarter.



Following the report of the Nigerian bureau of statistics, it was recorded that GDP in the third quarter of 2016 contracted by 2.24% in real term. As such, the contribution of oil sector to GDP dropped from 10.27% in 2015 to 8.19% in 2016. Accordingly, Nigeria 2015 and 2016 budget was lingered on a crude oil output of 2.2million barrel per day, but the country has struggled to produce about 1.4million barrels per day on the average in both years. The 2017 budget still lingered on the 2.2million barrel per day. Toward the third quarter of the year 2017, the Nigerian bureau of statistics reported that the economy is out of recession as her GDP rise with about 0.55% year in year out yet the positive effect has not been felt on prices of commodity in the market as expected by the layman and general public. This put together shows that the state of economy in the nation during the periods of recession is corrosive to economic development as larger percentage of the macroeconomic variables respond to this period in negative manner.

**Table 1 Oil Price, Fiscal, Monetary and Exchange Rate Indicator 2015-2017 (Average)**

| <b>Macroeconomics indicator</b>         | <b>Oil boom</b>  | <b>Oil Gint 2015-2017</b> |
|---|------------------|---------------------------|
| <b>Real Price Of Oil</b>                | <b>\$10.90pb</b> | <b>\$44.58pb</b>          |
| <b>Growth Rate Of Monetary Base (%)</b> | <b>0.33132</b>   | <b>10%</b>                |
| <b>Inflation (%Δ CPI)</b>               | <b>23.5%</b>     | <b>18.6%</b>              |
| <b>DEPRECIATION</b>                     |                  |                           |
| <b>Official rate</b>                    |                  | <b>253.0925</b>           |
| <b>Parallel market rate</b>             |                  | <b>490.00</b>             |
| <b>premium</b>                          |                  | <b>1.98071</b>            |

Source: world prices, World Bank data and CBN Statistical Bulletin

Net claims on government monetary base,

Inflation, official exchange rate: bureau of

Statistics, CBN and IMF, various years

Black market rates: CBN, forex market

Publication, international currency

Analysis, incorporated various years.

**Table 2: Fiscal Deficit, Monetary Base and Black Market Exchange Rate 2010-2017**

| <b>Year</b> | <b>Yearly Deficit<br/>(Dollar Value)</b> | <b>Monetary Base<br/>(Millions)</b> | <b>Real Monetary<br/>Base (Dollar<br/>Value)</b> | <b>Black Market<br/>Exchange Rate<br/>(#/\$)</b> |
|-------------|--|-------------------------------------|--|--|
| <b>2010</b> | <b>-1,105.40</b>                         | <b>2,817.88</b>                     | <b>410.56</b>                                    | <b>156.00</b>                                    |
| <b>2011</b> | <b>-1,158.52</b>                         | <b>3,751.50</b>                     | <b>709.09</b>                                    | <b>165.00</b>                                    |
| <b>2012</b> | <b>-975.68</b>                           | <b>5,613.34</b>                     | <b>926.41</b>                                    | <b>159.00</b>                                    |
| <b>2013</b> | <b>-1,153.49</b>                         | <b>2,574.54</b>                     | <b>1,338.54</b>                                  | <b>172.00</b>                                    |
| <b>2014</b> | <b>-835.68</b>                           | <b>7,463.95</b>                     | <b>1,223.03</b>                                  | <b>191.50</b>                                    |
| <b>2015</b> | <b>-1,557.79</b>                         | <b>10,001.69</b>                    | <b>1,054.33</b>                                  | <b>267.00</b>                                    |
| <b>2016</b> | <b>-2,208.22</b>                         | <b>10,796.69</b>                    | <b>372.64</b>                                    | <b>490.00</b>                                    |
| <b>2017</b> | <b>-3,240.43</b>                         | <b>11,124.55</b>                    | <b>367.75</b>                                    | <b>537.50</b>                                    |

Source: extraction from CBN statistical bulletin, World Bank data base and index mundi

Note: monetary base equals currency outside bank plus commercial banks deposits with the CBN plus cash in hand of commercial banks plus net claims on government by commercial banks.

### **Review of Related Literature**

Monogbe and Okah [7] using the autoregressive distributive lag approach examined the consociation between investment, exchange rate, interest rate and economic development in Nigeria. The study covers the periods 1986 to 2015 where the result of the causality test was used in testing the hypothesis. Findings shows that foreign investment react to interest rate in a positive manner against the aprior expectation while lower interest rate seems to promote investment paradox. The study further shows that appreciating exchange rate in favour of naira is capable of attracting foreign investors and thus normalizes the inflationary pressure in the long run. According to the study, the policy implication of appreciating Exchange Rate is that Naira will be cheap relatively to other currencies, which will attract Foreign Direct Investment inflow into the Nigerian economy through the window of reduce Naira value and cheap investment in Nigeria. Based on this findings, study recommends that authorities in charge of managing the Nigerian economy should as a matter of urgency revamp the lending habit by introducing low interest rate as this will make it cheaper to borrow and this encourages spending and investment lending to higher aggregate demand which will further stimulate economic development.

Momodu and Monogbe [8] examined the interplay between external debt, inflation and its effect on public sector using a structural analysis of VAR estimation. The study incorporated a time series data between the periods 1981 to 2016. The gross objective of the study was to ascertain how inflation react to change in government debt and its aftermath behaviour on public sector. The report from the study shows that excessive government debt will negatively promote public sector while inflation pressure will be pose at the economy.

Adeyerni and Samuel [9] investigated the exchange rate pass-through to consumer prices for Nigeria using VECM approach. The approach addresses specific features of the Nigeria economy, especially the import dependence nature and the role of foreign exchange inflows in the conduct of monetary policy. The degree of exchange rate pass-through was estimated by



means of IRFs from the VECM. Evidence from the analysis, covering the period 1970 through to 2008, reveals that exchange rate pass-through to consumer prices in Nigeria is substantial. This supported most works in developing countries. For instance, Sanusi [10] found a large exchange pass-through in Ghana.

Akinbobola [11] studied of the dynamics of money supply, exchange rate and inflation in Nigeria using Vector Error Correction Mechanism (VECM). The empirical results confirmed that in the long run, money supply and exchange rate have significant inverse effects on inflationary pressure. Imimole and Enoma [12] in their study of Exchange Rate Depreciation and Inflation in Nigeria from 1986-2008 conclude that there is one and only one relationship between exchange rate and price inflation. Basing their argument on empirical studies of some African countries, they concluded that devaluation could exert upward pressure on the general price level through its increased cost of production in the short-run, Darijuma and Shuaibu [13] assessed the impact of exchange rate volatility on inflation rate in Nigeria over the past 24 years through vector autoregressive analysis. The paper also made use of ARCH and GARCH model in the test of exchange rate volatility in Nigeria. The results obtained from the vector error correction suggest that inflation and exchange rates in Nigeria are negatively related which means that an increase in inflation rate leads to a decrease in exchange rate.

Dania and Igberaese [14] conducted a study on the determinants of and the effects of exchange rate and monetary growth on inflation. The results have shown that exchange rate devaluation/depreciation is not one of the ways of controlling inflation in Nigeria. Though this process is seen to be affective by international policy advisers, it can only help to restructure the price mechanism of both import and export in the short run, such that a increase exchange depreciation tend not to moderate any long run Dries in Nigeria. Ramzan (2013) studies of Fiscal determinants of inflation in Pakistan that conclude that exchange rate has important role in determining the inflation. Local credit and Exchange rate have positive relation with inflation in long run as well as in short run.

Bwire, Anguyo and Opolot [15] examined the degree of exchange rate volatility to inflation in Uganda with primary data over the period 1999Q3 to 2012Q2 using a triangulation of well specified VECM and SAR models. The findings show strong and significant association between the exchange rate movements and inflation in Uganda, and that the volatility to domestic inflation, although incomplete, is modest and persistent with a dynamic exchange rate volatility elasticity 0.48. This suggests that exchange rate movements remain a potentially important source of inflation in Uganda. Using variance decomposition, it found that exchange rate shocks have a modest contribution to inflation variance although inflation is mainly driven by own shocks especially at shorter horizons.

### **3. Methodology Design**

This study employed Descriptive research design considering the fact that the study comprises of empirical concept and analytical structure accordingly. The study covers for 18 years (1999-2017) while data were sourced from several statistical publications which includes central bank of Nigeria statistical bulletin, World Bank Data Base and index mundi. Average inflation rate is the dependent variable while real base money at constant price, Seigniorage in constant price,

average parallel market premium, Marginal tax on exports and real GDP were explanatory variables accordingly.

### Model specification

$$AVI = f(RBM, SCP, APMP, MTEX, RGDP) \dots \dots \dots (8)$$

We convert the model into an econometrics form thus;

$$AVI = \epsilon_0 + \epsilon_1RBM + \epsilon_2SCP + \epsilon_3APMP + \epsilon_4MTEX + \epsilon_5RGDP + \bar{d}_t \dots \dots \dots (9)$$

We convert the above model into ARCH and GARCH model thus

$$AVI = \epsilon_0 + \epsilon_1RBM^2_{t-1} + \epsilon_2SCP^2_{t-1} + \epsilon_3APMP^2_{t-1} + \epsilon_4MTEX^2_{t-1} + \epsilon_5RGDP^2_{t-1} + \bar{d}_t \dots \dots \dots (10)$$

### Where

AVI = Average Inflation

RBM = Real Base Money at Constant Price

SCP = Seigniorage in Constant Price

APMP = Average Parallel Market Premium

MTEX = Marginal Tax on Export

RGDP = Real Gross Domestic Product.

$\epsilon_1 - \epsilon_5$  = Estimation Parameters

$\bar{d}_t$  = Error terms

On a priori, we expect a varying response from each of the explanatory variables to the explained variable.

## 4. Presentation and Interpretation of Data

**Table 3**

**Inflation, Seigniorage and Tax on Export Through Premium 1999 To 2017**

| years | Average inflation % | Real base money at constant price | Seigniorage in constant prices | Average parallel market premium | Marginal Tax on exports | Real GDP  |
|-------|---------------------|-----------------------------------|--------------------------------|---------------------------------|-------------------------|-----------|
| 1999  | 0.2                 | 2,318.04                          |                                | 1.890239                        | 0.470966247             | 22,449.41 |
| 2000  | 14.5                | 65.46                             | 7.223378                       | 1.651699                        | 0.394562711             | 23,688.28 |
| 2001  | 16.5                | 115.52                            | 6.110307                       | 1.449943                        | 0.31031761              | 25,267.54 |

|      |       |          |          |          |             |           |
|------|-------|----------|----------|----------|-------------|-----------|
| 2002 | 12.2  | 182.92   | 1.399433 | 1.286336 | 0.222597884 | 28,957.71 |
| 2003 | 23.8  | 72.77    | -0.94096 | 1.151111 | 0.13127409  | 31,709.45 |
| 2004 | 10    | 257.51   | 4.869154 | 1.041347 | 0.039705439 | 35,020.55 |
| 2005 | 11.6  | 337.97   | 4.504031 | 1.079326 | 0.073495642 | 37,474.95 |
| 2006 | 8.5   | 652.65   | 4.88233  | 1.010598 | 0.010486551 | 39,995.50 |
| 2007 | 6.6   | 903.8    | 1.140568 | 0.967489 | -0.03360352 | 42,922.41 |
| 2008 | 15.1  | 379.3    | -0.26379 | 1.180144 | 0.152645591 | 46,012.52 |
| 2009 | 13.9  | 565.94   | 2.686886 | 1.052476 | 0.049859261 | 49,856.10 |
| 2010 | 11.8  | 410.56   | -3.25556 | 1.051851 | 0.049294742 | 54,612.26 |
| 2011 | 10.3  | 709.09   | 4.928083 | 1.086764 | 0.079837273 | 57,511.04 |
| 2012 | 12    | 926.41   | 4.350812 | 1.022836 | 0.022325927 | 59,929.89 |
| 2013 | 7.96  | 1,338.54 | -0.52226 | 1.107864 | 0.097362063 | 63,218.72 |
| 2014 | 7.98  | 1,223.03 | -1.05258 | 1.223761 | 0.182846889 | 67,152.79 |
| 2015 | 9.55  | 1,054.33 | 0.331586 | 1.39205  | 0.281634971 | 69,023.93 |
| 2016 | 18.55 | 372.64   | -1.6899  | 1.936051 | 0.483484707 | 67,931.24 |
| 2017 | 18.5  | 367.75   | -0.23544 | 1.98071  | 0.495130489 | 70,833.84 |

Source: extraction from CBN statistical bulletin, World Bank Data Base and Index Mundi

Note: inflation = %  $\Delta$  CPI

Real Base Money = Reserve Money Divided By CPI

Seigniorage = change in reserve money divided by CPI

Black Market Premium = Black Market Rate Divided By Official Rate

Marginal Tax on Export = (Black Market Rate Minus Official Rate)/ Black Market Rate

**Table 4 Presentation of Unit Root Test**

To ascertain the reliability of the data set in this research work, we subject it to stationarity test using Augmented Dickey Fuller Unit Root Test thus

| Variables | ADF test Statistic | ADF critical Value @ 5% | Remarks    |
|-----------|--------------------|-------------------------|------------|
| D(AVI)    | -12.8166           | -3.06558                | Stationary |
| D(RBM)    | -4.552838          | -3.14492                | Stationary |
| D(SCP)    | -5.19911           | -3.098896               | Stationary |
| D(APMP)   | -4.946623          | -3.098896               | Stationary |
| D(MTEX)   | -4.276043          | -3.081002               | Stationary |
| D(RGDP)   | -4.05791           | -3.11991                | Stationary |

Source: Extraction from E-view output

The data set show high level of reliability as their all exhibit ADF test coefficient greater than the critical value at 5% level of significant. This thereby suggest that the time series has no unit root at 5% level of alpha which signifies that there were all stationary after first differencing at the

order of 1(1) integration accordingly. Since the multiple regression is the most unbiased estimation tools which examine the dynamic influx among employed variable in the short run, this study tend to employ this tool accordingly.

**Table 5. Presentation of Multiple Regression Result**

| Dependent Variable: AVI                     |             |                       |             |        |
|---|-------------|-----------------------|-------------|--------|
| Method: Least Squares                       |             |                       |             |        |
| Date: 10/07/17 Time: 09:56                  |             |                       |             |        |
| Sample (adjusted): 2001 2016                |             |                       |             |        |
| Included observations: 16 after adjustments |             |                       |             |        |
| Variable                                    | Coefficient | Std. Error            | t-Statistic | Prob.  |
| C   | 26.41770    | 29.92711              | 0.882735    | 0.3981 |
| APMP  | 0.575022    | 1.048020              | 0.548675    | 0.5953 |
| MTE   | -0.081792   | 0.046797              | -1.747814   | 0.1111 |
| RBM   | -0.409249   | 0.145900              | -2.804990   | 0.0186 |
| RGDP  | -1.392074   | 3.860110              | -0.360630   | 0.7259 |
| SCP   | -0.015049   | 0.029955              | -0.502378   | 0.6263 |
| R-squared                                   | 0.691746    | Mean dependent var    | 11.36123    |        |
| Adjusted R-squared                          | 0.537619    | S.D. dependent var    | 51.89108    |        |
| S.E. of regression                          | 35.28520    | Akaike info criterion | 10.24480    |        |
| Sum squared resid                           | 12450.45    | Schwarz criterion     | 10.53452    |        |
| Log likelihood                              | -75.95840   | Hannan-Quinn criter.  | 10.25964    |        |
| F-statistic                                 | 4.488161    | Durbin-Watson stat    | 1.789401    |        |
| Prob(F-statistic)                           | 0.020941    |                       |             |        |

**Source: Extraction from E-view Output**

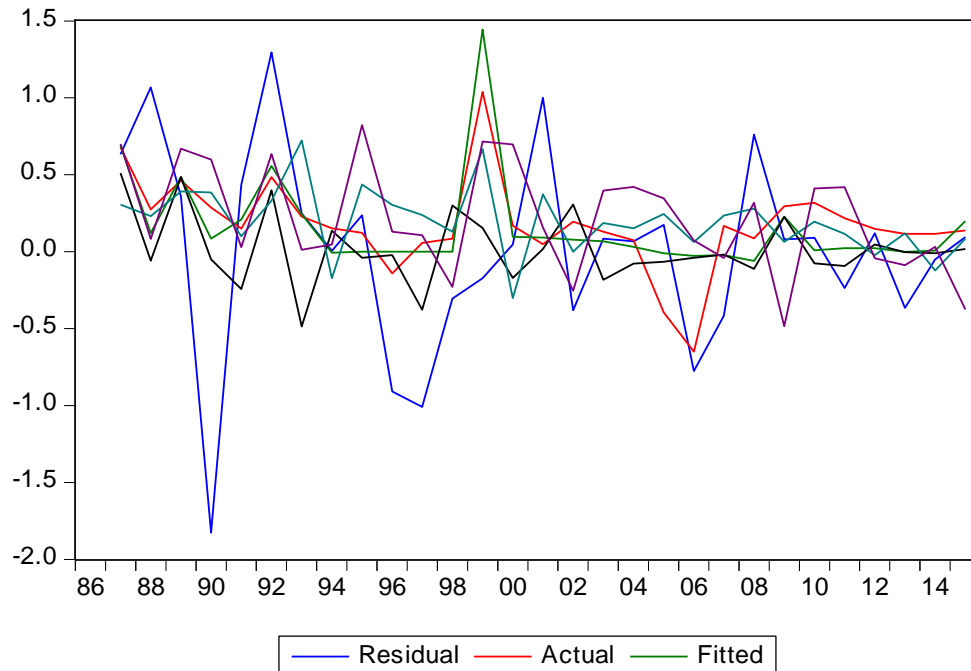
From the relative statistics, the coefficient of the constant (C) maintain a positive value of 26.41770 thereby suggesting that all things been equal, average inflation value in Nigeria will increase to the tune of 26.41770. Meaning that if all variables considered in this study remains constant, the rate of average inflation in the nation will increase. Hence, let see if all variable will remain constant to validate this assumption. Still from the result presented above, Real Base Money at Constant Price (RBM), Marginal Tax on Export (MTE), Real Gross Domestic Product (RGDP) and Seignior age in Constant price (SCP) respond in a negative manner to Average inflation in Nigeria thereby suggesting that there is an inverse relationship between the out listed explanatory variables and inflation rate in Nigeria. Though, Real Base Money at Constant Price exhibit a positive P-value of 0.0186 alongside a negative coefficient of -0.409207 while Average Parallel Market Premium report a positive relationship to average inflation.

The Global Utility report that the adjusted R<sup>2</sup> exhibit a coefficient of 0.537619 which suggest that all the explanatory variables jointly account for about 54% variation in average inflation

while the remaining 46% is captured in the error term. The Durbin Watson statistics exhibit a coefficient of 1.78940 which is within the acceptable range and thus suggest absent of autocorrelation. The F-statistics and the corresponding P-value maintains a significant coefficient of 0.020941 which shows the fitness of the model accordingly.

Since the ARCH and GARCH model has been designed in this study, Figure 1 seek to estimate the residual of the multiple regression so as to ascertain the volatility clustering of the model being one of the condition of ARCH and GARCH model.

**Figure 1 Residual Graph**



From figure 1.1 above, we observe the existence of a prolonged period of high volatility from 1986 to 1999 and also there exist a prolonged periods of low volatility from 2000 to 2017. In other word, period of high volatility is followed by periods of high volatility while the periods of low volatility tends to be followed by periods of low volatility. Since the residual behave in such an unstable manner, then we can introduce ARCH and GARCH model which suggest that the residual is conditionally heteroskedastic.

**Table 6 Heteroskedasticity Test for Arch Effect**

Null Hypothesis: There is no arch effect in the residual.

Alternative Hypothesis: There is arch effect in the residual.

Decision Rule: Reject  $H_{01}$  if the computed p- value is greater than 0.05 level of significant, otherwise accept.

| Heteroskedasticity Test: ARCH |          |                     |        |
|-------------------------------|----------|---------------------|--------|
| F-statistic                   | 0.442454 | Prob. F(1,13)       | 0.5176 |
| Obs*R-squared                 | 0.493720 | Prob. Chi-Square(1) | 0.0023 |
|                               |          |                     |        |

Source: Extraction from E-view Output

From the result above, since the p-value calculated is 0.0023 which is less than the 0.05 significant levels, we reject null hypothesis and accept alternative hypothesis which states that there is arch effect in the residual. Therefore, since there is clustering volatility and there is arch effect in the residual so we have all the validity to run Garch model.

### Arch and Garch Model

Arch model allows the conditional variance to change over time as a function of past errors leaving the unconditional variance constant. In order to ascertain the volatility cluster of the variable employed in the process of research, ARCH model was employed. In like manner, arch model is a function of lagged square residual.

Arch 11 model can be generally written thus

$$\sigma^2_t = \alpha_0 + \alpha_1 u^2_{t-1}$$

Where

$\sigma^2_t$  – conditional variance

t = time

There are two conditions to be met before developing GARCH MODEL. This conditions will test the validity of the data to run garch model.

1. There should be CLUSTERING VOLATILITY in the residual
2. There should be ARCH EFFECT.

**Table 7 Presentation of ARCH Model Result**

|   |             |            |             |       |
|---|-------------|------------|-------------|-------|
| Dependent Variable: AVI   |             |            |             |       |
| Method: ML ARCH - Student's t distribution (BFGS / Marquardt steps)                                       |             |            |             |       |
| Date: 10/07/17 Time: 11:24  |             |            |             |       |
| Sample (adjusted): 2001 2016  |             |            |             |       |
| Included observations: 16 after adjustments   |             |            |             |       |
| Failure to improve likelihood (non-zero gradients) after 57 iterations                                    |             |            |             |       |
| Coefficient covariance computed using outer product of gradients  |             |            |             |       |
| Presample variance: backcast (parameter = 0.7)  |             |            |             |       |
| t-distribution degree of freedom parameter fixed at 10  |             |            |             |       |
| GARCH = C(2) + C(3)*RESID(-1)^2 + C(4)*GARCH(-1) + C(5)*APMP + C(6)*MTE + C(7)*RBM + C(8)*RGDP + C(9)*SCP |             |            |             |       |
| Variable  | Coefficient | Std. Error | z-Statistic | Prob. |



|                    |           |                       |           |        |
|--------------------|-----------|-----------------------|-----------|--------|
| C                  | 0.474815  | 12.64339              | 0.037554  | 0.9700 |
| Variance Equation  |           |                       |           |        |
| C                  | 1515.999  | 3519.278              | 0.430770  | 0.6666 |
| RESID(-1)^2        | -0.292553 | 0.696165              | -0.420234 | 0.6743 |
| GARCH(-1)          | 0.492642  | 0.593460              | 0.830118  | 0.4065 |
| APMP               | -17.92055 | 58.46436              | -0.306521 | 0.7592 |
| MTE                | -6.504161 | 7.521297              | -0.864766 | 0.3872 |
| RBM                | -1.583964 | 21.78307              | -0.072715 | 0.0420 |
| RGDP               | -66.01429 | 341.5799              | -0.193262 | 0.8468 |
| SCP                | -3.145179 | 6.400839              | -0.491370 | 0.6232 |
| R-squared          | -0.046948 | Mean dependent var    | 11.36123  |        |
| Adjusted R-squared | -0.046948 | S.D. dependent var    | 51.89108  |        |
| S.E. of regression | 53.09519  | Akaike info criterion | 10.98385  |        |
| Sum squared resid  | 42286.49  | Schwarz criterion     | 11.41843  |        |
| Log likelihood     | -78.87081 | Hannan-Quinn criter.  | 11.00611  |        |
| Durbin-Watson stat | 2.342744  |                       |           |        |

**Source: Extraction From E-views Output**

From the mean equation, we take the residual and from the residual we estimate the variance of the residual which is  $H_t$  and it's the dependent variable which shows the volatility of the average inflation. Hence, the variance of the residual means the volatility of the average inflation in Nigeria which is the dependent variable. From the variance equation, the  $RESID(-1)^2$  which is the ARCH term whose P-value is higher than the 5% level of alpha suggest that the ARCH term is insignificant. Further, the  $e^2_{t-1}$  which is the GARCH term is also insignificant as it exhibit a value higher than the alpha level. Also, all other explanatory variables exhibit an insignificant P-value of 0.4065, 0.7592, 0.3872, 0.8468 and 0.6232 accordingly except for RBM whose P-value stood at 0.0420 thus suggesting the existence of significant relationship to average inflation in Nigeria.

In summary, we can conclude based on the outcome of the ARCH and GARCH model that the  $RESID(-1)^2$  which is the ARCH term is not significant in explaining the inflation clustering in Nigeria. Also, the report of the GARCH model suggest that GARCH(-1) which is the GARCH term it is not sufficient enough in forecasting volatility clustering on average inflation in Nigeria. Meanwhile, ARCH and GARCH are family whose shock is expected to influence the explained variable (AVI) while all other explanatory variables seems to be insignificant in transmitting the clustering of average inflation in Nigeria except for Real Base Money at Constant Price whose coefficient is significant. Hence we proceed to diagnostic test to unsure the viability of the model using the serial correlation test, residual test and ARCH effect test thus

**Table 8 presentation of Serial Correlation Q-statistics**

|                            |                     |    |     |        |       |  |
|----------------------------|---------------------|----|-----|--------|-------|--|
| Date: 10/07/17 Time: 12:10 |                     |    |     |        |       |  |
| Sample: 1999 2016          |                     |    |     |        |       |  |
| Included observations: 16  |                     |    |     |        |       |  |
| Autocorrelation            | Partial Correlation | AC | PAC | Q-Stat | Prob* |  |

|         |         |    |        |        |        |       |
|---------|---------|----|--------|--------|--------|-------|
| .   .   | .   .   | 1  | 0.013  | 0.013  | 0.0030 | 0.956 |
| . **  . | . **  . | 2  | -0.260 | -0.261 | 1.3989 | 0.497 |
| .   .   | .   .   | 3  | -0.046 | -0.041 | 1.4448 | 0.695 |
| .   .   | . *  .  | 4  | -0.058 | -0.134 | 1.5242 | 0.822 |
| .   * . | .   * . | 5  | 0.166  | 0.157  | 2.2443 | 0.814 |
| . *  .  | . **  . | 6  | -0.194 | -0.281 | 3.3284 | 0.767 |
| . **  . | . **  . | 7  | -0.298 | -0.237 | 6.1739 | 0.520 |
| .   .   | . *  .  | 8  | -0.023 | -0.189 | 6.1928 | 0.626 |
| .   * . | . *  .  | 9  | 0.081  | -0.072 | 6.4638 | 0.693 |
| .   * . | .   .   | 10 | 0.165  | 0.013  | 7.7762 | 0.651 |
| . *  .  | . *  .  | 11 | -0.129 | -0.191 | 8.7290 | 0.647 |
| .   .   | .   .   | 12 | -0.046 | -0.024 | 8.8806 | 0.713 |

\*Probabilities may not be valid for this equation specification.

Source: Extraction from E-view Output

The Null hypothesis is that there is no serial correlation. From the decision rule, we reject the null hypothesis when the P-value is less than 5%. From the result above, the P-value of all lags are more than 5% which suggest that we cannot reject the null hypothesis. Hence, we conclude that the Garch model with normal distribution has no serial correlation. Hence, we proceed to check for the ARCH effect thus

### Test for Arch Effect

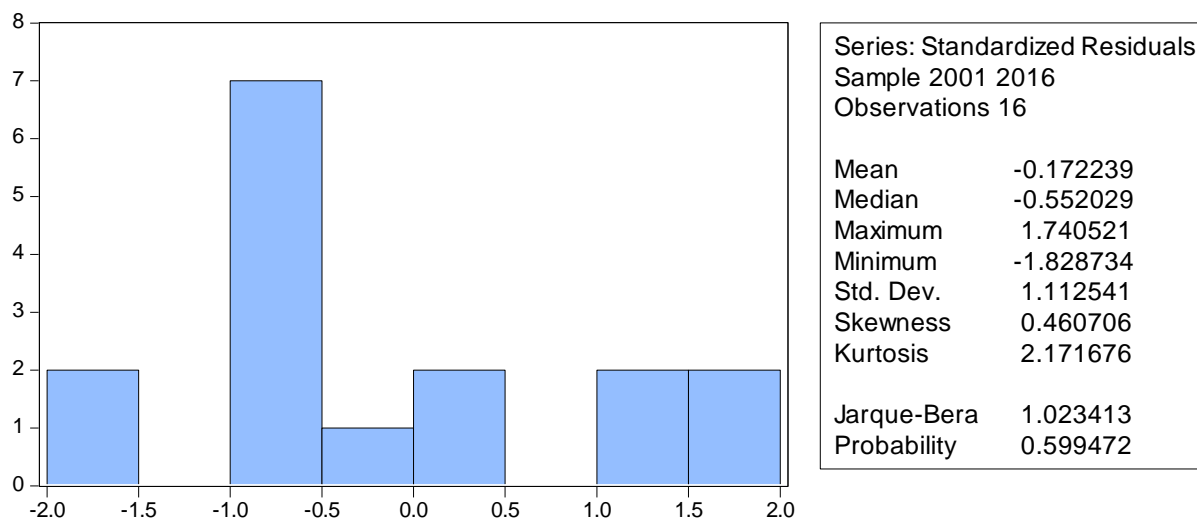
**Table 9 Presentation of Test for Heteroskedasticity**

| <b>Heteroskedasticity Test: ARCH</b> |          |                     |        |
|--------------------------------------|----------|---------------------|--------|
| F-statistic                          | 0.004936 | Prob. F(1,13)       | 0.9451 |
| Obs*R-squared                        | 0.005694 | Prob. Chi-Square(1) | 0.9399 |

Source: Extraction from E-view Output

From the Arch test, we found that the observed  $R^2$  exhibit a coefficient of 0.005694 and a corresponding P-value (0.9399) greater than 5% alpha level. The decision rule here states that if the P-value is more than 5% we cannot reject the null hypothesis and the null hypothesis is that there is no Arch effect. Hence we conclude that this model has no Arch effect which is a good sign of fitness's for the model. Lastly we check to ascertain if the residual are normally distributed using Jarque Bera Normality Test thus

**Figure 2 Presentation of Jarque Bera Normality Test**



Source: Extraction from E-view Output

The result of the normality test above shows a higher P-value which is greater than 5% level of alpha. The null hypothesis here is that the residual are normally distributed. Since the P-value is greater than the 5% level of alpha, we do not reject the null hypothesis but rather conclude that the residual are normally distributed. This therefore suggests that our model passes all the test conditions of no serial correlation, no Arch effect and finally, normal distribution of residual. This therefore suggests that the report from this findings could be used for decision making.

## 5. Conclusion

In Nigeria, one of the possible obstacles impeding successful harmonization of official and parallel market exchange rates could be traced to the increase in the level of and rate of inflation which follows. It is important to know that the inflationary effects have nothing to do with any slackening of fiscal discipline because inflation can rise permanently and substantially even if real government spending remains constant. Inflation rises because the devaluation involves eliminating revenues from purchasing export earnings at the overvalued official exchange rate. This then required increased monetization to finance the set level of government expenditure. This paper has explored the interactions between these two taxes – the taxation of export earnings, and the inflation tax on domestic financial assets.

The key changes in the determinants of the parallel market premium has been the fall in dollar oil prices which has directly reduced government revenues, since oil dollars accrue to the government in the first instant. In addition, because the Nigerian government is a net seller of dollars, any rise in the parallel market premium meant a bigger real transfer from the government to the private sector through the CBN auction. As a result the government added to its fiscal burdens as the premium rises, so that the reliance on inflation increase and the real fiscal deficits is now at the mercy of the parallel market premium.

From the analytical perspective of this paper, two issues are of interest; first, given the level of real government spending, one would expect harmonization to reduce inflation as the fiscal

burden of rents since floating of the naira has become a centrepieces of economic restructuring programme predicated on market incentives price signals, and the CBN occasional intervention which has become a permanent feature. Implicit in the parallel market will be eliminated.

Second, there is some debate about what the actual Naira-dollar rate should emerge from the float. Since the official dollar exchange was much lower than what it is current is #305 or more and since official oil dollars account for more than 90% of export, it is expected that there should be equalization close to the official rate. Such expectation ignore the fact that domestic price have substantially adjusted to the parallel market rate and that there exist a virtual secondary market in imports at the official exchange rate. Imports in Nigeria are priced at their opportunity cost, the parallel market rate.

To conclude from this paper, we opines that it is incorrect for a developing country to ever float its currency. This decision should depend on the credibility of accompanying fiscal reform and the initial size of the premium. At a minimum, the rationing of commercial transactions has eventually to be eliminated. It is difficult to think of doing this on a sustained basis with fixed exchange rates. Once equalization with or without capital controls is achieved, there remain the decision of whether to continue with a float as a permanent mechanism. But the issue of a permanent float should not be separated from the inflation tax and the credible sustainability of fiscal reform.

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