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Monetary Policy Effectiveness, Output Growth and Inflation in Nigeria

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ABSTRACT

This study examined the effectiveness of monetary policy on economic growth and inflation in Nigeria over the period 1970 to 2011. The lag selection criteria all indicated an optimum lag length of one, therefore a VAR (1) model was estimated using GDP, INTR, CPI, and M2 as endogenous variables. The model was dynamically stable and showed no evidence of serial correlation. Estimation results showed that in the short run it is output and inflation that drives monetary growth, while output growth is affected by inflation only. Results from the impulse response and variance decomposition showed that monetary policy variables may not have an instantaneous impact on output, but are key determinants of output growth in the long-run. Furthermore, in the short-run the level of production is more important in controlling inflation, but it is monetary policy variables that matter in the long-run. Therefore, there is the need to differentiate between short and long run monetary policy targets. It was recommended that, policy makers should concentrate on short-run output expansion policies and put measures in place to sustain growth in the long-run to control inflation. But to maintain long-run output expansion, monetary authorities should aim at adjusting the inter-bank rate but with caution as this can instead cause the problem it is meant to solve.

Keywords: *Inflation, Monetary Policy, Nigeria, Output growth*

1. INTRODUCTION

The goal of attaining sustainable economic growth and development has pre-occupied policy makers the world over. The economic management technique of monetary policy has therefore been a pursuit of nations since the formal articulation of how money affects economic aggregates by Adams Smith and the later proponents – the monetary economists. Since the role of monetary policy in influencing macroeconomic objectives such as economic growth, price stability, balance of payment equilibrium, etc became clear monetary authorities have been saddled with the responsibility of using monetary policy to grow their economies. In Nigeria, the story is not quite different. Since, the Central Bank Act of 1958 was promulgated the Central bank of Nigeria, has been saddled with the responsibility of formulating and implementing monetary policy to enhance economic growth and price stability. To live up to its bidding, the CBN Act of 1958 has facilitated the emergence of active money market in the country. Treasury bills, a financial instrument that is used for open market operations and raising debt for government has grown in volume and value and has become a prominent earning asset for investors and a source of balancing liquidity in the market. Since the CBN Act of 1958, there have been various regimes of monetary policy in Nigeria (tight and loose monetary policy) and these have been used to influence growth and price stability. The economy has also witnessed business cycles (periods of booms or expansion and recession or contraction). However, there has been the argument that the growth reported has not been sustainable and encompassing as there is evidence of growing poverty among the populace. Therefore, the questions that beckon for answers are (i) is the reported growth attributable to appropriate monetary policy? (ii)

are periods of stable prices attributable to monetary policy effectiveness? These are the questions this study attempt to answer.

2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

2.1 Theoretical Framework

Although the works of Adam Smith laid the foundation for monetary policy a formal formulation of a mathematical relationship have its root from the works of Irving Fisher (Diamond, 2003) who laid the foundation of the quantity theory of money through his equation of exchange. In his proposition money has no effect on economic aggregates but price. However, the role of money in an economy got further elucidation from Keynes and other Cambridge economists who proposed that money has indirect effect on other economic variables by influencing the interest rate which affects investment and cash holding of economic agents. The position of Keynes is that unemployment arises from inadequate aggregate demand which can be increased by increase in money supply which generates increase spending, increase employment and economic growth. However, he recommends a proper blend of monetary and fiscal policies, as at some occasions monetary policy could fail to achieve its objective. The role of monetary policy which is of course influencing the volume, cost and direction of money supply was effectively conversed by (Friedman, 1968), whose position is that inflation is always and everywhere a monetary phenomenon while recognising in the short run that increase in money supply can reduce unemployment but can also create inflation and so the monetary authorities should increase money supply with caution.

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2.2 Empirical Literature

Rakić and Radenović (2013) in an attempt to examine the influence of fiscal and monetary policy on the economic activity in Serbia, employed unit root and cointegration tests on quarterly time series for the period 2003-2012. They showed that monetary policy is more effective in stimulating economic growth relative to fiscal policy.

Asuquo (2012) evaluated inflation accounting and control through monetary policy measures in Nigeria from 1973 to 2010. Using multiple regression model and the ordinary least squares estimation techniques, Asuquo showed that money supply, interest rate and exchange rate had significant impact on inflation while domestic credit was statistically not significant. Danjuma, et al (2012), attempted to examine the impact of monetary policy on inflation in Nigeria over the period 1980– 2010 with the aim of measuring the effectiveness of monetary policy in Nigeria. Using the least squares technique, granger causality they showed that liquidity ratio and interest rate were the leading monetary policy instruments in combating inflation in Nigeria while cash reserve ratio, broad money supply and exchange rate were described as being “impotent” in effective monetary policy decision in Nigeria.

Nenbee and Madume (2011) attempted to examine the impact of monetary policy on Nigeria's macroeconomic stability between 1970 and 2009. Macroeconomic stability was taken to be synonymous to price stability. Employing the Co-integration and Error Correction Modeling (ECM) techniques they showed that only 47 percent of the total variations in the prices was explained by the monetary policy variables-Money Supply (MOS), Minimum Rediscount Rate (MRR) and Treasury Bills (TRB) in the long-run. They concluded that monetary policy tools therefore have mixed impact on inflation in Nigeria. Sanni, et al (2012) empirically investigated the use of fiscal policy and monetary policy in controlling economic activities in Nigeria over the period 1960-2011. Using Error Correction Mechanism (ECM) approach they showed that monetary policy instruments exert more influence on Nigeria, but results from granger causality test showed fiscal policy granger – causes GDP more than monetary policy. They therefore concluded that none of the policies can be said to be superior to other and that a proper mix of the policies may enhance economic growth.

Musa, et al (2013), investigated the effectiveness of monetary-fiscal policies interaction on price and output growth in Nigeria. Using the impulse response and variance decomposition analysis they showed that the policy variables, money supply and government revenue have more positive impact on price and economic growth in Nigeria specifically in the long run. They therefore come to the conclusion that, although some policy variables are considered to be more beneficial to the social and economic development, the impact of policy is solely dependent on the policy variable selected. Abata, et

al (2012), assessed how fiscal and monetary policies influence economic growth and development in Nigeria and showed a mild long-run equilibrium relationship between economic growth and fiscal policy variables in Nigeria. They therefore suggested that for any meaningful progress towards fiscal prudence on the part of Government to occur, some powerful pro-stability stakeholders strong enough to challenge government fiscal recklessness will need to emerge.

Edoumiekumo, et al (2013), examined the responsiveness of real sector output to monetary policy shocks in Nigeria over the period 1970 to 2011. Applying a VAR model their study revealed that credit to the private sector and investment had direct instantaneous impacts on real sector development (GDP). Real GDP responded more to shocks in MPR, CPI and own innovations in the log-run. Although monetary policy rate and interest rate had no instantaneous and direct impact on real sector development they indirectly do so through the credit and investment channels. To this end monetary policy rate and bank lending rates are the most important monetary policy tools that can make or mar the Nigerian real sector. It was concluded that a sound monetary policy in Nigeria is one that encourages credit to the private sector and capital accumulation. Nwosa and Saibu (2012) were concerned with the transmission channels of monetary policy impulses on sectoral output growth for the period 1986Q1 to 2009Q4. They adopted Granger causality and Vector Auto-regressive techniques and showed that interest rate channel was most effective in transmitting monetary policy shocks to Agriculture and Manufacturing sectors while exchange rate channel was most effective in transmitting monetary policy to Building/Construction, Mining, Service and Wholesale/Retail sectors. They therefore concluded that interest rate and exchange rate policies are the most effective monetary policy measures in stimulating sectoral output growth in Nigeria. Mbutor (2007) showed that bank loans rises contemporaneously with an unexpected monetary policy tightening in Nigeria. Also the quantity of bank loans may fall in response to the same policy shock, though with lags.

3. DATA AND METHODOLOGY

3.1 Data

Secondary data were drawn from the Central Bank of Nigeria, Statistical Bulletin, 2009 edition and Annual Report for the year ended December, 2011. The study covered the period 1970 to 2011. The dataset include monetary policy rate proxy for interest rate (INTR), real gross domestic product proxy for real output, consumer price index proxy for inflation and M2 broad money.

3.2 Model Specification

For the purpose of analyzing and forecasting macroeconomic activities and tracing the effects of policy changes and external stimuli on the economy, researchers have found that simple, small-scale VARs without a possibly flawed theoretical foundation have proved as

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good as or better than large-scale structural equation systems. In addition to forecasting, VARs have been used for two primary functions, testing Granger causality and studying the effects of policy through impulse response characteristics. This study therefore estimated a VAR model to trace the effectiveness of monetary policy

shocks on output growth and price stability. The model is specified as:

$$y_t = m + B_1 y_{t-1} + B_2 y_{t-2} + \dots + B_k y_{t-k} + \epsilon_t \quad (1)$$

Where y_t is a column vector of five (5) variables, that is $y_t = [\text{GDP}, \text{INTR}, \text{CPI}, \text{M2}]'$ modeled in terms of its past values. B_i are $k \times k$ matrix of coefficients to be estimated, m is a $k \times 1$ vector of constants and ϵ_t is a vector of white noise processes with the following properties

$$E(\epsilon_t) = 0 \text{ for all } t \quad E(\epsilon_t \epsilon_s') = \begin{cases} \Omega & \text{if } t=s \\ 0 & \text{if } t \neq s \end{cases}$$

Where the covariance matrix, Ω , is assumed to be positive definite. Thus the ϵ_t 's are serially uncorrelated but may be contemporaneously correlated. The lag length, k is determined empirically. To avoid the omission of relevant information estimation was done by iteration starting with the maximum lag length identified using the information criteria until the optimum model is arrived at that is until the model becomes stable (no modulus or eigenvalue lies outside the unit circle). GDP is gross

domestic product, INTR is monetary policy rate proxy for inter-bank lending rate (interest rate), M2 is broad money and CPI is consumer prices proxy for inflation.

Although the study uses the Granger Causality test to establish instantaneous relation between real GDP and the other endogenous variables the study relied on the impulse response function and the forecast error variance decomposition to establish monetary policy effectiveness on growth and price stability in the economy (Greene, 2002 and Johnston & Dinardo, 1996).

4. RESULTS AND DISCUSSION

To estimate the model of the study, first and foremost searched for the optimum lag length to be used. Using the Lag order Selection Criteria, for which results are presented on table 1 the optimum lag length was found to be lag(1), therefore a VAR(1) model was estimated.

Table 1: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-106.9937	NA	0.004740	5.999657	6.173810	6.061054
1	86.30588	334.3560*	3.28e-07*	-3.584102	-2.713335*	-3.277116*
2	97.48603	16.92130	4.41e-07	-3.323569	-1.756190	-2.770995
3	112.6768	19.70692	5.01e-07	-3.279826	-1.015833	-2.481662
4	131.5709	20.42604	5.09e-07	-3.436263	-0.475657	-2.392511
5	151.1652	16.94641	5.74e-07	-3.630549*	0.026670	-2.341208
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Author's Computation.

Upon estimation of the VAR(1) model, the roots of the characteristic polynomial were examined for VAR stability. Since no root of the characteristic polynomial lie outside the unit circle - all modulus were less than unity (see Table 2) the VAR(1) model satisfies the VAR stability condition and results thereof are consistent for policy analysis. Also the VAR residual Serial Correlation LM tests results presented on Table 3 showed that the model does not have serious serial correlation issues up to lag 12.

Table 2: Roots of Characteristic Polynomial

Root	Modulus
0.974381	0.974381
0.912307 - 0.092444i	0.916978
0.912307 + 0.092444i	0.916978
0.314682	0.314682

Source: Author's Computation

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Table 3: VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	19.19136	0.2589
2	14.53178	0.5592
3	27.34449	0.0378
4	15.37963	0.4970
5	15.85350	0.4632
6	11.97877	0.7454
7	17.66601	0.3438
8	9.470972	0.8928
9	19.64292	0.2367
10	10.19318	0.8563
11	18.47506	0.2968
12	14.88816	0.5328
Source: Author's Computation		

4.1 Monetary Policy Effectiveness and Output Growth in Nigeria

To measure the instantaneous relation of monetary policy variables and output growth the granger causality test is relevant, results for which are presented on Table 4. The results showed unidirectional causality running from LOG(GDP) to LOG(M2) at the 1% level of significance and, from LOG(GDP) to LOG(INTR) and from LOG(CPI) to LOG(GDP) at the 5% level. Therefore, inflation impacts instantaneous on national output growth and national output growth impacts instantaneously on money supply and interest rate. These results imply that, in the short run it is the level of national output that drives monetary policy while the level of inflation affects output growth. Besides the instantaneous relationships, this study also examined the indirect and total effect of the endogenous variables on national output (GDP), therefore use is made of the impulse responses and error variance decompositions. An impulse response function (IRF) traces the effect of Cholesky one standard deviation shock

of one variable in a current horizon on itself and on innovations in other endogenous variables in the current and future horizons. A shock generated in one variable does not only directly affect that variable it is also transmitted to all other endogenous variables indirectly through the dynamic lag structure of the VAR. The IRF graph in figure 1 describes the impact of monetary policy on the national output overtime. The results showed that the impact of money supply on national output though negative through the first to the seventh forecast horizon became positive thereafter and continued to increase into the long – run. Also, interest rate which had a zero impact on national output in the first horizon showed positive impacts thereafter and became significant in the sixth horizon and did not die out in the long –run. The impact of national output shocks on own innovations showed positive but declining trend from the first horizon and almost died out in the long – run. These showed that monetary policy variables though have no instantaneous impact on the level of national output they became the dominant and key determinants of national output in the long – run. This position is also affirmed by the Forecast Error Variance Decomposition presented on table 5. Although, the explanatory power of broad money declined from the first horizon, this decline was very slow and was able to explain about 67 percent of the error variance of national output in the long-run. Also, the explanatory power of interest rate which was just 2 percent in the first horizon increased gradually and was able to explain about 26 percent of the error variance of national output in the long-run. The explanatory power of national output on own innovation which was 24 percent in the first forecast horizon declined rapidly and stood at about 6 percent in the long-run while inflation was able to explain just 1 percent of the innovations in national output.

Table 4: Granger Causality between LOG(GDP) and Monetary Policy Variables

Hypothesized relation	Wald Statistic	Decision
LOG(M2) does not granger cause LOG(GDP)	0.0564	Do not reject
LOG(GDP) does not granger cause LOG(M2)	10.8298***	Reject
LOG(INTR) does not granger cause LOG(GDP)	0.5499	Do not Reject
LOG(GDP) does not granger cause LOG(INTR)	3.7878**	Reject
LOG(CPI) does not granger cause LOG(GDP)	3.5317**	Reject
LOG(GDP) does not granger cause LOG(CPI)	0.0254	Do not Reject

***(**)* significant at the 1%(5%)10% level

Source: Author's computation

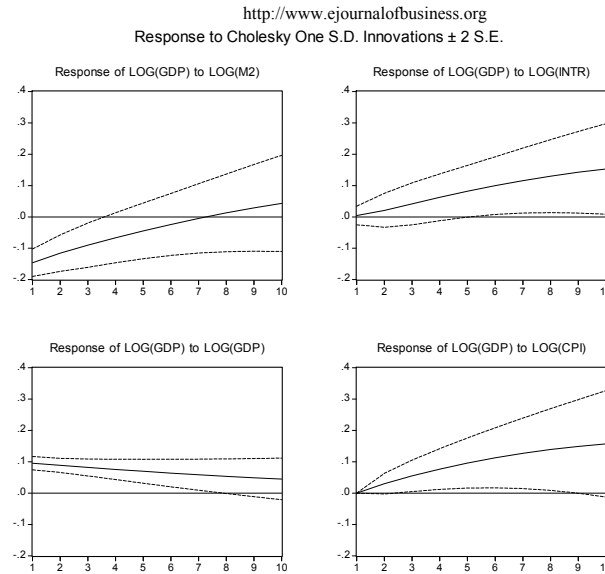


Fig 1: Impulse Response of Aggregate Output to Cholesky one standard deviation shock in Monetary Policy Variables

Table 5: LOG (GDP) Forecast Error Variance Decomposition

Period	S.E.	LOG(M2)	LOG(INTR)	LOG(GDP)	LOG(CPI)
1	0.170120	73.21562	2.073307	24.71107	0.000000
2	0.240511	72.06534	3.367781	20.94565	3.621229
3	0.287791	73.55417	2.358994	21.37123	2.715611
4	0.338014	73.49626	6.612962	17.70264	2.188139
5	0.387165	73.10356	10.58355	14.49221	1.820687
6	0.437017	72.89820	13.64574	11.69503	1.761027
7	0.486822	71.63205	17.28329	9.449417	1.635242
8	0.533777	70.08960	20.60446	7.860691	1.445255
9	0.579038	68.71896	23.29960	6.687843	1.293600
10	0.623427	67.38425	25.64796	5.793752	1.174032
Cholesky Ordering: LOG(M2) LOG(INTR) LOG(GDP) LOG(CPI)					

Source: Author's computation

4.2 Monetary Policy Effectiveness and Consumer Prices in Nigeria

On the effectiveness of monetary policy on inflation in Nigeria the granger causality tests on table 6, impulse response graphs in figure 2 and forecast error variance on table 7 are relevant. The granger causality test results revealed a unidirectional causality running from inflation to money supply at the 1 percent level of significance and a bi-directional causality from interest rate to inflation at the 1 percent level and from inflation to interest rate at the 5 percent level. Therefore, it is interest rate that granger causes consumer prices more. This shows that although, higher interest rates are required to control consumer prices producers are able to effectively transfer the increase in cost of production through increased interest rate to the final consumer through higher prices. It is important to point that these are instantaneous effects. In the long – run things are no longer the same as the impulse response function in figure 2 indicates. Though money supply and interest rates had near zero instantaneous impacts on inflation, in the long – run things were different, their impacts increased and did

not die out. Further, inflation response to the level of income was slow and declining but did not die out in the long – run. Own shock was also important to inflation as the responsiveness of inflation to shocks in own innovation was positive and almost constant throughout the horizons. Table 7 showed that in the first horizon it was own innovations that explained more of the variations in the forecast variance of consumer prices (89.57 percent) followed by national output (8.66 percent) while money supply and interest rate together explained a meager 1.76 percent. However, all of these changed in the long –run. The explanatory power of interest rate innovations increased rapidly and explained 38.17 percent of the variance of inflation while money supply was able to explain 7.42 percent national output explained 2.16 percent which is the least in the long – run. These imply that though in the short – run the level of production is more important in controlling inflation in the long – run it is monetary policy variables that matter. Therefore there is the need for differentiating between short – and long – run monetary policy targets.

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Table 6: Granger Causality between LOG (CPI) and Monetary Policy Variables

Hypothesized relation	Wald Statistic	Decision
LOG(M2) does not granger cause LOG(CPI)	0.1083	Do not Reject
LOG(CPI) does not granger cause LOG(M2)	9.2258***	Reject
LOG(INTR) does not granger cause LOG(CPI)	11.108***	Reject
LOG(CPI) does not granger cause LOG(INTR)	4.9731**	Reject
LOG(GDP) does not granger cause LOG(CPI)	0.0254	Do not Reject
LOG(CPI) does not granger cause LOG(GDP)	3.5317**	Reject

Source: Author's computation

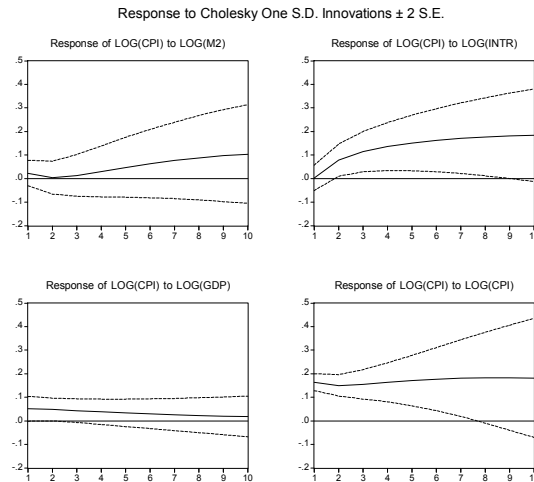


Fig 2: Impulse Response of Consumer Prices to Cholesky one standard deviation shock in Monetary Policy Variables

Table 7: LOG (CPI) Forecast Error Variance Decomposition

Variance Decomposition of LOG(CPI):					
Period	S.E.	LOG(M2)	LOG(INTR)	LOG(GDP)	LOG(CPI)
1	0.161233	2.617521	0.891030	2.018813	94.47264
2	0.213592	2.458554	1.838393	3.661370	92.04168
3	0.261204	1.649087	15.04845	3.340102	79.96236
4	0.309222	1.678827	33.82763	2.446973	62.04657
5	0.371045	2.370176	49.88914	2.265785	45.47490
6	0.439904	2.792293	59.68063	3.184645	34.34243
7	0.509938	2.954553	65.17051	4.373513	27.50143
8	0.579074	3.012072	68.55548	5.380896	23.05155
9	0.646688	3.036962	70.84728	6.187698	19.92806
10	0.712390	3.063681	72.49699	6.848340	17.59099
Cholesky Ordering: LOG(M2) LOG(INTR) LOG(GDP) LOG(CPI)					

Source: Author's Computation

5. CONCLUSION AND RECOMMENDATION

The conclusions drawn from this study are: (i) in the short – run money supply and expected output are the key factors influencing the level of output but in the long-run it is interest rate and consumer prices that matters and; (ii) for inflation, in the short–run it is the level of production (output level) that matters but in the long–run monetary policy is more important. Findings from this study are similar to that of Asuquo, (2012), who showed that money supply and interest rate had significant impact on inflation in Nigeria and; Musa, et al

(2013), who showed that money supply have more positive impact on price and economic growth in the long run and; Nwosa and Saibu (2012) who concluded that interest rate and exchange rate policies are the most effective monetary policy measures in stimulating sectoral output growth in Nigeria. They however, differ from that of Danjuma, et al (2012) who showed that broad money supply was an “impotent” ineffective monetary policy instrument in combating inflation in Nigeria and; Nenbe and Madume (2011), which showed that monetary policy tools have mixed impact on inflation in Nigeria. This study therefore recommends as follow:

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- a. To effectively control the level of inflation policy makers should concentrate on short-run output expansion policies and put measures in place to sustain the expanded growth in the long-run.
- b. If some acceptable level of output is maintained in the long-run then inflation will become a monetary issue and then monetary policy variable of inter-bank rates and money supply will be more effective.
- c. For output expansion in the short-run monetary authorities should aim at creating more money and the money thus created should be channeled to productive ventures instead of consumption. This will lay the foundation for output expansion.
- d. To maintain long-run output expansion monetary authorities should aim at adjusting the inter-bank rate but with caution as this can cause inflation and instead cause the problem it is meant to resolve.
- [4] Diamond, R. (2003) Irving Fisher on the International Transmission of Boom and Depression through Money Standard. *Journal of Money, Credit and Banking*, 35, 49.
- [5] Edoumiekumo, S. G., Karimo, T. M. and Amaegberi, M. (2013). Real Sector Responsiveness to Monetary Policy Shocks in Nigeria. *Journal of Research in National Development*, 11(2), 269 – 277.
- [6] Keynes, J. (1930). *Treatise on Money*. London: Macmillan.
- [7] Mbutor, O. M. (2007). The Lending Channel of Monetary Policy Transmission in Nigeria: Vector Autoregressive (VAR) Verification. *Economic and Financial Review*, 45(1), 57-77.
- [8] Musa, Y., Asare, B. K. and Gulumbe, S. U. (2013). Effect of Monetary-Fiscal Policies Interaction on Price and Output Growth in Nigeria. *CBN Journal of Applied Statistics*, 4(1), 55 – 74.
- [9] Nenbee, S. G. and Madume, J. V. (2011). The Impact of Monetary Policy on Nigeria's Macroeconomic Stability (1970 - 2009). *International Journal of Economic Development Research and Investment*, 2(2), 174 – 183.
- [10] Nwosa, P. I. and Saibu, M. O. (2012). The Monetary Transmission Mechanism in Nigeria: Asectoral Output Analysis, *International Journal of Economics and Finance*, 4 (1), 204 – 212.
- [11] Rakić, B. And Radenović, T. (2013). the Effectiveness of Monetary and Fiscal Policy in Serbia. DOI: 10.5937/industrija41-4011.
- [12] Sanni, M. R., Amusa, N. A., and Agbeyangi, B. A. (2012). Potency of Monetary and Fiscal Policy Instruments on Economic Activities of Nigeria (1960-2011). *Journal of African Macroeconomic Review*, 3(1), 161 – 176.

REFERENCES

- [1] Abata, M. A., Kehinde, J. S. and Bolarinwa, S. A. (2012). Fiscal/Monetary Policy and Economic Growth in Nigeria: A Theoretical Exploration. *International Journal of Academic Research in Economics and Management Sciences*, 1(5), 75 – 88.
- [2] Asuquo, A. (2012). Inflation accounting and control through monetary policy measures in Nigeria: Multi-regression analysis (1973-2010). *IOSR Journal of Business and Management*, 1(2), 53-62.
- [3] Danjuma, I., Jbrin, S. M. and Success, E. B. (2012). An Assessment of the Effectiveness of Monetary Policy in Combating Inflation Pressure on the Nigerian Economy. *Erudite Journal of Business Administration and Management*, 1(1), 7-16.