

THE RELATIVE EFFECTIVENESS OF FISCAL AND MONETARY POLICY IN MACROECONOMIC MANAGEMENT IN NIGERIA

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ABSTRACT

The relative effectiveness of monetary and fiscal policy on economic activity in Nigeria was determined through cointegration and error correction modeling techniques. The time series properties of the variables were investigated by conducting a unit root test using annual series data for the period 1970-1998 and the data source was mainly CBN Statistical Bulletin. The result of our analysis shows that monetary rather than fiscal policy exerts a great impact on economic activity in Nigeria. The emphasis on fiscal action of the government has led to greater distortion in the Nigerian economy. We are, however, of the opinion that both monetary and fiscal policies should be complementary.

INTRODUCTION

The objectives of monetary and fiscal policies in Nigeria are wide-ranging. These include increase in Gross Domestic Product growth rate, reduction in the rates of inflation and unemployment, improvement in the balance of payments, accumulation of financial savings and external reserves as well as stability in Naira exchange rate. The policy as well as instruments applied to attain these objectives, however, have until recently been far from adequate undue reliance

has been placed on fiscal policy rather than monetary policy in Nigeria (Darrat, 1984) which is frequently breached.

However, a re-direction in monetary policy and in particular the emphasis on more relevant and effective instruments came in the wake of deregulation of money market beginning from 1987. Monetary policy from then onwards laid greater emphasis on preventing money from becoming a major source of disturbance in the economy. Excessive monetary expansion is being tackled at all costs, hence the recourse to stabilization securities among other instruments.

Today, monetary and fiscal policies are both commonly accorded prominent roles in the pursuit of macroeconomic stabilization in developing countries, but the relative importance of these policies has been a serious debate between the Keynesians and the monetarists. The monetarists believe that monetary policy exert greater impact on economic activity while the Keynesian believe that fiscal policy rather than the monetary policy exert greater influence on economic activity.

Despite their demonstrated efficacy in other economies as policies that exert influence on economic activities, both policies have not been sufficiently or adequately used in Nigeria. The objective of this study is, therefore, to examine the relative effectiveness of monetary and fiscal policy in Nigeria using the recent econometric modeling techniques of co-integration and error correction. The remaining part of this study is divided thus: section II focuses on the literature review, section III discusses the theoretical framework adopted, section IV embraces the model formulation and analysis of results, and section V concludes the study.

LITERATURE REVIEW

Literature abounds on the relative effectiveness of monetary and fiscal policy in developed and developing countries of the world. However, there has

been contrasting opinions on which of the two policies exert greater influence on economic activity. This section hereby critically reviews previous studies in this area.

Ajayi (1974) emphasized that in developing economy in which Nigeria is a typical example, the emphasis is always on fiscal policy rather than monetary policy. In his work, he estimated the variables of monetary and fiscal policies using ordinary least square (OLS) technique and found out that monetary influences are much larger and more predictable than fiscal influences. This result was confirmed with the use of beta coefficients that changes in monetary action were greater than that of fiscal action. In essence, greater reliance should be placed on monetary actions.

Elliot (1975) examined the relative importance of money supply changes compared to government expenditure changes in explaining fluctuations in nominal GNP. He was of the opinion that this area of study had continuing capacity to provide debate among economists. He estimated St. Louis equation with the use of OLS technique. The equation is of the form:

$$\Delta Y_t = c + \sum m_i \Delta M_{t-i} + \sum e_i \Delta E_{t-i} + u_t \quad (1)$$

where ΔY represents the change in nominal GNP, ΔM represents the change in money supply while ΔE represents the change in high employment federal government expenditures. After estimating the equation above the result of his evaluation clearly support the conclusion that fluctuations in nominal GNP more importantly attach to monetary movements than to movements in federal government expenditure in federal government expenditure.

Batten and Hafer (1983) also discussed the relative effectiveness of the two stabilization policies in some developed countries. In their study, they found out that monetary action rather than fiscal action had a greater influence on the

nominal GNP. However, the results from this study cannot be generalized for the developing countries since they have significantly different economic and political structures. The above study however confirms the work of Dewald and Marchon (1978).

Contrary to these results is the work of Andersen and Jordan (1986). They tested empirically the relationships between the measures of fiscal and monetary actions and total spending for United States. These relationships were developed by regressing quarter to quarter changes in Gross National Product (GNP) on quarter to quarter changes in the money stock (MS) and the various measures of fiscal actions namely; high employment budget surplus (R-E), high employment expenditure (E) and high employment receipt (R). The analysis of their results was that the influence of fiscal action on economic activity occurred faster than that of monetary action.

Chowdhury (1986) in his study of monetary and fiscal impacts on economic activity in Bangladesh was also of the opinion that fiscal rather than monetary action had greater influence on economic activities. He also made use of the ordinary least square (OLS) technique in his empirical investigation. He adopted St. Louis equation in estimating the monetary and fiscal variables. The modified model estimated here is of the form:

$$Y_t = C_0 + \sum m_i M_{t-i} + \sum f_i F_{t-i} + \sum e_i E_{t-1} + u_t \quad (2)$$

where Y, M, F, and E represent the growth rate of nominal income, money supply, government expenditures and exports respectively. In analyzing his results he confirmed the result of some authors and concluded that fiscal actions exert greater impact on economic activity in Bangladesh than monetary actions. This result was confirmed with the t-statistics of the summed coefficients, which is significantly larger than the corresponding value for the monetary summed

coefficients. It follows from this study that fiscal policy impacts on nominal income are more predictable than the monetary impact.

Olaloye and Ikhide (1995) in their article entitled "Economic Sustainability and the Role of Fiscal and Monetary Policies in A Depressed Economy: The Case Study of Nigeria" estimated a slightly modified form of the basic St. Louis equation of the form:

$$Y_t = g_0 + \sum m_i M_{t-i} + \sum f_j F_{t-i} + \sum x_i X_{t-i} + u_t \quad (3)$$

In estimating the above equation, monthly data for the period 1986-1991 was employed. The analysis of their results showed that fiscal policy exerts more influence on the economy than monetary policy. The result, therefore, suggests that fiscal policies have been more effective in Nigeria at least in the period of depression. They are, however, of the opinion that government expenditure will be an appropriate measure of fiscal policy.

In Nigeria, there have been very few empirical studies regarding the relative efficacy of the stabilization tools. The purpose of this study is, therefore, to test empirically the comparative effectiveness of the two policy variables in the case of developing economy like Nigeria taking due advantage of longer time series. Not only this, most studies, if not all applied the ordinary least square (OLS) technique in their model estimation. We are, however, of the opinion that the result may be spurious given the nonstationarity property of time series data.

THEORETICAL FRAMEWORK

The question of whether an expansionary monetary policy (MP) or fiscal policy (FP) will help to raise output starts from the basic Keynesian model. In general, either an increase in government expenditure or an expansionary monetary policy (MP), leading to an increase in investment via lower interest rate,

will lead to an increase in output Nevertheless, for many years, and to some extent and even now, there is the view that Keynesians ascribe that only fiscal policy (FP) can affect income and output, while monetarists believe that only MP can have such an effect. It turns out, therefore, that in certain special cases, only FP works and in another special case, only MP works.

It has, however, been observed that only FP will work, and MP will not have any effect, if one of the links between changes in money supply and changes in investment is broken. The accounts of Keynesian theory concentrate on the liquidity trap as the extreme Keynesian special case. The important implication of the liquidity trap is that once the rate of interest has fallen to the level at which the liquidity trap occurs, an increase in the money supply will not reduce the interest rate any further. Therefore if the level of investment which could occur at this minimum rate of interest is still not great enough to provide expenditure equal to full employment output, then MP will not be able to increase investment and thereby restore full employment and income by this route.

However, in a liquidity trap, an increase in government expenditure will still increase output. In fact, as long as we remain in liquidity trap, an increase in government expenditure will have the full effect on income predicted by the multiplier because interest rates do not rise at all and there is no crowding out of private investment to offset any of the effects of the increase in government expenditure. Hence, the support for the fiscal action of the government to boost output

On the other hand, those who accuse Keynesian believe that only fiscal policy can work, and that monetary policy cannot, then point out the extreme unlikelihood of liquidity trap, and the lack of evidence that it has ever occurred. It seems to us, however, that most of those Keynesians who claim that monetary policy cannot raise income did not have liquidity trap in mind. Instead they usually based their view on the other link between monetary policy and

investment. If investment is completely insensitive to the rate of interest, then monetary policy will have no effect even if it does to a fall in the interest rate except that investment is sensitive to interest rate. By now, virtually all economists accept that investment is sensitive to interest rate.

It follows therefore that the general theoretical framework accepted by Keynesians indicated that provided that the economy was not in a liquidity trap and provided that there was some sensitivity of investment to interest rates, monetary policy would affect output. This view is now accepted as the empirically relevant case. The converse case, in which monetary policy can affect income while fiscal policy is powerless, will also not occur in the general Keynesian model. This view referred to as the monetarists' view is expressed by making reference to the "Quantity Theory of Money" as in equation (4) below:

$$MV=PY \tag{4}$$

where M stands for money stock; V, velocity of circulation; P, an index of the price level and Y, the income. The right-hand side of equation (4) is the value of nominal national income. If V is constant then equation (4) tells us that there is a one-to-one relationship between changes in the stock of money and changes in the value of national income.

$$M = kPY \tag{5}$$

If, in addition, as in the present context of our discussion of monetary and fiscal policy, we keep the price level (P) fixed, then the only way that y can change is if M changes. The implication is that any other change, such as a change in government expenditure will not affect the level of real income. Hence, fiscal policy must be powerless while monetary policy will affect real output.

Considering equation (5) as a demand for money which is not dependent at all on interest rates, one has the idea that there is one, and only one, level of national income which would lead to a demand for money balances which is equal to the exogenously given money supply. This suggests that if there is an increase in one of the components of desired expenditure, such as government expenditure, what will happen is that there will be an excess demand for funds which will drive up the interest rate in the financial markets. The process will only stop when enough investment has been crowded out by the rise interest rates so as to leave total expenditure back to its old level.

The end result of the dynamic process is however clear from the model in equation (6) below:

$$Y = C + I + G \quad (6)$$

An increase in government expenditure will lead to a drop in private investment of exactly the same magnitude leaving total expenditure and output unchanged. In terms of equation (6), the increase in G will be matched by a fall in I, and there is full crowding out. Hence fiscal policy cannot have any effect in the special case where the demand for money is completely insensitive to interest rate.

Given the above discussion, the tendency now is for the monetarists to say that Keynesians believe only in fiscal policy and for Keynesians to accuse monetarists of believing only monetary policy. The issue now is to determine which view is more relevant to the Nigerian economy

MODEL SPECIFICATION AND ANALYSIS OF RESULTS

(a) Model Specification and Data Sources:

Reading through the various works and analyses of the various writers it is possible to specify our empirical model in the following manner:

$$Y_t = f(MP_t, FP_t) \quad (7)$$

where Y is a measure of economic activity in which Gross Domestic Product (GDP) is employed as a proxy, MP and FP are measures of monetary and fiscal actions of the government respectively. Both narrow money (MI) and broad money (M2) are employed as proxies for monetary policy variable while the search for fiscal policy variable is among the government revenue receipts (R), government expenditure (E) and government budget deficits (BD) which is measured as (R -E).

Considering the log-linear specification, equation (7) in its explicit form becomes:

$$\ln Y_t = a_0 + b_1 \ln MP_t + b_2 \ln FP_t + e_t \quad (8)$$

where all variables are as earlier defined, ln is natural logarithm and e_t is error term. It is known a-priori that GDP is expected to be positively related to MP and FP. Annual data series are employed for the estimation of equation (8) above and the estimation period is 1970 through 1998. All the time series data employed are gathered mainly from the Central Bank of Nigeria (CBN) Statistical Bulletin (1998). The empirical results of this study have been obtained through the use of PC-GIVE computer package of econometric data analysis and estimation.

(b) Model Estimation and Interpretation of Results:

(i) Unit Root Tests:

Following Engle and Granger (1987) procedure, we start with the testing for the order of integration of the variables, which appear in our model. To characterize the time series property of the variables of interest, the Dickey-Fuller

(DF) and Augmented Dickey-Fuller (ADF) tests are employed. Adopting the simple economic relationship of random walk with drift, the DF test is based on the following equation:

$$\Delta X_t = a + \beta X_{t-1} + U_t \quad (9)$$

Under the null hypothesis of unit root, the coefficient of X_{t-1} will not be statistically different from zero (i.e. $\beta = 0$). If there is no unit root, the series X_t is said to be stationary in levels or integrated of order zero (denoted as $I(0)$). If there is a unit root, but differencing the series once makes it stationary, then it is said to be integrated of order one (denoted as $I(1)$).

Table 1: Unit root tests for variables.

Variable	Dickey -Fuller (DF)	Augmented Dickey- Fuller (ADF)
LMI	-0.0551	-0.4271
LM2	-0.2580	-0.2776
LGDP	-1.8150	-1.2412
LGE	-0.3054	-0.0227
LGR	-1.0318	0.3836
LBD	-3.3225	-1.8382
Δ LMI	-2.8913	-2.0531
Δ LM2	-3.2645	-1.9775
Δ LGDP	-5.1972	-2.1365
Δ LGE	-5.4041	-2.0324
Δ LGR	-5.9254	-1.9759
Δ LBD	-7.4880	-3.0182

where: LGDP = Natural Log of Gross Domestic Product, LMI = Natural Log of Narrow Money (CC + DD)
 LM2 = Natural Log of Broad Money (MI + Quasi Money), LGR = Natural Log of Government Revenue
 LBD = Natural Log of Government Expenditure, LBD = Natural Log of Government Budget Deficits (LGR - LGE), Δ = First difference operator.

In addition to testing for the unit root, equation (9) will establish if there is a drift ($a \neq 0$). The error term, u_t , should be white noise. If, X_t is a first order autoregressive process (AR(1)), then the single lagged value of the variable will be sufficient to ensure this condition. If the process is not AR(1), then additional difference terms will need to be added to equation (9) to make u_t white noise hence the Augmented Dickey-Fuller (ADF). The ADF test is therefore based on the equation (10).

$$\Delta X_t = a + \beta X_{t-1} + \sum c_i \Delta X_{t-i} + u_t \quad (10)$$

The null hypothesis of non-stationary is rejected if the t-statistic is less than the critical t-value (i.e. if estimated \hat{a} is significantly negative). The critical values adopted in this study are adapted from Charemza and Deadman (1997). The results of the unit root tests are reported in Table 1.

Using DF test, all variables except for budget deficit (BD) are regarded as non-stationary at their levels since each reported t-statistic is not smaller than the 5% critical t-value of -1.97. Again using ADF, the null hypothesis of non-stationary is accepted for all the series investigated in levels. The ADF critical t-value is -1.87. In general, the results of these tests shown in Table 1 are consistent with the presence of a unit root in each of the variables, investigated.

This result is followed by testing whether first differencing makes the variables stationary. In other words, for each variable we tested the null hypothesis that the variables ARE I(1). The results of these tests are also reported in Table 1. The results, however, confirm that differencing once is all that is required to bring these variables to stationarity.

(ii) Tests for Co-integration:

Following our findings in (i) above that all variables of interest are of I(1) we, therefore test for possible co-integration among these variables. Adopting

Engle and Granger two-step method, we first estimate the long run relations among these variables by OLS and test for stationarity of the residuals. Here, we test whether a postulated equality in the long run relationship between economic activity, fiscal and monetary policy gives a stationary error. Again, DF and ADF tests were employed to test for cointegrated variables. The results of cointegration tests are reported in Table 2 for bivariate and multivariate regressions.

Table 2: Cointegration Regressions for Bivariate Variables

Variable	Constant	Coefficient of V1	Coefficient of V2	DF	ADF
LGDP on LMI & LBD	10.5962 (91.01)	0.0833 (6.66)	0.2183 (3.05)	-5.3650	-4.1874
LGDP on LM2 & LBD	10.5617 (83.50)	0.0825 (6.39)	0.2197 (2.98)	-5.3574	-4.3808
LDGP on LMI	10.6465 (80.80)	0.0714 (5.25)		-2.0569	-2.2920
LGDP on LM2	10.6217 (74.83)	0.0702 (5.04)		-2.0052	-2.2971
LGDP on LBD	11.3457 (236.8)		0.0697 (0.63)	-1.6488	-1.3491
LGDP on LGR	10.4427 (88.94)		0.0922 (7.64)	-1.9735	-2.4235
LGDP on LGE	10.5009 (80.16)		0.0836 (6.39)	-2.1169	-1.8985

Given the DF and ADF 5% critical t-values of -4.17 and -4.09 respectively, variables in the multivariate cointegration regressions 1 and 2 in Table 2 are said to be cointegrated (i.e. both monetary (MP) and fiscal (BD) cointegrates with GDP). However, all the bivariate models in Table 2 are not cointegrated given the DF and ADF 5% critical t-values of -3.82 and -3.73 respectively. Addressing the issue of appropriate income measure, we employ GDP while we employ MI and BD as the appropriate monetary and fiscal measures respectively. The solved static long run equation is reported in equation (11) below:

$$\begin{array}{l}
 \text{LGDP} = 10.480 + 0.080 \text{ LM1} + 0.247 \text{ LBD} \\
 \text{S.E.} \quad (0.12057) \quad (0.01661) \quad (0.11123) \\
 \text{R2} = 0.65
 \end{array} \tag{11}$$

We next switch to a short run model with an error correction mechanism. Adopting the Engle-Granger representation, we employ an error correction dynamic specification of the form:

$$\Delta \text{GDP}_t = \alpha_0 + \alpha_1 \Delta \text{Z}_t + \alpha_2 (\text{GDP} - \text{Z})_{t-1} + e_t \tag{12}$$

where z is the vector of variables that cointegrate with GDP variable as reported in Table 2. Since MI and BD cointegrate with GDP, equation (12) can be written as:

$$\Delta \text{LGDP}_t = \alpha_0 + \alpha_1 \Delta \text{LMI}_t + \alpha_2 \Delta \text{LBD}_t + \alpha_3 \text{ECM}_{t-1} + e_t \tag{13}$$

where ECM_{t-1} is the lagged time series of residuals from the cointegrating vector.

Equation (13) incorporates a corrective mechanism by which previous disequilibria in the relationship between the level of GDP and the levels MP and BD together as in equation (13) are permitted to affect the current change in GDP. This way, an allowance is made for any short run divergence in GDP from the long run target. The estimated form of equation (13) gives equation (14).

EQ(14): Modeling $\Delta LGDP$ by OLS

VARIABLE	COEFF	STD ERROR	H.C.S.E.	T-VALUE	PARTIAL R2
$\Delta LGDP$ 1	0.69123	0.19971	0.18993	3.46122	0.5996
$\Delta LGDP$ 2	0.03142	0.14859	0.13041	0.21144	0.0056
$\Delta LGDP$ 3	0.14984	0.20008	0.27834	0.74889	0.0655
$\Delta LGDP$ 4	0.42196	0.17148	0.17594	-2.46064	0.4308
CONSTANT	0.00970	0.03918	0.05628	-0.24750	0.0076
$\Delta LM1$	0.22698	0.11204	0.13357	2.02590	0.3391
$\Delta LM1$ 1	-0.16165	0.11272	0.09097	-1.43402	0.2045
$\Delta LM1$ 2	0.03767	0.11649	0.09904	0.32333	0.0129
$\Delta LM1$ 3	0.11816	0.11815	0.14329	1.00014	0.1111
$\Delta LM1$ 4	-0.14203	0.09011	0.09882	-1.57615	0.2369
ΔLBD	0.01086	0.04599	0.0206	0.23620	0.0069
ΔLBD 1	0.02575	0.04164	0.02485	0.61850	0.0456
ΔLBD 2	-0.02536	0.04398	0.05232	-0.57659	0.0399
ΔLBD 3	0.02514	0.04210	0.04443	0.59709	0.0427
ΔLBD 4	-0.11594	0.04187	0.04045	-2.76940	0.4895
$ECM1$ 1	-1.50305	0.32774	0.46138	-4.58614	0.7244

$R^2 = 0.9000620$, $\hat{\sigma} = 0.0451059$, $F(15, 8) = 4.80$ [0.0155], $DW = 2.733$, $RSS = 0.0162763309$ for 16 variables and 24 observations, Information Criteria: $SC = -5.177395$; $HQ = -5.754405$; $FPE = 0.003391$; R^2 Relative to DIFFERENCE+SEASONALS = 0.94958; The Sample is 1975 to 1998 less 0 Forecasts

Equation 14 is then reduced to a parsimonious equation through the elimination of insignificant terms and the imposition of constraints that hold a reasonable approximation. The imposition of this constraint leads us to our final equation (15), which is then used for further analysis.

EQ(15): Modeling Δ LGDP by OLS

Variable	Coefficient	Std. Error	H.C.S.E	t-value	Partial r^2
Δ LGDP 1	0.6495125	0.13839	0.13994	4.69321	0.5949
Δ LGDP 4	-0.4292460	0.12227	0.07851	-3.51067	0.4510
CONSTANT	-0.0247152	0.02321	0.01976	-1.06500	0.0703
Δ LM1	0.3184162	0.05952	0.06618	5.34971	0.6561
Δ LM1 1	-0.1871140	0.06423	0.06745	-2.91317	0.3613
Δ LM1 3	0.2267770	0.05795	0.06855	3.91325	0.5052
Δ LM1 4	-0.1999759	0.06113	0.06920	-3.27124	0.4164
Δ LBD 4	-0.1328881	0.02766	0.02694	-4.80365	0.6060
ECM1 1	-1.4586232	0.25956	0.32655	-5.61953	0.6780

$R^2 = .8705705$; $\sigma = 0.0374873$; $F(8, 15) = 12.61$ [0.0000]; $DW = 2.336$
 $RSS = 0.0210794403$ for 9 variables and 24 observations; Information Criteria: $SC = -5.845741$; $HQ = -6.170309$; $FPE = 0.001932$; R^2 Relative to DIFFERENCE +SEASONALS = .93470;

(iii) Result of Error Correction Model

Equation (14) reports the initial over-parameterized error correction of economic activity in Nigeria. All the variables were lagged equally in this model (4 lags). The result of parsimonious model as reported in equation (15) indicates model parsimony. Equation (15) is preferred to equation (14) since it has the lower Schwartz Criterion (SC) and standard deviation. This result clearly shows a well-defined error correction term, ECM, and indicates a feedback of 146% of the

previous year's disequilibrium from the long run money supply and budget deficit elasticity of economic activity. The implication of this is that both the money supply (M1) and budget deficits (BD) maintain the GDP equilibrium through time. The effect of these disequilibria error corrections is not only large, but also have negative signs as expected. The strong significance of the coefficient of ECMt-I supports our earlier assertion that GDP indeed cointegrates with M1 and BD (that is both the monetary and fiscal variables).

CONCLUSION

The empirical model is developed in the light of recent developments in the methodology of econometric modeling and the analysis of time series with stochastic non-stationary components. Starting with an analysis of the unit root properties of the relevant series, the results clearly show that the tests fail to reject the null hypothesis that these variables are non-stationary and they are, indeed, integrated of order 1.

Given the non-stationarity of the series, the cointegration equations were estimated. The evidence shows that GDP cointegrates with both MI and BD. Cointegration was also found for GDP series with M2 and BD series. It was also evident that neither GB nor GR series was found to be cointegrated with the GDP series. The existence of one cointegrating linear combination was, therefore, established which corresponds to a long run GDP function with respect to M1 and BD. On the basis of this information, an error correction model was developed which was shown to be well-specified relative to its own information set and capable of parsimoniously representing the data set.

Adopting cointegration and error correction modeling strategy, the relationship between Nigeria's GDP and both monetary and fiscal policy were analyzed through a series of reduction from over-parameterized model interrelating GDP, MI, BD and error correction term. The estimates presented in

this study suggest that monetary rather than fiscal policy exert greater impact on economic activity in Nigeria. The conclusion, therefore, is that the emphasis on fiscal action of the government has led to a greater distortion in the Nigerian economy.

We are, however, of the opinion that the proxy for trade liberalization which came as a consequence of Structural Adjustment Program (SAP) in 1986 might be statistically insignificant even though, this policy shift could have caused significant impact on economic activity in the country further investigation. This serves as a major limitation of our study therefore calling for further investigation. Also the relationship of our model cannot be interpreted as GDP equation. It then follows that money supply targeting for stabilization purposes rather than fiscal actions will be a useful exercise. However, the combination and coordination of both monetary and fiscal policy are highly recommended.

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