

Evaluation of Monetary, Fiscal and External Inflationary Sources in Nigeria

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Abstract: This study focuses on evaluating the monetary, fiscal and external inflationary sources in Nigeria. Empirical evidence suggests that the adoption of either monetary or fiscal policy or a synchronization of both policies appears to be very popular in Developing Nations like Nigeria. Often time, the policy choice that prevails is taken to be the sole cause of inflation in the economy. Such understanding has led to the obvious ambiguity in empirical literature centred on developing nations, regarding what the actual sources of inflation are. Thus, this study adopts the Auto Regressive Distributive estimation technique to capture the monetary, fiscal and external inflationary effects. Empirical findings of the study showed that overall, the main determining cause of inflation in both short run and long run periods in Nigeria, are more of monetary and external factors and less of fiscal sources. Specifically, the problem of inflation in Nigeria appears to be more of a structural phenomenon than monetary in the short run. However, in the long run, combinations of monetary and external factors tend to be the major cause of inflation. The study also found the long run effect of lending rate on inflation, to be indicative of the Neo-Fisherism effect.

Keywords: Monetary policy; Fiscal policy; External factors; Inflation; Nigeria

JEL Classification: E31; E41; E62

1. Introduction

The growing trend of deficit finance through the government budget in both developing and developed nations has been argued to be a major reason for the rise in public debts. Public debts most imperatively arise from the desire by governments of both developed and developing nations to accelerate the growth of their economy. However, the existence of a huge vacuum between available savings and the investments to be undertaken has overtime made attaining such goals difficult. This is because the gap created by the inefficiency of public funds in developing countries in fulfilling growing investment demands has led to; low productivity of labour, low tax revenues, low foreign exchange earnings from weak terms of trade and the desire

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to diversify in most cases the mono-cultural economy among others. Therefore, the adoption of either monetary or fiscal policy or a synchronization of both policies appears to be very popular in filling such gap. Often time, the policy choice that prevails is taken to be the sole cause of inflation in the economy. Such understanding has led to the obvious ambiguity in empirical literature centred on developing nations like Nigeria, regarding what the actual sources of inflation are. For instance, studies such as; Musa et al. (2013), Havi and Enu (2014) and Tamunonimim (2016) have overwhelmingly examined the interactive impact monetary and fiscal policies have on inflation.

Consequently, such efforts adduced above have made the determination of the sources of inflation essential for policy formulators. This is because adequate information on inflationary sources can help in diagnosing and efficient implementation of appropriate policies. As identified by Kia (2006), sources of inflation in an economy can be traced to both internal (government deficits, debt financing, monetary policy, institutional economics and structural regime changes) and external (terms of trade, foreign interest rate, and world attitude) factors. Another known proposition put forward by the structuralist school of South America is that structural rigidities are the key sources of inflation in developing countries. To the “Structuralists”, as the economy develops, rigidity evolves which leads to structural inflation. This is because, in the short run, there are increases in non-agricultural incomes; complemented by a high growth rate of the population that tend to increase the demand for goods.

From the fiscal perspective, examining the numerous avenues through which inflation is being impacted upon by both government deficit and public debt is through the crowding out effect of capital accumulation, the sale of government securities and the wealth-creating potential of debt (Kia, 2006). Monetary policy on the other hand through its instruments (such as; money supply, interest rate, exchange rate, etc.) have also been argued in the literature as major inflationary sources. This, in fact, led Milton Friedman, a key advocate of the Monetary School of thought to view inflation always and everywhere as a monetary issue. In addition, most developing nations are import as well as foreign financing of debt reliant; which suggest that variations in foreign interest rates can impact on inflation rate in such countries.

Therefore, this study answers three main questions for Nigeria which are: is inflation truly a monetary or fiscal phenomenon? Are there external factors that impact inflation other than monetary and fiscal policy? Is inflation a function of the synchronization between any of these three sources? Answering the preceding questions consequently reveals that this study objective will not only examine the monetary and fiscal policy impact on inflation but will further incorporate the impact of external factors. Data for this study are obtained from the Nigerian economy. The

justification for this study from the Nigerian viewpoint is based on the fact that just like Kia (2006) study on Iran, Nigeria in the past three decades has witnessed several distortions in policy regimes alongside numerous exogenous shocks. This makes Nigeria an ideal case to test whether external or internal distortions or a combination of these distortions lead to inflation.

The remainder of this paper is structured as follows. Section 2 is devoted to related theoretical and empirical literature reviews. Section 3 captures the analytical framework and estimation technique. In section 4, we described the data used in the study as well as present our empirical findings. While the concluding remarks of the study, from the empirical findings, can be found in section 5.

2. Literature Reviews

2.1 Theoretical Reviews

The extensive review of the theoretical link between deficit and inflation abounds in literature such as Friedman (1968), Sargent and Wallace (1981); and Miller (1983). For example; Sargent and Wallace (1981) revealed a model showing that increasing government deficits do not follow with increasing taxes, but rather growth in the fiscal deficit or public debt will yield growth in money supply at present and future time periods. This they submit as the main cause of inflation in the economy. Dornbush et al. (1990) stressed that in economies where money creation is deployed as a means of financing budget deficits, makes such approach as the primary determinant of money growth and inflation. While Easterly and Schmidt-Hebbel (1993) contend that inflation arises in any economy due to the use of money creation approach to funding the deficit in the budget. Furthermore, the theoretical model of Catão and Terrones (2005) revealed that persistent fiscal deficits might generate inflation through money creation; also equilibrium inflation is linked to the fiscal deficit scaled by the stock of narrow money which represents an inflation tax base. They present their model that inflation is proportional to the product of the deficit-to-GDP ratio by the ratio of GDP to narrow money. Consequently, they opined that with a change in the deficit-to-GDP ratio, an economy operating at a higher inflation level would be much significantly impacted by an increase in the deficit, since its inflation tax base would typically be narrower. Noteworthy is the fact that the deficit–inflation relationship is dynamic since governments allocate seigniorage inter-temporally by borrowing, also fiscal deficits play a significant role in the present value of the monetary adjustment of financing government bonds (Sargent and Wallace, 1981; Catão and Terrones, 2005).

However, Ashra et al. (2004) developed a monetarist approach to inflation determination, in which inflation rate is linked to the growth rate of money in excess of the growth rate of income. Along with a steady growth path, the fully anticipated

rate of price change remains constant. While a divergence from long-run equilibrium stimulates excess demand for or supply of money and goods. Kia (2006) also adopted a monetary model developed on the basis of equilibrium in the money market; where optimization goal of the consumer serves as the determinant of the demand for money while the supply of money is exogenously given. Kia's model showed that divergence from long-run equilibrium stimulates excess demand for or supply of money and goods. Thus price adjustments are essential for equilibrium restoration in the markets. Furthermore, in testing the views of Sargent and Wallace's (1986) that the more contractionary the monetary policy, the higher the expected inflation rate as well as the long run monetization of government deficits and debt. Kia (2006) used an augmented version of the monetarist model which enabled the inclusion of fiscal policy by incorporating both government deficit and debt. The model's major contribution is its unique integration of both external and internal causes of inflation in a developing economy. Effects of both anticipated and unanticipated fiscal variables were captured by the model by allowing external and institutional shocks to affect the inflation rate in the country.

Furthermore, another core theory of inflation known as structural inflation, explains inflation in developing countries in a slightly different way. This theory as put forward by the structuralist school of South America emphasizes structural rigidity as the major cause of inflation in developing countries, especially in Latin America. They further noted that such direct cause applies to other developing countries, around the world; given the similarities in the economy of developing countries. The structuralists were of the view that expansion in investment expenditure, financed by expansion in money supply; is the only immediate and not the eventual factors responsible for inflation in the developing countries (Chand, 2016).

They hold the view that inflation is necessary for growth. This is because, as the economy develops, rigidity also develops which leads to structural inflation. Their argument was that in the short-run, developing economies experience increases in non-agricultural incomes such as manufacturing; together with high population growth rate that tend to increase the demand for commodities. Actually, the pressure of population growth, as well as growing urban incomes, would tend to enlarge through a chain reaction mechanism. First, the prices of agricultural goods, followed by the general price level, and then wages; with inflation as the end result.

2.2 Empirical Reviews

The remarkable work of Sargent and Wallace (1981) extensively differentiated between "monetary dominance" and "fiscal dominance" regimes in the nexus between fiscal deficits and inflation by two explicit phenomena. The study expressed that a situation whereby the budget deficit is simultaneously funded by bond sales to the public and seigniorage created by a monetary authority, would result in a scenario whereby if the monetary authority implements a monetary policy independently of

the fiscal authority, then the fiscal authority would be limited by the actions of the monetary authority when it formulates the fiscal policy. This is because the monetary authority has the edge in determining the money supply. Thus, inflation does not arise from the fiscal deficits. Distinctively, a fiscal dominance regime would constrain the monetary authority from determining the money supply. The end result is a fiscal deficit being inflationary.

Elmendorf and Mankiw (1998) examined the macroeconomic effects of government debt. The study expressed an orthodox theory of government debt; emphasizing the increase in aggregate demand within the short-run period while expressing the crowding in effect in the long run. The study submitted that a rise in debt creates a positive wealth effect on households; thereby stimulating a rise in the demand for goods and services, which yields inflation in the economy.

Raghbendra (2001) researched on the macroeconomics of fiscal policy in developing countries by considering some aspects of the effects of fiscal policy on macroeconomic adjustment in developing countries. First, the paper reviews the notion of the fiscal deficit in the particular context of developing countries. Followed by spelling out the conditions under which the internal and external debts are sustainable while highlighting the significance of the “twin deficits”. The study further presented some evidence on the sustainability of the internal and external deficits in the perspective of some developing countries. Another contribution of the study was developing the theme of endogeneity of money supply to fiscal policy and international capital flows; while pointing out the challenges faced by stabilization policy under these conditions.

Over time some studies have shown that monetary and fiscal policies jointly determine the price level, as against it being solely a monetary phenomenon.¹ The study by Kia (2006) focused on internal and external factors which influence the inflation rate in developing countries from the Iranian perspective. The study developed and tested a monetary model of the inflation rate, capable of incorporating both monetary and fiscal policies as well as other internal and external factors. Empirical results of the study showed that, in the long run, higher exchange rate tends to result in higher price and that fiscal policy could be used as a very effective tool in curbing inflation.

Murota (2010) in the study titled “inflation, fiscal deficits and multiple states in a cash-in-advance Model”; observed that by imposing constraint on both consumption and investment, and where the central bank is compelled to finance the fiscal deficit through money creation. There is the tendency for high inflation trap to arise, but also a poverty trap will likewise be a possibility. This is because, if there are two steady states, the high-inflation trap can occur and the economy will most probably

¹ See (Leeper, 1991; Sims, 1994; Woodford, 2001).

attain a high-inflation steady state. Further, if there are three steady states, the poverty trap can be revealed, while the initial capital stock determines which steady state the economy reaches. If the threshold result is lower, the economy is believed to converge to a high-inflation, low-capital steady state. However, if the fiscal deficit is significantly minimize, the economy will prevent the poverty trap and attain a low-inflation, high-capital steady state independently of it. Since the combination of the fiscal deficit and the dependent monetary authority creates both these traps, they disappear if the monetary authority is independent or if there is no fiscal deficit. Thus their result suggest that lowering fiscal deficits and improving the independence of the central bank, will be essential in bringing under control inflation, stabilizing economies, and enhancing economic growth.

Sergey (2011) was of the view that fiscal deficit can be divided into two parts; one that causes inflationary effect and the other that does not. The literature shows that it is the consumption component of government expenditure that leads to fiscal deficit growth in the long run while the investment expenditures are more sustainable in long run (Tiwari et al., 2012).

Lin and Chu (2013) applied the dynamic panel quantile model for an auto regressive distributive lag (ARDL) specification in examining deficit-inflation nexus in 91 countries. The results reveal strong deficit links with inflation in high-inflation episodes and weak results in low-inflation episodes. Implying that fiscal consolidation would be more effective in maintaining price levels the higher the inflation rate is; which is consistent with the theoretical model of Catão and Terrones (2005).

Jalil et al. (2014) suggested an immediate correction of fiscal imbalances by testing the fiscal theory of price level for Pakistan. The study finds that fiscal deficit is a major determinant of the price level alongside variables like interest rates, government sector borrowing, and private borrowing.

The role played by institutions in analyzing the link existing between deficits and inflation can be very significant. Examining whether deficits are inflationary or not in the presence of dependent central bank and fragile financial markets, Tahira and Hassan observed for eleven Asian countries that deficits are inflationary, while inflationary pressure caused by the budget deficits is particularly stronger in the presence of evolving financial markets and non autonomous central banks (Tahira & Hassan, 2015).

Egwaikhide et al. (1994) examined the quantitative effects of exchange rate depreciation on inflation, government revenues, expenditures, and money supply in Nigeria. The study finding submits that real output, domestic money supply as well as the shadow price of the exchange rate (the parallel market exchange rate) are key in evaluating the direct causes of inflation in Nigeria. In the deficit- inflation relationship, they found no correlation between both variables. However, studies

such as Onwioduokit (1999), Chimobi and Igwe (2010) and Oladipo and Akinbobola (2011), reveal a positive relationship between fiscal deficit and inflation in Nigeria for various time frames. These studies concluded that deficits were accountable for inflationary pressure in the Nigerian economy. A contradictory submission was made by Odusanya and Atanda (2010), who found a negative relationship between fiscal deficit and inflation in Nigeria.

Musa et al. (2013) examined the interactive impact of monetary and fiscal policy interaction on price and the growth of output in Nigeria. Result for the study reveals a long run positive impact of money supply and government revenue on price and economic growth. In a similar study, Havi and Enu (2014) examined the relative significance of monetary and fiscal policy on economic growth in Ghana; with the objective of determining which of the two policies is more efficient in boosting economic growth. The study reveals a positive significant effect of both policies on the Ghanaian economy. Furthermore, it was observed that monetary policy is more efficient in economic growth promotion.

Daniel & Nuhu (2015) examined the effectiveness of monetary policy as an anti-inflationary measure in Nigeria. Estimated result of the study reveals that; interest rate, exchange rate, money supply and oil-price are the major causes of inflation in Nigeria. Money supply variable also showed a significant positive effect on inflation both in short and long run periods. Suggesting that Nigerian inflationary situation is driven by monetary impulses.

Oseni & Sanni (2016) assessed if fiscal deficit, leads to impulsiveness in the inflation rate in Nigeria for the period 1981-2014. The study adopted a Granger causality analytical approach on a quarterly based time series data. The study submission was that there is a bi-directional causality between fiscal deficit and inflation volatility. Suggesting that volatility in inflation is linked to the constant fiscal deficit in the budgetary process and vice versa.

Tamunonimim (2016) empirically examined the effectiveness of monetary policy in controlling inflation in Nigeria. The study modelled inflation rate in Nigerian as a function of monetary policy variables made up of monetary policy rate, Treasury bill rate, savings rate, prime lending rate, maximum lending rate, and growth of narrow money supply; others were growth of broad money supply, net domestic credit, net credit to government and credit to private sector. The study findings showed that monetary policy rate, Treasury bill rate, prime lending rate, maximum lending rate and net domestic credit are not statistically significant, while saving rate, narrow and broad money supply, net credit to government and credit to private sector were statistically significant in explaining the changes in Inflation rate in Nigeria. The study submitted that not all monetary policy instruments are effective in managing inflation in Nigeria. The study further recommends that contractionary monetary

policy with the objective of controlling excess liquidity in circulation should be used to regulate inflation in Nigeria.

The literature review has shown obviously the existence of immense studies explaining theoretical and empirical determinants of inflation. Studies conducted for developing countries, with special emphasis to Nigeria, have ordinarily presented facts supporting various fiscal and monetary variables as culprits of inflationary pressure; with a few incorporating the interdependence between these policies and how they impact on inflation. Furthermore, these studies have rarely identified external factors aside from monetary and fiscal factors that could give rise to inflation. Nevertheless, this study fills this gap by not just examining monetary and fiscal policy impact on inflation; but also examining external factors that can give rise to the problem of inflation in the Nigerian economy.

3. Analytical Framework and Estimation Technique

In the traditional Keynesian short-run analysis, if we assume that fiscal deficits are created by holding government outlays constant and cutting tax revenue, it is expected that household disposable income should rise, as well as their lifetime wealth. Fundamental economic teaching believes that such increases stimulate individual consumption; thus aggregate spending and demand for goods and services is enhanced. This analysis serves as justification for the policy of fiscal dominance, which encourages deficit financing when the economy is in recession. Therefore, so long as the economy is yet to attain full employment of resources, aggregate output is guaranteed to rise; otherwise, inflation is bound to ensue. In the Keynesian school of thought, funding of budget deficit through borrowing and debt monetization leads to inflation. Developing nations thus find the application of fiscal dominance in financing the deficits in their budget more appealing. This is because of the comparative ease of financing their deficits via seigniorage; thus making the subject matter of inflation more of a fiscal issue.

However, classical quantity theory offers an opposing view for the fluctuations in prices. An examination of Fisher (1911) suggests that since the velocity of money in the economy is exogenously determined, variation in the money supply by monetary authorities will trigger changes in price level. Hence, growth in aggregate demand is transmitted into inflation by means of higher prices. Consequently, the major determinant of inflation is considered to be more monetary policy; thus, fiscal policy has no independent impact on price level (Jalil et al., 2014).

A more current argument in explaining the causes of higher price level says that growth in the price level is a function of the fusion between fiscal and monetary

policies.¹ When fiscal authorities target inter-temporal budget constraints, the end result is higher prices. When the debt profile of a country is enormous, the interest rate is also expected to be high. Thus, in fiscal dominant regimes, monetary authorities may be pressured to act in line with funding the fiscal requirements and thus affecting the price level. Conversely, in a monetary dominant regime with a free policymaking central bank, printing of new notes would be curtailed by the monetary authorities; thereby making funding the government deficit difficult. This shows that fiscal harmonization of both policies is possible and inflation can be targeted. Thus, gauging the inflationary effect of a fiscal deficit is a function of the relative dominance of fiscal and monetary policy.

Evidence by some studies have shown that there exist a number of variables that impact on inflation levels such as trade openness, exchange rate, oil prices, food prices, and growth rate of the economy.² For instance, Catao and Terrones (2005) and Lin and Chu (2013) models examined and validated Romer (1993) study which showed that trade openness is inversely related to inflation in more open economies. The conclusion of these studies was that trade openness strongly impact on inflation for developing countries, but weakly impact on inflation in the developed economies. Samimi et al. (2012) and Jalil et al. (2014) however found a positive impact from trade openness to inflation in developing countries.

Another empirical determinant of inflation from the supply side is interest rate which is the cost of borrowing capital. Studies such as Boschi and Girardi (2007) and Kose et al. (2012) have empirically shown that the prevailing interest rates in a country do impact on inflation. Jalil et al. (2014) posit that both lending and deposit rates significantly and positively impact on the inflation rate. Furthermore, the exchange rate value of a country is often considered a contributing factor to inflation. Egwaikhide et al. (1994) observed for Nigeria that the parallel market exchange rate appears to correlate with inflation more when compared with the official rate.

As for external factors, foreign prices or import prices is another key variable in considering factors influencing inflation. This is because growth in the level of import for a country has the capacity to raise the country's volume of trade. Boujelbene and Boujelbene (2010) found a positive effect for import prices on inflation. This variable is vital when examining the source of imported inflation, especially when the study country (such as Nigeria) is a major import dependent. Furthermore, foreign interest rate as also observed by Kia (2006) is negatively and significantly related to the price level.

To achieve the objective of this study, the above identified inflationary controlling variables are grouped into those used to measure the monetary, fiscal and external

¹ See (Leeper, 1991; Sims, 1994).

² See (Romer, 1993, Durevall, 1998, Hanif, 2012; Samimi et al., 2012).

sources of inflation. Conventional variables such as money supply, public debt, deficit finance, were also given due consideration. Thus, to evaluate the monetary, fiscal, and external sources of inflation in Nigeria, three long-run inflation relationship models were developed. Variables in each model were derived from earlier identified sources of inflation in the study. Where equation 1 include monetary determinant variables of inflation, equation 2 captures variables depicting the fiscal sources of inflation, and equation 3 expresses the variables with external sources of inflation.

$$lcpit = \beta_0 + \beta_1 lrgdp_t + \beta_2 lms_t + \beta_3 lrmb_t + \beta_4 lexch_t + \beta_5 dcrpgdp_t + \beta_6 brate_t + \varepsilon_t \quad (Equ. 1)$$

$$lcpit = \gamma_0 + \gamma_1 lrgdp_t + \gamma_2 lgexp_t + \gamma_3 fdef_t + \gamma_4 dbgdp_t + \mu_t \quad (Equ. 2)$$

$$lcpit = \tau_0 + \tau_1 lrgdp_t + \tau_2 impd_t + \tau_3 lipxd_t + \tau_4 lvom_t + \tau_5 dop_t + v_t \quad (Equ. 3)$$

Where $lcpit$ is the log of consumer price index, $lrgdp$ is the log of real gross domestic product, lms is the log of money supply, $lrmb$ is the log of real money balances, $lexch$ is the log of exchange rate, $dcrpgdp$ is domestic credit to the private sector to gdp ratio, $brate$ is borrowers rate, $lgexp$ is the log of federal government expenditure, $fdef$ is deficit financing, $dbgdp$ is government debt to gdp ratio, $impd$ is import dependence of the economy, $lipxd$ is the log of interest payments on external debt, $lvom$ is the log of value of major imports, and dop is the degree of openness.

If we choose to estimate Equ.1-3 directly by means of Ordinary Least Square (OLS), we may end up having a bias or spurious estimates if the variables were specified in their non-stationary form. Thus, pretesting for unit root or stationarity to determine the order of integration of variables is imperative. In light of the above, this study will adopt the Auto-Regressive Distributive Lag (ARDL) bounds technique developed by Pesaran et al. (2001). The justification for the selection of this approach is base on its certain econometric advantages in comparison to other single cointegration procedures (such as Engle & Granger, 1987; Johansen, 1988; Johansen & Juselius, 1990). Also, the approach allows testing for the existence of a long-run relationship between variables in level form, regardless of the order of integration of variables whether purely I(0) or purely I(1) but not I(2). Endogeneity problems and inability to test hypotheses on the estimated coefficients in the long-run associated with the Engle-Granger (1987) method are avoided. Finally, Narayan (2005) posited that the small sample properties of the bounds testing approach provide a superior consistent outcome to that of multivariate cointegration. Hence, the ARDL transformation for equations1-3 is stated below:

$$\begin{aligned}
\Delta lcp_i = & \alpha_0 + \sum_{i=1}^p \varphi_i \Delta lcp_{i,t-i} + \sum_{i=1}^p \pi_i \Delta lrgdp_{t-i} + \sum_{i=1}^p \rho_i \Delta lms_{t-i} \\
& + \sum_{i=1}^p \sigma_i \Delta lrmb_{t-i} + \sum_{i=1}^p \theta_i \Delta lexch_{t-i} + \sum_{i=1}^p \vartheta_i \Delta dcrpgdp_{t-i} \\
& + \sum_{i=1}^p \omega_i \Delta brate_{t-i} + \gamma_1 lrgdp_{t-1} + \gamma_2 lms_{t-1} + \gamma_3 lrmb_{t-1} \\
& + \gamma_4 lexch_{t-1} + \gamma_5 dcrpgdp_{t-1} + \gamma_6 brate_{t-1} \\
& + \varepsilon_t \quad (\text{Equ. 4})
\end{aligned}$$

$$\begin{aligned}
\Delta lcp_i = & \alpha_0 + \sum_{i=1}^p \varphi_i \Delta lcp_{i,t-i} + \sum_{i=1}^p \pi_i \Delta lrgdp_{t-i} + \sum_{i=1}^p \rho_i \Delta lgexp_{t-i} \\
& + \sum_{i=1}^p \sigma_i \Delta fdef_{t-i} + \sum_{i=1}^p \theta_i \Delta dbgdp_{t-i} + \gamma_1 lrgdp_{t-1} \\
& + \gamma_2 lgexp_{t-1} + \gamma_3 fdef_{t-1} + \gamma_4 dbgdp_{t-1} + \mu_t \quad (\text{Equ. 5})
\end{aligned}$$

$$\begin{aligned}
\Delta lcp_i = & \alpha_0 + \sum_{i=1}^p \varphi_i \Delta lcp_{i,t-i} + \sum_{i=1}^p \pi_i \Delta lrgdp_{t-i} + \sum_{i=1}^p \rho_i \Delta limp_{t-i} + \\
& \sum_{i=1}^p \sigma_i \Delta lipxd_{t-i} + \sum_{i=1}^p \theta_i \Delta lvom_{t-i} + \sum_{i=1}^p \vartheta_i \Delta dop_{t-i} + \gamma_1 lrgdp_{t-1} + \\
& \gamma_2 limp_{t-1} + \gamma_3 lipxd_{t-1} + \gamma_4 lvom_{t-1} + \gamma_5 dop_{t-1} + \\
& v_t \quad (\text{Equ. 6})
\end{aligned}$$

Where terms with summation signs signify the error correction relationship; the second part of the equation with γ corresponds to long run relationships. Next, we specify the error correction model (ECM) estimates from equations 4-6 to obtain the short-run dynamic parameters as specified below.

$$\begin{aligned}
\Delta lcp_i = & \alpha_0 + \sum_{i=1}^p \varphi_i \Delta lcp_{i,t-i} + \sum_{i=1}^p \pi_i \Delta lrgdp_{t-i} + \sum_{i=1}^p \rho_i \Delta lms_{t-i} \\
& + \sum_{i=1}^p \sigma_i \Delta lrmb_{t-i} + \sum_{i=1}^p \theta_i \Delta lexch_{t-i} + \sum_{i=1}^p \vartheta_i \Delta dcrpgdp_{t-i} \\
& + \sum_{i=1}^p \omega_i \Delta brate_{t-i} + \phi_{ecm} \Delta lcp_{i,t-1} + \varepsilon_t \quad (\text{Equ. 7})
\end{aligned}$$

$$\begin{aligned} \Delta lcp_i = & \alpha_0 + \sum_{i=1}^p \varphi_i \Delta lcp_{i,t-i} + \sum_{i=1}^p \pi_i \Delta lrgdp_{t-i} + \sum_{i=1}^p \rho_i \Delta lge_{t-i} \\ & + \sum_{i=1}^p \sigma_i \Delta fdef_{t-i} + \sum_{i=1}^p \theta_i \Delta dbgd_{t-i} + \phi ec_{2t-1} \\ & + \mu_t \end{aligned} \quad (\text{Equ. 8})$$

$$\begin{aligned} \Delta lcp_i = & \alpha_0 + \sum_{i=1}^p \varphi_i \Delta lcp_{i,t-i} + \sum_{i=1}^p \pi_i \Delta lrgdp_{t-i} + \sum_{i=1}^p \rho_i \Delta imp_{t-i} \\ & + \sum_{i=1}^p \sigma_i \Delta lipx_{t-i} + \sum_{i=1}^p \theta_i \Delta lvom_{t-i} + \sum_{i=1}^p \vartheta_i \Delta dop_{t-i} \\ & + \phi ec_{3t-1} + v_t \end{aligned} \quad (\text{Equ. 9})$$

Where ϕ represent the short-run speed of adjustment parameter, measuring the return to long-run equilibrium after a short run shock. Residual tests such as normality, serial correlation, and heteroscedasticity are performed to ensure the goodness of fit of the model.

4. Data Description and Empirical Findings

4.1 Data Description

Data used in this study is based on annual frequency from 1970 to 2015 for Nigeria. The sources include the Central Bank of Nigeria (CBN) statistical bulletin for various years, the World Development Index (WDI) and the International Financial Statistics (IFS).

Annual consumer price index values are used to proxy for inflation which is our dependent variable. The variables used to measure monetary effect on inflation are: MS which captures nominal money supply (M1)¹, RMB measures the real money stock balance², the cross exchange rate of the Naira (₦) selling rate to the U.S dollar (\$) (in the parallel market) is used to measure the depreciation effect of the domestic

¹ Nominal money stock balance, and according to Catão and Terrones (2005) represents transactionary money concept

² It is the nominal quantity money balance divided by a price index (Friedman 1971). It is used to measure the actual purchasing power of money supply in the economy. Based on a priori expectation, it is expected to be inversely related to inflation.

currency on domestic price level¹, the DCRPGDP is the total volume of credit to the private sector by deposit money banks (DMBs)², and BRATE is the lending rate to borrowers of capital. For fiscal channel effect on inflation, we used: total government expenditure, deficit finance is the nominal deficit of the federal government and total debt to GDP ratio. The external factors are measured using: import dependence of the economy³, interest payments on external debt, the nominal value of major imports which proxy for the foreign price⁴, and the degree of openness⁵. Real gross domestic product (RGDP) which is the nominal GDP deflated by CPI to proxy for real output forms our control variable. All these variables link to inflation through the monetary, fiscal and external channels in Nigeria.

4.2 Empirical Findings

4.2.1 Unit Root test Result

This study adopts the Phillips and Perron (1988) (PP) nonparametric technique of controlling for serial correlation in unit root testing⁶. Table 1 below presents the PP unit root test result on the variables at I(0) and I(1) respectively. However, as noted earlier, ARDL is applicable irrespective of the whether the data series are I(0) or I(1) but not I(2) data series.

Table 1. Unit Root Test Result

Variable	PP I(0)	Decision Rule	PP I(1)	Decision Rule
CPI	-1.108531	Not stationary	-3.388747**	Stationary

¹ The end period selling naira cross exchange rate (i.e. Parallel exchange rate) is used in this study to measure the channel through which depreciation of the domestic currency impact on domestic prices. This is established on the premise that induced increases in the price of imported inputs and finished goods, from a devalued local currency, will reflect on domestic prices. A proposition based on the supply side (cost push) theory of inflation (Egwaikhide et al. 1994).

² Based on its WDI definition, DCRPGDP are loans, purchases of non-equity securities, and trade credits and other accounts receivable that establish a claim for repayment by other deposit taking corporations other than the central bank.

³ IMPD was derived by dividing the country's total import by total export.

⁴ Value of major import was computed base on the International Trade Statistic (ITS) compiled from customs bills of entry, which are usually completed by importers and exporters; indicating the quantities and values of goods imported into or exported out of the compiler economy (CBN bulletin 2015) and unadjusted for balance of payments. For analytical purposes, Nigeria's ITS is presented using the format of the Standard International Trade Classification (SITC), which has 10 main groups, with codes 0 – 9 (see; CBN bulletin 2015).

⁵ The degree of openness is the summation of trade activities (imports + exports) divided by the GDP.

⁶ The PP method estimates the non-augmented DF test equation and modifies the α -ratio of the coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic (see: E-views help topic, p. 551).

RGDP	-0.712221	Not stationary	-6.194184***	Stationary
MS	-1.388918	Not stationary	-4.634544***	Stationary
RMB	-2.677571*	Stationary	-12.94101***	Stationary
EXCH	-1.166419	Not stationary	-5.673952***	Stationary
DCRPGDP	-2.522541	Not stationary	-10.38283***	stationary
BRATE	-1.738837	Not stationary	-7.436138***	Stationary
GEXP	-1.296017	Not stationary	-5.951950***	Stationary
FDEF	-0.358982	Not stationary	13.07989***	Stationary
DBGDP	-1.355798	Not stationary	-5.504613***	Stationary
IMPD	2.747946	Not stationary	-3.575582***	Stationary
IPXD	-4.779605***	Stationary	-26.07243***	Stationary
VOM	-0.806963	Not stationary	-7.420737***	Stationary
DOP	-2.352380	Not stationary	-8.953729***	Stationary

Note: *, ** and *** represent significance levels at 10%, 5% and 1% respectively.

Source: Author's Estimated Output

The unit root test results in Table 1 reveal that RMB and IPXD are I(0) series, while others are I(1) stationary. The stationarity of RMB and IPXD in level forms provide significant validation for the adoption of the ARDL model in this study.

4.2.2 Bounds Cointegration Determination

The next step is to determine the existence of a long-run relationship between the variables using the bounds approach. Table 2 below shows the long run relationship between the variables.

Table 2. Bounds Tests Result for Cointegration

Variables (K=6,4,5)	AIC optimal lags	F-Statistic	Bounds I(1) Critical Values	Outcome
lcp _t = f(lcp _{t-1} , lrgdp, lms, lrmb, lexch, dcrpgdp, brate)	2	5.389666* **	4.43	Cointegration
lcp _t =f(lcp _{t-1} , lrgdp, lgexp, fdef, dbgdp,)	3	4.107227* *	4.01	Cointegration
lcp _t = f(lcp _{t-1} , lrgdp, impd, lipxd, lvom, dop)	3	9.862364* **	4.68	Cointegration

Note: *, **, *** represents significance at 1%, 5% and 1% respectively, K= number of variables, AIC represents the Akaike Information Criterion.

Source: Author's Estimated Output

The F-statistic of the bounds test was compared to the upper bounds critical values I(1) as a yardstick to reject the null of no cointegration. Conventionally if the bounds I(1) critical value falls below the F-statistic, then we have cointegration. Thus, the monetary variables with the lagged CPI show a long run relationship with CPI at the 1% significance level. Likewise the fiscal and external variables also report long-run relationships with CPI at 5% and 1% significance levels respectively.

4.2.3 Estimated long run Effects determination

The next procedure is to present the estimated long-run monetary, fiscal and external effects of these variables on inflation as captured in equations 1-3 and is reported in table 3 below.

Table 3. Long run ARDL Estimated Output

Dependent Variable: <i>lcpi</i>			
Regressors	Monetary Effect	Fiscal Effect	External Effect
Constant	-9.368914 (5.663677)	-211.7692*** (39.742213)	70.356798*** (8.514196)
<i>lrgdp</i>	-0.217567 (0.207683)	6.863308*** (1.293681)	-2.299388*** (0.260658)
<i>lms</i>	0.690443*** (0.054761)	-	-
<i>lrmb</i>	-0.177019*** (0.052080)	-	-
<i>lexch</i>	0.173775*** (0.063571)	-	-
<i>dcrpgdp</i>	-0.005234 (0.004491)	-	-
<i>brate</i>	0.038319** (0.016244)	-	-
<i>lgexp</i>	-	0.458205** (0.222404)	-
<i>fdef</i>	-	-0.002344 (0.001416)	-
<i>dbgdp</i>	-	0.057657*** (0.011958)	-
<i>impd</i>	-	-	-14.918237*** (3.664741)
<i>lvom</i>	-	-	1.330747*** (0.070509)
<i>dop</i>	-	-	-0.038644*** (0.004630)
<i>lipxd</i>	-	-	-0.081829** (0.034562)

Note: *, **, *** represents significance at 10%, 5% and 1% respectively, values in () represent standard errors.

Source: Author's Estimated Output.

4.2.4 Estimated Short-run Effects Determination

The final procedure involves estimating the error correction model of Equations 7-9. As stated earlier, the ECM variable reflects the link relationship between the short-run and long-run period through its coefficient. Table 4 presents the short-run estimated output of the ARDL model.

Table 4. Short run ARDL Estimated Output

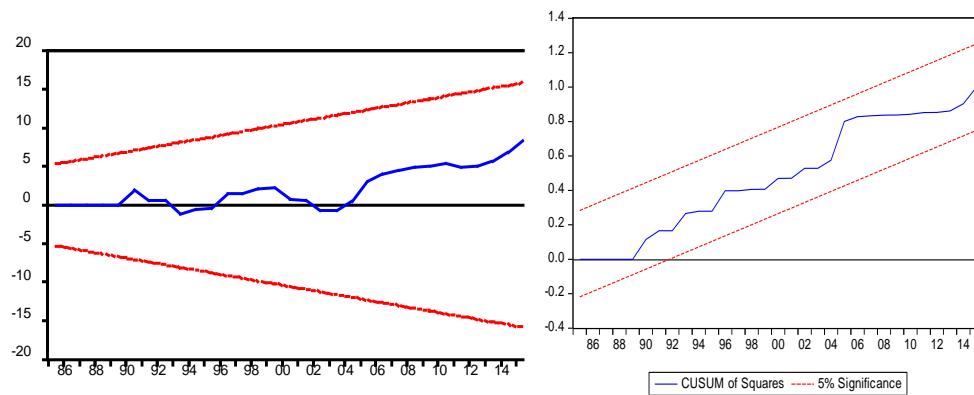
Dependent Variable: Δlcp_i			
Regressors	Monetary Effect	Fiscal Effect	External Effect
$\Delta lcp_{i,t-1}$	0.184934* (0.094434)	0.279063* (0.147639)	0.320253*** (0.102138)
$\Delta lrgdp$	0.089531*** (0.029660)	-0.490731** (0.204281)	0.843523*** (0.183732)
Δlms	0.212822*** (0.062378)	-	-
$\Delta lrmb$	-0.079116*** (0.020172)	-	-
$\Delta lexch$	0.077666** (0.035392)	-	-
$\Delta dcrpgdp$	-0.002339 (0.002055)	-	-
$\Delta brate_{t-1}$	-0.013318*** (0.004371)	-	-
$\Delta lgexp$	-	0.022496* (0.013407)	-
$\Delta fdef$	-	-0.000118 (0.000071)	-
$\Delta dbgdp$	-	-0.000254 (0.000657)	-
$\Delta impd$	-	-	0.819311 (0.713841)
$\Delta lvom$	-	-	0.283018*** (0.037036)
Δdop	-	-	-0.007038*** (0.001278)
$\Delta lipxd$	-	-	-0.027793** (0.011722)
ecm_{t-1}	-0.446935*** (0.063742)	-0.050488*** (0.014652)	-0.339652*** (0.049871)
Residual Test			
Normality test	0.324266	0.512765	0.418402
Serial correlation	0.7545	0.2016	0.3792
ARCH-LM Test	0.3875	0.2208	0.2488

Note: *, **, *** represents significance at 10%, 5% and 1% respectively, values in () represent standard errors.

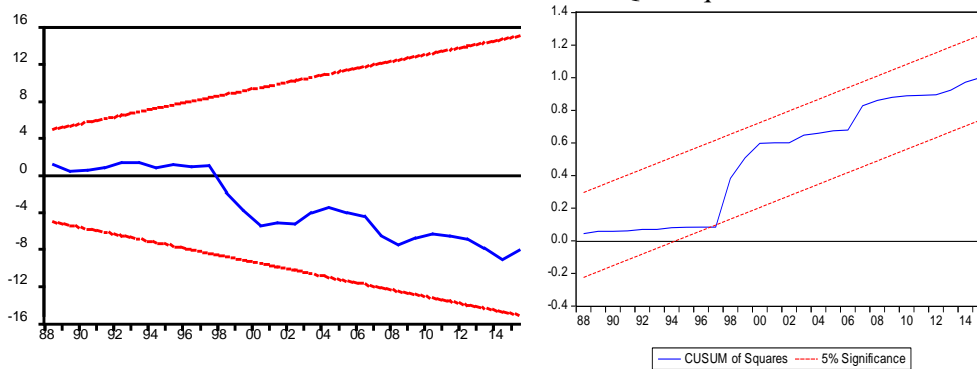
Source: Author's Estimated Output.

4.2.5 Equations Stability Test

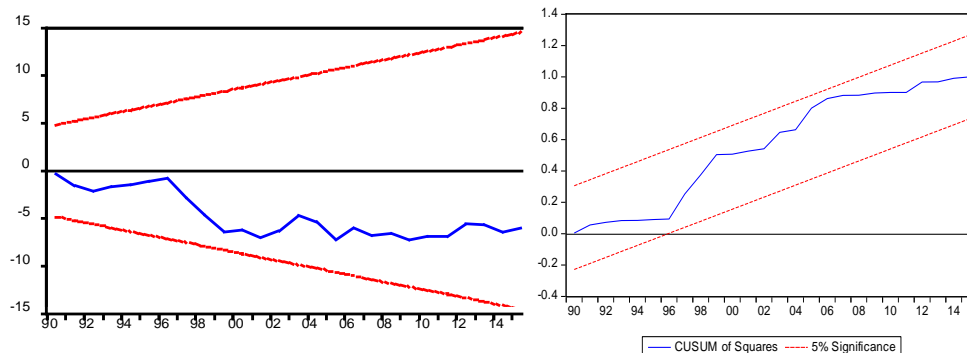
Lastly, to ensure the models satisfy the stability test, we apply the cumulative sum of recursive residuals (CUSUM) and the CUSUM of squares (CUSUMSQ). Figure 1 presents plots of both the CUSUM and the CUSUMSQ test statistics that fall inside the critical bounds of 5 percent significance for Equations 4-6.



CUSUM and CUSUMSQ on equation 4



CUSUM and CUSUMSQ on equation 5



CUSUM and CUMSUMSQ on equation 6

Figure 1. Stability Test on Study model residuals

Source: Author's Estimated Output.

Movements outside the critical lines are suggestive of instability. Figure 1 thus, shows that in general, the residuals for the three equations are stable at the 5 percent significance level. Consequently, the estimated coefficients of our regressions can be used for monetary and fiscal policy decision-making purpose; most importantly as it regards to inflation.

4.2.5. Monetary Effect

As expected, money supply significantly impacts on inflation in Nigeria for both the long-run and short-run (see tables 3 and 4) periods. Suggesting that expansion of the nominal money supply by the monetary authority, to finance investment expenditure is inflationary in nature. Real money balances also show a significant negative effect on inflation for both long and short run periods. The significance of this outcome shows that rising prices do deflate the purchasing power of consumers; thus inflation ensues and vice versa. Furthermore, exchange rate also reflects the significant positive impact on inflation. This confirms findings by Egwaikhide et al. (1994) for Nigeria, Kia (2006) for Iran and Jalil et al. (2014) for Pakistan that a depreciation of the domestic currency against a major foreign currency, leads to an increase in the price level. The more the naira trades for a US dollar, the higher the cost of imports; consequently leading to imported inflation.

Domestic credit to the private sector although positively related to inflation in both time periods considered, was however insignificant. This implies that access to credit by businesses from the DMBs has not been significant. The high cost of borrowing from these banks and other associated bottlenecks are possible reasons. Finally, lending rate interestingly enters the regression positively and significantly in the long

run but negative and significant in the short-run. The short run effect signifies that lower lending rates encourage borrowing by making more money available; this translates to a surge in aggregate demand for commodities while aggregate supply remains constant. As a result, the surge in aggregate demand will lead to higher pressure on prices, resulting in inflation. Evaluating this result alongside the positive effect of money supply and exchange rate on inflation, suggest that the problem of inflation in Nigeria in the short run appears to be more of structural than a monetary phenomenon. However, the long-run result is indicative of the Neo-Fisherism effect¹. Implying that with time, the monetary authority (i.e., the Central Bank of Nigeria) becomes more disposed to rising nominal interest rate; which has also resulted in the lending rate rising higher, with inflation as the result.

Additionally, the ECM coefficient, which measures the speed of adjustment from short-run disequilibrium to long-run equilibrium, is rightly signed and significant. The ECM coefficient of -0.45 indicates that it would take approximately at least 2 years for long-run equilibrium to be restored in the case of short-run distortion.

4.2.6. Fiscal Effect

The coefficient of government expenditure is positively significant both in the long run and short run. This shows that higher government spending does actually lead to higher inflation in the Nigerian economy. This finding aligns with Kia (2006) for Iran. Fiscal deficit, however, has a very weak insignificant negative effect on inflation in both long-run and short-run periods. This finding contradicts Onwioduokit (1999), Chimobi and Igwe (2010) and Oladipo and Akinbobola (2011), who found the positive significant impact of deficit on inflation for Nigeria; while affirming Odusanya and Atanda (2010) negative deficit to inflation nexus. This result finding could be the use of deficit by fiscal authorities to finance subsidy payments and capital-intensive projects as against immediate consumption needs². For example, Nigeria in the past two decades has witnessed some amount of investment in electricity projects, modernization of its rail system as well as the construction of new rail tracks, construction of roads, dams, bridges, fertilizer and oil subsidy payments, etc. Thus, the need to embark on more of such investment in capital projects by the fiscal authorities is evident in the insignificance of the fiscal deficit coefficient.

The long-run estimated parameter of total debt per GDP which is another fiscal variable measure has a positive significant effect on inflation. This indicates that a higher government debt in Nigeria is associated with a riskier business environment.

¹ Neo-Fisherism means that if the central bank wants inflation to go up, it should increase its nominal interest rate target, rather than lowering it, as traditional central banking wisdom would suggest and vice versa (Williamson, 2016).

² High inflation occur when fiscal stimulus is used to sustain growing aggregate consumption, rather than investing in income generating assets; to help service the debt repayment responsibilities.

i.e., continuous total debt growth is inflationary in nature and could create uncertainty or depreciate investors' confidence in the economy.

Moreover, the speed of adjustment factor is rightly signed and significant. The ECM coefficient value of -0.05 implies that short run distortion could cost about 20 years for long-run equilibrium restoration.

4.2.7. External Effect

Though the variable import dependence has a positive insignificant effect on inflation in the short run; the long-run coefficient estimate reveals otherwise an inverse significant effect on inflation in the long run. Foreign price, which proxy for the nominal value of import in our model is significantly positive. This implies that increase in the price of import easily translates to increase in domestic prices. The outcome reveals another pass of imported inflation through to rising domestic prices. This finding aligns with Kia (2006) for Iran. The degree of openness which is another external measure supports a significant inverse effect on inflation. This outcome is in line with studies of Romer (1993), Catao and Terrones (2005) and Lin and Chu (2013) which shows that trade openness is inversely related to inflation in developing or high inflation episode countries. Romer (1993) noted that the discrepancy in time of implementing monetary policy is less significant in more open countries.

Interest payment on external debt appears to have a significant negative effect on inflation. This means that as the interest payments on foreign borrowing increases, there is a crowding-out effect of funds for government spending due to the rising cost of debt servicing. The implication of this outcome is a reduced inflationary pressure.

Furthermore, the ECM measuring the speed of adjustment is rightly signed and significant. The coefficient value of -0.34 signifies that short-run disequilibrium emanating from the external variables will take approximately 3 years before long-run equilibrium is restored.

Lastly, the three models were subjected to the conventional residual diagnostic tests. Values reported in the lower part of table 4 represent the p-values for normality test; as well as the observed R-squared values for serial correlation and the Lagrange multiplier (LM) test for autoregressive conditional heteroskedasticity (ARCH) in the residuals. The values validate the model specifications in this study, as well as the acceptance of the null hypothesis of normality assumption, no serial correlation, and homoskedastic residuals. Furthermore, The CUMSUM and the CUMSUMSQ test was also conducted to test the stability of the equation residuals. Movements outside the critical lines are suggestive of instability. Figures 1-3 shows that in general, the residuals for the three equations are stable at the 5 percent significance level. Consequently, the estimated coefficients of our regressions can be used for monetary

and fiscal policy decision-making purposes; most importantly as it regards to inflation.

5. Conclusions and Policy Implications

This study evaluates the monetary, fiscal and external inflationary sources in Nigeria. The ARDL estimation technique was adapted to capture these effects. The evaluated outcome of our model submits that; over the long run, increase in money supply as well as higher depreciation of the domestic currency results in higher inflationary levels. The coefficient of the real money balance effect indicates that falling consumers' purchasing power due to rising domestic prices induces inflation. While lending rate tends to follow the conventional path of an inverse effect on inflation in the short run; its long-run impact is indicative of the Neo-Fisherism effect on inflation.

Obviously, monetary policy alone has not been the sole determinant of inflation in Nigeria; fiscal policy happens to be effective in inflation determination and control. However, its efficacy was found most significant in the long run. The long-run result showed that increases in government expenditures, as well as domestic debt, are inflationary in nature. Although fiscal deficit was found to be negatively linked to inflation, it was however observed not to have any significant effect. Contributing factors could be the use of such deficits as observed in recent times by the government, to fund capital projects as against recurrent spending; and the need for improvements in funding of such projects. Consequently, this will ensure that government debts can easily be repaid.

As for external factors, we found the significant negative long-run effect of the import dependence nature of the economy on inflation. Evidence of imported inflation was also discovered through positive impact of the value of import on inflation. Growing interest payments on external debt were observed to crowd-out government spending; thereby reducing the latter's impact on inflation, hence the former's inverse effect.

Overall, we discover that the main determining cause of inflation in both short run and long run periods in Nigeria; are more of monetary and external factors and less of fiscal sources. Specifically, the problem of inflation in Nigeria appears to be more of a structural phenomenon than monetary in the short run. However, in the long run, combinations of monetary and external factors tend to be the major cause of inflation. The study also found the long run effect of lending rate on inflation, to be indicative of the Neo-Fisherism effect.

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