NOVEMBER 1995

RESEARCH PAPER THIRTY-NINE

MONEY SUPPLY MECHANISMS IN NIGERIA (1970-1989)

OLUREMI OGUN
and
ADEOLA ADENIKINJU

AFRICAN ECONOMIC RESEARCH CONSORTIUM

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Money supply mechanisms in Nigeria (1970-1989)

Oluremi Ogun
and
Adeola Adenikinju
University of Ibadan

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

Contents

List of tables

List of figures

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[1]. 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 indicators of the monetary management process: Nigeria

Date	Real GDP growth rate	Money growth rate	Inflation	Velocity of circulation	Nominal deposit rate[1]	Real deposit rate	Deficit money ratio(%)	Growth rate of foreign exchange receipts
1970	–	–	–	5.74	3.50	–	49.8	–
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	-9.3
1984	-5.1	11.6	17.3	2.99	10.00	-7.30	0.0	20.5
1985	9.4	9.0	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

Note: Rate on deposits, 12 months and above.

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

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

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

where Δ 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.[2] 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.[3] This would appear to admit changes in nominal income (ΔY) 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 (ΔY_{t-1}) would appear more appropriate.

An increase in foreign exchange receipts (ΔF) 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. ΔF 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 (ΔNDCg) 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 (ΔTT) 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:

$$\Delta DCp = \alpha_0 + \alpha_1 \Delta Y_{t-1} + \alpha_2 \Delta F + \alpha_3 \Delta NDCg + a_4 \Delta TT + \alpha_5 \Delta DCp_{t-1} + \mu \qquad (2)$$

$\alpha_1, \alpha_2, \alpha_5 \geq 0$; $\alpha_3 \leq 0$; $\alpha_4 \geq/\leq 0$ (Here and in all cases μ 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 (ΔY_{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:

$$\Delta NDCg = a_0 + \alpha_1 \Delta Y_{t-1} + \alpha_2 \Delta P + a_3 \Delta NDCg_{t-1} + \mu \qquad (3)$$

$$\alpha_1, \alpha_2, \alpha_3, \geq 0$$

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 (ΔDC) 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 (ΔF). Using lagged changes in GDP, the NFA equation in partial adjustment expression is:

$$\Delta NFA = \alpha_0 + \alpha_1 \Delta F + \alpha_2 \Delta Y_{t-1} + \alpha_3 \Delta (d - \dot{p}) + \alpha_4 \Delta DC + \alpha_5 \Delta NFA_{t-1} + \mu \qquad (4)$$

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

$$a_1, a_2, a_3, a_5, \geq 0; \alpha_4 \leq 0$$

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_{t-1}, the NOI function as a partial adjustment specification is:

$$\Delta NOI = \alpha_0 + \alpha_1 \Delta NFA_{t-1} + \alpha_2 \Delta NOI + \mu \qquad (5)$$

$$a_1 \leq 0; a_2 \geq 0$$

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.

Table 2: Percentage composition of money supply (M2)

	Period	DCp	NDCg	NFA	NOI	Total
I	1970-75	48.1	2.7	70.9	-21.8	99.9
II	1976-80	50.8	28.8	36.6	-16.2	100.00
III	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

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 function by LS

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

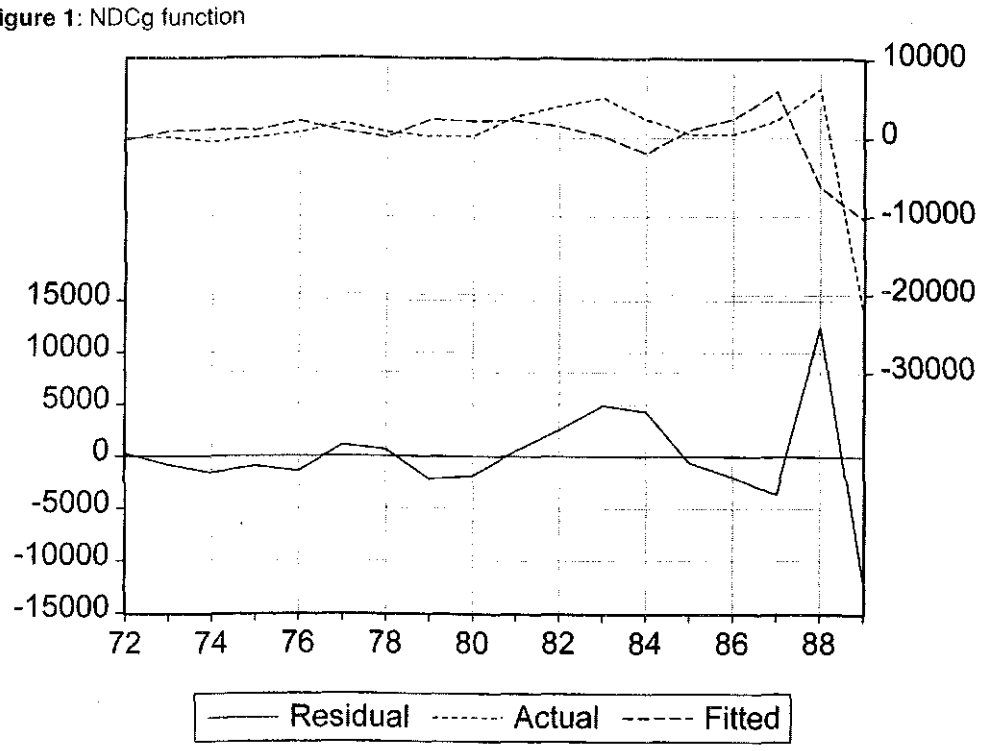
Variable	Coefficient	Std. Error	T-Statistic	Prob
C	374.0799	262.0334	1.427604	0.1789
ΔGDP (-1)	0.061792	0.020309	3.042580	0.0102
ΔFX	0.055742	0.024864	2.241918	0.0446
ΔNDCG	-0.099893	0.061338	-1.628579	0.1294
ΔDCP (-1)	0.530008	0.167436	3.165441	0.0081
ΔTOT	-372.5361	230.4144	-1.616809	0.1319
R-squared	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:

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

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

Figure 1: NDCg function



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 $\bar{R}^2$ 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:

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

Table 4: Equation 3: NDCg function by LS

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

Variable	Coefficient	Std. error	T-statistic	Prob
C	-123.2257	504.8801	-0.244069	0.8110
ΔGDP (-1)	0.085111	0.044424	1.915863	0.0776
ΔP	40.26420	29.25420	1.376356	0.1920
ΔNDCG (-1)	0.664137	0.215753	3.078228	0.0088
D89	-31259.75	2212.527	-14.12853	0.0000
R-squared	0.958790	Mean dependent var		272.444
Adjusted R-squared	0.946110	SD dependent var		5897.950
SE of regression	1369.169	Akaike info criterion		14.67405
Sum squared resid	24370114	Schwartz criterion		14.92138
Log likelihood	-152.6074	F-statistic		75.61366
Durbin-Watson stat	1.307689	Prob (F-statistic)		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 (ΔP) 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 $\bar{R}^2$ 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[4] are:

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

Apart from lagged NFA, all variables have the correct sign. The coefficients of lagged GDP and domestic credit (ΔDC) 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 ΔNFA
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 yearís 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:

$$\Delta NOI = -0.24\Delta NFA_{t-1} + 0.30\Delta NOI_{t-1} \qquad (9)$$

Figure 2: NFA function

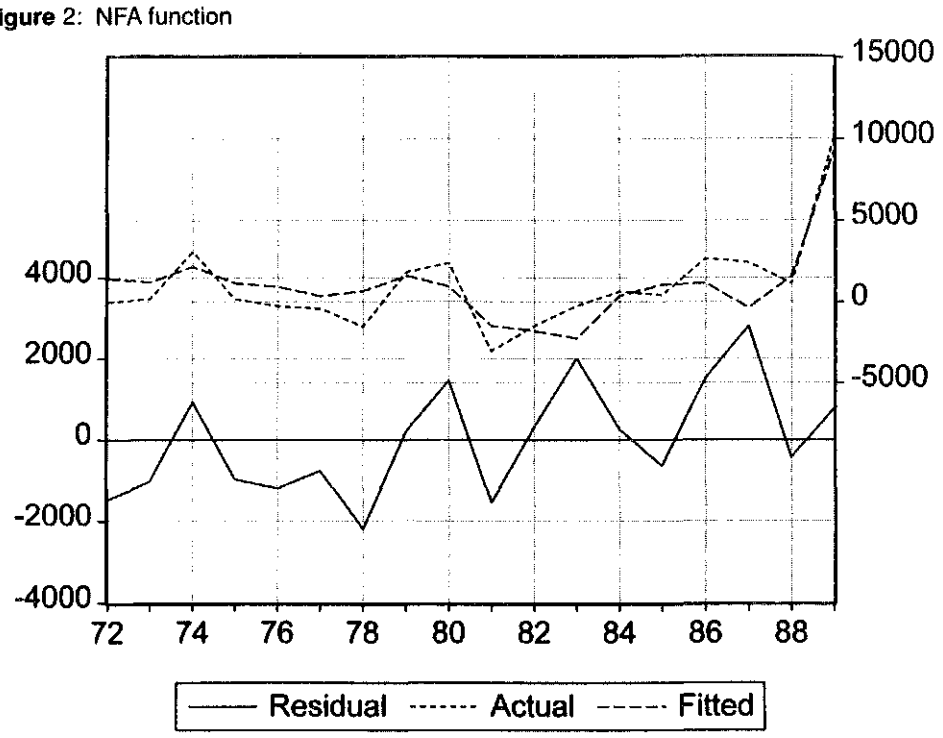


Figure 3: NOI function

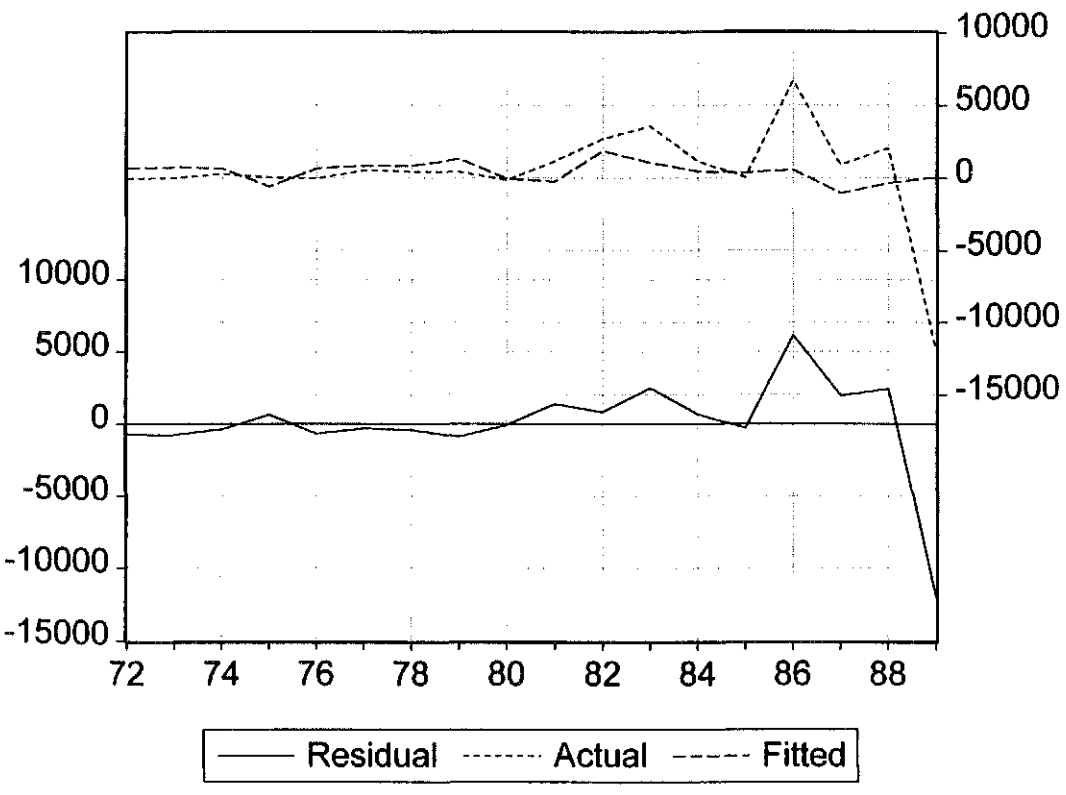


Table 6: Equation 5: NOI function by LS

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

Variable	Coefficient	Std. error	T-statistic	Prob
C	1139.938	528.4386	2.157182	0.0489
ΔNFA (-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 dependent var	440.6111
Adjusted R-squared	0.729724	SD dependent var	3540.316
SE of regression	1840.541	Akaike info criterion	15.22876
Sum squared resid	47426273	Schwartz criterion	15.42662
Log likelihood	-158.5997	F-statistic	16.29958
Durbin-Watson stat	2.044689	Prob (F-statistic)	0.000076

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 yearís 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.

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

$$\alpha_1, \alpha_2 \leq 0; \alpha_3, \alpha_4 \geq 0$$

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.

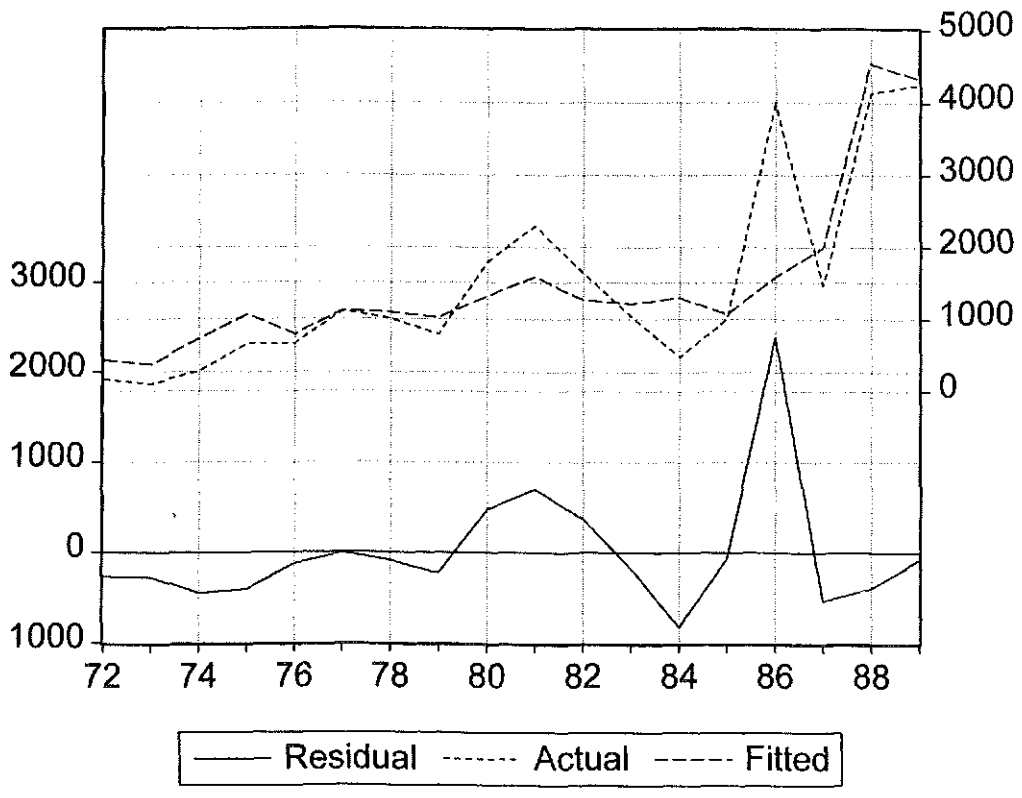
Table 7: Equation 10: DCp by LS

LS // dependent variable is ΔDCP
Sample: 1972, 1989
Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. error	T-statistic	Prob
C	118.2376	151.3714	0.781109	0.4499
ΔNDCG	0.013963	0.027547	0.506897	0.6214
ΔNFA	-0.089498	0.064974	-1.377445	0.1935
ΔGDP (-1)	0.096862	0.010628	9.114116	0.0000
ΔDCP (-1)	0.435613	0.087847	4.958749	0.0003
D86	2806.089	399.6687	7.021037	0.0000

R-squared	0.946339	Mean dependent var	1491.167
Adjusted R-squared	0.923981	SD dependent var	1338.412
SE of regression	369.0215	Akaike info criterion	12.08291
Sum squared resid	1634123	Schwartz criterion	12.37970
Log likelihood	-128.2871	F-statistic	42.32549
Durbin-Watson stat	1.457704	Prob (F-statistic)	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: ΔLog DCp by LS

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

Variable	Coefficient	Std. error	T-statistic	Probability
C	-0.016965	0.047282	-0.358793	0.7260
ΔLOGGDP (-1)	0.571048	0.119976	4.759663	0.0005
ΔLOGFX	0.050553	0.027822	1.816979	0.0943
ΔLOGNDCG	0.000652	0.011286	0.057765	0.9549
ΔLOGDCP (-1)	0.563258	0.200938	2.803146	0.0160
ΔLOGTOT	-0.050970	0.165977	-0.307092	0.7640
R-squared	0.759412	Mean dependent var		0.212928
Adjusted R-squared	0.659166	SD dependent var		0.111845
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-statistic)		0.002012

Table A2: ΔLog NDCg by LS

LS // dependent variable is ΔLOGNDCG
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
ΔLOGGDP (-1)	-4.428808	4.042286	-1.095620	0.2917
ΔLOGP	-6.883813	4.218808	-1.631696	0.1250
ΔLOGNDCG (-1)	-0.049854	0.256031	-0.194717	0.8484
R-squared	0.243366	Mean dependent var		0.129120
Adjusted R-squared	0.081230	SD dependent var		2.251882
SE of regression	2.158486	Akaike info criterion		1.731944
Sum squared resid	65.22686	Schwartz criterion		1.929804
Log likelihood	-37.12839	F-statistic		1.500997
Durbin-Watson stat	1.696597	Prob (F-statistic)		0.257554

Table A3: ΔLog NDCg by LS

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

Variable	Coefficient	Std. error	T-statistic	Probability
C	2.004816	1.130673	1.773116	0.0996
ΔLOGGDP (-1)	-4.168888	4.259288	-0.978776	0.3456
ΔLOGP	-6.662260	4.417528	-1.508142	0.1554
ΔLOGNDCG (-1)	-0.041630	0.265964	-0.156525	0.8780
D89	-0.750525	2.378167	-0.315590	0.7573
R-squared	0.249118	Mean dependent var		0.129120
Adjusted R-squared	0.018078	SD dependent var		2.251882
SE of regression	2.231435	Akaike info criterion		1.835423
Sum squared resid	64.73094	Schwartz criterion		2.082749
Log likelihood	-37.05970	F-statistic		1.078245
Durbin-Watson stat	1.699554	Prob (F-statistic)		0.406813

Table A4: ΔLogNFA by LS

LS // dependent variable is ΔLOGNFA
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
ΔLOGGDP (-1)	1.667887	1.371404	1.216189	0.2518
ΔLOGRI	-0.064904	0.111719	-0.580963	0.5741
DLOGDC	-2.059995	0.467986	-4.401825	0.0013
ΔLOGNFA (-1)	-0.035301	0.266205	-0.132610	0.8971
R-squared	0.758721	Mean dependent var		0.176901
Adjusted R-squared	0.638081	SD dependent var		0.749655
SE of regression	0.450990	Akaike info criterion		-1.312625
Sum squared resid	2.033918	Schwartz criterion		-1.022904
Log likelihood	-6.202020	F-statistic		6.289159
Durbin-Watson stat	2.098802	Prob (F-statistic)		0.006854

Table A5: ΔLOGNOI by LS

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

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

Table A6: NOI by LS

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

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

Table A7: LOGDCp by LS

LS // dependent variable is ΔLOGDCP
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
ΔLOGNDCG	0.004331	0.010635	0.407260	0.6904
ΔLOGNFA	0.001221	0.031168	0.039170	0.9693
ΔLOGGDP (-1)	0.577390	0.131644	4.385984	0.0007
ΔLOGDCP (-1)	0.443706	0.194768	2.287123	0.0403
R-squared	0.691567	Mean dependent var		0.212928
Adjusted R-squared	0.596664	SD dependent var		0.111845
SE of regression	0.071032	Akaike info criterion		-5.059129
Sum squared resid	0.065591	Schwartz criterion		-4.811804
Log likelihood	24.99127	F-statistic		7.287132
Durbin-Watson stat	1.743220	Prob (F-statistic)		0.002627

Table A8: DCp by LS

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

Variable	Coefficient	Std. error	T-statistic	Probability
C	250.0822	326.1495	0.766772	0.4569
ΔNDCG	0.058610	0.058200	1.007047	0.3323
ΔNFA	0.049154	0.134410	0.365702	0.7205
ΔGDP (-1)	0.093000	0.023046	4.035419	0.0014
ΔDCP (-1)	0.360949	0.189350	1.906260	0.0790
R-squared	0.725906	Mean dependent var		1491.167
Adjusted R-squared	0.641569	SD dependent var		1338.412
SE of regression	801.2950	Akaike info criterion		13.60259
Sum squared resid	8346958	Schwartz criterion		13.84992
Log likelihood	-142.9642	F-statistic		8.607243
Durbin-Watson stat	2.019318	Prob (F-statistic)		0.001259

Appendix B: Basic data in regression

obs	M2 m	NDCG m	NFA m	NOI m	CPI (1985=100)	TOT
1970	981	666.0000	154.0000	315.0000	11.8	3.669297
1971	1041	532.0000	280.0000	365.0000	12.6	4.095955
1972	1205	518.0000	244.0000	313.0000	12.7	4.055200
1973	1508	545.0000	414.0000	305.0000	18.1	4.263115
1974	2730	-1310.000	3500.000	594.0000	27.1	6.049647
1975	4179	-631.0000	3668.000	650.0000	32.4	5.989452
1976	5845	622.0000	3396.000	625.0000	37.0	6.110447
1977	7814	2452.000	2962.000	1158.000	40.6	6.233887
1978	7520	3143.000	1420.000	1605.000	48.3	5.870853
1979	9849	3313.0000	3228.000	2042.000	56.3	6.423737
1980	14389	3539.000	5607.000	1907.000	63.0	7.614086
1981	15239	6299.000	2556.000	3064.000	68.7	8.084915
1982	16694	10328.00	1057.000	5774.000	70.2	7.845970
1983	19034	15465.00	808.0000	9363.000	82.0	7.463317
1984	21243	17823.00	1423.000	10603.00	96.2	7.463317
1985	23153	8297.00	1816.000	10562.00	100.0	7.389056
1986	23605	18827.00	4463.000	17267.00	97.9	5.697343
1987	28895	21157.00	6865.000	18179.00	146.6	5.989452
1988	38406	27488.00	7974.000	20248.00	177.9	5.365556
1989	42519	5436.000	17944.00	8296.000	228.3	5.812437

obs	GDP m	F m	obs	GDP m	F m
1970	5621.000	894.4000	1980	50489.00	14557.50
1971	7098.000	1354.000	1981	50749.00	11454.50
1972	7703.000	1446.700	1982	51709.00	8354.800
1973	11199.00	2385.700	1983	57142.00	7577.000
1974	18811.00	6198.300	1984	63608.00	9128.200
1975	21779.00	5425.700	1985	72355.00	4091.200
1976	27572.00	6621.000	1986	73062.00	30544.70
1977	32747.00	8203.000	1987	108855.0	31379.60
1978	36084.00	6816.500	1988	145243.0	59091.40
1979	43151.00	10266.20	1989	196151.0	11584.30

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_t nominal deposit rate, Π = inflation. It performed better than the linear approximation $(d - \dot{p})$ used in the descriptive part of the paper.

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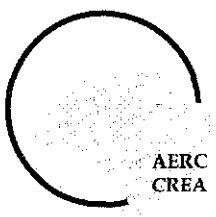

P.O. BOX 62882
NAIROBI, KENYA

TELEPHONE (254-2) 228057
225234 215898 212359
332438 225087

TELEX 22480

E-MAIL AERC@elci.gn.apc.org

FAX (254-2) 219308

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ISBN 9966-900-48-9