

## Stationarity Analysis of the Impact of Monetary Policy on the Economic Performance in Nigeria

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**Abstract:** The study looked at the impact of monetary policy on the economic performance in Nigeria. The study made use of unit root and cointegration test so as to correct the mistake of most previous studies that were based on spurious regression. The study found out that for the periods covered in the study. There was negative relationship between interest rate and GDP while there was positive relationship between inflation rate and interest rate. Effort should therefore be made by government to reduce the interest rate charge by bank, which will thereafter affect the level of overall growth of the economy.

**Key words:** Stationarity, monetary policy, economic performance, GDP, Nigeria

### INTRODUCTION

The issue of the persistent low level of economic development in Nigeria has been a matter of concern to many analysts. It has been argued that this is the outcome of capital shortage (Yohannes, 1994). It has also been contended that the fragmented state of domestic resource mobilization and the resultant inefficient intermediation between savings and investment are key bottlenecks to self-sustainable development in Nigeria (Akyuz, 1993). Capital shortage portends the need to mobilize greater domestic resources if sustainable economic development is to be promoted. However, mobilizing domestic resources via savings and then, channeling the savings into productive investment can hardly be done without the existence of a sound monetary policy capable of directing the resources into major productive investment (Soyibo, 1997).

The objective of this study is to measure the impact of monetary policy on economic performance in Nigeria.

### LITERATURE REVIEW AND THEORETICAL FRAMEWORK

According to Aryeetey (1994), Aryeetey *et al.* (1991), Stiglitz and Weiss (1981), Stiglitz (1989) and Nisanke (1994). There is fairly widespread consensus among macroeconomists that the primary long-term objective of monetary policy will be attainment of development.

In the economic literature, the relationship between financial condition, savings and economic growth is hinged on 2 conflicting hypotheses: substitutability and complementarity. Tobin (1978) articulated the hypothesis of substitutability between money and capital assets. He contends that an increase in interest rate would result in portfolio shift towards monetary assets and a reduced rate of capital accumulation and growth (Ikhide, 1993). The transmission mechanisms for affecting this relationship may, however, differ. In the view of McKinnon complementarity hypothesis, because potential investors accumulate money balances prior to investment, the more attractive the process of accumulating, the greater the incentive to invest (McKinnon, 1973; Arietta, 1988). In contrast, Shaw's debt intermediation hypothesis emphasizes the role of external rather than internal financial resources as the effective constraint on capital formation. It places premium on the role of deposits as a source of funds for financial intermediation. Thus, expanded financial intermediation between savers and investors resulting from higher real interest rates increases incentives to save by means of deposits, stimulates investments due to an increased supply of credit and raises the average efficiency of investment (Shaw, 1973; Molho, 1986). Though substitutability and complementarity hypotheses use different approaches, both emphasize the importance of high interest rate for enhancing investment projects either through own funds or borrowing via credit availability doctrine.

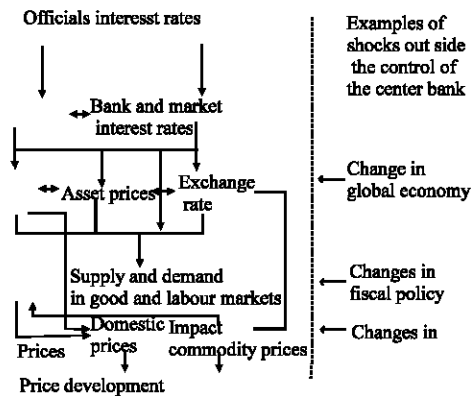


Fig. 1: A stylized illustration mechanism from interest rates to prices

Recent quantitative evaluations of policy rules suggest that rules that are very effective in stabilizing output and inflation do indeed entail substantial variability in the short-term nominal interest rate.

**Analytics of monetary policy:** The process through which changes in the monetary policy get transmitted to the ultimate objectives like inflations or growth has come to be known as monetary transmission mechanism. Interestingly, economists often refer to the channels of monetary transmission as a black box-implying that we know that monetary policy forces influence output and inflation but we do not know for certain how precisely it does so.

Figure 1 provides a schematic illustration of the main transmission channels of monetary policy decisions.

**Change in official interest rates:** The central bank provides funds to the banking system and charges interest. Given its monopoly power over the issuing of money, the central bank can fully determine this interest rate.

**Affects banks and money-market interest rates:** The change in the official interest rates affects directly money-market rates and indirectly, lending and deposit rates, which are set by banks to their customers.

**Affects expectations:** Expectations of future official interest-rate changes affect medium and long-term interest rates. In particular, longer-term interest rates depend in part on market expectations about the future course of short-term rates.

Monetary policy can also guide economic agents' expectations of future inflation and thus influence price developments. A central bank with a high degree of

credibility firmly anchors expectations of price stability. In this case, economic agents do not have to increase their prices for fear of higher inflation or reduce the, for fear of deflation.

**Affects asset prices:** The impact on financing conditions in the economy and on market expectations triggered by monetary policy actions may lead to adjustments in asset prices (e.g. stock market prices) and the exchange rate. Changes in the exchange rate can affect inflation directly, insofar as imported goods and directly used in consumption, but they may also work through other channels.

**Affects saving and investment decisions:** Changes in interest rates affect saving and investment decisions of households and firms. For example, everything else being equal, higher interest rates make it less attractive to take out loan for financing consumption or investment.

**Affects the supply of credit:** For example, higher interest rates increase the risk of borrowers being unable to pay back their loans. Banks may cut back on the amount of funds they lend to households and firms. This may also reduce the consumption and investment by households and firms, respectively.

**Leads to changes in aggregate demand and prices:** Changes in consumption and investment will change the level of domestic demand for goods and services relative to domestic supply. When demand exceeds supply, upward price pressure is likely to occur. In addition, changes in aggregate demand may translate into tighter or lower conditions in labour and intermediate product markets. This in turn can affect price and wage-setting in the respective market.

## MODEL SPECIFICATION

From the transmission mechanism of monetary policy presented above there is the theoretical relationship between interest rate and inflation, interest rate and output. Also there is theoretical link among the following economic indicators and they are; interest rate, exchange rate, export and inflation rate. Each of these relationship are specified as follows:

$$IFR = \alpha_0 + \alpha_2 INT + V_1 \quad (1)$$

$$GDP = \alpha_3 + \alpha_4 INT + V_2 \quad (2)$$

$$GDP = \alpha_4 + \alpha_5 INT + \alpha_6 EXR + \alpha_7 EXP + \alpha_8 IFR + V_3 \quad (3)$$

Where:

IFR = Inflation Rate,

GDP = Gross Domestic Product, INT = Interest Rate,

EXR = Exchange Rate,

EXP = Export, IFR = Inflation Rate,  
 $V_1$ ,  $V_2$  and  $V_3$  = white noise;

$\alpha_0, \dots, \alpha_5$  = Parameters to estimate.

**The non-stationarity of the data:** If a model is given as:

$$y_t = \alpha y_{t-1} + u_t, y_0 = 0 \quad (4)$$

A stationary series is one where  $\alpha_1 < 1$ . Stationary series have a finite variance, transitory innovations from the mean and a tendency for the series to return to its mean value. Consequently, the value of the mean of a stationary series is independent of time and thus, intuitively, no matter at what point in its history the series was examined we would always recover the same information about its structure (in a probabilistic sense). In contrast, the non-stationary series is one where  $\alpha_1 \geq 1$ . Non-stationary series have a variance, which is asymptotic infinite; the series rarely crosses the mean (in finite samples) and innovations to the series are permanent.

It has been common practice to refer to the structure of series in terms of their order of integration. A series is said to be integrated of order  $d$  if it becomes stationary after differencing  $d$  times. Such a series is denoted as  $x_t \sim I(d)$ . Using this terminology, a stationary series is an  $I(0)$  series. Most non-stationary series (specifically the random walk) are  $I(1)$ , but it is entirely possible for non-stationary series to be of order 2 or even higher-in other words the first difference or growth rate of the series is itself non-stationary. In general, however, the properties of  $I(1)$  series apply to all non-stationary series.

## EMPIRICAL RESULT

The result of the unit root test on the series shows that only export is stationary at the level while other series are difference stationary. Therefore, the need for cointegration test. The result of the likelihood ratio test shows that there is long run relationship between the GDP and other economic indicators captured on the model. We concluded that there is only two cointegrating relationship among the variables.

The unit root and cointegration tests are shown in Table 1 and 2.

Table 1: Results Using the ADF unit root test

Variables	ADF-Test Statistics at Level	ADF-Test Statistics 1st Difference
Interest Rate	1.4221	-4.2975
Inflation Rate	-0.8716	-5.6011
GDP	-0.77516	-6.7178
Exchange Rate	-0.4416	-4.3617
Export	-2.4221	NA

Note: The critical values are -1.60 at the 10% level, -1.95 at the 5% level and -2.66 at the 1% level; Source: Authors computation

Table 2: Likelihood Ratio Test Result

H <sub>0</sub> = Null Hypothesis	Eigenvalue	Likelihood Ratio	10% Critical Value
$r = 0$	0.383665	85.19312	67.14*
$r \leq 1$	0.256031	63.00201	41.23*
$r \leq 2$	0.915161	34.27111	27.61*
$r \leq 3$	0.082672	9.11262	10.71
$r \leq 4$	0.030481	0.10301	2.91

Note: \* Statistically significant at 10% level; Source: Authors computation

Table 3 summarized the descriptive statistics for the annually gross domestic product, exchange rate interest rate, export and inflation rate for the time series data for the period between 1990-2002.

It shows, in particular, that the GDP and exchange rate minimum were 541.48 and 0.07. The minimum value for interest rate and inflation rate were 3.60 and 3.20, respectively while the minimum export for the period covered in the study was 855.4.

To be able to measure the impact of interest rate on different important sectors of the economy the following regression analyses were carried out

### Interest rate and inflation:

$$\begin{aligned} \text{IFR} &= 9.35 + 1.14\text{INT} \\ &\quad (6.3) \quad (0.5) \\ t\text{-stat} &= 1.46 \quad 2.16 \\ R^2 &= 40\% \\ F\text{ stat} &= 4.70 \text{ (sig F change 0.038)} \end{aligned}$$

The result shows that there is positive relationship between inflation and interest rate. A 1% change in interest rate lead to 14% change in inflation. Inflation explained 40% of the systematic variation in inflation rate. The implication of this is that adjustment in interest rate will affect inflation level in Nigeria

### Interest and output:

$$\begin{aligned} \text{GDP} &= 67572.2 - 1940.44 \text{int} \\ &\quad (5911.050) \quad (470.22) \\ t\text{ stat} &= 11.43 \quad 4.127 \\ R^2 &= 35\% \\ F\text{ stat} &= 17.03 \text{ (sig F change 0.000)} \end{aligned}$$

Table 3: Descriptive statistics for important economic indicators

Statistic	GDP million	Exchange rate	Interest rate	Export	Inflation rate
Minimum	54148	0.07	3.60	855.4	3.20
Maximum	127830	1205	26.00	9455723	72.8
Standard Deviation	19703.20	3425	6.04	1688776.6	18.06
Skewness	0.32	2.23	0.47	4.80	1.32
Std. Error of skewness	0.40	0.40	0.40	0.40	0.40
Kurtosis	-0.74	3.79	-0.64	25.2	1.04
Std. Error of Kurtosis	0.79	0.79	0.798	0.798	0.827

Source: Author's computation

Table 4: Estimated regression result

Variable	Coefficient	Std. Error	t. Statistics	Prob
C	722.38	5.49	-0.0487	0.96
INT	-6.885	0.000069	1.24	0.22
EXR	368.47	0.069	2.07	0.04
EXP	0.006	0.0000083	-1.47	0.05
IFR	0.097	0.0488	2.02	0.05
R <sup>2</sup>	0.56	Mean dependent var.	10.59	
R <sup>2</sup>	0.47	Std. Depen. Var.	5.89	
S. E. of Regress	4.64	Akaike Info Var	3.21	
Sum Square res	561.2	Schwarz Criterion	3.45	
Log Likelihood	-88.8	F. Statistics	5.59	
DW	0.866	Prob	(F Statistics)	0.0021

Source: Authors computation

Table 5 Diagnostic Tests

<b>Forecast evaluation</b>			
Root Mean Squared Error		11354.34	
Mean Absolute Error		9617.327	
Mean Absolute Percentage Error		11.83163	
Theil Inequality coefficient		0.062531	
Bias proportion		0.00000	
Variance proportion		0.104431	
Covariance proportion		0.895569	
<b>Ramsey reset test</b>			
F statistics	5.991166	Probability	0.021163
Log likelihood	6.613298	Probability	0.010132

Source: Authors computation

The result above shows the relationship between interest rate and output. From the result one could see that there is a negative relationship between interest rate and GDP. A 1% fall in interest rate will affect GDP to the tune of 194044%. The Standard Errors are in parenthesis and these show that the estimates are statistically significant.

From the results in Table 4, we can observe that all the variables fulfilled the *a priori* expectation. The results showed that there was negative relationship between interest rate and GDP, whereas, exchange rate export and inflation rate all have positive relationship with GDP. The coefficient of determination indicated that all the exogenous variable that is, interest rate, exchange rate, export and inflation rate explain the systematic variation in GDP to the tune of 56%. Using the Theil inequality coefficient, these results can be used to forecast into the future to know the behaviour of the monetary mechanism since the bias proportion is 0.000 which is less than the p-value of 0.05.

The implication of this is that for there to be a continuous increase in gross domestic product there must be a fall in the level of interest rate.

The Ramsey Reset test is used to detect specification error in an equation, which was known *a priori* to be mis-specified but give satisfactory for all the more traditional test criteria. This result showed that the estimated equation did not has specification error and so therefore it is stable Table 5.

## CONCLUSION AND RECOMMENDATIONS

The main objective of this study was to analyse the impact of monetary policy on economic performance in Nigeria. This was done within Nigeria's institutional framework and the basic hypothesis that an upward adjustment in real interest rate increases output and GDP which are then utilized to support a high level of credit supply and investment in the economy. The results of the study support the conclusion interest rate is positively related to inflation but negatively related to GDP. A 1% change in inflation lead to 1.141% change in inflation rate. However, a 1% increase in interest rate lead to 1940.44% decrease in GDP. As a result of this the government should try to reduce interest rate. Despite this there should be upward adjustment in different interest rate policy instruments, which will allow the savings-interests gap to reduce. The excess-liquidity syndrome idle savings and low lending attitude must be discouraged.

In summary, the following major policy issues and options need to be addressed in order to meaningfully rekindle savings and investment in Nigeria. Firstly, there is need for an institutional rearrangement that recognizes the interests of the major participants in the savings and development and interest rate. These are the government, the business community and the banking industry. Secondly, conscious efforts need to be made to promote good government in order to create an environment conducive for savings low interest rate and investment. Finally, deliberate efforts need to be made to address some chronic macroeconomic problems-most especially inflation and the distortion in the exchange rate market.

## REFERENCES

- Akyuz, Y., 1993. Financial Policies for Industrialization and Development: Reflections on the Financial Deepening and Efficiency. In: Nissake and A. Hewitt (Eds.) *Economic Crises in Developing Countries*. London: Painter Publication.
- Aryeetey, E., 1994. Formal Financial Institutions and the Development of Integrated Financial Markets in Africa: A Case Study of Ghana. Report of a Study Sponsored by the World Bank Research Committee and Administered by the Overseas Development Institute.
- Aryeetey, E., Y. Asante and A. Kyei, 1991. Domestic Savings Mobilization for African Development and Diversification. Mimeo, I.D.C., University of Oxford.
- Arietta, G.M.G., 1988. Interest Rates, Savings and Growth in LDCs: An Assess. Recent Empirical Res. *World Dev.*, 16 (5): 589-605.
- Ikhide, S.I., 1993. Financial Liberalization and the Inflationary Process: Is there a Link in Adjusting Developing Countries? *Rivista Internazionale de Scienze Economiche e Commerciali*, 40 (2): 157-74.
- McKinnon, R.I., 1973. *Money and Capital in Economic Development*. Washington, D.C.: Brooking Institution.
- Molho, L.E., 1986. Interest Rates, Savings and Investment in Developing Countries: A Re-examination of McKinnon Shaw Hypothesis *IMF Staff Papers*, 33 (1): 90-116.
- Nissanke, M., 1994. Financial Linkage Development in Sub-Saharan Africa. In: Achi Atsain, S. Wangwe and A.G. Drasek (Eds.). *Economic Policy Experience in Africa. What Have we Learned?* Nairobi: AERC.
- Shaw, E., 1973. *Financial Deepening in Economic Dev.* New York: OUP.
- Stiglitz, J.E., 1989. Financial Markets and Development. *Oxf. Rev. Econ. Policy*, 5 (4): 67-89.
- Stiglitz, J.E. and A. Weiss, 1981. Credit Rationing in Markets with Imperfect Information. *Am. Econ. Rev.*, pp: 71.
- Soyibo, A., 1997. Financial Liberalization and Bank Restructuring in Sub-Saharan Africa: Some Lessons for Sequencing and Policy Design. *J. African Econ. Supplement*, 6 (1): 100-150.
- Tobin, J., 1978. Monetary Policy and the Economy: the Transmission Mechanism. *Southern Econ. J.*, pp: 421-431.
- Yohannes, L.G., 1994. Macroeconomic Policy and Stock Market Efficiency in Nigeria: A Case Study. In: Achi Atsain, S. Wangwe and A.G. Drasek (Eds.). *Economic Policy Experience in Africa. What Have We Learned?* Nairobi: AERC.