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NIGERIA'S ECONOMIC GROWTH AND FOREIGN DEBT: AN ANALYTICAL RE-EXAMINATION

By

E. A. ESSIEN And E.A. ONWIODUOKIT¹

Countries borrow for Consumption smoothing as well as for investment with the sole essence of promoting economic growth. The implied relationship between foreign debt and economic growth is empirically examined in this paper. ARIMA models were developed for the endogenous variables of a dynamic error-in-variable type model. Using data for the Nigerian economy, results of the analyses lend credence to a significant positive relationship. The paper goes further to recommend a more focused approach to external debt management in Nigeria if growth is to be realised through externally injected funds.

I. INTRODUCTION

Nigeria, like most other less developed Countries (LDCs) has been classified by the World Bank among the severely indebted low income countries since 1992. The country's debt stock as at 31st December 1997, stood at US \$27.0878 billion, made up of; US \$18.9804 billion Paris club debt; US \$4.3727 billion multilateral debt; \$1.6125 billion promissory notes; and \$0.7919 billion non-Paris Bilateral debt (Ministry of Finance, 1997).

The nations inability to meet all its debt service payments constitutes one of the serious obstacles to the inflow of external resources into the economy. The accumulation of debt service arrears which is being compounded with penalty interest, has not permitted reduction in the debt stock, despite the fact that

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government has been servicing its external debt with US \$2.0 billion annually between 1991 and 1997. In 1996 alone, debt service was estimated at US \$5.271 billion, while the total debt service arrears up to December 31, 1995 was \$11.280 billion. Thus, the cumulative total debt service requirement totalled \$15.551 billion by the end of 1996. However, the foreign exchange inflow from the sale of crude oil, which constituted over 90.0 per cent of the nation's foreign exchange earnings in 1996, was estimated at \$7.664 billion, of which \$2.050 billion was expected to be paid to the joint venture partners, leaving a sum of \$5.614 billion for all other competing activities, including debt service payments. Given this scenario, total available foreign exchange to the country in 1996 was only 33.0 per cent of the country's total debt service payment requirement.

The Minister of Finance captured the seriousness of the situation when he admitted:

***"It is not possible to meet our debt obligations
without recourse to concessional debt relief "
(Federal Ministry of Finance, 1996).***

Certainly, Nigeria is not alone in the debt quagmire. In the last two decades, many developing countries have faced acute external debt servicing problems. The reasons for this are varied. In some cases, debt problems have mainly stemmed from the inefficient use and control of borrowed funds by debtor countries. In most debtor countries, returns on investment had not even covered debt servicing costs, while in others an inadequate policy framework for debt management has led to accumulation of external debts that have proved excessive for the countries' debt servicing capacity. In other cases, debt difficulties have been caused by factors beyond the control of debtor countries. For instance, international developments in interest rates, terms of trade and trade policies in the 1980's have often been adverse and unexpected, compared to the experience during most of the previous decade. In effect, many debtors have faced a much

higher-than-anticipated growth in debt servicing payments relative to the growth in their exports of goods and services.

Other difficulties have arisen from reversal in the supply of external finance as portfolio constraints have been compounded by the debt servicing difficulties faced by borrowers. Hence, adequate supply of private funds in some periods has been followed by a sharp retraction in other periods. For instance, since the onset of the debt crisis in 1982, there has been a virtual cessation of voluntary private lending to many developing countries (IMF, 1985).

The underpinning philosophy that underscores external borrowing is the existence of savings-investment gap in a domestic economy. Indeed, the existence of foreign exchange gap has also been identified in theory to justify foreign borrowing. The assumption, is that, external borrowing can bridge the gap between domestic savings and investment, and between exports and imports of goods and services. By allowing higher expenditures over a given period of time than would otherwise be possible, external borrowing may assist development by supplementing export revenues and foreign direct investment, or it may smooth the impact of temporary shocks that reduce consumption, and thus improve economic welfare by allowing for higher domestic incomes. However, this happy outcome can only manifest if:

- i. external borrowing is used for productive investment, with returns that at least match the cost of borrowing, taking into account, inter alia, the absorptive capacity of the borrower;
- ii aggregate domestic savings that at some point exceed aggregate domestic investment by a margin which is sufficiently large to meet at least the interest charges on previously incurred debts;
- iii growth in national output exceeds population growth, as well as an ability to obtain the external resources needed to service the debt (Pfeffermann, 1984).

that utility in period t is a concave function $u(C_t)$ of consumption, C in period t ($C_t \geq 0$). The representative individual discounts future consumption by some factor ρ ($0 < \rho < 1$) and he/she can borrow or lend in international credit market at an interest rate, r , which, for simplicity is treated as constant overtime. Output per period is Q_t .

Consider an initial time when the Country's foreign debt is 0. At that point, the country's objective is to maximize;

$$u_0 = \sum_{t=0}^{\infty} \rho^t u(C_t) \text{ ----- (1)}$$

In each period t , the country chooses to borrow some net amount B_t (defined as new borrowing less repayments of principal on old debt), but it must pay interest rD_{t-1} on debt accumulated as of the end of the previous period. What is left over for consumption is then given as:

$$D_t = \sum_{i=0}^t (1+r)^{t-i} NT_i \text{ ----- (2)}$$

Thus, debt in period t is just the cumulative discounted net resource transfer since the initial period, 0 (when debt was 0).

If the country faces absolutely no limit on what it can borrow in any period, it can attain an arbitrarily high level of consumption without defaulting by perpetually financing debt service obligations with new borrowing. However, lenders as a group would lose money if they let the borrower to do this. To avoid a loss, lenders cannot allow the anticipated discounted value of resource transfers that they ultimately provide the country to exceed 0, so that:

$$\sum_{t=0}^{\infty} \frac{NT_t}{(1+r)^t} = \sum_{t=0}^{\infty} \frac{(C_t - Q_t)}{(1+r)^t} \leq 0 \text{ ----- (3)}$$

The last condition is often called the inter-temporal budget constraint.

Dividing equation (2) by $(1 + r)^t$ gives;

$$\frac{D_t}{(1+r)^t} = \sum_{i=0}^t \frac{NT_i}{(1+r)^i} \text{-----} (4)$$

Equations (3) and (4) imply the following restrictions on debt: the solvency restrictions and the transversality condition.

Substituting equation (4) in (3) gives, for any period t ;

$$D_t \leq \sum_{r=t+1}^{\infty} \frac{(Q_r - C_r)}{(1+r)^{t+1}} \text{-----} (5)$$

Since consumption cannot be negative, this condition implies that

$$D_t \leq W_t \text{-----} (6)$$

where,

$$W_t = \sum_{r=t+1}^{\infty} \frac{Q_r}{(1+r)^{t+1}} \text{-----} (7)$$

is the present discounted value of the borrowing countries remaining income stream. The solvency condition, often called the solvency constraints, states that debt in any period cannot exceed the discounted value of a country's resources (W_t) if lenders are to find their relation with the borrower profitable as in (6). In principle, the right-hand-side of (5) could be infinite, in which case the constraints disappears. This would mean that the country's current and future resources are infinitely valuable, which would happen if the country's growth rate was on average greater than the interest rate.

Some of the earlier literature on external debt classified a country as 'solvent' if its growth rate exceeds the interest rate. For a country to be permanently solvent in this sense implies that its resources are infinitely valuable. In which case, any level of debt is consistent with solvency. This criteria is unlikely to be met by any country. A growth rate above the interest rate is almost surely a temporary phenomenon. However, almost all sovereign borrowers are probably solvent in the sense that the discounted present value of their natural resources exceeds the value of their external debt.

The Transversality Condition

Taken together, equation (3) and (4) imply that

$$\lim_{t \rightarrow \infty} \frac{D_t}{(1+r)^t} \leq 0 \quad (8)$$

Equation (8) is often called the transversality condition. Thus, to realize a collective positive return on their loans, foreign creditors cannot allow the discounted value of debt in the infinite future to be positive. The condition allows D_t to remain positive, that is, for the country to remain a net debtor forever. Debt just cannot grow, on the average, faster than the interest rate.

Borrowing for Consumption Smoothing

If the output during each period is exogenous, then, the country's problem can be seen as choosing NT_t in each period, t , to maximise u_0 , subject to either the intertemporal budget constraint (equation 3) or the transversality condition (equation 8). Setting this problems up as a constrained maximization, it becomes

$$\max_C \left[\sum_{t=0}^{\infty} \rho^t u(C_t) + \lambda \left[\frac{(Q_t - C_t)}{(1+r)^t} \right] \right] \quad (9)$$

where, λ is the shadow price associated with the solvency condition. The first-order conditions for a maximum are;

$$[(1+r)\rho] u'(C_t) \lambda = 1, \forall t=0, \dots, \infty \quad (10)$$

With non satiation (so that the marginal utility of consumption is always strictly positive), λ is strictly positive, meaning that the constraint is binding. Optimal borrowing thus implies that equation (3) holds with equality, or that

$$\sum_{t=0}^{\infty} \frac{C_t}{(1+r)^t} = W_0 \quad (11)$$

This framework identified two motives for borrowing. One is to allow consumption to grow permanently at a different rate than the endowment. Another is to smooth consumption in the short-run if endowments fluctuate. Empirically, the framework suggests why countries borrow after disasters that reduce output (if the reduction is perceived as temporary) and why expectations that future output will be higher than previously anticipated can lead to borrowing binge.

Equation (11) has two implications. First, given the discounted present value of initial resources, W_0 , international borrowing and lending completely separate the timing of consumption from that of production. The inter temporal budget constraint is the only link between the two; given the present discounted value of resources, the timing of their availability should have no implications for consumption. Second, consumption rises or falls over time depending upon whether $(1+r)\rho$ is larger or smaller than 1, or whether the world interest rate is higher or lower than the country's discount rate. The first implication follows from the assumption of perfect capital mobility and smallness in international capital markets: an economy should maximize the present discounted value of its output at the world interest rate regardless of its own preferences. Obstfeld, (1989) provides

evidence that the consumption smoothing model very poorly describes borrowing by developing countries in the 1970s.

The Second implication follows from the assumption of a constant discount factor. Engel and Kletzer (1989) developed a model of borrowing with a variable discount factor. This modification can imply a much richer dynamic structure, one that is more descriptive of the historical experience of industrial countries, which have passed through "stages" of borrowing and lending.

Borrowing for Investment

This analysis can be extended to incorporate a productive role for capital (i.e borrowing for investment). As long as the production technology and other factors of endowment are exogenous, however, little is affected. Let us say, for example, that output in period t is a constant returns to scale function $F(K_t, L_t, t)$, where K_t is the capital stock and L_t is a set of exogenous factors such as labour and land. Optimal investment requires investing up to the point at which $F_k = r$, where F_k is the marginal product of capital. Let $K^*(L_t, t, r)$ denote the value of K that is consistent with optimal investment. Defining $Q_t = F(K^*, L_t, t)$ and redefining foreign debt $D_t = D_t + K_t^* - K_0$, where K_0 is the capital stock at period 0 capital stock D_t is derived as before, the analysis follows as in equation (11) above. This extension is a specification, expressing in quantitative terms, another motive for borrowing, that is, bringing the capital stock up to the level at which its marginal products equal the world interest rate. However, this happy outcome is not automatic as assumed owing to adjustment cost of investment, consequently, borrowing and investment should be smoothed out (Cohen, 1991)¹.

II.3 Foreign Debt and Economic Growth

The role of foreign capital in the development process of the less developed economies had been stressed as far back as the 1950s. Foreign capital inflow to the LDCs help to bridge a number of gaps identified by the

development economists as major constraint to the growth efforts of these countries. These include - savings, foreign exchange and technological gaps. The work of early development economists, including Higgins (1959), Pearson (1969), Symonds (1970), Lewis (1954), Singer (1949), Nurkse (1953), Domar (1957), Kaldor (1955), Eshag (1983) and Kindleberger (1965) agreed that the transfer of foreign resources to less developed countries will help to transform their economies, characterized by low or zero growth rate, into economies capable of adequate and sustainable growth. Thus, foreign resources to developing countries is necessary and serves to supplement domestic resource gaps with positive effects on growth.

Haggins (1959) noted that domestic investment in developing countries has been too low to promote rapid economic growth. He maintained that these countries would not raise enough capital resources for economic growth without foreign assistance in one form or the other. He, therefore, argued that where enough capital resources could be raised internally through domestic savings, foreign exchange requirement would also rise. Pearson (1969), opined that in order to properly assess the effect of foreign resources on development in an economy, such an economy must be divided into sectors; each sector could then be effectively evaluated. According to him, the sectors which have demonstrated most developmental value in the less developed countries are agricultural and industrial. He argued that foreign credit would not only enable the industrial sector to have access to capital stock but could also help in the provision of intermediate inputs like fertilizer and pesticides. Other infrastructural assistance could also be rendered through the construction of roads, railways, pumps, irrigation systems and dams.

The World Bank/IMF Development committee investigated the subject of foreign credit to the developing countries and concluded that external finance has been productive and helpful to development; without it, a number of countries would not have been able to graduate from the ranks of poor nations to middle - income nations; and the countries that remain poor would have been poorer

(World Bank, 1986). The committee, consequently argued for more external resources for the developing countries.

The role of external assistance in the less developed countries has been controversial. Some economists hold a different view about the effect of external assistance to the LDCs. Prominent among them are Singer, (1949), Grifins and Enos (1970). They believe that foreign assistance is anti-developmental because it displaces the domestic developmental resources of the recipient countries and thereby causes disequilibrium in the foreign sector, debt crises, over dependency and undesirable high degree of openness and general entanglement of developing countries' economies. In sum they assert that:

"the provision of external resources is in any case irrelevant to the real problem of World poverty which can only be resolved by the determined efforts of the poor countries themselves"

Also, the view of some other scholars like Malaba (1991), Ake (1989) and Ndekwi (1997) is that foreign assistance is given to make the partnership look plausible, but as it is worked out, the proletarian countries get poorer and the technological gap widens. They maintain that some of the components of the present crisis in public administration in Africa might not be unconnected with the external assistance. However, in other recent studies, Solis and Zedillo (1985), Ajayi (1991) and Osei (1993), using the Selowsky and Van Der Tak framework, specified that only net transfers (taking into account the debt repayment flows) of external resources of the period, 1970-1991, have positive effect on growth. Also Ashinze and Onwioduokit (1996) confirmed that in Nigeria, external resources contributed to growth only in the years that the externally acquired resources were deployed productively.

Given resource constraints faced by most LDCs, including Nigeria and the contrasting conclusions on the role of foreign capital in the process of growth, there is need to re-examine the issue as it affects Nigeria.

III. ANALYTICAL FRAMEWORK

III.1 Zellner's Reformulated Errors-in-variable Model

Zellner's reformulated model is an explicit two equation system with one behavioural equation containing an unobservable variable as a regressor; and the other equation relating the unobservable variable, through observed proxies, to observable causes with parameter restrictions across equations (as in any conventional simultaneous equation system (Ganti and Kullori, 1979)). It is a structural model of the form:

$$y_1(t) = y_2^*(t) \cdot \alpha + z'(t) \lambda + \mu_1(t) \text{ ----- (12)}$$

$$y_2(t) = y_2^*(t) + \mu_2(t) \text{ ----- (13)}$$

$$y_2^*(t) = x'(t) \beta \text{ ----- (14)}$$

where,

Y_1, Y_2 = observed dependent variables

y_2^* = unobservable variable (regressor)

x = $G \times 1$ vector of observable nonstochastic (independent) variables

z = $H \times 1$ vector of observable nonstochastic explanatory variables

μ_1, μ_2 = error terms (assumed white noise)

α = a scalar parameter

β = $G \times 1$ vector of parameters

λ = $H \times 1$ vector of parameters

t = index of number of observations

The reduced form of the above three equations could be written in matrix form (for convenience) as:

$$Y_1 = x\theta_{11} + z\theta_{12} + v_1 \text{-----} (15)$$

$$Y_2 = x\theta_{21} + v_2 \text{-----} (16)$$

where,

Y_1, Y_2, Y_2^* , are $N \times 1$ vectors of observable and unobservable endogenous and predetermined variables,

X is an $N \times G$ matrix of observable explanatory variables,

Z is an $N \times H$ vector of observable explanatory variables,

$V_1, V_2 = U_1, U_2$ are $N \times 1$ vectors of disturbances.

If we, define the matrices as:

$Y = (Y_1, Y_2)$, $V = (V_1, V_2)$; $\theta_1 = (\theta_{11}, \theta_{12})$, $\theta_2 = (\theta_{21}, 0)$, and $\theta = (\theta_1, \theta_2)$, then we may write (4) and (5) as;

$$Y = (X/Z)\theta + V \text{-----} (17)$$

This matrix of reduced form coefficients is over identified.

III.2 The Structural Econometric Time Series

This decade has witnessed a growing synthesis of econometric modeling with the Box Jenkins modelling. In particular, developing ARIMA models for the endogenous variables of a dynamic simultaneous equation system (Wallis, 1977; Zellner and Palm, 1974).

For instance, if we consider an econometric structural equation representation of the form;

$$B(L)y_t + C(L)X_t = \mu_t \text{-----} (18)$$

we could obtain, through its reduced form and under regularity conditions, a final form equation which gives a set of multiple input transfer functions or rational distributed lag "equations" with the special characteristics that the denominator polynomials are the same for every input variable and error term and in every equation assuming that no cancellation of common factors occur (Wallis, 1977). This is given as

$$y_t = \frac{-b(L)c(L)}{|B(L)|} x_t + \frac{b(L)}{|B(L)|} \mu_t \text{-----} (19)$$

Thus, if the exogenous variables of the model in (18) have an ARIMA (p,d,q) representation then its structural form could be regarded as specialization of a multi-dimensional multiple time series model.

The above approach supposes that the structural econometric model are special cases of multivariate time series process in which a priori restrictions suggested by economic theory have been imposed on the parameters. Thus, a simultaneous econometric structural model embracing the usual input from economic theory is developed amidst the derived and implied properties of the corresponding ARIMA equations. Subsequently, time series methods are then used to estimate the ARIMA equations which are then checked for consistency with the restrictions implied by the econometric model (Egbon, 1994).

Starting from a dynamic Zellner- type formulation (equations (12) -(14)), this study would derive an ARIMA representation which would be used in studying the relationship between foreign debt and economic growth, after uniquely determining the structural parameters of the model.

III.3 The Model

A model for foreign debt and growth could be developed from two mutually exclusive perspectives. First, there was the reasoning that external borrowing to

supplement domestic savings would stimulate economic activities, in particular production, which in turn would lead to increase in output and accelerate the growth of the economy. Second, the heavily indebted less developed countries such as Nigeria, were borrowing indiscriminately without an accompanying capacity for repayment a situation which led to a growing debt burden and decline in investment. This is not to suggest that increased debt burden was solely responsible for decline in investment as high world interest rates and perhaps declining export prices in indebted countries could have played a part. The investment could have boosted production if properly utilised. The transmission mechanism, therefore becomes obvious, that is, borrowed funds in itself when invested in productive activity could lead to the growth of an economy.

While it is possible to investigate the consequences of borrowing on economic growth, the implied correlation between debt and investment may only allow us to specify a one- variable multi- equation model relating growth and foreign debt, while all other variables like exports, exchange rates, excess money supply production capacity etc. are subsumed in the error, the size of which would be measured.

Furthermore there has been growing skepticism as to whether the actual total debt stock of the country is known. This was a subject of intense debate more than a decade ago during the Structural Adjustment Program (SAP) era. If the total debt stock is not known, then it could be safely assumed to be unobservable and thus we could relate;

- i. growth in GDP(g_t) to the unobservable total debt stock(d_t^*)
- ii observable total debt stock(d_t) as a function of the unobservable total debt stock (d_t^*),
- iii total debt stock in a current year(d_t^*) as the sum of the total debt stock in the preceding year(d_{t-1}^*) and net foreign public sector borrowing in the current year(bf_t), as indicated by theory.

The three relations meet the criteria of Zellner's specification and

could be written in a structural econometric form (since there are derived from theoretical reasoning), with lagged endogenous variable for the growth rate of GDP (as also indicated by theory-permanent income hypothesis) as follows:

$$g_t = a_1 g_{t-1} + a_2 d_t^* + \mu_{1t} \text{-----} (20)$$

$$d_t = d_t^* + \mu_{2t} \text{-----} (21)$$

$$d_t^* = a_3 d_{t-1}^* + a_4 b f_t \text{-----} (22)$$

where, a_1 , a_2 , a_3 and a_4 are elasticities with

$a_1 > 0$, $a_2 > 0$, $a_3 = a_4 = 1$. Also, μ_{1t} , μ_{2t} are error terms, assumed well behaved. GDP growth rate is in real form, and log linearly related to the other variable in the model.

Equations (20) - (22) are **structural forms** of the simultaneous equation system (since they are derived from theoretical reasoning and is a form of Zellner error-in-variable structural formulation).

Assume for simplicity that all variables in the model are intrinsically linear, and that the conditions for invertibility and stability are observed so that the inferential procedures become valid, then the **reduced form** equation could be derived from the structural equations by substituting (22) in (21) and (20), and the derived autoregressive moving average models (ARIMA) could be written in compact form as;

$$g_t - \phi_1 g_{t-1} + \phi_2 g_{t-2} + \phi_3 g_{t-3} = \theta_0 + \mu_{1t} - \theta_1 \mu_{1t-1} + \theta_2 \mu_{1t-2} \text{-----} (23)$$

and

$$d_t - \phi'_1 d_{t-1} + \phi'_2 d_{t-2} = \theta'_0 + \mu_{2t} - \theta'_1 \mu_{2t-1} \text{-----} (24)$$

where,

$$\phi_1 = 1 + a_1 + a_6, \phi_2 = a_1 + a_6 + a_1 a_6, \phi_3 = a_1 a_6, \phi_1' = 1 + a_6,$$

$$\phi_2' = a_6, \theta_0 = a_2 a_5, \theta_0' = a_5, \theta_1 = 1 + a_6, \theta_2 = \theta_1' = a_6 \text{ (See annex 2 for the derivation).}$$

Data for this work were obtained from International Financial Statistics and World Debt Tables (current editions) and spanned 1971 to 1996. Also, conditional sums of squares estimation technique available in time series processor(TSP) version 4.3 was used for the analysis and the results are presented in tables 1 to 3. Starting values for the parameters used in the iterations were TSP “reasonable guesses”.

IV. MAJOR FINDINGS OF THE STUDY

IV.1 Evaluation of Results

The parameters of ARIMA models, derived from structural equations, were estimated from where the structural parameters were obtained to determine the effect of debt stock on economic growth. The derived models were ARIMA(3,1,2) and ARIMA(2,1,1) (see annex 2), while the results are presented in tables 1, 2 and 3 (annex 1).

Table 1 shows that in both models convergence was achieved after eight iterations. The explanatory power was 30% and 19% for ARIMA(3,1,2) and (2,1,1), respectively. However, for a maximum likelihood estimation, the likelihood ratio test² provides an indication of the goodness of fit of a model. As shown in table 1, this were significant for the derived ARIMA models. Also, there was no presence of serial correlation for the two models as shown by the Durbin-Watson statistics. Also, PHI(3), PHI(1) and Theta(1) were all significant at the 5% level, while the constant term was only significant for ARIMA(2,1,1).

From table 1, using the value for $\phi(3)$, which was significant and by appropriate substitution, the structural parameters were derived and are presented in tables 2 and 3. The tables show that the coefficient of growth lagged one period was 0.76 with appropriate sign. Thus, the Nigerian economy would grow by 0.76 for every one unit growth in the preceding year. In the face of growing debt, the growth of the economy depends on its growth in the preceding year. There is thus, a positive relationship between current income growth rate and past income growth rate.

The positive relationship between debt stock and economic growth conforms with a priori expectation. The results in table 3 show that the economy grows by 0.96 for every unit increase in debt stock. The debt stock elasticity of growth is approximately unity. Thus, economic growth is responsive to changes in debt stock in Nigeria. The contrasting results of earlier empirical work could have been due to the analytical procedure which differs from that adopted in this study. The analytical framework in this study uses the error-in-variable type model, and then processes it in an ARIMA mill to derive efficient parameter estimates with an added advantage that results are obtained from differenced series from where all wild swings have been ironed out.

IV.2 Economic Implications and Policy Relevance

The empirical finding has shown that the degree of responsiveness of growth to external finance in Nigeria is elastic. This is indeed revealing. It differs markedly from the results of earlier studies on the subject where debt was portrayed not to relate or contribute to growth in Nigeria (see Ajayi, 1991 and Ashinze and Onwioduokit, 1996).

The place of external resources in economic growth and development is properly located and situated in the development literature. Thus, earlier results seem to have been abnormal cases which needed a re-examination as done in this paper. The degree of growth elasticity could have been higher if leakages probably did not exist. The Federal Ministry of Finance puts the amount within this category

at \$836 million as at December 31, 1996. Admittedly this should lead to decline in the economy, but given the ratio of the said amount to the cumulative flow of external resources within the period of analysis, this would have a negligible effect on the results of the analysis.

It is probable that the current government embargo on new loans is informed by the belief that debt does not contribute to growth in Nigeria. This study has, however, shown that what should be of more policy relevance now is how we utilise the externally sourced resources. The policy of strict project-linked external financing should be adhered to. The government should now concentrate on improving the domestic economic environment with the aim of attracting private foreign resources, especially in the form of direct private investment as well as actively contracting long-term debt for investment in the productive sector of the economy.

Admittedly, the current Nigeria's debt burden is high and entails resource flow from Nigeria to the creditor countries. For the future, it would be necessary to avoid indiscriminate and unprofessional debt accumulation.

V. CONCLUDING REMARKS

This study has re-examined the impact of foreign debt on economic growth using a methodology that yields more efficient parameter estimates. The relationship was positive and the degree of responsiveness was elastic. We, therefore, propose that the government should put in place appropriate debt management strategy which should include feasibility study of projects to be financed from external resources since the prospects for economic growth from externally injected resources invested in productive ventures is very bright. As a matter of fact, given the low level of capital formation in Nigeria, caused by the low level of income and the general low level of poverty, the country cannot hope to source enough resources for development domestically. There is thus, a compelling need to resume negotiations on a long-term sourcing of external funds and put in place a well articulated strategy for managing the funds.

In general, borrowing will normally bring about growth. However the extent would be determined by the use made of the acquired resources. Nigeria would be losing out of the benefits of the recent globalisation if doors are shut against foreign borrowing. This is even more worrisome in the present dispensation where private capital flows are inadequate owing to uncertain political climate.

ANNEX 1

TABLE 1: Results for ARIMA(3,1,2) and (2,1,1) Models

| Statistics | ARIMA(3, 1,2) | ARIMA(2, 1,1) |
|--------------------------------------|-----------------------------|------------------------------|
| No. of Iterations before Convergence | 8 | 8 |
| Mean | 0.2322 | 0.3379 |
| Standard Deviation | 0.1846 | 0.3609 |
| Residual sums of squares | 0.5735 | 2.5472 |
| Variance of sum of squares | 0.0302 | 0.1213 |
| Standard Error of Residual | 0.1737 | 0.3483 |
| Coefficient of Determination | 0.3000 | 0.1900 |
| Durbin-Watson statistics | 1.9400 | 2.0046 |
| F.- ratio | 1.6200 | 1.5900 |
| Log Likelihood | 11.7131 | -6.9247 |
| Constant | 0.1591(0.9907) | 0.1663(2.3847) ^a |
| Phi(1) | -0.3138(-0.9847) | |
| Phi(2) | -0.0148(-0.0443) | |
| Phi(3) | 0.7115(3.6100) ^a | |
| Theta(1) | -0.4673(-1.2777) | |
| Theta(2) | -0.1866(-0.5299) | |
| Phi(1)* | | 0.6767(3.1980) ^a |
| Theta(1)* | | -0.1379(0.6050) |
| Theta(2)* | | 0.9374(31.2800) ^a |

a = significance at 5 %.

TABLE 2: Determination of Coefficient of Growth in GDP Lagged One Period

| Variable | $\theta_2 = \phi'_2 = \theta'_2 = a_6$ | | |
|--|--|---------|---------|
| | -0.1866 | -0.1379 | 0.9374* |
| Coefficient of Growth in GDP Lagged one period (g_{t-1}) = a_1 | -5.3780 | -5.1595 | 0.7574* |

*The value of a_6 that was significant from the ARIMA results in table 1 was used for determining a_1 .

** $\phi_3 = a_1 a_6 = 0.7115$

TABLE 3: Determination of Coefficient of Total Debt Stock

| Coefficient of Total Debt stock (d^*) = a_2 | $\theta_0 = a_2 a_5$ | $\theta_0 = a_5$ |
|---|----------------------|------------------|
| 0.9567 | 0.1591 | 0.1663 |

ANNEX 2

Define;

- i. a backward operator(L) such that, $Y_{t-s} = L^s Y_t$
- ii $D(L) = \delta_0 + \delta_1 L + \dots + \delta L^s$, a lag operator and appeal to the Taylor's series expansion to give
- iii $1/(1-\alpha_1 L) = 1 + \alpha_1 L + \alpha_1^2 L^2 + \dots$, and
- iv suppose net foreign borrowing has a deterministic representation of the form;

$$bf_t = a_5 + a_6 bf_{t-1} \quad (1)$$

thus, from (22)

$$d_t^* (1 - a_3 L) = a_4 bf_t \quad (2)$$

i.e

$$d_t^* = \frac{a_4}{(1-a_3 L)} bf_t \quad (3)$$

substituting (3) in equations (20) and (21) we get

$$g_t = \frac{a_2 a_4}{(1-a_1 L)(1-a_3 L)} bf_t + \frac{1}{(1-a_1 L)} \mu_{1t} \quad (4)$$

and

$$d_t = \frac{a_4}{(1-a_3 L)} bf_t + \mu_{2t} \quad (5)$$

Equations (4) and (5) are called the **final form**. They could, however, be expressed more parsimoniously in an **autoregressive final form** or **transfer function form** as;

$$(1-a_1L)(1-a_3L)g_t = a_2a_4bf_t + (1-a_3L)\mu_{1t} \text{ ----- (6)}$$

and

$$(1-a_3L)d_t = a_4bf_t + \mu_{2t} \text{ ----- (7)}$$

in which the lagged jointly determined variables(JDV) depends only on its lagged values, all exogenous variables and the disturbances.

Finally, we could substitute (1) in (6) and (7) to get;

$$(1-a_1L)(1-a_3L)(1-a_6L)g_t = a_2a_4a_5 + (1-a_3L)(1-a_3L)\mu_{1t} \text{ ----- (8)}$$

and

$$(1-a_3L)(1-a_6L)d_t = a_4a_5 + (1-a_6L)\mu_{2t} \text{ ----- (9)}$$

Since $a_3 = a_4 = 1$, by definition of unobserved total debt stock, equations (8) and (9) could be written in compact form as;

$$g_t - \phi_1g_{t-1} + \phi_2g_{t-2} + \phi_3g_{t-3} = \theta_0 + \mu_{1t} - \theta_1\mu_{1t-1} + \theta_2\mu_{1t-2} \text{ ----- (10)}$$

and

$$d_t - \phi'_1d_{t-1} + \phi'_2d_{t-2} = \theta'_0 + \mu_{2t} - \theta'_1\mu_{2t-1} \text{ ----- (11)}$$

Equation (10) and (11) has autoregressive (AR) and moving average (MA) components on the left and right-hand-sides respectively. This two equations are identified as ARIMA(3,1,2) and (2,1,1) respectively. Here, differencing once was enough to induce stationarity.

ANNEX 3

FOOTNOTE

1. This section has benefited immensely from J. Eaton (1993).
2. The likelihood ratio (LR) is defined as:

$$LR = -2 \ln I$$

where,

$$I = L(\theta_0)/L(\theta_1)$$

and follows a χ^2 distribution with h degree of freedom, where h = number of explanatory variables in the model. $L(\theta_0)$, $L(\theta_1)$ are the likelihood for the null and alternative hypotheses, respectively. The test is at 5% level of significance.

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