Monetary and Fiscal Policy Coordination in Nigeria: A replication Research of a Set Theoretic Approach:

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ABSTRACT

In this article, we use the Set Theoretic Approach (STA) to determine the extent of coordination between monetary and fiscal policies in Nigeria from 1981 to 2015. Our main findings generally indicate a weak level of policy coordination estimated to be 17%. A further disaggregation of the results showed that the highest level of coordination of 36.4% occurred during the period of low growth and high inflation. However, there was no evidence of coordination during periods of high GDP growth and inflation. These findings point to the obvious need for fiscal and monetary authorities to strengthen policy coordination towards enhanced macroeconomic stability.

Keywords: Monetary policy, fiscal policy, coordination, STA, Nigeria

1. INTRODUCTION

In most countries, the primary objectives of macroeconomic policy include price stability, full employment, balance of payment equilibrium as well as stable and sustainable economic growth that can improve the quality of lives for the majority of the population (Ojo, 2000). Two key tools popularly employed by government in achieving macroeconomic balance are the fiscal and monetary policies (Wren-Lewis (2011). Monetary policy, used by monetary authorities such as the central bank, deploys monetary instruments such as money supply, credit and interest rate to influence aggregate demand towards the achievement of macroeconomic targets, while fiscal policy relies on government taxes and expenditure, including borrowings to determine aggregate demand in the economy. There has been no consensus in the literature as to which of them is superior to the other. While the Keynesians consider fiscal policy as more potent than monetary policy, the monetarists championed by Milton hold a contrary viewpoint (Folawewo and Oshinubi, 2006).

Although both monetary and fiscal policies attempt to achieve the same broad objective of macroeconomic stability, individual policy objectives and instruments employed by each authority differ and often conflict. Fiscal policies‟ focus on attaining economic growth and employment may at times be pursued even at the cost of inflation and the reverse is also true (Arby and Hanif, 2010). In order to avoid the pursuit of these objectives at cross-purposes, it is pertinent for extensive coordination and collaboration between them (Laurens and Piedra, 1998). In practical terms, coordination entails regular interactions between the fiscal and monetary authorities to facilitate joint decisions on issues pertaining to the design and implementation of macroeconomic policies. Effective coordination between the fiscal and monetary authorities helps immensely in fast-tracking the achievement of stated policy objectives more efficiently. Absence of monetary-fiscal policy coordination adversely affects macroeconomic management. A weak monetary policy stance undermines the performance of fiscal policy and vice versa.

All these facts point to the need to conduct a study that would quantify the level of monetary – fiscal policy coordination. Despite the importance of monetary-fiscal policy coordination in ensuring macroeconomic balance, little attention has been devoted to this area of research. Available literature indicated only few studies on the determination of the extent of policy coordination in Nigeria. As its main contribution to knowledge, this paper applies the Set Theoretic Approach to Nigeria using country-specific variables, covering a lengthy sample period. This in effect is necessary for producing more relevant and reliable results for policy decisions. In this paper, we attempt to determine the extent of coordination between monetary and fiscal policies in Nigeria.

2. STYLIZED FACTS ON FISCAL AND MONETARY POLICY COORDINATION IN NIGERIA

2.1. A review of the Nigerian monetary policy framework

The mandate for formulating and implementing monetary policy rests with the Central Bank of Nigeria (CBN) since its establishment in 1958. In terms of institutional arrangement, the Monetary Policy Committee meets bi-monthly to review and take decisions on monetary policy. It is supported by other Committees such as the Monetary Policy Technical Committee, Monetary Policy Implementation Committee, Liquidity Assessment Group and the Fiscal Liquidity Assessment Committee (CBN, 2011a).

Since its establishment, the CBN has adopted two major types of framework for implementing monetary policy. These are the exchange rate targeting and monetary targeting. Exchange rate targeting framework was in operation between 1959 and 1973 and replaced subsequently with monetary targeting in 1974 till date. The policy shift to monetary targeting was largely informed by the collapse of the fixed exchange rate regime of the Bretton Woods System. The monetary targeting framework entails the use of direct or indirect instruments to control monetary aggregates. Since inflation is usually a monetary phenomenon, a successful control of money supply required for sustainable output growth would „all things being equal" control inflation. It focuses on regular monitoring of monetary aggregates, effective liquidity management, coordination between fiscal and monetary authorities and regular communication with key stakeholders. In Nigeria, under the monetary targeting framework, the operating and intermediate targets are the policy rate and broad money supply respectively, while the ultimate target is single digit headline inflation (Tarawalie et al., 2013). In terms of autonomy, the CBN Act 2007 empowers the Bank with operational and instruments independence in the conduct of monetary policy. Figure 1 showed the performance of monetary policy in terms of ensuring price stability. As indicated, there were major spikes in inflation between 1974 – 1977 and 2002-2003, but was largely moderated between 2004 and 2014 indicating the efficacy of monetary instruments deployed by the CBN.
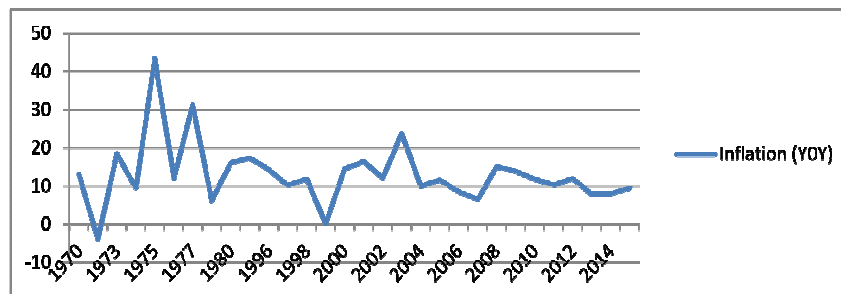

Figure 1. Trends in Inflation Rate (1970-2015)
Source: National Bureau of Statistics Reports (various editions)

 The key instruments employed for implementing indirect monetary policy is the open market operations (OMO) supported by reserve requirements, CBN securities as well as moral suasion. Table 1 showed the growth rate of broad money supply, inflation and other macroeconomic variables. It revealed that headline inflation had been largely subdued within single digit range between 2013 and 2015.

Table 1. Selected Macroeconomic Indicators (2009-2015)

Indicators (%)	2009	2010	2011	2012	2013	2014	2015	Eight year Average
Real GDP Growth	6.96	7.98	5.31	4.21	5.49	6.31	2.65	5.56
Non-oil Real GDP Growth	8.32	8.51	5.85	5.81	8.42	7.18	3.75	6.83
Headline Inflation	13.9	11.8	10.3	12	8	7.9	9.55	10.49
M2 Growth	17.6	6.91	15.37	16.39	1.2	20.64	5.9	12

Source: CBN database

2.2. An overview of the Nigeria's fiscal policy framework

Nigeria's fiscal policy depends largely on oil export earnings. With oil and gas constituting the major source of Nigeria's export revenues, volatility driven by oil prices affects government revenue and expenditure significantly (Baunsgaard, 2003). The volume of public expenditure exhibits a direct relationship with accrued oil revenues (Figure 2). This implies that any fluctuation in oil earnings which is the major source of revenue directly affects the domestic economy.
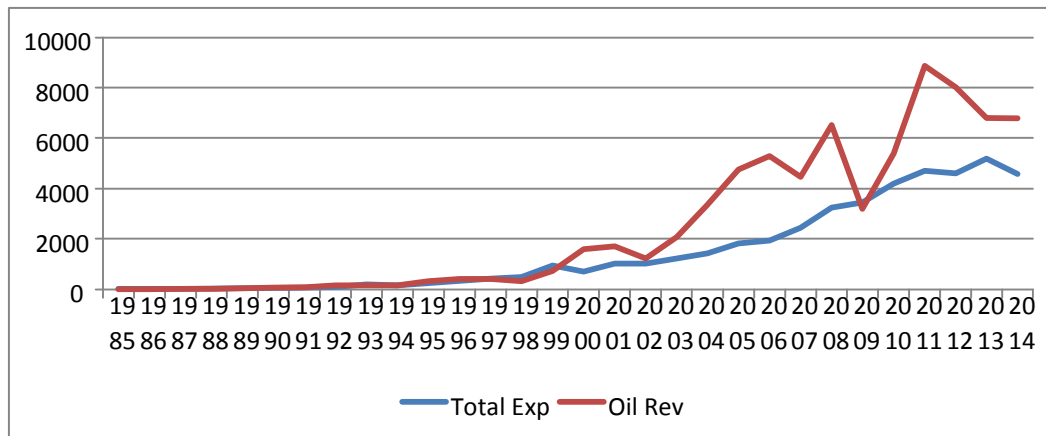

Figure 2. Trends in Federal Government Oil Revenue and Expenditure (N Billions)
Source: CBN database

Government's fiscal operations have expanded in response to increased oil revenue accruing to government treasury. According to Iwayemi (2009), about four out of every five naira of government revenue inflow was generated from oil revenue. The main thrust of government's fiscal policy is macroeconomic growth, debt sustainability and increased public sector revenue. Two legislations have been enacted at the federal level to improve fiscal sustainability and quality of public expenditure towards enhanced growth. These are the Fiscal Responsibility Acts (FRA) of 2007 and Public Procurement Act of 2007 (Usman, 2007). Amongst others, the FRA has improved the budgetary process by replacing the short-term fiscal perspective with the medium/long term fiscal planning horizon.

According to the Fiscal Responsibility Act, the annual budget would be based on the medium-term fiscal framework which comprises the medium term expenditure framework, medium term revenue framework and medium term sector strategies. The major variables considered in the assumptions are fiscal oil price rule, growth rate of GDP, exchange rate, inflation rate, and fiscal account balance (Usman, 2007).

2.3. Trends in government spending and monetary aggregates

The federal government in 2010 approved a more efficient debt management framework to prevent Nigeria's relapse into the debt trap after the debt relief granted the country in 2005/2006. Some of the key strategies of the framework include medium term debt management plan guidelines on domestic and external borrowings and quarterly debt issuance calendar. The Debt Management Office (DMO) plays a vital role by preparing an annual debt sustainability analysis (DSA) that assesses the country's debt profile.

Table 2: Growth of federal government expenditure (N million) Real Terms

Year	GDP market Price	FG Total Expenditure	Total Expenditure as % of GDP
1961	2,361.20	163.9	6.9
1970	5,281.10	903.9	17.1
1980	47,632.32	14,968.50	30.2
1990	267,549.99	60,268.20	22.5
2000	4,582,127.29	701,059.40	15.3
2010	28,707,700.00	4,194,217.88	14.61
2015	95,177,735.68	476737	0.5

Source: Computed from CBN Annual Reports and statistical bulletins (various editions)

The sharp drop in oil prices in 1994 slowed down government spending and kept broad money supply low. As shown in Figure 3, the return to democratic rule in 1999 triggered expansionary fiscal policy financed largely from issuance of short-term debt and draw-down of government deposits in the banking systems. With the expansionary fiscal policy stance, broad money supply rose by 17.5% within the first nine months of 2001 and continued till 2004. Government embarked on fiscal consolidation in 2004 accompanied by tight monetary policy stance resulting in the CBN meeting its inflation target until 2007.
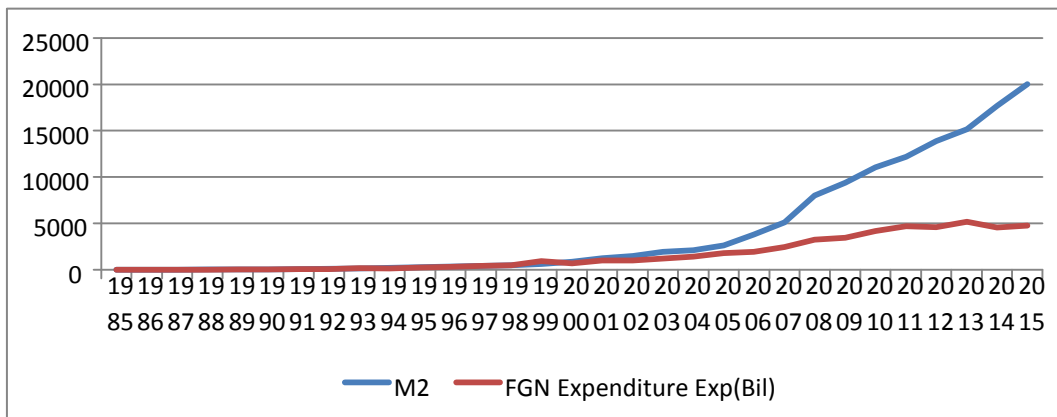

Figure 3. Broad Money (M2) and FGN total expenditure (N billions)

The introduction of fiscal reforms paid off with more efficient public spending, resulting in the creation of huge fiscal buffers which helped immensely in weathering through the storms of the global financial and economic crisis within this period. However, these developments were short-lived as the era of cyclical fiscal policy resurfaced with government expenditure rising by 10% in 2009, 37% in 2010 and11.18% in 2013. Essentially, aggregate expenditure of the federal government continued to expand during the 2000s rising from N70.106 billion in 2000 to N4, 194.22 billion in 2010 and N4, 767.37 billion in 2015. Key factors that triggered the rapid growth in expenditure include increased earnings from oil, massive investments in infrastructure and

economic stimulations in the aftermath of the 2007-2008 global economic and financial crisis. Within this period, overall fiscal deficit averaged N324.06 billion largely financed from the banking sector, particularly the deposit money banks. Inflation rate also rose averaging 12.9% inching from 6.9% in 2000 to 13.9% in 2008 and declined to 11.8% in 2010. Thus, the direct relationship between broad money supply and public expenditure is clearly evident in Figure 3. As shown in Table 2, average growth rate of real government revenue between 1971 and 1975 and 1986-1990 were the highest. These were the periods of the oil boom and the SAP respectively (Obioma and Ozughalu, 2010). This implies that government revenue profile experienced best performance during the early period of the oil boom followed by the SAP period.

Government revenue declined most in 1981-85 coinciding with the collapse of the world oil market followed by serious macroeconomic crisis leading to the introduction of SAP in 1986. Real expenditure recorded its highest growth in 1971-75 coinciding with the era of oil boom in the 1970s and immediately after the civil war during which time government spent a lot of money on rehabilitation, reconstruction and reconciliation programme. 1981-85 recorded the highest decline in rate of real government expenditure due to the oil crisis In terms of real budget deficit: 1991-95 had the highest growth rate while 1986-90 had the highest decline.

2.4. Policy coordination

Two methods are commonly used to achieve monetary and fiscal policy coordination. The first involves close interaction between the monetary and fiscal authorities to mutually agree on decisions concerning macroeconomic policy formulation and implementation while the second method entails the articulation of a set of rules and procedures (Tarawalie, 2013). Nigeria practices the first method through the setting up of joint committees. Membership of the committees comprise representatives of the Central bank, Ministry of Finance, Debt management Office and other revenue generating parastatals of government. These committees provide platforms for key stakeholders to discuss and analyze ways through which monetary management and debt management be conducted in a mutually reinforcing manner. Coordination between monetary and fiscal policies is done through communication outlets at various levels. One of the levels involves bilateral communications between heads of fiscal and monetary authorities while the other entails the setup of various committees. Some of the platforms and committees that coordinate monetary and fiscal policies are discussed below.

First is at the level of Board of Directors and Monetary Policy Committee of the CBN. The fiscal authority is adequately represented at the highest policy making level of monetary management which are the Board of Directors and Monetary Policy Committee of the CBN. To ensure coordination, the Board of Directors and the Monetary Policy Committee (MPC) in addition to the CBN representation draws membership from the Federal Ministry of Finance; the private sector and academia and appointees of the President. In line with Section 12 (3) of the CBN Act of 2007, the responsibility for formulating monetary and credit Policy rests with the MPC. The Permanent Secretary, Federal Ministry of Finance is statutorily one of the three members appointed by the President to the MPC. The second platform involves the establishment of Committees with members drawn from both fiscal and monetary policy institutions. One of such is the Fiscal Liquidity Assessment Committee (FLAC) of the CBN. Established on April 26, 2007 in response to the International Monetary Fund (IMF) Mission recommendation, FLAC helps to strengthen effective coordination of fiscal and monetary policies through regular high level interactions between the monetary authorities and the relevant departments of the fiscal authority. It also develops a database on fiscal operations of the relevant MDAs that helps to forecast the impact of treasury's operations on CBN"s liquidity. The Committee meets weekly and enables CBN's access to high frequency data on fiscal operations of the Federal Government that impact on price stability. Representing the fiscal authorities at the Committee are Federal Ministry of Finance, Debt Management Office (DMO), Office of the Accountant-General of the Federation (OAGF), Budget Office of the Federation (BOF), Nigerian National Petroleum Corporation (NNPC), Nigeria Customs Service (NCS), Federal Inland Revenue Service (FIRS) and the Department of Petroleum Resources (DPR). The Central Bank of Nigeria is represented by the Monetary Policy Department (MPD), Financial Market Department (FMD), Branches Operations Department (BOD), Banking & Payment Systems Department (BPSD), Statistics Department (SD), and the Research Department (RD).

The second is the Monetary and Fiscal Policy Coordinating Committee (MFPCC) of the Debt Management Office. Established on 13 October, 2004, the multi-agency advisory committee meets quarterly to harmonize fiscal and monetary policies as it relates to public debts. It also helps to prevent potential conflicts that may arise between monetary and fiscal authorities in the implementation of debt policies and, strategies. The Committee draws membership from Federal Ministry of Finance, Budget office of the Federation (BOF), Office of the Accountant-General of the Federation (OAGF), National Planning Commission (NPC), Securities & Exchange Commission (SEC), Nigerian Stock Exchange (NSE), Pension Commission (PENCOM), Federal Inland Revenue Services (FIRS), National Insurance Commission (NAICOM), National Assembly and the Central Bank of Nigeria (CBN). The meeting of the Committee holds once every two months to assess economic performance particularly with respect to public debt.

Thirdly, the Cash Management Committee of the Federal Ministry of Finance meets monthly to monitor and project the revenue and expenditure profile of the Federal Government. Members of the Committee include OAGF, BOF, all Revenue Generating Agencies of the Government and the CBN. During its meetings, the Committee reviews the budget performance and provides advice on areas that would strengthen revenue generation and suggest efficient borrowing sources in case of revenue shortfall. Other ad-hoc platforms that assist in policy coordination are the Bankers" Committee conferences, National Economic Council, Federal Executive Council, Economic Management Team and Manufacturers" Associations of Nigeria (CBN 2011b).

3. LITERATURE REVIEW

Policy decisions made by either monetary or fiscal authority derive largely from their respective utility functions. Their preferences on which macroeconomic variables to emphasize depend on their utility function. While the monetary authority bothers more on inflation, the fiscal authority concentrates on growth and employment. These sometimes contrasting preferences reflect the type of instruments deployed by the central banks to contain inflation and that of the fiscal authority to tackle unemployment (Kuncoro and Sebayang, 2013). These biases are also reflected in the amount of weight assigned by each of the authorities to macroeconomic variables. Thus, monetary authorities assign more weight to inflation than unemployment while the reverse holds for the fiscal authority. There has been no consensus in the literature as to which of this policy is superior to the other. While the Keynesians consider fiscal policy as more potent than monetary policy, the monetarists championed by Milton hold a contrary viewpoint (Folawewo and Oshinubi, 2006).

4. METHODOLOGY OF RESEARCH

As indicated in the literature review section, majority of the empirical work on fiscal-monetary policy coordination focused on vector auto regression (VAR) models. However, applying the same VAR model with the same variables has limited potential to enhance scholarship as it may only produce conflicting results. For this reason, our work follows the Set Theoretic Approach of Arby and Hanif (2010) and Tarawalie et al. (2013). The latter is the only known study that used the STA for Nigeria but it covered the West Africa Monetary Zone (WAMZ). The broad scope of the study area and some of the sub region-wide variables used in the analysis severely limited its focus and depth of analysis for specific countries including Nigeria. The major benefit of using the STA is its ability to quantify the level of coordination between the fiscal and monetary policies. This is important consideration in the case of Nigeria where most empirical research on the subject presents mixed results. We began our preliminary analysis by empirical interrogation of the operational independence of the monetary and fiscal policies. Estimating the degree of coordination would only be a valid exercise if the independence of the two policy institutions can be established. In this regard, we conducted the Granger Causality test and also carried out co-integration test. The Granger-Causality test assesses the impact of past information in one variable on the present value of the other variable while co-integration test explores the existence of long-run relationship between the two indicators. Absence of co-integration and no pair- wise causality indicates that the two institutions are at least operationally independent. This would pave the way for further analysis to determine the extent of coordination between the two policies if they are exposed to policy shocks.

4.1. The set theoretic approach

The set theoretic approach adopts the set theory to model explicit coordination. In an attempt to determine the extent of explicit policy coordination, we construct two matrices. The first is the macroeconomic environment matrix while the second is the policy response matrix. The macroeconomic matrix is as shown in Table 3.

Table 3. The macroeconomic Matrix

Targets		Shocks to Inflation (Monetary Policy target)	
		Positive (P)	Negative (N)
Shocks to Growth (Fiscal Policy Target)	Positive (P)	PP	PN
	Negative (N)	NP	NN

As shown in Table 3, there may be four possible fiscal and monetary policy shock scenarios. Two of these scenarios could assume extreme conditions. The first extreme scenario could be an economic condition affected by positive shocks. This policy environment can be represented as „PP". The second extreme possibility could be a scenario in which both inflation and growth are hit by negative shocks, represented as „NN". Apart from these extremes there may be possible conflicting shocks to growth and inflation. Growth and Inflation could be hit by positive and negative shock respectively. These scenarios could be represented as „PN" and „NP" policy environments respectively. Table 4 shows the nature of fiscal and monetary policies response to shocks to the four policies scenarios in Table 3. The policy environment „PP" can be described as an overheated economy characterized by increased growth and rising inflation. This could happen if demand increases faster than supply causing the firms to take advantage of the excess demand to raise prices. In general, higher inflation arising from upward pressure on wages and prices could be as a result of rapid economic growth. In this scenario, the likely response of policy makers would entail the use of both contractionary fiscal and monetary measures represented as „CC".

Table 4. Macroeconomic Policy Response matrix

Policy response		Monetary Policy Response	
		Contraction (C)	Expansion (E)
Fiscal Policy Response	Contraction (C)	CC	CE
	Expansion (E)	EC	EE

The policy scenario „NN" describes an economic condition characterized by rapidly slowing growth and deflation. Appropriate policy response in this case would usually involve expansionary monetary and fiscal policies to stimulate aggregate demand so as to increase growth. For the policy environment with increased growth and low inflation (PN), fiscal policy response would be to slow down growth or at least keep it constant so as not to get out of control. Monetary policy on the other hand would respond by taking an expansionary stance. The last policy environment „NP" depicts a scenario of decreasing growth and rising inflation.

In this environment known as stagflation, standard macroeconomic remedies cannot be relied upon as expansionary monetary and fiscal policies would heat up inflation. Rather, the fiscal authority is expected to maintain an expansionary stance while the monetary authority attempts to stabilize price by a contractionary measure (or at best by doing nothing). Thus, the likely policy response is represented as „EC". In analyzing policy coordination using the STA, annual data were collected between 1981 and 2015 on four variables: Gross domestic product GDP, inflation, budget deficit and money supply. Data on GDP and inflation were sourced from the National Bureau of Statistics, while budget deficit and money supply were accessed from the CBN statistical bulletin. Since policies are expected to cause substantial deviation of output growth and inflation from attaining long run equilibrium, we measured the shock to growth as deviations of real GDP growth from the sample mean. Similarly, we define shock to inflation as the deviation of observed inflation from the threshold rate for Nigeria as estimated by Doguwa (2013).

The monetary policy variable is represented by a change in money supply while the fiscal policy variable is proxied by a change in annual budget deficit. A positive change or value is indicative of expansionary policy position while a negative change or value indicates a contractionary policy stance. By comparing the macroeconomic environment matrix with policy response matrix, we identify a set of years in which shocks and policy responses are commonly observed (Arby and Hanif, 2010). These are represented in each cell. We then define the extent of coordination as follows:

$$C = þ /T \quad (1)$$

Where: $þ = n (PP∩CC) + n (PN∩CE) + n (NP∩EC) + n (NN∩EE)$
T refers to the total number of years covered by the study.

Perfect coordination would occur if we have a congruence of 4 quadrants of macroeconomic matrix and policy response matrix, that is, $þ = 1$. Zero coordination would result if $þ = 0$. It should be noted that the extent of coordination as measured in the study only indicates revealed coordination which may or may not emerge from formal interaction between the monetary and fiscal authorities.

5. RESULTS AND DISCUSSIONS

One of the key requirements for using time series data is to establish their level of stationarity. For this purpose, we applied the Augmented Dicker Fuller (ADF) and KPSS estimators to test the stationarity of the data series. The results of the ADF and KPSS test are presented in Table 5. Interestingly, all the data series are stationary at I(1).

Table 5. Results of Unit Root Tests

Variable	ADF test statistic			
KPSS test statistic				
	First difference		First difference	
MS -5.46*** -0.59**	DEFICIT -3.89** 0.360**			

Note: ** and *** denote significance at 5% and 1% levels of probability.

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We then conduct the Granger Causality and co integration tests. The pair-wise Granger Causality test is intended to establish if causality exists between money supply and budget deficit. As shown in Table 6, neither money supply caused budget deficit nor does the reverse direction holds. This clearly shows that the null hypothesis that money supply does not granger cause budget deficit and vice-versa cannot be rejected at 1% level of significance.

The result therefore precludes any evidence of causality running through budget deficit to money supply and vice-versa in the case of Nigeria.

Table 6. Pair-wise Granger causality tests

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Null Hypothesis	F-statistics		Prob.
MS does not granger cause DEFICIT	3.049		0.139
DEFICIT does not granger cause MS	0.771		0.473

Note: Sample: 1981-2015;   No of Observations = 33; Lags = 2

Next, we employed the Phillips-Oularis co-integration test to determine the existence of long-run relationship between money supply and budget deficit. The choice of the Phillips-Oularis co-integration test is justified on the ground that it is a single equation residual test. Table 7 reported the results of the co-integration test which indicated that we cannot reject the null hypothesis of no co-integration. It can therefore be concluded that there is no evidence of co-integration between money supply and budget deficit.

Table 7. Co-integration Result using Phillips-Ouliaris test

Null hypothesis: No co-integration between DEFICIT and MS

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
MS	-3.459	0.195	-18.090	0.189
DEFICIT	-2.479	0.309	-10.659	0.265

*Mackinnon (1996) p-values.

The result is corroborated by the absence of any clear co-movements of the two variables as shown in Figure 4.
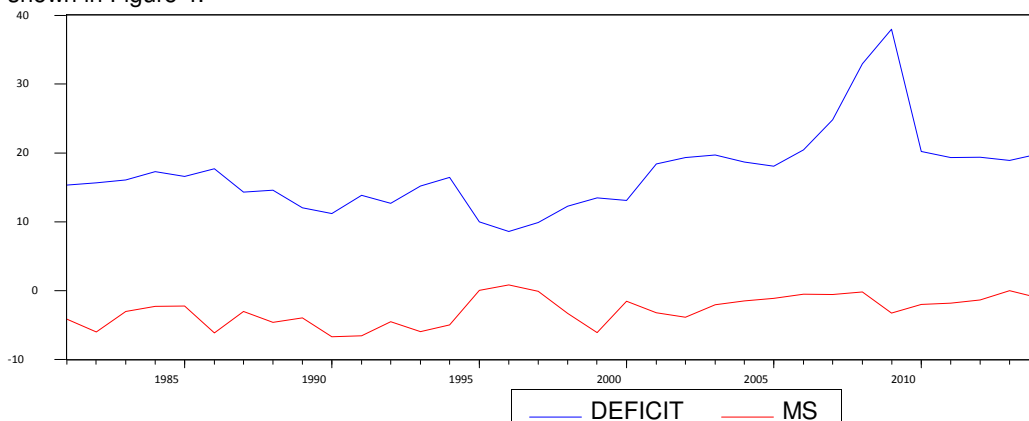

Figure 4. Trends in Money Supply (% of GDP) and Budget Deficit (%of GDP)

Having established evidence that indicators of monetary and fiscal policies adopted in the study are independent, we took a further step to determine the extent of revealed coordination. As indicated in the section on methodology, we adopted the set theoretic approach to determine the degree of revealed coordination between monetary and fiscal policies. Table 8 showed the results for shocks to the macroeconomic environment.

Table 8. Result of macroeconomic Matrix for Nigeria (1981-2015)

Macroeconomic Targets		Inflation (deviations from threshold)	
		Positive	Negative
Growth(deviations from the mean)	Positive (P)	A: 81, 88, 89, 00, 01, 02, 03, 05, 08, 09, 10	B: 85, 04, 06, 07, 11, 13, 14
	Negative (N)	C: 83, 84, 86, 90, 91, 92, 93, 94, 95, 96, 98, 12	D: 82, 87, 97, 99, 15

Note: Numbers in the cells represent end of fiscal year

Cell „A" displays the years in which deviations from the mean and threshold values respectively are positive. Similarly, cell „D" indicates the years when GDP and inflation deviates negatively from the mean and threshold values respectively. Cell „B" shows the years that real GDP growth was above the mean and inflation was lower than the threshold. The reverse holds for cell „C". Results of policy responses to shocks are shown in Table 9.

Table 9. Result of Macroeconomic Policy Response matrix for Nigeria (1981-2015)

Policy response		Monetary Policy Response	
		Contraction	Expansion
Fiscal Policy Response	Contraction	A: 15	B: 81, 82, 86, 88, 93, 97, 98, 99, 01, 02, 07, 09, 14
	Expansion	C: 85, 87, 89, 90, 92, 95, 96, 00, 04, 05, 10, 11, 13	D: 83, 84, 91, 94, 03, 06, 08, 12

With similar explanations to Table 8, cell „A" contains the years in which both values of fiscal deficit and money supply decreased, implying contractionary response of both policies to the positive macroeconomic shock. In the same vein, cell „D" shows the years in which values of both budget deficit and money supply increased indicating that the fiscal and monetary authorities embarked on expansionary policy stance in response to the negative shock. Cell „B" indicates the years during which fiscal budget values decreased and money supply values increased. The reverse holds for cell „C". Next, we compute the extent of coordination between monetary and fiscal policies based on the distribution of years as shown in Figure 5. The degree of coordination for each of the four economic environments is calculated as follows:

i. $n(PP \cap CC)/n(PP) = 0.00$;   ii. $n(PN \cap CE)/n(PN) = 0.29$
iii. $n(NP \cap EC)/n(NP) = 0.33$;   iv. $n(NN \cap EE)/n(NN) = 0.00$

Extent of coordination, C = 0.17 or 17%.

Years of coordination
  90, 92, 95, 96, 07, 14

Years of non-coordination
81, 82, 83, 84, 85, 86, 87, 88, 91, 93, 94, 97, 98, 99, 00, 01, 02, 03, 04, 08, 06, 09, 10, 11, 12, 13 15

Note: Numbers in the cells represent end of fiscal year

Figure 5. Years of fiscal and monetary coordination/non-coordination

According to the results, the extent of coordination between the monetary and fiscal policies as measured by changes in policy indicators in response to economic shocks for the study period is 0.17. This implies that the degree of coordination within the sample period was very weak. This result is in line with other available empirical evidence which also established weak coordination between monetary and fiscal policies in Nigeria. For example, Goshit and landi (2014), Tarawalie et al. (2013) and Chuku (2012) using different analytical techniques found low level of coordination between the two policy authorities in Nigeria.

The coordination score of 17% is lower than the score of 46.6% obtained by Tarawalie (2013) for Nigeria. The disparity in the extent of coordination could probably be attributed to the choice of different sample period and measures of policy indicators.

A further analysis of the results showed that no coordination took place during the periods of growing GDP and high inflation as well as during low levels of both indicators. The highest level of coordination of 33.3% occurred during the period of low growth and high inflation – a phenomenon often referred to as stagflation. Arby and Hanif (2010) also found a closely similar result in Pakistan where low level of coordination occurred during a period of high growth and high inflation. This could perhaps be attributed to policy makers" exhibition of laxity in the face of favourable economic conditions. In contrast, the weak macroeconomic environment exhibited by stagflation warranted quick and decisive policy actions and close collaboration in order to restore macroeconomic stability. This could probably explain the relatively higher degree of coordination experienced during the period of stagflation.

6. CONCLUSIONS AND POLICY RECOMMENDATION

The study attempts to quantify the extent of monetary and fiscal policy coordination in Nigeria using the set theoretic approach with time series data covering 1981 and 2015. Despite the establishment of several committees and for deepening policy coordination, the results generally showed a weak level of coordination within the sample period. As measured by changes in policy indicators in response to economic shocks, the extent of policy coordination for the study period was estimated at 0.17 (17%). A detailed analysis of the results further showed that no coordination took place during periods of growing GDP and high inflation as well as during low levels of both indicators. The highest level of coordination of 33.3% was recorded during the period of low growth and high inflation.

Based on these findings, fiscal and monetary authorities are encouraged to show more commitment towards deepening policy coordination between them. To achieve this, appropriate mechanisms should be put in place to ensure that relevant committees do not only meet regularly but also implement decisions reached at such meetings. Furthermore, there is need to formalize all the necessary inter-agency policy coordination committees with relevant rules of operations. Ensuring that such rules are binding on both authorities with provision for sanctions would strengthen policy coordination.

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