NOVEMBER 1995

**RESEARCH PAPER THIRTY-NINE** 

## MONEY SUPPLY MECHANISMS IN NIGERIA (1970-1989)

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# Money supply mechanisms in Nigeria (1970-89)





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# Money supply mechanisms in Nigeria (1970-1989)

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AERC Research Paper 39 African Economic Research Consortium, Nairobi November, 1995 ©African Economic Research Consortium, 1995

Published by The African Economic Research Consortium, P.O. Box 62882, Nairobi, Kenya.

Printed by the Regal Press Kenya Ltd., P.O. Box 46116, Nairobi, Kenya.

ISBN 9966-900-48-9

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## Acknowledgements

We are grateful to AERC for financing this study. This version of the report has benefitted from comments of AERC's Group C technical committee members and two anonymous referees. Mark Schneipp gave valuable advice and assistance and June Finney provided excellent secretarial support. We bear full responsibility for all views expressed and errors therefrom.

## Abstract

This study investigates the process of money in Nigeria in order to provide an explanation for the inflationary acceleration in money supply that occurred in the period 1970-1989. Initial double-digit inflation was found to have originated from the rapid growth in the external sector as a result of the oil export boom of the 1970s. The monetary authorities largely monetized the export receipts in order to finance a greater level of economic activities. The government then followed the monetization policy with a real bills doctrine, the success of which was ensured by the generous lending stance of Central Bank.

## I. Introduction

This study investigates and analyses the process of money supply in Nigeria in the fashion of the Turkish economy model developed by Fry (1978, 1985, 1988). The choice of the analytical framework was informed by the striking similarities in the developments in both economies, as well as the behaviour of their monetary authorities in the periods covered by the different studies. Both countries have experienced bouts of doubledigit inflation triggered by rapid monetary growth that was initially influenced by rapid increases in foreign exchange receipts corresponding to different phases of booming external sector. For example, the Turkish economy benefitted from the Korean war boom of the 1950s as well as a large increase in agricultural exports in the same period; in the 1970s, it enjoyed a substantial increase in remittances from Turkish workers in Germany and also experienced a commodity export boom. On its part, Nigeria experienced an oil export boom in the 1970s.

The monetary authorities of both countries made frequent use of traditional instruments of direct monetary control, such as fractional reserve banking, interest rate ceilings and mandating commercial banks to take up unsold government securities. When this is coupled with the fact that governments in both countries held a substantial proportion of the paid-up capital of several commercial and development banks in the relevant periods, it is clear that the monetary authorities in both countries had a monopoly control over the supply side of their money markets. Nigeria, however, introduced a structural adjustment programme (SAP) in 1986 that was supposed to achieve reasonable reductions in fiscal and monetary expansion while also moving the country in the direction of a market economy. Due recognition is given to these factors in the course of the analysis.

Table 1 presents some indicators of the monetary management system in Nigeria over the period from 1970-1989. The following observations emerged from the table. First, money supply growth averaged about 33% in 1971-1980 and 13% in 1981-1989; inflation appears to have moved in line, with respective levels of 19% and 16% in the two decades. Second, the explosive stage of Nigeria's inflationary experience appears to be the 1973-1975 period which coincides with the period of the first oil shock of the 1970s; between 1973 and 1974 alone, the country's foreign exchange receipts grew at the unprecedented rate of about 113%. Third, the monetary authorities appear to have relied almost exclusively on commutation of foreign exchange receipts into domestic expenditures in the oil boom period but resorted to deficit financing to sustain the expansionary monetary impulse in non-oil boom years<sup>1</sup>. Fourth, the real deposit rate of interest in the country was mostly negative, suggesting deliberate inflationary financing on the part of the monetary authorities. Fifth, the somewhat general decline in the velocity

Table 1:	Selected indicato	rs of the monetary	r management	process: Nigeria				
Date	Real GDP growth rate	Money growth rate	Inflation	Velocity of circulation	Nominal deposit rate <sup>1</sup>	Real deposit rate	Deficit money ratio(%)	Growth rate of foreign exchange receipts
1970			I	5.74	3.50	ł	49.8	I
1971	18.2	6.4	6.8	6.81	3.50	-3.30	0.0	51.4
1972	7.7	15.5	0.8	6.40	3.50	2.70	0.0	6.8
1973	2.0	25.2	42.5	7.43	3.50	-39.00	0.0	64.9
1974	12.0	81.0	49.7	6.89	3.50	-46.20	0.0	161.6
1975	-3.2	53.0	19.6	5.21	4.50	-15.10	11.8	-12.5
1976	10.9	39.9	14.2	4.72	4.50	-9.70	20.2	22.0
1977	8.2	33.7	9.7	4.19	3.50	-6.20	12.8	23.9
1978	-7.4	-3.7	19.0	4.80	5.50	-13.50	0.0	-16.9
1979	2.6	31.0	16.6	4.38	5.50	-11.10	0.0	50.6
1980	5.3	46.1	11.9	3.53	5.75	-6.15	13.7	41.8
1981	-8.5	5.9	9.0	3.33	6.50	-2.50	25.3	-21.3
1982	-0.3	9.5	2.2	3.10	7.75	5.55	32.2	-27.1
1983	-5.4	14.0	16.8	3.00	7.75	-8.25	17.8	-0.0-
1984	5.1	11.6	17.3	2.99	10.00	-7.30	0.0	20.5
1985	9.4	0.0	4.0	3.13	10.00	6.00	12.8	-1.2
1986	3.1	2.0	-2.1	3.10	10.00	12.10	33.6	238.7
1987	-0.5	22.4	49.7	3.77	15.80	-33.90	19.6	2.7
1988	10.0	32.9	21.4	3.78	14.30	-7.10	28.4	88.3
1989	5.2	10.7	28.3	4.61	21.20	-7.10	28.6	88.8

Sources: Computed from: Central Bank of Nigeria, Annual Report and Statement of Accounts, various issues; International Monetary Fund, International Financial Statistics, various issues.

Note: Rate on deposits, 12 months and above.

of circulation of money during the period suggests a reduction in the efficiency of money in the production process.

Based on the foregoing, this study analyses the money supply process in Nigeria in order to provide an explanation for the inflationary acceleration in money supply that occurred in the period from 1970-1989. It identifies the components of the money supply and analyses the factors that accounted for changes in them.

The rest of the paper is organized as follows. Section II describes the analytical framework used in the analysis while Section II deals with the issues of methodology and data. Section IV covers the analysis including the estimated results and their interpretations, while Section V is concerned with testing for sterilization. Section VI gives some concluding remarks. An appendix presents alternative specifications and estimating techniques.

## II. The analytical framework

The standard approach to modelling the money supply process in developed countries is the money multiplier approach. This approach may, however, be inappropriate in the case of developing countries with peculiar monetary management features. Such features as identified in Fry (1985) include the failure of monetary authorities to use any macroeconomic model for monetary policy purposes, excessive monetary behaviour as would perhaps be informed by the belief that money is just a veil with no real effect on either prices or output, and the widespread application of direct monetary control measures including institutionally determined interest rates that are usually fixed for a long period of time.

The monetary management system in Nigeria was characterized by all of these features prior to 1986. Hence, the money supply model employed in this study departs from the multiplier approach and derives from the consolidated balance sheet of the central and commercial banks such that

$$\Delta M = \Delta DCp + \Delta NDCg + \Delta NFA - \Delta NOI;$$
(1)

where  $\Delta$  implies change; M is broad money supply; DCp is domestic credit expansion to the private sector; NDCg is domestic credit expansion to the government or public sector; NFA is net foreign assets and NOI is net other items.<sup>2</sup> Changes in the money supply would result from overall changes on the right hand side of Equation 1. Hence, explanations of changes in domestic credit, net foreign assets and net other items would combine to explain changes in the money supply.

## Private sector domestic credit (DCp)

A factor long identified as accounting for the expansionary character of money supply in the country is the need to finance a greater level of economic activities.<sup>3</sup> This would appear to admit changes in nominal income ( $\Delta Y$ ) as an explanatory variable in a DCp function. However, for the simple reason that the past level of gross domestic product (GDP) has been the basis of forecasting current GDP in the economy, lagged GDP ( $\Delta Y_{tel}$ ) would appear more appropriate.

An increase in foreign exchange receipts ( $\Delta F$ ) would not only raise net foreign assets but would also stimulate domestic credit expansion to the private sector to finance a greater level of imported raw materials and machineries.  $\Delta F$  thus enters as an exogenous variable in this model. Both the government and the private sector compete for available domestic credit which means that an increase in net domestic credit to the government ( $\Delta$ NDCg) would be at the expense of credit to the private sector. Also, Fry's (1978, 1985, 1988) model includes changes in the terms of trade ( $\Delta$ TT) as an independent variable in the sense that a fall in terms of trade would elicit an increase in private sector demand for credit in order to boost trade. The same argument may not readily apply in the context of Nigeria due to the dominating influence of oil export receipts in revenue and expenditure matters. Hence a change in terms of trade may not necessarily produce any significant effect on demand for credit in the private sector.

Aggregating the factors, the DCp function (which is specified as a partial adjustment model) is as follows:

$$\Delta DCp = \alpha_0 + \alpha_1 \Delta Y_{1,1} + \alpha_2 \Delta F + \alpha_3 \Delta NDCg + \alpha_4 \Delta TT + \alpha_5 \Delta DCp_{1,1} + \mu$$
(2)

 $\alpha_1, \alpha_2, \alpha_5 \ge 0; \alpha_3 \le 0; \alpha_4 \ge \le 0$  (Here and in all cases  $\mu$  is error term).

### Public sector domestic credit (NDCg)

In the tradition of models of self-generating inflation (e.g., Aghevli and Khan, 1977, 1978; Dutton, 1971), lags in revenue collection often influence government's demand for credit. Lags in revenue collection can be proxied by lagged changes in GDP ( $\Delta Y_{t-1}$ ). An additional argument for specifying lagged changes in GDP as an explanatory variable in a NDCg function can be advanced for the Nigerian situation. The monetary authorities often use the previous year's GDP, as the basis of projecting current GDP which in turn is used as basis of targeting budget deficit.

In a high inflation setting, the effect of rising prices on government borrowing cannot be overlooked. Rising prices not only erode the tax base but also increase government expenditure outlay. The propensity for rising government borrowing will be high in a situation (as was the case in Nigeria for the greater part of the period under consideration) where government freezes the prices of products of state-owned enterprises as part of its anti-inflation drive. An additional channel of influence of inflation on government borrowing is through its effect on the real cost of credit especially in a situation of fixed nominal interest rates. Seigniorage gains accrue to the government as it is thus able to borrow cheaply in the domestic market. Thus, our NDCg equation expressed as a partial adjustment model is:

$$\Delta NDCg = a_0 + \alpha_1 \Delta Y_{1-1} + \alpha_2 \Delta P + a_3 \Delta NDCg_{1-1} + \mu$$
(3)  
$$\alpha_1, \alpha_2, \alpha_3, \ge 0$$

## Net foreign assets (NFA)

The monetary approach to balance of payments (see, e.g., IMF, 1977; Johnonson, 1972) suggests that changes in net foreign assets will be affected negatively by an increase in domestic credit ( $\Delta DC$ ) and positivly by factors raising the demand for money. Basic factors accounting for growth in demand for money are nominal GDP and the real deposit rate of interest  $(d - \dot{p})$ . Net foreign assets would also change in line with changes in foreign exchange receipts ( $\Delta F$ ). Using lagged changes in GDP, the NFA equation in partial adjustment expression is:

$$\Delta NFA = \alpha_0 + \alpha_1 \Delta F + \alpha_2 \Delta Y_{t-1} + \alpha_3 \Delta (d - \dot{p}) + \alpha_4 \Delta DC + \alpha_5 \Delta NFA_{t-1} + \mu$$

$$+ \alpha_5 \Delta NFA_{t-1} + \mu$$

$$a_1, a_2, a_3, a_5, \ge 0; \alpha_4 \le 0$$
(4)

## Net other items (NOI)

Import predeposits, as in import licensing, constitute an important component of net other items. However, as they are measures designed to conserve foreign exchange, they would vary inversely with changes in net foreign assets. Using NFA<sub>t-1</sub>, the NOI function as a partial adjustment specification is:

$$\Delta \text{NOI} = \alpha_0 + \alpha_1 \Delta \text{NFA}_{t-1} + \alpha_2 \Delta \text{NOI} + \mu$$

$$a_1 \le 0; a_2 \ge 0$$
(5)

## III. Methodology and data

Both ratio and estimation techniques are used in this analysis. In the estimations, we follow the principle of general to specific methodology. For example, we interchange GDP and GNP to establish better relative performance. Also, all equations were initially estimated in log difference; however, only the DCp function performed reasonably well. As a result, we settled for specification in linear difference. Some of the estimated functional equations did not give a good fit especially in the period beginning from 1986. While a variety of factors (such as structural breaks in data series or omitted variables) could have accounted for the development, initial estimates were adversely affected. We therefore resorted to the use of dummy variables in the affected models. However, the dummy variables were applied selectively depending on the year that a functional equation was judged through graphics examination to have experienced such a poor fit. Equations estimated without dummy are reported in the appendix. All the data used in the study were obtained from the publications of the Central Bank of Nigeria and the International Monetary Fund (IMF).

## IV. The analysis

An indication of the relative importance of the variables in money supply is given by their proportional distribution in Table 2. The table shows that private sector domestic credit constituted roughly 50% of M2 in the periods 1970-1975 and 1976-1980, after which it rose into the 60% range. This growth trend would appear to reflect the need for increased economic activities in order to sustain the growth rate of the country. Public sector domestic credit, which was a low 3% in the first period, rose sharply to about 29% in the next period before shooting up rapidly into the lower half of the 70 percentile range. It fell to about 55% in the last period.

This growth trend appears to be consistent with the macroeconomic developments in the country. The government had little or no reason to borrow during the period of the first oil shock (1970-1975). Indeed, in the years 1974 and 1975, net domestic credit to the government was negative, suggesting that government lent money to the private sector of the economy. The combination of the oil glut of 1976/77 and the fiscal response to the first oil shock saw public sector domestic credit rising rapidly in the second period. Further enlargement in the fiscal responsibilities of the government (as evidenced, for example, by the increase in federal universities from about 6 in the early 1970s to over 20 in the late 1980s) accounted for the astronomical growth in public sector domestic credit to over 70% in the third period. Its decline in period IV may not be unconnected with the SAP that was being implemented then.

In contrast to private sector domestic credit and public sector domestic credit, changes in net foreign assests M2 was more dramatic; it fell from about 71% during 1970-1975 to about 10% during 1981-85, before rising to about 28% in the last period. More than any factor, this trend appears to reflect the vissicitudes of the external sector of the economy from oil boom in the 1970s to oil glut in the 1980s.

In a somewhat unique fashion, net other items which serves to reduce the supply of M2, fell in relation to M2 only during 1976-1980, after which it rose through 41% in the period 1981-85 to about 48% in the last period. Expectedly, the net other items growth trend appears to mirror the developments in the external sector of the economy with the fall in foreign exchange receipts in the 1980s resulting in tightened exchange control measures such as increased quantitative restrictions.

The estimated supply function for domestic credit to the private sector (DCp) is presented in Table 3 below.

	Period	DCp	NDCg	NFA	NOI	Total	
l	1970-75	48.1	2.7	70.9	-21.8	99.9	
11	1976-80	50.8	28.8	36.6	-16.2	100.00	
Ш	1981-85	61.7	71.5	8.0	-41.3	99.9	
IV	1986-89	65.4	54.6	27.9	-47.9	100.00	

**Table 2**: Percentage composition of money supply (M2)

Note: Figures may not sum up to 100 due to rounding.

Source: Computed from International Monetary Fund, International Financial Statistics, various issues.

Table 3: Equation 2: DCp ful	nction	by	LS
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LS // dependent variable is  $\Delta$ DCP Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	T-Statistic	Prob	
C	374.0799	262.0334	1.427604	0.1789	
ΔGDP (-1)	0.061792	0.020309	3.042580	0.0102	
ΔFX	0.055742	0.024864	2.241918	0.0446	
ΔNDCG	-0.099893	0.061338	-1.628579	0.1294	
ΔDCP (-1)	0.530008	0.167436	3.165441	0.0081	
ΔTOT	-372.5361	230.4144	-1.616809	0.1319	
R-squared	0.850816	Mean dependent var		1491.167	
Adjusted R-squared	0.788656	SD dependent var		1338.412	
SE of regression	615.2971	Akaike info criterion		13.10541	
Sum squared resid	4543086.	Schwartz criterion		13.40220	
Log likelihood	-137.4896	F-statistic		13.68751	
Durbin-Watson stat	1.475308	Prob (F-statistic)		0.000132	

The corresponding elasticities computed about the mean are as follows:

$$\Delta DCp = 0.32\Delta Y_{t-1} + 0.02\Delta F - 0.02\Delta NDCg - 0.02\Delta TT + 0.45\Delta DCp_{t-1}$$
(6)

The results show that all variables have the expected sign with the negative sign of the terms of trade coefficient, suggesting that a decline in the terms of trade elicited an increase in domestic credit to the private sector, probably to sustain the growth of the



GDP. However, the terms of trade coefficient was not significant at the 5% level of testing. The coefficients of lagged GDP, foreign exchange and lagged DCp are significant at 5%, but the coefficient of NDCg is not.

In the context of the computed elasticities, the result suggests that, holding other factors constant, a 1% increase in previous year's GDP is associated with about 0.32% increase in domestic credit to the private sector. In the same vein, a 1% increase in foreign exchange receipts would result in about 0.02% increase in private domestic credit. Also, about 0.45% increase in private domestic credit would result from a 1% increase in its previous year's level. In contrast, a 1% decrease in net domestic credit to the government (NDCg) and terms of trade (TT) would each, other things being equal, generate about 0.02% increase in private domestic credit.

Overall, the regression result appears a good fit with an adjusted  $\overline{R}^2$  of over 78%, which was obtained at a Durbin-Watson statistic of about 1.48. With respect to the public domestic credit function, a poor fit was graphically observed around 1989 (see Figure 1) and this in turn appears to have adversely affected the estimated result. A dummy variable for 1989 was subsequently introduced into the equation and the improved results are presented in Table 4.

The corresponding elasticities computed about the mean are as follows:

$$\Delta NDCg = 2.42\Delta Y_{t,1} + 1.77\Delta P + 3.63\Delta NDCg_{t,1}$$
(7)

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Table 4: Equation 3: ND	OCg function by L	3
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#### LS // dependent variable is ∆NDCG Sample: 1972 1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Prob	
C ΔGDP (-1) ΔP ΔNDCG (-1) D89	-123.2257 0.085111 40.26420 0.664137 -31259.75	504.8801 0.044424 29.25420 0.215753 2212.527	-0.244069 1.915863 1.376356 3.078228 -14.12853	0.8110 0.0776 0.1920 0.0088 0.0000	
R-squared Adjusted R-squared SE of regression Sum squared resid Log likelihood Durbin-Watson stat	0.958790 0.946110 1369.169 24370114 -152.6074 1.307689	Mean deper SD depende Akaike info Schwartz cr F-statistic Prob (F-stat	ndent var ent var criterion iterion tistic)	272.444 5897.950 14.67405 14.92138 75.61366 0.000000	

The results show that all variables bear the expected sign. Whereas the coefficient of lagged GDP is only significant at about 10% level of testing, that of lagged NDCg is significant at 5%. The coefficient of the price level ( $\Delta P$ ) is not significant at even 10%. In terms of the elasticities, a 1% increase in previous year's GDP would, other things being equal, lead to about 2.42% increase in net domestic credit to the government. Similarly, a 1% increase in previous year's government borrowing would generate about 3.63% increase in current NDCg, and a 1% inflation would engender about 1.17% increase in net government borrowing. The equation's adjusted  $\overline{R}^2$  is about 90%, suggesting a good fit of the regression results. However, the Durbin-Watson statistic appears to suggest the presence of some degree of autocorrelation between the error terms of the succeeding periods.

The supply function for net foreign assets (NFA) is presented in Table 5.

The corresponding elasticities<sup>4</sup> are:

$$\Delta NFA = 0.07\Delta F + 0.74\Delta Y_{t-1} + 0.001\Delta (d - \dot{p}) - 1.03\Delta DC - 0.05\Delta NFA_{t-1}$$
(8)

Apart from lagged NFA, all variables have the correct sign. The coefficients of lagged GDP and domestic credit ( $\Delta DC$ ) are significant at 5%, while the coefficients of foreign exchange receipts and real deposit rate of interest are not. The wrong sign of lagged NFA appears to suggest a poor partial adjustment of NFA to changes in its deter-

#### Table 5: Equation 4: NFA function by LS

#### LS // dependent variable is ∆NFA Sample: 1972 1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
C	1257.477	609.4821	2.063189	0.0614
ΔFX	0.116518	0.070979	1.641582	0.1266
ΔGDP (-1)	0.093038	0.044619	2.085170	0.0591
ΔRI	65.42666	123.6193	0.529259	0.6063
ΔDC	-0.574449	0.177713	-3.232444	0.0072
ΔNFA (-1)	-0.118748	0.300046	-0.395766	0.6992
R-squared	0.753060	Mean dependent var		981.3333
Adjusted R-squared	0.650168	SD dependent var		2758.636
SE of regression	1631.639	Akaike info criterion		15.05588
Sum squared resid	31946956	Schwartz criterion		15.35267
Log likelihood	-155.0438	F-statistic		7.318951
Durbin-Watson stat	1.712460	Prob (F-statistic)		0.002329

Note: RI is real deposit rate of interest, which is represented as  $(d - \dot{p})$  under the analytical framework.

minants. Figure 2 suggests a lack of good correspondence between the actual and fitted values of net foreign assets.

In the context of the computed elasticities, domestic credit appears to have a strong influence on net foreign assets. A 1% decline in domestic credit, other things being equal, would result in about 1.03% increase in NFA. Also, a 1% increase in previous year's GDP and foreign exchange receipts would produce an increase of about 0.74% and 0.07% respectively, in NFA. The effect of a 1% change in real deposit rate of interest is almost negligible at about 0.001%.

Overall, the regression results appear to be a good fit with an adjusted  $\overline{R}^2$  of about 65% and a Durbin-Watson statistic of 1.71.

Figure 3 depicts the relationship between the actual and fitted values of the NOI function. The relationship appears to break down in 1989. Adjusting for this through a relevant dummy variable produces the result in Table 6.

The computed elasticities are:

$$\Delta \text{NOI} = -0.24 \Delta \text{NFA}_{t-1} + 0.30 \Delta \text{NOI}_{t-1}$$
(9)





Figure 3: NOI function



Included observations	cluded observations: 18 after adjusting endpoints					
Variable	Coefficient	Std. error	T-statistic	Prob		
с	1139.938	528.4386	2.157182	0.0489		
∆NFA (-1)	-0.246155	0.281253	-0.875210	0.3962		
ΔNOI (-1)	0.120690	0.260421	0.463440	0.6502		
D89	-13068.66	1919.592	-6.808041	0.0000		
R-squared	0.777420	Mean depend	ent var	440.6111		
Adjusted R-squared	0.729724	SD dependen	t var	3540.316		
SE of regression	1840.541	Akaike info cri	terion	15.22876		
Sum squared resid	47426273	Schwartz crite	rion	15.42662		
Log likelihood	-158.5997	F-statistic		16.29958		
Durbin-Watson stat	2.044689	Prob (F-statist	lic)	0.000076		

#### Table 6: Equation 5: NOI function by LS

#### LS // dependent variable is DNOI Sample: 1972 1989 Included observations: 18 after adjusting endpoints

The results show that both explanatory variables are correctly signed, but neither is significant. The computed elasticities associate about 0.24% decline in net other items to 1% increase in net foreign assets while about 0.3% increase in net other items would result from a 1% increase in its previous year's value.

The regression results appear to be a good fit. The adjusted is about 70%, while the Durbin-Watson statistic is about 2.0.

The estimates presented in Tables 2 to 6 and their respective elasticities in equations 6, 7, 8 and 9 purport to explain the behaviour of money supply in Nigeria in the period 1970-1989. The monetary authorities appear to have sanctioned private sector credit expansion in response to the need for increased economic activities while also pursuing a real bills policy. The real bills policy, which was principally anchored on Central Bankís generous lending operations, became a major means of monetary expansion especially in periods of sluggish growth in the external sector.

## V. Testing for sterilization

Sterilization policy warrants that domestic credit should be reduced when net foreign assets rise. It also requires that changes in domestic credit expansion to the government should be sterilized through appropriate changes in domestic credit to the private sector. Thus, in a DCp function as in Equation 10 below, sterilization policy would be indicated by negative coefficients of NFA and NDCg.

$$\Delta DCp = \alpha_0 + \alpha_1 \Delta NDCg + \alpha_2 \Delta NFA + \alpha_3 \Delta Y_{t-1} + \alpha_4 \Delta DCp_{t-1} + \mu$$
(10)  
$$\alpha_1, \alpha_2 \le 0; \alpha_3, \alpha_4 \ge 0$$

The initial estimates of Equation (10) show both NDCg and NFA as wrongly signed. However, a break in the correspondence between the actual and fitted values of the function around 1986 was graphically detected (see Figure 4). Adjusting for this through a relevant dummy variable produces the results in Table 7.

The results show that, of the two variables of concern (NFA and NDCg), only the coefficient of NFA has the correct sign; the coefficient of NDCg is, however, close to zero. The coefficient of NFA is not significant at even 10% level of testing. All of these suggest a lack of sterilization policy in the period.

#### Table 7: Equation 10: DCp by LS

## LS // dependent variable is $\Delta DCP$ Sample: 1972, 1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Prob
C ΔNDCG ΔNFA ΔGDP (-1) ΔDCP (-1) D86	118.2376 0.013963 -0.089498 0.096862 0.435613 2806.089	151.3714 0.027547 0.064974 0.010628 0.087847 399.6687	0.781109 0.506897 -1.377445 9.114116 4.958749 7.021037	0.4499 0.6214 0.1935 0.0000 0.0003 0.0000
R-squared Adjusted R-squared SE of regression Sum squared resid Log likelihood Durbin-Watson stat	0.946339 0.923981 369.0215 1634123 -128.2871 1.457704	Mean depende SD dependent Akaike info crite Schwartz criteri F-statistic Prob (F-statistic	nt var var erion ion	1491.167 1338.412 12.08291 12.37970 42.32549 0.000000

Figure 4: NDCp function (sterilization test)



## VI. Concluding remarks

This paper has shown that the Nigerian monetary authorities pursued an expansive monetary policy over the period from 1970-1989 in order to accommodate both the private and public sector's increasing demand for credit. Both foreign exchange receipts and deficit budgeting were used to finance the expansive policy. Thus, while the monetary authorities did not pursue any sterilization policy in the period, they did promote a real bills policy, the success of which was ensured by the generous lending stance of the Central Bank (through its frequent holding of substantial proportion of unsubscribed government securities). Whereas both inflation and lags in tax revenue collection influenced government borrowing in the period, the need for increased economic activities and foreign exchange receipts was the strongest determinant of credit expansion in the private sector.

The general effects of the monetary expansion of the period were the rapid depletion of the country's foreign assets and a money supply level that clearly exceeded the absorptive capacity of the economy hence, potentially threatening price stability and real output growth.

These findings generally suggest that the monetary authorities in the country should pay particular attention to the level and growth rate of the money supply and, by implication, the extent of government borrowing from the Central Bank. In order to avoid the type of destabilizing inflationary monetary expansion that characterized of the period covered by this study, the Central Bank should establish money supply growth targets based on real output growth targets. Efforts should thus be geared towards ensuring that the actual money supply level does not exceed the established targets.

Finally, an active sterilization policy would serve to reduce the effect of exogenous shocks on money supply, hence domestic economic activities. The frequent tendency of the economy towards a recession after a period of rapid growth in the external sector would thus be eliminated, or at least, significantly reduced.

## Appendix A: Alternative estimates and specifications

#### Table A1: ALog DCp by LS

LS // dependent variable is  $\Delta$ LOGDCP Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
<u>_</u>	0.040005	0.047000	0.050700	0.7000
C	-0.016965	0.047282	-0.358793	0.7260
∆LOGGDP (-1)	0.571048	0.119976	4.759663	0.0005
∆LOGFX	0.050553	0.027822	1.816979	0.0943
∆LOGNDCG	0.000652	0.011286	0.057765	0.9549
∆LOGDCP (-1)	0.563258	0.200938	2.803146	0.0160
∆LOGTOT	-0.050970	0.165977	-0.307092	0.7640
R-squared	0.759412	Mean depend	lent var	0.212928
Adjusted R-squared	0.659166	SD depender	SD dependent var	
SE of regression	0.065296	Akaike info criterion		5.196435
Sum squared resid	0.051163	Schwartz criterion		-4.899645
Log likelihood	27.22702	F-statistic		7.575543
Durbin-Watson stat	1.908834	Prob (F-statis	tic)	0.002012

#### Table A2: ∆Log NDCg by LS

LS // dependent variable is  $\triangle$ LOGNDCG Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
•				
C	2.047434	1.085881	1.885505	0.0803
∆LOGGDP (-1)	-4.428808	4.042286	-1.095620	0.2917
∆LOGP	-6.883813	4.218808	-1.631696	0.1250
∆LOGNDCG (-1)	-0.049854	0.256031	-0.194717	0.8484
R-squared	0.243366	Mean depend	lent var	0.129120
Adjusted R-squared	0.081230	SD depender	it var	2.251882
SE of regression	2.158486	Akaike info cr	iterion	1.731944
Sum squared resid	65.22686	Schwartz crite	erion	1.929804
Log likelihood	-37.12839	F-statistic		1.500997
Durbin-Watson stat	1.696597	Prob (F-statis	tic)	0.257554

#### Table A3: △Log NDCg by LS

#### LS // dependent variable is △LOGNDCG Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
~	0.004816	1 1 2 0 6 7 2	1 770110	0.0000
	2.004616	1.130073	-0.978776	0.0996
ALOGP	-6.662260	4.417528	-1.508142	0.1554
∆LOGNDCG (-1)	-0.041630	0.265964	-0.156525	0.8780
D89	-0.750525	2.378167	-0.315590	0.7573
R-squared	0.249118	Mean depende	ent var	0.129120
Adjusted R-squared	0.018078	SD dependent	var	2.251882
SE of regression	2.231435	Akaike info crit	erion	1.835423
Sum squared resid	64.73094	Schwartz criter	ion	2.082749
Log likelihood	-37.05970	F-statistic		1.078245
Durbin-Watson stat	1.699554	Prob (F-statisti	c)	0.406813

#### Table A4: △LogNFA by LS

LS // dependent variable is △LOGNFA Sample: 1972-1989 Included observations: 16 Excluded observations: 2 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
C	0 235015	0 287336	0.817908	0 4325
ΔLOGFX	0.650916	0.220932	2.946226	0.0146
∆LOGGDP (-1)	1.667887	1.371404	1.216189	0.2518
∆LOGRI	-0.064904	0.111719	-0.580963	0.5741
DLOGDC	-2.059995	0.467986	-4.401825	0.0013
∆LOGNFA (-1)	-0.035301	0.266205	-0.132610	0.8971
R-squared	0.758721	Mean depende	ent var	0.176901
Adjusted R-squared	0.638081	SD dependent	var	0.749655
SE of regression	0.450990	Akaike info crit	erion	-1.312625
Sum squared resid	2.033918	Schwartz criter	ion	-1.022904
Log likelihood	-6.202020	F-statistic		6.289159
Durbin-Watson stat	2.098802	Prob (F-statisti	c)	0.006854

#### Table A5: △LOGNOI by LS

#### LS // dependent variable is $\triangle$ LOGNOI Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
C ∆LOGNFA (-1) ∆LOGNOI (-1) D89	0.277017 -0.142643 -0.037411 -1.143906	0.091052 0.091672 0.247634 0.280980	3.042389 -1.556014 -0.151074 -4.071131	0.0088 0.1420 0.8821 0.0011
R-squared Adjusted R-squared SE of regression Sum squared resid Log likelihood Durbin-Watson stat	0.573095 0.481616 0.271147 1.029288 0.212648 2.049872	Mean depende SD dependent Akaike info crit Schwartz criter F-statistic Prob (F-statisti	ent var var erion ion c)	0.173535 0.376599 -2.417060 -2.219200 6.264740 0.006422

#### Table A6: NOI by LS

#### LS // dependent variable is ∆NOI Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
C ΔNFA (-1) ΔNOI (-1)	733.9951 -0.415029 -0.102111	1053.181 0.561943 0.518215	0.696932 -0.738561 -0.197044	0.4965 0.4716 0.8464
R-squared Adjusted R-squared SE of regression Sum squared resid Log likelihood Durbin-Watson stat	0.040531 -0.087399 3691.785 2.04E+08 -171.7496 1.375862	Mean depende SD dependent Akaike info crit Schwartz criter F-statistic Prob (F-statisti	nt var var erion ion c)	440.6111 3540.316 16.57874 16.72714 0.316821 0.733218

#### Table A7: LOGDCp by LS

#### LS // dependent variable is △LOGDCP Sample: 1972-1989

Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability	
C	0.011980	0.049221	0.243404	0.8115	
ALOGNDCG	0.004331	0.010635	0.407260	0.6904	
ALOGNFA	0.001221	0.031168	0.039170	0.9693	
$\Delta LOGGDP (-1)$	0.577390	0.131644	4.385984	0.0007	
$\Delta LOGDCP (-1)$	0.443706	0.194768	2.287123	0.0403	
R-squared Adjusted R-squared SE of regression Sum squared resid Log likelihood Durbin-Watson stat	0.691567 0.596664 0.071032 0.065591 24.99127 1.743220	Mean depende SD dependent Akaike info crit Schwartz criter F-statistic Prob (F-statisti	ent var var erion ion c)	0.212928 0.111845 -5.059129 -4.811804 7.287132 0.002627	

#### Table A8: DCp by LS

LS // dependent variable is △DCP Sample: 1972-1989 Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Probability
	050.0900	206 1405	0.766770	0.4560
	200.0022	320.1495	0.700772	0.4569
ANDCG	0.058610	0.058200	1.007047	0.3323
∆NFA	0.049154	0.134410	0.365702	0.7205
∆GDP (-1)	0.093000	0.023046	4.035419	0.0014
△DCP (-1)	0.360949	0.189350	1.906260	0.0790
R-squared	0.725906	Mean depende	nt var	1491.167
Adjusted R-squared	0.641569	SD dependent	var	1338.412
SE of regression	801.2950	Akaike info crit	erion	13.60259
Sum squared resid	8346958	Schwartz criter	ion	13.84992
Log likelihood	-142.9642	F-statistic		8.607243
Durbin-Watson stat	2.019318	Prob (F-statistic	c)	0.001259

## Appendix B: Basic data in regression

obs	M2 m	NDCG m	NFA m		NOI m	CPI (1985	TOT 5=100)
1970 1971 1972 1973	981 1041 1205 1508	666.0000 532.0000 518.0000 545.0000	154.0000 280.0000 244.0000 414.0000		315.0000 365.0000 313.0000 305.0000	11.8 12.6 12.7 18 1	3.669297 4.095955 4.055200 4.263115
1974 1975 1976 1977 1978	2730 4179 5845 7814 7520	-1310.000 -631.0000 622.0000 2452.000	3500.000 3668.000 3396.000 2962.000		594.0000 650.0000 625.0000 1158.000	27.1 32.4 37.0 40.6	6.049647 5.989452 6.110447 6.233887 5.870853
1979 1980 1981 1982 1983 1984 1985 1986 1987	9849 14389 15239 16694 19034 21243 23153 23605 28895	3313.0000 3539.000 6299.000 10328.00 15465.00 17823.00 8297.00 18827.00 21157.00	3228.000 5607.000 2556.000 1057.000 808.0000 1423.000 1816.000 4463.000 6865.000		2042.000 1907.000 3064.000 5774.000 9363.000 10603.00 10562.00 17267.00 18179.00	56.3 63.0 68.7 70.2 82.0 96.2 100.0 97.9 146.6	6.423737 7.614086 8.084915 7.845970 7.463317 7.463317 7.389056 5.697343 5.989452
1988 1989	38406 42519	27488.00 5436.000	7974.000 17944.00		20248.00 8296.000	177.9 228.3	5.365556 5.812437
obs	GDP m	F m	(	obs	GDP m	F m	
1970 1971 1972 1973 1974 1975 1976 1977 1978 1979	5621.00 7098.00 7703.00 11199.00 18811.0 21779.0 27572.0 32747.0 36084.0 43151.0	00         894.4           00         1354.           00         1446.           00         2385.           00         6198.           00         5425.           00         6621.           00         8203.           00         6816.           00         10266	000 000 700 300 700 000 000 500 3.20	1980 1981 1982 1983 1984 1985 1986 1987 1988 1989	50489.00 50749.00 51709.00 57142.00 63608.00 72355.00 73062.00 108855.0 145243.0 196151.0	14557.5 11454.5 8354.80 7577.00 9128.20 4091.20 30544.7 31379.6 59091.4 11584.3	50 50 00 00 00 70 50 40 80

Note: Nominal deposit rate of interest series can be found in Table 1 . Sources: same as Table 1.

## Notes

- 1. The pattern of deficit financing in Nigeria is such that the government often borrows from the Central Bank. Thus, in the period 1976-1980, aggregate government borrowing from the Central Bank was almost one and a half times the size of the corresponding budget deficit. However, total borrowing (from Central Bank) in terms of budget deficits fell to about 47% in the period 1981-1985 and 66% in 1986-1989. For details, see Central Bank of Nigeria, *Annual Report and Statement of Accounts*, issues covering the relevant periods.
- 2. The preference for broad money supply is based on empirical evidence. See e.g. Ajayi (1974).
- 3. See e.g. Oyejide (1972) where the monetary expansion and increasing deficit financing of the 1960s were attributed to the need to speed up the rate of capital formation.
- 4. The real interest rate (RI) series in the regression was computed as  $RI = \left(\frac{1+R_t}{1+\Pi_t}\right)$ where R<sub>t</sub> nominal deposit rate,  $\Pi$  = inflation. It performed better than the linear approximation  $(d - \dot{p})$  used in the descriptive part of the paper.

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