Still on the Determinants of, and the Effects of Exchange Rate and Monetary Growth on Inflation: Nigeria in the Policy Debate.

Evenly Ndidi Dania
and
Francis Ilenloa Igberaese
School of Higher Education and Professional Studies, Institute of Continuing Education, Benin City, Nigeria.

Keywords:
Inflation, Exchange Rate, Money Supply, Nigeria

Abstract

One macro economics goal economist had always had interest in is price stability. This is because it directly affects the standard of living of the people and determines the level of poverty through the purchasing power theory. Such age long interest in developing countries such as Nigeria had been centered on its trend and determining factors, with differing findings, resulting into debate among policy makers. However, those findings mainly ascertained that inflation or price instability is the case in Nigeria and some other developing economies, with exchange rate and money supply playing major roles. This study employs time series econometrics technique, using mainly Augmented Dickey Fuller (ADF) and Philips Peron (PP) for stationarity and cointergration tests to situate Nigeria in this debate in a dynamic world. It uses quarterly data between 1981 and 2009, and finds that, "as it was in the beginning", inflation remains the order of the day, and exchange rate devaluation and money supply have positive and significant effects on inflation in Nigeria, but in the long run only money supply matters. It then recommends among others, that until Nigeria is fully able to stimulate production for export in the long run, devaluation of the Naira should be discouraged. The study also recommends a continuous contractionary monetary policy to reduce inflation in Nigeria.

Introduction

One of the thorniest issues in Nigeria's policy area had been how to put inflation under effective control. The control of inflation has been central to both monetary and fiscal policy before the decade of 2000s, as demonstrated in the various budgets and policy statements (Blake and Kirsanova, 2011; James and Stehn, 2008). Historically, the origin of the current inflation dates back to the 1970s, when the revenue accruing to the government from the non-renewable oil resource rose steeply. With the increase in public expenditure, enhanced by oil revenues, there was vast expansion in aggregate demand (Aiyede. 2002). With the inelastic supply of domestic output, inflation inevitably resulted. The rapid growth in money supply, as a result of the monetization of the earnings from oil and the Udoji award, also exerted upward pressure on the general price level.

The price of crude oil slumped in the world market during the first half of 1980s. Thus" Nigeria's crude oil, which sold at slightly above U.S $41 a barrel in early 1981, fell precipitously to less than US $9 by August 1986). This triggered a series of developments in the economy. One example is the state's fiscal crisis, as reflected in the persistent and substantial budget deficit which cumulated to approximately N17.4 billion in the five years between 1980 and '984. Monetary policy became highly expansionary as a large part of the deficits incurred during this period were financed through the creation of credit. Indeed, the total domestic credit to the economy recorded an average annual growth rate of 29.9% between 1980-84 and most of the increase was attributable to net claims by the government. Simultaneously, two-digit inflation at a mean yearly rate of 20.20/0 was registered, clear evidence, perhaps, in support of the monetarist proposition. But the inflation in 1984, which stood at almost 40% is often explained in terms of acute shortages of exported goods and services imposed by inadequate foreign exchange earnings, a derivative of the steep fall in crude oil prices.

With the deepening internal and external disequilibria, it became imperative to adopt the Structural Adjustment Programme (SAP) from July 1986. The SAP, which predicated mainly on the principle of "getting price right" has foreign exchange rate reformed as its central focus (FRN, 1986). In pursuit of this, the second- Tier Foreign Exchange Market (SFEM) was introduced in late September 1986 and since then the naira has depreciated sharply against the US dollar and other major currencies. Quantitatively, the naira, which traded at N4.62: $1.00 at the inception of SFEM in late September 1986, had by the end of 1996, exceeded N7.65 : $1.00, a change of almost 65.6% , and it is now N159:$1.00. During the same period, inflation leaps from barely 5.0% to almost 41.0%.

This development shows that the depreciation of the naira has a role to play in Nigeria's recent inflationary process. Concomitant with this is the substantial budget deficit operated annually by the various

tiers Government in the last decade. Part of the budget deficit is financed through bank credit, which directly affects the money base. This also exerts upward pressure on the general price level. All these suggest that there are many sources of the current inflation. While the channels through which exchange rate depreciation affects prices are well known, the extent to which this phenomenon engenders price inflation in Nigeria is one of the problems for this research.

This study is divided into five sections. Section one looks at the introductory aspect, while section two examines related literature works, section three established the theoretical frame work and model specification. Section four analysis the empirical results while section five gives the policy implications, recommendations and conclusion. It examines the quantitative effects of exchange rate depreciation on inflation in Nigeria using Error Correction model (ECM) , with quarterly secondary data from the Central Bank of Nigeria and the National Bureau of Statistics between 1981 and 2009. This, of course is met to understand whether the findings of the yester years are still valid in Nigeria, and to see what has changed.

Literature Review

Much attention has been paid to the process and stabilization of extreme inflation, at rates well in excess of 100 per cent a year (Dornbusch, 1987). Much less attention has been devoted to the inflationary problem in countries that, which Gil-Alana, Olanrewaju and OlaOluwa (2012) believe is double-digit, often in the aftermath of stabilization programme that have successfully brought extreme inflation to an end. At least since the 1920s it has been understood that money creation is one way of financing budget deficit (Bakare, 2011). An important conclusion from various econometric models employed by of Ajayi (1988) indicates that inflation in Nigeria is determined largely by developments in the external sector, but complemented by internal influences. Specifically, their finding demonstrates that the openness of the economy is highly correlated with inflation.

Imimole and Enoma (2011) posit that there is one and only one relationship between exchange rate and price inflation. Basing his argument on empirical studies of some African countries, one of his main conclusions is that devaluation could exert upward pressure on the general price level through its increased lost of production in the short-run. Focusing on Uganda, Elbadawi's (1990) research revealed that rapid monetary expansion and the precipitous depreciation of the exchange rate were the principal determinants of inflation during 1988-1989. He concluded from the comprehensive review of exchange rate and price movements that devaluation of the official exchange rate is inflationary. Canetti and Greene (1991) employ analytical to evaluate the relative contributions of exchange rate movements and monetary expansion to price inflation in ten African countries during 1978-89. The broad conclusion that emerged is that exchange rate movement and monetary growth explain the inflationary trend in the study countries. In countries such as Sierra Leone, Tanzania and Zaire, the bi-variants and tri-variant Granger tests point out that the exchange rate has significant causal influence on inflation. With respect to the role of money supply, the statistical test identified causation from money to prices in The Gambia, Sierra Leone and Uganda. As for Nigeria and Zambia, the various tests performed could not identify any significant causal relationship between money supply, exchange rate and inflation.

London (1989) had examined the role of money supply and exchange rate in the inflationary process in 23 African countries. The pure monetarist model was employed and the results revealed that in the period of 1974-1985, the growth of money supply, expected inflation and real income were significant determinants of inflation in the sample countries. The author however argued that because the results obtained only give account of the period averages of the countries studies, they should be seen as suggestive rather than definitive. The exchange rate was later introduced as one of the explanatory variables in the pure monetarist model. The results of this indicate that exchange rate movements had a significant impact on the inflationary process in the 1980s. Conversely, the growth of the money supply played a decreasing role in the course of inflation on the continent. This possibly suggests that structural elements have been the proximate cause of inflation in recent years.

In examining exchange rate depreciation and inflation in Nigeria. Egwaikhide, et-al (1994) find that depreciation of the exchange rate exerts upward pressure on inflation - but it takes a minimum period of one year before this is reflected on price inflation. Acceptance of this result implies acceptance of the fact that the county's price inflation is caused both monetary and structural factors.

According Ajakaiye and Ojowu (1994), the influence of exchange rate depreciation on the structure of sectional price is not invariant with respect to the prevailing pricing regime. The indication is that the pricing regime under which exchange rate depreciation causes the structure of sectional prices to change the most may not necessarily be under which the inflationary pressure will be the greatest. In their study, whereas exchange rate depreciation will cause the greatest changes in the structure of sectional prices under the

mixed mark-up pricing regime, it will cause the greatest upward pressure on prices under the universal flexible mark–up pricing regime.

Pinto (1990) identified the determinants of parallel market premium as demand for domestic money, the rate of inflation another terms of trade and argued that inflation rises because the devaluation involved in unification of both the official and parallel exchange rates eliminates revenues from export earnings.

Fakiyesi (1996) analyzed the main factors which influence inflation in Nigeria with a view to determining the relevant policy instruments that could reduce it. The study found that monetary expansion has been the dominant factor influencing inflationary growth in Nigeria, while exchange rate. Fullerton and Ikhide (1993) in their study of "inflation Dynamics in Nigeria" indicated that the consider devaluation of naira in the late 1980s and the 1990s in the midst of rising prices, might have considerably promote inflation. It was, however shown that exchange rate coefficients are not statistically significant, hence the emphasis was on monetary factor alone.

Section Three-Empirical Analysis

The goal of this study is to empirically investigate the main macroeconomic determinants of inflation in Nigeria by estimating a model that helps explain the long run (steady state) behaviour of inflation, as well as its interim short term pattern in the face of temporary movements in the mentioned determinants.

Testing for cointegration can be performed in a bivariate or multivariate framework. However, given that the present study considers more than one determinant, we restrict the discussion to the multivariate framework. Engle and Granger's criteria is that if two time series variables, p_t and q_t, are both non-stationary in levels but stationary in first-differences, i.e., both are *I(1)*, then there could be a linear combination of p_t and q_t, which is stationary, i.e., the linear combination of the two variables is *I(0)*. The two time series variables that satisfy this requirement are deemed to be cointegrated. A necessary condition for cointegration is that they are integrated of the same order.

To check whether or not two or more variables are cointegrated, it is necessary to first verify the order of integration of each variable by performing unit root tests.

Unit Roots Analysis

Generally, unit root test involves the test of stationarity for variables used in regression analysis. The importance of stationarity of time series used in regression borders on the fact that a non-stationary time series is not possible to generalize to other time periods apart from the present. This may produce spurious result.

Table 3.1 presents results of tests, in levels, without taking into consideration the trend in variables. The reason for this is that an explicit test of the trending pattern of the time series has not been carried out. In the result, the ADF and P-P test statistics for each of the variables is shown in the second and fourth columns respectively, while the 95 percent critical values are shown in the third and fifth columns. The result indicates that all of the variables have ADF values that are less than the 95 percent critical ADF value of 2.887. The implication of this is that most of the time series for these variables are non stationary in their level.

Table 3.1 Unit Root Test for Variables in Levels

Variable	ADF			P-P			Remark
	Test Statistic	95% Critical Value		Test Statistic	95% Critical Value		
INFL	-2.752	-2.887		-2.862	-2.887		Non-Stationary
LMS	0.932	-2.887		1.558	-2.887		"
LGDP	-0.715	-2.887		-0.246	-2.887		"
OPN	-1.962	-2.887		-2.596	-2.887		"
EXRT	0.006	-2.887		0.110	-2.887		"

Result extracted from the Eviews 3.1 output.

Moving forward, we take the first differences of the respective variables and perform the unit root test on each of the resultant time series. The rationale behind this procedure is that Box and Jenkins (1978) have argued that differencing non stationary time series will make it attain stationarity.

The result of the unit root test on these variables in first differences is reported in table 3.2 below. From the result, it is seen that the ADF and P-P test statistics for each of the variables is greater than the 95 percent critical ADF values (in absolute values). With this result, these variables are adjudged to be stationary. This implies that the variables are actually difference-stationary, attaining stationarity after the

first differences of the variables. Thus, we would accept the hypothesis that the variables possess unit roots. Indeed, the variables are integrated of order one (i.e. I[1]).

Table 3.2 Unit Root Test for Variables in First Difference

Variable	ADF		P-P		Remark
	Test Statistic	95% Critical Value	Test Statistic	95% Critical Value	
INFL	-4.664	-2.888	-7.364	-2.888	Stationary
LMS	-4.425	-2.888	-10.338	-2.888	"
LGDP	-3.819	-2.888	-12.114	-2.888	"
OPN	-5.519	-2.888	-11.698	-2.888	"
EXRT	-4.457	-2.888	-9.608	-2.888	"

Result extracted from the Eviews 3.1 output.

Analysis

Having established that the variables are characterized by a unit root process, we proceed to analyse the long run relational properties of the data series. This co integration test is based on the argument by that "given that time series have unit roots, a long run relationship exists between a linear combination of such series. Due to the nature of the study, the Engle and Granger (1987) two-stage method is employed in the cointegration test. If the residuals turn out to be stationary, then these variables are accepted as cointegrated. The second method employed in the study is the Johansson's trace test.

The result of the Engle and Granger cointegration tests for the two models is reported in table 3.3 below. In the table, the ADF test statistic value (which is -5.112) is greater than the 95 percent critical ADF value of -4.859 (in absolute values). This clearly indicates that the residuals are stationary. Indeed, there is cointegration between inflation and the selected monetary determinant variables in the model. Thus, we will conclude that a long run relationship exists between Price stability and both Money supply and interest rate.

Table 3.3: Results of Engle and Granger Residual Based Cointegration Tests

ADF Lag	ADF Test Statistic	95% Critical ADF Value	Remark
2	-5.112	-4.859	Stationary

Result extracted from the Microfit 4.1 output.
Note: The selection of lag is based on minimum Akaike Information Criterion

The Short -Run Dynamic Model

The short-run dynamic behaviour of inflation with respect to temporary changes in its determinants can be analyzed within the context of an error correction model (ECM). The Autoregressive Distributed Lags (ARDL) approach is used for the estimation of the ECM. The result of the estimation is presented in table 3.5 below. It should be noted that the R-Bar squared criterion was used to select the parsimonious equation.

In the error correction result, the diagnostic statistics are not quite impressive. The R squared value of 0.341 indicates that over 34 percent of the systematic variation in capital inflow is explained by the explanatory variables. However, the F-statistic value of 6.67 is also high and easily passes the significance test at the 1 percent level, indicating that the model possesses a high overall significance.

Table 3.5 Unit Root Test for Variables in First Difference

Variable	Coefficient	T-ratio
Intercept	-22.19	-1.667
ΔINFL(-1)	0.374	4.358
ΔLMS	8.588	1.980
ΔEXRT	-0.468	-1.260
ΔLGDP	4.392	0.703
ΔLGDP(-1)	13.41	2.049
ΔOPN	-5.231	-0.790
ecm(-1)	-0.191	-4.746
$R^2 = 0.341$	F= 6.67	DW Statistic = 2.14

Result extracted from the Microfit 4.1 output.

A close examination of the estimated coefficients for each of the explanatory variables reveals that the coefficients of lagged INFL, LMS and lagged GDP are significant in the ecm. Each of these coefficients is positive, indicating that they both contribute positively to inflation in Nigeria. Indeed, expected inflation, which is represented by the one period lagged inflation, is a strong determinant of current inflation in Nigeria. The higher the expectations, the higher will be the level of current inflation. This brings about the issue of persistence in inflation over time. when expectations are always exerting influence on inflation, current disequilibrium will tend to persist over time.

Money supply is also shown as a strong determinant of short term movement in inflation in |Nigeria. This is in line with findings in Masha (2000) where growth in money supply was shown to have very strong effects

on inflation in Nigeria. As the monetary base rises, individuals tend to spend more on goods and services. This tends to generally jack up prices and cause cost-push inflation.

In addition to the two variables above, lagged GDP is also a strong determinant of short run inflation. However, the response of inflation to the level of economic activities in the country is with a lag. Inflation is likely to rise after a period has elapsed, following a rise in GDP. Thus, inflation is seen to always post date GDP growth, suggesting that the level of inflation may be estimated given the current level of economic expansion. This apparently makes the management of inflation a bit easier given that it always responds to GDP changes in the short run.

The coefficient of the ECM is significant at the 1 percent level and has the correct negative sign. This suggests that any short run disequilibrium in the system will be adjusted in the short long. The coefficient is small and suggests that adjustment to equilibrium is very slow. Only about 19 percent of the adjustment to long run equilibrium is completed within the first period. Indeed, inflation in Nigeria seems to be persistent over time.

The Long Run Relationships

Finally, we analyse the long run behaviour of inflation in Nigeria. The results of the estimates of the long run equations are presented in Table 3.6 below. Only the coefficients and their asymptotic t-ratios are reported in the table.

Table 3.6: The Long run Model

Variable	Coefficient	T-ratio
Intercept	-116.3	-1.712
LMS	45.01	1.869
EXRT	-0.245	-1.310
LGDP	-28.40	-1.343
OPN	-27.41	-0.796

Result extracted from the Microfit 4.1 output.

In the long run result, non of the explanatory variables passes the 5 percent significance test. Only the coefficient of money supply manages to pass the test at the 10 percent level. All the other coefficients fail the significance test. Thus, long run behaviour of inflation in Nigeria is predicted by money supply, with positive impact on inflation. Sustained money supply is therefore shown to be a primary factor in long run inflation determination. The long run insignificance of exchange rate can easily be accepted because Nigeria has not been able to stimulate production for export since industrialization so as to benefit from devaluation.

Section Four - Policy Implications, Recommendations and Conclusion.

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 effective by international policy advisers, it can only help to restructure the price mechanism of both import and export in the short run, such that an increase exchange depreciation tend not to moderate any long run prices in Nigeria. It is therefore not sustainable because Nigeria is not industrialized for te long run benefit of exchange manipulation (devaluation). The deregulation of the naira may definitely help in curbing or moderating inflation, there is need for policy makers not to totally relied on this instrument to control inflation because of the mono-product nature of the Nigerian economy.

It is found that money supply is the only long run determinant of inflation in Nigeria, and they have positive relationship. This mean that the higher the money supply (monetary growth, the higher will be the inflation). This is evident in Nigeria whereby prices continue to rise during political campaigns and festivities, when so much money is push into the economy.

References

Aiyede, E. R. (2002), *Decentralizing public sector collective bargaining and the contradictions of federal practice in Nigeria* African Study Monographs, 23(1): 11-29

Ajaikanye O. and Ojowu (1994) *Exchange Rate Depreciation and Structure of sectoral prices in Nigeria* under an alternative pricing Regime, 1986 - 89 Africa Economic Research consortium.

Ajayi S.I (1988) *"Issues of overvaluation and Exchange rate adjustment in Nigeria"* Prepared for Economic Development Institute of the World Bank, Washington D.C

Andrew P. Blake, A.P. and Kirsanova,T. (2011), *Inflation conservatism and   monetary-fiscal   policy interactions.* International Journal of Central   Banking, Vol. 7 No. 2

Bakare, A. S. (2011), *An empirical study of the determinants of money supply   growth and its   effects   on inflation rate in Nigeria.* Journal of Research   in International Business and Management (ISSN: 2251-0028)   Vol.   1(5) pp. 124-129

Dornbush R. (1987), "*Purchasing power party in Eatwell J.M Milgate and P Newman (eds) 1987*". The New Palgrane: A Dictionary of Economics. Vol. 3 (London; Macmillan Press).

Egwaikhide, L. A. Et-al (1984) "*Exchange rate Depreciation, Budget Deficit and Inflation - the Nigerian Experience*" African Economic Research Consortium.

Elbadawi, LA (1990) "*Inflationary Process, Stabilization and the Role of Public Expenditure in Uganda*", Mimeo, World Bank.

Engle, R. & Granger C. (1987) "*Co-integration and Error-Correction: Representation, Estimation, and Testing*" Econometric, 55, 251 - 76.

Fakiyesi, T. (1996) "Further Empirical Analysis of Inflation in Nigeria", CBN Economic and Financial Review, Vol. 34, No.1. Pp. 489 - 499.

Gil-Alana, L. A. et-al (2012), *Long memory, structural breaks and mean shifts in   the inflation rates in Nigeria.* African Journal of Business Management   Vol. 6(3), pp. 888-897.

Ikhide, S. I. (1993) "*Financial Liberalization and the Inflationary Process: Is There a Link in adjusting Developing Countries?*", International Review of Economics and Business, Vol. 40, pp. 157 - 174.

Imimole, B. and Enoma, A. (2011), E*xchange rate depreciation and inflation in Nigeria (1986–2008).* Business and Economics Journal, Volume 2011: BEJ-28

James,J and Stehn, J. (2008) *Modelling the interactions of monetary and fiscal   policies   in   the   US.* University of Oxford.

London A. (1989*)* "*Money inflation and adjustment policy III Africa. Some further evidence*" African Development Review, Vol. 1. No.2.

Masha, I. (2000), *New perspectives on inflation in Nigeria*. CBN Economic &   Financial   Review, Vol. 38 No. 2 34-56

Pinto, B. (1990) "*Black Market Premia, Exchange Rate Unification and Inflation in Sub-Saharan Africa*" , World Bank Economic Review vol. 3, No.3 pp. 321 - 338.