

THE Q-THEORY OF MONEY AND THE NIGERIAN ECONOMY: AN EMPIRICAL VERIFICATION

Sede I.Peter (Ph.D)

*Department of Economics and Statistics,
University of Benin,
Benin City.*

And

Godfrey Osaseri

*Department of Economics,
College of Education,
Ekiadolor, Benin.*

Abstract

Irvin Fisher initiated the quantity theory of money and emphasized that a direct and proportional relationship exist between money and price of goods and services. This gave a serious insight to money supply monetary policy) and price movement inflation). In the case Nigeria the structure of the economy, has created doubt as to the sanctity and efficacy of the Fisharian postulation. To examine this, secondary data spanning from 1981 to 2011, from the central bank of Nigeria (CBN), statistical bulletin, several years issue), were employed. Having cleared them from the usual unit root problem of the time series and obtain the assurance of the existence of a cointegrating relationship among the variables, results showed that monetary variable of broad money supply, exchange rate and interest rate had statistically significant impact on inflation. Also government spending was found to impact significantly on inflation in Nigeria. These variables were all correctly signed. Thus they were all concluded to be crucial instrument for inflation modeling in Nigeria. The paper therefore recommended that inflation control in Nigeria should not be a monetary affair alone but that of fiscal and monetary policy issue.

Key Words: Inflation, Q-theory and Monetary Policy.

This study reviewed and appraised the impact of monetary policy on inflation in Nigeria and to chart a credible prognosis of future monetary policy directions. In

Nigeria, monetary policy measures and other macro-economic variables are used to control inflation in order to ensure economic stability. Monetary policy involves measures designed to regulate and control the volume, cost, availability and direction of money and credit in an economy to achieve some specific macroeconomic policy objectives (Anyanwu and Oaikhenan, 1995). See also, (Nnanna, 2001; Johnson 1962; Nyong, 2001; Adamson, 2000; CBN, 2006).

Empirical survey over time showed undesirable trend in inflationary growth in Nigeria. For instance, in pre-sap era (1980 – 1985), inflation was above 40% (Oduola, 2006). Therefore, for the attainment of sustainable economic growth and price stability, the Nigerian monetary authority seeks to reduce inflation to a single digit. To look at this, the Irvin Fisher quantity theory of money Q-Theory) was singled out by this study as a key theory for inflation modeling in Nigeria. Hence this study seeks to know if the sanctity and efficacy of the Q-theory holds in the case of Nigerian economy and to seek answer to the question of how significant the monetary variables impact on inflation in Nigeria. This is intended for the development of concise and sound inflation policy in Nigeria.

Inflation Indices in Nigeria and Some Selected Countries

Table 2 below presents inflation figures for 2009 to 2012 for Nigeria and some selected countries of the world. Brazil, China, India and Spain are included because it is considered that they are contemporaries of Nigeria on demographic and economic considerations. Kenya, and South Africa, are two African economies that can possibly compare with Nigeria on the same premises. USA and UK are two advanced economies that can be considered standard enough to compare economy of Nigerian with. Thus from the table, when compared with these three phases of contemporaries Nigeria records much higher rate of inflation. This is not economically comfortable enough.

Table 2: Inflation indices in Nigeria and Some Selected Countries

	Brazil	China	India	Kenya	Nigeria	Senegal	S/Africa	Spain	USA	UK
2009	4.9	-0.7	10.9	9.2	11.5	-1.1	7.1	-0.3	-0.4	2.2
2010	5.0	3.3	12.0	4.0	13.7	1.3	4.3	1.8	1.6	3.3
2011	6.6	5.4	8.9	14.0	10.8	3.4	5.3	3.2	3.2	4.5
2012	5.4	2.7	9.3	9.4	12.2	1.4	5.4	2.4	2.1	2.8

Source: World Bank Dataset

Literature Review

Among the early efforts to explain how money affects economic activities was that of Fisher (1932). He, like other neoclassical writers, held the view that in the short-run, monetary influence was dictated by interest rates that were “sticky” initially though

rising subsequently, but on the long run. The channel of influence was real cash balance. Thus, when money stock increases following, for example, an increase in gold stock and rise in reserves, the short-run effect according to Fisher, would be to increase commodity prices since he assumed that output and velocity were fixed initially, Fisher assumed also that a rise in commodity prices would precede the increase in interest rates which was regarded as a component of the firm's operating costs. Consequently, the rise in commodity prices would lead to an increase in the firm's profits, followed by increase in business investment and loan demand, demand deposits and money stock which would lead to further increase in commodity prices, profit and investments; and the circle would begin all over again. One of the major criticism of this theory was that of unrealistic assumptions of the theory one of which was the assumption of full employment.

Yakubu (2013) investigated the effectiveness of monetary-fiscal policies interaction on price and output growth in Nigeria. The paper captured dynamic correlations of variables by the analyses of impulse response and variance decomposition. The results of the study suggested 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. The paper further observed that although monetary and fiscal policy variables had a dominant effect on economic activity, it was clear that economic activity was dominated by its own dynamics in most of the periods. Conclusively the paper stated that the estimates presented in the study suggested that both monetary and fiscal policy exert greater impact on real GDP and inflation in Nigeria. Thus it is evident that the impact of policy is solely depending on the policy variable selected, although some policy variables are considered to be more beneficial to the social and economic development.

Akabom-Ita (2012) in his empirical study on "inflation accounting and control through monetary policy measures in Nigeria: multiple regression analysis (1973-2010) found that some of the variables (money supply, interest rate and exchange rate) were statistically significant, which means that the studied variable could be used to predict or control inflation. Furthermore, domestic credit was not statistically significant, even though it could be used as a policy variable to account for inflation. It is in light of the above that this research intended to assert to what extent monetary policy variable have affected inflation in Nigeria.

Osuji, (2012) employed vector autoregressive framework to examine whether or not one of the preconditions for a successful inflation-targeting is present in Nigeria and Ghana. In short, the paper sought to find out whether or not a stable and predictable relationship exists between inflation and monetary policy instruments in

these countries in line with the work of Goltschalk and Moore (2002) and Tutar (2002). The study specifically estimated three VAR models starting with a two-variable model including money supply and prices, and then, adding some financial variables such as nominal exchange rate and interest rates in order to see their contributions to a VAR system for Nigeria and Ghana. It was observed from the VAR -the two variable model- that inflation is an *inertial* phenomenon in Nigeria and Ghana. Moreover, it was also noticed that money innovations are neither strong nor statistically important in determining prices when compared with price shocks themselves. When financial variables like exchange rates and interest rates were added to the models, the paper did not observe any significant improvement in the model. Thus the paper concluded that innovations in prices were mostly explained by their own shocks, the monetary policy instruments, such as interest rates and exchange rates, have little or no effect on prices. Therefore policy linkage between inflation and monetary policy instruments in Nigeria and Ghana is not strong in the short run and thus, these countries are not yet candidates for inflation targeting.

Charles , (2012) Employed the Ordinary Least Squares Method (OLS) to examine the impact of monetary policy on the Nigerian economy. In doing this, the study used secondary data between 1981 and 2008 to carry out the analysis. The result of the analysis showed that monetary policy, represented by money supply, exerts a positive impact on GDP growth and Balance of Payment but negative impact on rate of inflation. The paper thus recommended that monetary policy should facilitate a favourable investment climate through appropriate interest rates, exchange rate and liquidity management mechanism and the money market should provide more financial instruments that satisfy the requirement of the ever-growing sophistication of operators. John (2004) examined whether changes in monetary policy can account for the noticed phenomenon of decrease in rise of inflation when unemployment falls and the sharp fall in volatility of output and inflation. The results of the study suggested that changes in the parameters and shock volatility of monetary- policy-reaction functions can account for most or all of the changes in the inflation-unemployment relationship. The study also alluded that as in other work, monetary-policy changes can explain only a small portion of the output *growth* volatility decline. Thus it asserted that changes in policy can explain a large proportion of the reduction in the volatility of the output *gap*. The study further added that a broader concept of monetary-policy changes—one that includes improvements in the central bank’s ability to measure potential output—can enhance the ability of monetary policy to account for the changes in the economy. In all these, none relates to the quantity theory of money which is the course of investigation of this study.

Theoretical Framework

The theoretical basis of this study is based on the Irvin Fisher 1932. This asserts that inflation is always a monetarist phenomenon and that prices tend to rise when the rate of increase in money supply is greater than the rate of increase in real output of goods and services. In the quantity theory of money,

$$MV = PY \dots\dots(1)$$

$$M = KP \dots\dots(2)$$

Where

M = quantity of money supply

P = price level

V = velocity of money which is constant

Y = Volume of real goods and services generated in the economy which is assumed constant.

K = factor of proportionality between m and p

Following the monetarist theory above, the model for this study is stated as follows;

Equation 1 above states that the quantity of money (M) supplied in an economy circulating at a given constant velocity (V) generates an equal and constant values of goods and services (Y) at a given price.

Equation 2 on its part states that given the constancy of velocity of money (V) and goods and services produced (Y) that an increase of M over Y will directly impact on P by increasing it. From the foregoing it follows that equation (ii) above can be presented as; $P = XM \dots\dots\dots iii$

Where $X =$ factor of proportionality of price to money supply.

Model Specification

Following the Fisherian postulate the model for the study is as specified below;

$$INF = F(M_2, GDP, EXRT, INTR, GSP) \dots\dots (1)$$

Where;

INF = Inflation Rate

M_2 = Money Supply

GDP = Gross Domestic Product

EXRT = Exchange Rate

INTR = Interest Rate (Prime Lending Rate)

GSP = Government Spending

Equation 1 above is linearised to assume

$$Infl = B_0 + b_1m^2 + b_2DGP + b_3EXRT + b_4INTR + b_5GSP + U \dots\dots\dots (2)$$

U = the stochastic error term

B_0 = the intercept

b_1 to b_5 = represent the various parameters estimates measuring the impact of explanatory variables on the dependent variable.

Apriori = $B_0, b_1, b_3, b_4, b_5 > 0$

$b_2 < 0$

Data Presentation and Analysis

Methodology

In this study, the main research objective is to examine or investigate the impact of monetary policy on inflation in Nigeria. In the estimation of the model, various econometric estimation techniques were adopted. The time series characteristics of the data were tested to investigate whether the variables are integrated. The Augmented Dickey Fuller (ADF), as specified in Dickey and Fuller (1979) was employed to carry out the unit root test. Next, the Johansen cointegration methodology was used to test for the existence of long run and stable relationship between the dependent and independent variables. Also, the use of the Error Correction Model was employed.

Presentation and Analysis of Unit Root Test Result

The variables tested were inflation (INFL), broad money supply (M2), gross domestic product (GDP), exchange rate (EXRT), interest rate (INTR) and government spending (GSP). The result of the unit root test is presented in the table below.

Table 4.1 Unit Results

LEVELS					FIRST DIFFERENCE			
VARIABLES	ADF TEST STATISTIC	95% CRITICAL VALUE OF ADF	ORDER OF INTEGRATION	REMARKS	ADF TEST STATISTIC	95% CRITICAL VALUE OF ADF	ORDER OF INTEGRATION	REMARKS
INFL	-3.2538	-3.5683	I(0)	NON-STATIONARY	-5.4404	-3.5742	I(1)	STATIONARY
M2	-6.3293	-3.5683	I(0)	STATIONARY	-4.241	-3.5831	I(1)	STATIONARY
GDP	4.1432	-3.5683	I(0)	STATIONARY	-3.9578	-3.5742	I(1)	STATIONARY
EXRT	-2.0975	-3.5683	I(0)	NON-STATIONARY	-5.1813	-3.5683	I(1)	STATIONARY
INTR	-1.9657	-3.5683	I(1)	NON-STATIONARY	-5.6831	-3.5742	I(1)	STATIONARY
GSP	-3.3265	-3.5683	I(0)	NON-STATIONARY	-2.9614	-2.9639	I(1)	STATIONARY

The result revealed that only two variables – M2 and GDP were stationary at levels. However, at first difference, all the series were stationery at 5 percent level of significance. Hence, the result indicates that all series are unit roots free. Since, all the series were not stationary in the same order, it is therefore imperative for the researcher to test for cointegration among the series. The result is shown in the table below.

Presentation and Analysis of Johansen Cointegration Test Result

Given the unit root properties of the variables, the researcher proceeded to establish whether or not there is a long run cointegrating relationship among the variables in the equation by observing the stationarity status of the residual at levels and at 5% levels.

Table 4: ADF Results of The Residual at 5% Levels.

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.270965	0.0103
Test critical values: 1% level	-4.284580	
5% level	-3.562882	
10% level	-3.215267	

Null Hypothesis: RESIDUAL has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic - based on SIC, maxlag=7)

The stationarity test of the residuals at 5% levels showed that the residual is stationary. This implies that the variables in the investigating model are cointegrated. Thus the null hypothesis of the absence of a cointegration relation among the five variables is rejected at 95% confidence level. This is because the t-ratio was found to be higher than the critical value at 5%. In addition the normalized cointegrating coefficients showed that the variables in the equation are relatively important. The consistency in the tests results confirms the existence of cointegration which is indicative of a long run relationship between INFL and the regressands.

Presentation and Analysis of Error Correction Model (ECM)

As the date series are stationary and the vector of variables in the equation appears to be cointegrated, the ECM, which basically adds a term containing the lagged

residuals from the levels equation to the specification in first differences, is used to induce flexibility by combining the short run dynamics and long run equilibrium model in a unified system, while at the same time ensuring theoretic rigour and data coherence and consistency.

Thus, proceeding to the Error Correction Model, using Auto Regressive Distributed Lag, ARDL (3, 2, 3, 3, 3, 3), selected based on R – squared criterion, the results below were obtained;

Table 5: Results from Error Correction Representation for the Selected ARDL Model

REGRESSOR	COEFFICIENT	STD ERROR	T-RATIO (PROB)
dDINF(1)	2.0388	0.43335	4.7049 (0.001)
dDM2	-0.8504E-4	0.02201E-4	-3.8634 (0.004)
dDM2(1)	3636E-3	0.6979E-4	5.2094 (0.001)
dDGDP	0.8854E-4	0.1812E-4	4.8856 (0.001)
dDEXRT	-1.7286	.54776	-3.1558 (0.012)
dDINTR(2)	2.2321	1.1087	2.0132 (0.075)
dDGSP	0.010256	0.3027E-3	3.3882 (0.008)
Dc	-6.9310	65741	-1.0543 (0.319)
ecm (-1)	-3.4479	0.61205	-5.6333 (0.000)

R-squared = 0.96, R – Bar – squared = 0.77, F-statistics = F(17,9) 6.6365 (0.003), DW = 2.2180, AIC = -101.0810, SC = -115.9831, Std Error of Regression = 11.3330
From the result above, judging by the significance of the t-statistics, the coefficients are well determined. The disequilibrium error term, ECM_{t-1} , is statistically significant and negative (as expected) in the equations. The significance of the error term confirms the existence of long run relationship between the variables in the error correction models. The ECM induces about 34% adjustment per period in this model.

Given the R squared as 0.96, it means that 96% systematic variations in the dependent variable can be explained by the systematic variations in the independent variables combined. The value of the adjusted R^2 which adjust for degree of freedom shows that the model accounts for at least 77% changes in inflation in the short run.

Thus, the equation is statistically significant and the overall statistical fit is good. The marginal significance level of the F – statistics is zero. Hence, the null hypothesis of the F – statistics is rejected for all choices of significance level because there is simultaneous linear relationship between the explanatory variables taken

together and the dependent variable (INFL) based on the F – probability value of .003. Therefore, the regression coefficients are significantly different from zero at 5% level of confidence. The Durbin – Watson (DW) at 2.21 indicates the absence of autocorrelation in the model.

Finally, the relatively low value of standard error of the regression at 11.33 is a clear evidence of the goodness of fit of the equation.

Since the ECM is derived from an over-parameterized ARDL model, its lag structure is quite flexible and is certainly less restrictive than that used in the traditional partial adjustment model which has only one lag. Thus, using a criterion of optimality like maximum R – bar squared, we then obtained a parsimonious representation of the ECM.

Estimates from error correction model reveal that one period lag of inflation has a positive significant effect on current level of inflation. This means that inflation last year has the tendencies to influence the level of inflation this year, especially in the short run period. Money supply was observed to impact on inflation significantly. One period lagged of M2 shows a positive and significant relationship with inflation. This means that to achieve price stability and to reduce inflationary trend, monetary authority can employ monetary policy (money supply control mechanism) to bring about desirability/stability in the economy. Thus, monetary policy impacts on inflation in Nigeria based on the empirical result obtained from this study. For example, a unit decrease in money supply (M2 (1)) will cause inflation level to drop by 0.003 units. Also, the study revealed that gross domestic product (GDP), exchange rate (EXRT), interest rate (INTR) and government spending (GSP) impact significantly on inflation in Nigeria. This implies that to ensure optimal price control in Nigeria, these variables (GDP, EXRT, INTR and GSP) are critical to price stability. Thus, the effective combination of monetary and fiscal policy is vital in the pursuit of economic stability. This has been underscored in this study. Moreover, the price variants exchange and interest rates) harp much on the efficacy of the Q-theory of money in Nigeria as they confirmed the postulation.

Policy Implication

The study reveals that a unit decrease in money supply (M2(1)) will cause inflation to drop by 0.03 units. In emphasis the price/monetary variables exchange and interest rates) imparted more on inflation than government variable. Each of them had a coefficient of 1.73, and 2.23 respectively while government spending had a coefficient of 0.01. They were all correctly signed. This confirms the efficacy of the Fisharian theory of money and the strength of the monetarist stance in inflation control on

Nigeria. It implies that to ensure optimal price control in Nigeria, these variables (GDP, EXRT, INTR and GSP) are critical to price stability, thus, the effective combination of monetary and fiscal policy is vital in the pursuit of economic stability.

Conclusion

It is a well known fact that over the years, monetary policy has not made the desired impact on price stability in Nigeria. However this study reveals that money supply (m2(1)), gross domestic product (GDP), exchange rate (EXRT), interest rate (INTR) and government spending (GSP) impact significantly on inflation in Nigeria. Hence while the efficacy of quantity theory of money is confirmed in Nigeria, the truth is that its inflation modeling is not just a wholly monetarist issue. This is so because results have shown that there are other sources of inflation, apart from monetary variables, in Nigeria. Thus the effective combination of monetary and fiscal policy is vital in the pursuit of price stability in Nigeria.

Policy Recommendations

In the light of the findings as discussed above

- There is need to maintain harmony between monetary policy and fiscal policies in Nigeria in order to achieve a steady and consistent price stability.
- More emphasis should be placed on monetary instrument like money supply, exchange and interest rates. Hence they have much influence in controlling inflationary pressure in Nigeria. It is imperative on the side of government not to arbitrarily change money supply. Since the growth rate of money induce inflation, government should ensure that money supply is just sufficient to stimulate non-inflationary sustainable economic growth.
- The monetary authority should as a matter of priority monitor interest rate to ensure that it is relatively stable. This would boost investment and by extension reduce inflation.
- It is equally realized that effective and successful implementation of monetary policy depends on the health of the banking institutions. For this reason there is need for sound banking system.
- Finally the monetary authority should design monetary policy instruments contingent to Nigeria's socio-political environment, and not necessarily copy-paste from other developed economy, hence monetary policy is recognized to be a potent tool in controlling inflation in Nigeria.

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