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Monetary Policy and Economic Stabilisation in Nigeria; 1986 – 2019; (Distributional Koyck Lag Model Approach)

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ABSTRACT

This study examined the relevance of Monetary Policy in stabilizing the Nigerian Economy for the period (1986-2019); using the Koyck Model, regression. The results obtained reveal that the rate of growth in the money stock has significant impact on output, contrary to its impact on inflation. Changes in money supply did not exert significant influence on the lending interest rate; however operating lag period of money stock on interest rate was instantaneous. The lending interest rates were exogenously determined by lending institutions. Lending interest rates influenced investment significantly, though with a very long operating lag period. The immediate past value of Money supply significantly influenced the succeeding inflation rate and investment. Likewise, inflation caused growth in the gross domestic output. The joint influences of money stock and national output impacted significantly on the general price level. Consequently, monetary policy measures through adjustments in money stock were better in stabilizing growth than Inflation. Measures that make cash directly available to economic units stimulated investment.Based on the results of this study,we recommend that; the growth of Money Supply cannot be used to influence the general price level and the lending Interest Rate especially in the short run. Changes in the stock of Money Supply can be used to stimulate Economic Growth. Inflation can better be managed with proportionate growths in Money Supply and the Gross Domestic Product. Investment can be tracked by manipulating the lending interest rate.

KEYWORDS: Monetary Policy, Macro-economic, Indicators respond and Nigerian Economy.

BACKGROUND TO THE STUDY

The goal of every economy is to ensure that the living standard of the citizenry at least do not depreciate over time. Unfortunately, the attainment of this ultimate goal has been seriously threatened with instabilities in most economies since the great depression in America of the 1930s. Economic instabilities are manifested through unpredictable high rates of unemployment and inflation; with low growth rates of national and per capita incomes (Thirlwall; 1987). Frantic efforts have been made through policies towards ensuring that these indicators are progressively stable rather than fluctuating cyclically.

Nigeria is a richly endowed country. Over the last three decades, the country has earned over $300billion from oil sales. In spite of this wealth, the country's economy has tended to be fluctuating widely (Bakare, 2011).

In addressing the above scenario, the Nigerian Government has tremendously employed monetary policy measures in stabilizing the trend of these indicators over the years. Consequently, an important public policy issue that calls for in-depth analysis is the examination of the effectiveness of monetary policy in fine-tuning the Nigerian economy towards achieving the desired goals. In this vein, Bernanke (1995) found that money matters in the management of the Nigerian economy. Also, Ajisafe and Folorunso (2002) in their study found that monetary rather than fiscal policy exert greater impact on economic activities in Nigeria. It is on the basis of the foregoing that in this study, we joined other scholars to examine the effectiveness of monetary policy in economic stabilization in Nigeria.

Although it has been accepted that monetary policy could be a veritable tool for economic stabilization, certain questions requiring answers still needed to be asked. These are: Do monetary policy measures give desired results in all

economies. If it is important in some other economies, what of the Nigerian experience? Which of the macro-economic indicators in Nigeria are responsive to monetary policy measures and how rapidly? Which of the various instruments of monetary policy can best be used to achieve desired goals? Originally, from 1971 – 1982, the focus of monetary policy in Nigeria was to address growth. Monetary policy measures were geared towards employing abundant potential resources of the economy to boost growth. This was mainly to advance and consolidate on the major policies of reconciliation; reconstruction and rehabilitation of the then administrations after the Civil War. Impliedly, employment and growth was the goal of monetary policy. During the era, expansionary Monetary Policy measures were adopted through the direct manipulation of the volume of money stock and Interest Rates and channeling of credits to the preferred sectors of the Economy (Okorie & Uwaleke;2010).

From the 1980's, control of inflation started emerging as one of the monetary policy goals in Nigeria. The economic situation precipitated into affecting the country's external reserves; hence the adoption of the Austerity Measures of the then administration. Emphasis started shifting from growth and employment to price stability and favorable balance of payments. The situation worsened such that by 1986, the government adopted the free market operating economy under the Structural Adjustment Programme mainly to check unfavourable balance of payments and high inflationary trends in the economy (Nnanna; 2001). Indirect monetary policy instruments working through the market system were used to regulate monetary aggregates. Econometric exercises were conducted to determine optimal money stock deemed to be consistent with the targeted Gross Domestic Product, Inflation and external reserves (CBN; 2010).

Pursuance of price stability has turned to be the main monetary policy goal for almost a decade now. Consequently, policy authorities that see inflation as a monetary phenomenon have been on their toes juggling with monetary instruments to have full grasp of the cankerworm. Most recently, stabilization of the financial system due to impending bank failures and high financial bubbling in the system is also raising its ugly head to be the prime focus of monetary authorities (Sanusi; 2010).

Accepted that some research works have been done in this field of study, Onyemesim (2011), in his study, concluded that more studies needed to be conducted to ascertain the degree of effectiveness of monetary policy in stabilizing the Nigerian economy. We argue, however, that a greater focus should be placed on understanding the specific mechanisms through which macroeconomic monetary policy targets, instrument and monetary objectives work towards impacting and stabilizing the domestic macroeconomic performance. Therefore this study examines effectiveness of monetary policy and economic stabilization in Nigeria from 1970 to 2015 time frame, specifically, we found the extent to which and the length of time it took the major macroeconomic indicators to respond to changes in the monetary aggregates. Hence there raised the following challenging questions as far as Monetary Policy measures are implemented in Nigeria: (i) Is there any relationship between money supply, Interest rate, Investment, National output, and price level in the Nigerian economy? (2) How immediate do macroeconomic indicators respond to changes in monetary variables? (3) What are the directions of the causal relationships between the monetary variables and macro-economic indicators?

OBJECTIVES OF THE STUDY

(i) To evaluate the significance of the impacts of monetary aggregates on some macroeconomic indicators like interest rates, investment, Gross domestic product and the general price level;

(ii) Examine how fast Macro-economic Indicators respond to changes in Monetary Variables in the Nigerian economy; and macroeconomic indicators.

HYPOTHESES OF THE STUDY

i. Monetary policy variables do not exert significant impact on macroeconomic indicators like interest rates, investment, Gross domestic product and the general price level.

ii Examine how fast Macro-economic Indicators respond to changes in Monetary Variables in the Nigerian economy.

THEORETICAL LITERATURES

There are many versions of the classical monetary theory. These views are encapsulated in the Classical Quantity Theory of Money. However, the generally accepted one, as encompassing all the tenets of the classical theory of money is the one advanced by Fischer, (1983). Generally, the classical economists in their quantity theory of money, states that the quantity of money stock is the main determinant of the price level in an economy. The theory, went further to posit that other things remaining unchanged, a change in the quantity of money in circulation gives rise to a direct and proportional change in the general price level (Jhingan; 2008). The other things remaining unchanged assumption of the classical theory need to be expatiated upon. These assumptions were in respect of: Flexibility of Prices: There is no price hedging. Prices can go up and come down without direct price control measures (Jhingan; 2008). Long Run analysis: There is enough time for all impacts of any action/policy to be captured in the analysis. Full Employment: There is no idle resource in the economy. No measure can bring about further increase in the use of factor inputs. Output therefore cannot change. Consequently, volume of transaction does not change.

The monetary authorities exogenously determine the quantity of money in circulation. The classicalists used the Irving Fisher's equation of exchange to explain the relationship

between money in circulation and the general price level (Jhingan; 2008).

$MV = PT \quad . \ . \ . \quad (1)$

M = the quantity of money in circulation

V = Velocity of money in circulation (the average number of times a unit of currency in circulation changes hand in the exchange of goods and services)

P = the general average price level

T = the amount of Transaction carried out or volume of goods and services exchanged.

The equation states that in equilibrium, the quantity of money supply represented by (MV) equals the quantity of money demanded (PT). With the assumptions of the classical, as already enunciated, V and T are constant. Therefore:

$MV = PT$

$P = (V/T)\, M$

Since V & T do not change, V/T does not change too.

Let $(V/T) = \beta_o$.

Therefore $P = \beta_o M \quad . \ . \ . \quad (ii)$

Equation II, states that a percentage change in money supply brings about a direct and proportionate change in the price level of bo magnitude. The implication of the above is that the elasticity of the general price level to money supply is unitary.

$\ln P = A + \beta_o \ln M \ . \ . \ . \ (iii)$

$\beta_o = 1$

It is based on the forgoing that the classical concluded that money is just a "veil". It is Neutral and can only influence nominal values like Nominal Price Level and nominal incomes but not real variables like output or employment (Gurley & Shaw; 1965). The classical therefore concluded that money does not matter in real economic stabilization. It is only used for transactionary purposes as a medium of exchange to facilitate transactions. Therefore, money can only be used to stabilize nominal values. In this study, we tried to know if the Nigerian experience truly reflects the classical theory that inflation is purely a monetary phenomenon.

Furthermore, Crowther's comment on the classical theory that "the effect of a given change in the quantity of money in circulation on the price level is not a simple cause and effect relationship" (Jhingan; 2008) was also examined with the Nigerian data. Here we will examine the direction of causal relationship between money supply and the price level.

It has been generally accepted that cause and effect relationships among economic variables are better captured with lagged rather than with one-off cause and effect relationship models (Obiekezie; 2011). We therefore took note of the effects of lagged values of money supply on the general price level in our research models.

The Cambridge monetary theory is an extension of the classical theory. The school opines that cash balances include cash held for both the transactionary and precautionary motives. This school says that money can also be held as a store of value (Anyanwu; 2000). In this regard, if the demand to have cash balances increases, the money available for the purchase of goods and services will reduce. This will reduce aggregate demand for goods and services then price level will fall. On the other hand, if the demand for cash balances reduces, there will be increase in cash available to purchase goods and services. With full employment, output will not increase, and then price level will rise. This is what accounts for the demand push inflation.

According to this school, there is a bearing/relationship between the cash balances that individuals wish to hold and their levels of income. Alfred Marshal expressed this relationship algebraically as follows:

$M^d = M_{T+P} = K(PY) \quad . \ . \ . \quad (IV)$

This says that cash balances held (M^d) are directly proportionate by K to the money income (PY). Money income therefore determines money demand.

M^d = Total Demand for money (cash balances head)

M_T =Volume of cash balances held for transactionary purpose. This represents the cash balances held in circulation.

Mp = Volume of cash balances held as store of value for precautionary

purposes could be held in Demand deposits.

P = Price level

Y = Aggregate Real Income

K = is a constant

In Equilibrium, money supply equals money demand such that;

$M_s = M_d = K(PY)$

In the Cambridge school, Ms is exogenously determined.

From the above,

$P = \underline{M^s}$

KY

This says that the price level is directly related to money supply/demand but inversely related to real output {the aggregate of all incomes (value of goods and services produced)}

$\ln P = \beta_1 + \beta_2 \ln M_s + \beta_3 \ln Y \quad . \ . \ . \quad (V)$

$\beta_2 > 0 \quad \beta_3 < 0$

Therefore, to increase price level, increase money supply or reduce real income/output; or the rate of increase in money supply should be higher than the rate of growth in output.

Equation (v) while acknowledging that money supply have a direct relationship with price level, it introduces the concept that price level is inversely related to the aggregate real income. This captures the views of the supply side economists that increases in output have reducing effect on inflation (Lipsey; 1983).

In this study, we will examine the practicality of equation (V) in Nigeria.

John Maynard Keynes reformulated the quantity theory of money (Keynes, 1936). While the classical quantity theory

expresses a direct and proportional relationship between money supply and price level, the Keynesian theory depicts an indirect and non-proportional relationship between money stock and indicator variables.

Implying a non-proportionate relationship between Price (P) and Money supply (Ms).

But if there is full employment, then $\beta_4 = 1$ then $\beta_5 = 0$

Given the above postulation of the Keynesian school, it becomes necessary therefore to expatiate on the monetary transmission mechanism so as to appreciate the flow of monetary impulses in an economy. Monetary Transmission Mechanism is the process in which monetary factors operate in the asset markets to influence output and asset prices and these in turn influence desired consumption and Investment spending.

(1) The Keynesian monetary transmission theory is propounded on the following basic assumptions: There is unemployment in the economy. The economy is not in full employment;

(2) Effective aggregate demand is directly proportional to the quantity of money in circulation.

In the Keynesian monetary transmission analysis, the impact of a change in the quantity of money in circulation first is on the rate of interest (Tobin; 1969). An increase in money stock makes more money available for spending. People can only make use of the monetary injection if the cost of using it (rate of interest) falls. Otherwise, the monetary injection will be idle and un-accessed. The fall in the rate of interest, reduces the cost of capital and the returns on investment (marginal efficiency of capital), becomes higher (Taylor; 1995). Investors will be motivated to increase investment. More resources will be engaged, employed and output will increase. The price level will be affected depending on the capacity/elasticity of the real sector to accommodate the impact of the monetary expansion. The process can be depicted as follows:

$Ms\uparrow \Rightarrow$ Int. rate$\downarrow \Rightarrow$ Investment$\uparrow$

Employment $\uparrow \Rightarrow$ Output $\uparrow \Rightarrow$ Price level $\uparrow$

This transmission process could generate three possible outcomes as shown below.

(1) $Ms\uparrow \Rightarrow r\downarrow \Rightarrow I\uparrow \Rightarrow E^{\emptyset}\uparrow \Rightarrow O^{\emptyset}\uparrow \Rightarrow P^{\emptyset}$ the monetary injection impact on the output & price level partially.

(2) $M\uparrow \Rightarrow r\downarrow \Rightarrow 1\uparrow \Rightarrow E^{o} \Rightarrow O^{o} \Rightarrow P\uparrow$ Only the price level captures the full impact of the monetary injection. This is the full employment situation

(3) $Ms\uparrow \Rightarrow r\downarrow \Rightarrow I\uparrow \Rightarrow E\uparrow \Rightarrow O\uparrow \Rightarrow P^{o}$ Only output captures the full impact of the monetary injection. Where,

Ø	=	partial impact
O	=	nil impact
↑	=	Proportionate impact

In cases:

(i) The effect of the change in money supply impact partially on output and price level.

(ii) There is zero impact on output but a proportionate impact on price level

(iii) There is zero impact on price level but a proportionate impact on output (Meltze;, 1995). From the above, Keynes opines that the impact of money stock on employment, output and price level depends on its impact on aggregate demand/expenditure through investment (Uchendu; 1996).

Investment being a very important component of aggregate expenditure varies with interest rate (the cost of borrowing investible fund). The relevance of monetary policy in economic stabilization rests on the extent to which monetary policy measures influence the interest rate; the interest rate on investment and investment on employment and output. Therefore, the impact of monetary aggregates in the economy depends on the responsiveness of the economic variables in the transmission chain to changes in money stock. This is called the elasticities in the monetary transmission mechanism (Mishkin; 1996). These relationships were empirically examined in this study. What is the Money Supply elasticity of Interest Rate?

$\ln R = \beta_6 \ln Ms$ . . . (vi)

$\beta_6 < 0$

What is the interest rate elasticity of investment expenditures?

Investment = f(r), $\ln I = \beta_7 \ln R$ . . . (vii)

$\beta_7 < 0$

The above transmission analysis has been criticized as a single portfolio equation model, derived from the money and commodity markets, in a simplified economy with bond as the only financial asset to substitute with cash (Fischer; 1983). Bernake and Gertler (1995) describes the Credit Channel as another mechanism through which monetary policy measures can influence the real sector of the economy; by changing the balance sheet portfolio of banks. This influences the quantity of loan able fund available for borrowing and investment. Others, especially the Monetarists, also posit that monetary impulses do also influence the real sector through prices of other financial and real assets (equities, houses, foreign exchange, land etc.)

Although there are other monetary theories as propounded by various schools of thought, the emphasis of this study is on the early classical schools and that of the Keynesian postulations. Consequently, it would be important to highlight on a very important proposition of the Keynesian School as a dangerous limitation of monetary policy as an effective Economic Stabilization tool – the liquidity trap.

The Keynesians advanced strongly that the efficacy of monetary policy in influencing economic variables is limited when the interest rate is so low such that further increases in money stock can no longer reduce the interest rates. The interest rate then becomes perfectly inelastic to money stock.

They called this scenario the liquidity trap (Wrigthsman; 1983). The economy is highly liquid but paradoxically, interest rate cannot go down. Investment would not change. To the Keynesians this is normally the case during depressions. It is on the basis of this postulation that the Keynesians attach more importance to fiscal measures as a better economic stabilization tool rather than monetary policy; especially in reviving Economic down turns. The core monetarists (Friedman & Schwartz; (1963) and Mordi**,** (2009) through empirical research have opposed the above view as follows:

The US experience, during the great depression, when interest rates were near zero, indicates that this view is demonstrating false. Expansionary monetary policy to increase liquidity in the economy can be conducted. This increased liquidity helps to revive the economy by raising the general price level expectations and by reflecting on other investible asset prices, stimulate aggregate demand. Therefore, monetary policy can be a potent force for reviving economies at interest rates near a floor of zero" (Mishkin; 1996). This exposition goes further to strengthen the role of money in economic stabilization even at periods of economic slumps. Some other economies might have also had the same experience.

These are general economic objectives, which monetary policy measures attempt to achieve. The government through monetary authorities' influences investment, employment, output, general Price Level, Balance of Payments position through monetary policy measures (Obinna; 1982). These are also referred to as Macro-economic goals. There are Indicators with which the performance of any Economic system is measured. There is unemployment If productive inputs, available to an economic unit are not fully engaged in production (Ugwuanyi; 2004). In order to reduce unemployment, expansionary monetary policy measures are taken so as to mobilize such idle resources into active production; and as well create demand for produced goods and services.

Economic growth is defined as the process whereby the real per capita income of a country increases over a long period of time. It is measured by the value of goods and services produced over the period of time, usually annually, at current prices. The real per capital income, Gross domestic Product, Gross National Product are used as growth indicators. For stability, the indicator chosen must be increasing successively over time at about at least 4% per annum (Todaro; 1994).There is tendency for economic growth if unemployed resources are engaged in production and/or the level of aggregate demand is enhanced in order to mob up what is produced. Expansionary monetary policy measures are adopted to encourage economic growth. These measures lower the interest rate, ease credit opportunities, increase investment, production and output (Grupta; 1982)

The price level is the average level of prices of commodities in the product market. It is measured by the general price level index (CP1), known as the GDP deflator. There is inflation if there is rise and deflation if there is decrease in the price level index over time. Price stability does not mean that prices remain unchanged indefinitely. In the UK, there is stability if the inflation rate is within 2% (Lipsey; 1983). In Nigeria, there is price stability if inflation is within a digit rate i.e. not above 9%. (Batini, 2004). Contractionary policies are undertaken to reduce inflationary trend while expansionary measures are taken to address deflation.

The balance of payments represents the balance of a country's transaction with other economies in respect of goods, services and capital flows. The balance of payments is positive/favourable/surplus if the value of exports is above import and negative if that of import is higher (Jhingan; 1998). It is zero if imports equal exports. The balance of payments is preferred to be (positive); but at least zero. Negative/deficit Balance of Payments is said to be unfavourable because it implies that the Economy is consuming more than her production. Contractionary monetary policy measures are adopted to reduce balance of payments deficits. This measure reduces the domestic aggregate demand; hence import; but increases foreign capital inflow.

It is obvious that one monetary policy measure cannot be used to achieve all the macroeconomic goals at a time. While contractionary measures are used to achieve price stability and favorable Balance of Payments, expansionary measures are adopted in order to achieve full employment and economic growth.

Expansionary monetary policy measures adopted to encourage growth and employment may trigger off inflation. This may also encourage unfavorable balance of payments. Advancing on this precarious scenario, Authur Okun developed a law, (the Okun's Law) which says that every growth rate of 2.2% in the real Gross National product above the trend rate reduces unemployment by 1% (Ugwuanyi; 2004). This limits the extent to which monetary policy measures could be adopted to boost economic growth as it may encourage unemployment. On the other hand, it has been advanced that full employment can be achieved with inflation; and price stability better achieved with 5 to 6 % unemployment. Through the Philips Curve analysis, it has been shown that attempts to reduce unemployment increases inflation (Ugwuanyi; 2004). Similarly, efforts to reduce Balance of Payments deficit, further reduces employment and growth.

It is therefore worthy of note that while recommending/adopting monetary policy measures for the attainment of a given economic objective, the effect of such a measure in worsening another economic goal should be properly examined (Lipsey; 1981). Policy makers should then be well equipped to be able to ascertain the gains arising

from achieving a goal and the associated loss in another objective while embarking on a given monetary policy measure. These tradeoffs should be borne in mind to avoid strengthening destabilization in an attempt to stabilize the economy. The guiding principle might be the specific policy goal at each time.

EMPIRICAL LITERATURES

Fundamentally, inflation was seen purely as a monetary phenomenon; such that a change in the money stock brings about a proportionate change in the price level. This opinion was upheld until the 1930's when Keynes in his study on the American Economy on the economic glut of the period. It was discovered that changes in money stock could not explain the treats in the price level and other economic indicators. Keynes then reasoned that probably during economic slumps, interest rates are so low such that further increase in money supply does not affect interest rate and other economic variables remain uninfluenced. It was then that Keynes opined that interest rates are better monetary policy instruments rather than monetary aggregates. In this research, we examined the impact of the two variables as monetary policy targets on some macroeconomic indicators.

The first celebrated empirical study on monetarism was by the Chicago University School of thought led by Milton Friedman in the 1960s. This study revealed that there is a strong relationship between the quantity of money and the national money income (i.e. the nominal Gross National income. The narrow money supply (MI) was initially used but has been further extended to the broader (M2, M3) definitions with similar results obtained. Interestingly in America, in 1980's, efforts towards reducing inflation through monetary policy was successful. The observation that the contractionary monetary policy measures adopted also reduced output and increased unemployment gave more credence to the monetary assertion that monetary policy/aggregates influence both nominal and real economic variables. The result also depicts the trade –offs analysis earlier explained in this study.

Furthermore, Mishkin (1991) has it on record that most financial crises in the US started with sharp rises in interest rate and then, stock market crashes, arising from contractionary monetary measures adopted. This goes to confirm the Keynesian transmission analysis that the interest rate is a better medium through which monetary impulses enter the aggregate economy. It also fulfils the generally accepted monetary transmission relationship that monetary aggregates influence interest rates and that there is inverse relationship between stock of money in circulation and the interest rates.

Nevertheless, the views of Federal Reserve of Kansas state Government in 2001 should not be over looked. Meyer (2000) states that money plays no role in today's Macroeconomic modeling in the US. According to him, money is just a mere indicator variable.

On the contrary, the European Central Bank in 2006 in the paper "The ECB's monetary policy strategy" stated, "money should never be ignored in policy and research". In his study, he noted that monetary aggregates represent the pillar of monetary policy as it sends complementary signals about current economic conditions in the European Economies. Money growth shows tremendous impact on the Interest rate, Real GDP and Inflation (Issing; 2006).

The result of a study on the US experience from 1960 – 2006 shows that only 18% of the changes in inflation is caused by money stock. A similar study was carried out on the European countries as an entity and an R2 value of 0.64 was obtained. This shows that the impact of money supply on inflation is higher on the European block than in the US. Whatever is the case, the fact still remains that monetary policy is a potent policy tool for price stabilization both in the US and European countries. While money stock is the main policy instrument in the European countries, interest rates are more potent in the US (Kahn & Benolkin; 2007). From the South American bloc, Kama (1995) tested the impact of money supply on inflation in Columbia; and found that money has limited role in influencing the general price level. This result suggests that inflation is not a monetary phenomenon. Also, Pinga & Neslson in 2001 looked into the relationship between money and prices in some countries. They found that in Chile and Sri Lanka, it is the price level that causes money instead. The later study goes to align with the inculcation of the rational expectations model of the Neoclassicals in the Demand for money theory. This implies that economic agents adjust their cash holdings in anticipation of the future changes in the price level (Omoke; 2011).

Having examined the experiences in the developed economies, it might be pertinent to extend our review to some developing countries mainly from the Asian block before coming home. These economies have some factors similar to ours and an understanding of the behavior of those economies with regard to money stock will hopefully be helpful in this study.

Rangarajan (1998) carried out a study on the relationship between money supply and price level in the Indian Economy and found that there is a unitary elasticity between money and inflation. The study also shows that it is money supply that causes price level. Das (2003) undertook a long run analysis of the relation between money supply and price level and income in India. The result shows that money supply has significant influence on prices and National income (GDP).

However, while there is a unidirectional causality from money to Income there is a bilateral causality between money

supply and price level. The implication of this study is that money is not neutral and has some elements of endogeneity with respect to price level. Lee & Li (1993), in their analysis of the relationship between money supply, Income and Inflation in Singapore found that money causes inflation while there is bi-directional causality between money supply and the GDP. Nanchace & Nadkarn (1985), using quarterly data obtained a similar result that money influences inflation significantly. However, Ramanchandra (1986), using annual data, found that while money causes real income, nominal income causes money stock.

Khan and Siddique (1990) and Abbas and Huisain (2006), found with respect to that in the long run the GDP causes money supply. However, there is bidirectional causality between money supply and inflation. Studies done by Tan & Cheng (1995) and Majid (2005) using VAR model using Malaysian data show that there is bidirectional casual relationship between money supply and national income. Later, Tan & Baharumshat (1991) examined the causal relationship between monetary aggregates, output, interest rate and inflation. The study provided evidence that money supply and real output do cause price level. This result supports both monetarism and structuralism. In this study, we examined this model with Nigerian data.

The implications of the above results are that no doubt money matters in the developing Asian economies. However, the exogeneity of money stock is still being questioned by the various results examined above.

Some relevant studies on the subject of study have also been undertaken in some North African countries. Amongst such is that of Darrat (1986) on the causality between money and prices in Morocco, Tunisia & Libya (1960 – 1980). The result shows that there is a unidirectional relationship between them money stock to price level. On the other hand there is a feedback relationship between the variables in Nepal as revealed by the Nepal Rastra Bank study in (2001). In another result, Benbouziane and Benamar (2004) discovered that there is no casualty between money and prices in Algeria. This is difficult to explain based on existing theory.

Recently in 2009, the West African Monetary Agency undertook a study on money supply growth and macroeconomic convergence in 15 ECOWAS countries (2002-2008). The result of the study shows that money grew at a very high rate, followed by inflation and low economic growth. This implies that money supply is more related to inflation than economic growth. Through correlation analysis, it was discovered that there was weak positive relationship between money supply and economic growth in seven countries, moderate positive relationship in four countries and unexpectedly negative relationship in four countries.

On money supply and price level, it was found that while there was weak positive relationship between the variables in eight countries there was negative relationship in seven countries. The result therefore queries Classical proposition that inflation is a monetary phenomenon. In the same study, it was found that in six countries though money has effect on interest rate; Interest rate rises with increase in money supply. This negates economic theory. However in three countries including Nigeria, interest rate was seen to have significant negative relationship with money supply. Money supply also impacts on interest rate.

On interest rate and economic growth it was found that interest rate cause growth. Although there is negative relationship between the variables in six countries there is positive relationship between them in three countries. The later scenario is awkward; unfortunately that is the Nigerian experience.

THE NIGERIAN EXPERIENCE

In our theoretical framework, we had established that monetary policies are designed to achieve four major macroeconomic objectives. In Nigeria, according to Nnanna (2001), "current monetary policy framework focuses on the maintenance of price stability while the promotion of growth and employment are the secondary goals of monetary policy". This view goes to suggest that in the country, inflation is seen more as a monetary phenomenon. However this does not preclude the fact that money affects real variables in the country. In recognition of this fact, the major objective of monetary policy in Nigeria (1974 – 1992) was to promote rapid and sustainable economic growth.

In retrospect, Falegen and Ogundare (1974) empirically found money supply to be a significant variable that cause inflation in Nigeria. Based on the study, price increases could largely be attributed to changes in money supply. In another study by Ajayi and Teriba (1974), it was discovered that current value of money supply was not a significant variable in influencing inflation. This contradicts the view that changes in price level can be explained by changes in money stock. This study recognizes the relevance of lagged values of money stock in influencing the price level. Owosekun and Odama (1974) found that a period lagged value of money stock was significantly related to inflation. This says that the impact of monetary policy on inflation is not felt until the second period. It should be noted that this study used real money balance instead of nominal money supply. Osakwe (1983) examined government expenditure, money supply and price in Nigeria and found that there was a positive relationship between the variables. The coefficient of the preceding value of money stock was found to be higher than that of the current value. The results confirm that money affects price level with lags.

Ajayi (1983) extended the study on money supply and price level relationship to prying into their directional causalities. He found that there are bidirectional casualties between them. However, the coefficient of money supply causing price level was higher. Osakwe (1988) found that price level was significantly found to be increasing and decreasing functions of money supply and real output respectively. This result is in line with theoretical specification implying that money supply and real output could be used to manage inflation in Nigeria. However, in the same study, output was found to have higher impact on the price level. The annual data used in this study seem to have concealed some relevant shocks in the analysis. In this study quarterly data was used to really depict all fluctuations in the variables. Omoke (2011) in his study on the causality between money supply and inflation in the Nigerian economy found that there is a long run unidirectional causal relationship; running from money supply to the price level. The implication of the study is that stability in monetary aggregates ensures price stability in Nigeria. This supports the Monetarist view, only that the broad money (M2) was used for money stock in the study contrary to the classical definition of money as strictly a medium of exchange denoted by the narrow money (M1).

Again, Omoke and Ugwuanyi (2010); in another recent empirical study observed that money supply influences both output and inflation. This result suggests that monetary policy could be an important tool for economic stabilization especially in terms of prices and the Gross domestic output. However, they found in the same study that the variables did not have long run relationships among themselves. This calls for doubt in the earlier postulation. Many more of such opposing views on the relevance of monetary policy abound; but the above expositions are sufficient to provide the basis for this study; with the aim of appreciating the efficacy of monetary policy measures in stabilizing prices and output in Nigeria; during the period of our study.

METHODOLOGY

Research Design

We have examined the basis for employing monetary policy measures in stabilizing economies; both in general terms and with particular reference to the Nigerian economy. we emplyed ex-post factor research method. All data used in this study are time series secondary data; obtained from various publications of the Central Bank of Nigeria (Financial and Economic Reviews) and the National bureau of statistics.

Model Specification

The Koyck transformed model was used to estimate the short and long run relationships among the variables (the monetary and macro-economic variables). The Koyck Model was used in order to separate the impacts of monetary variables on the Economic indicators in the short run from that of the long run scenario. With the Koyck model, we were able to estimate the span of the Monetary Policy lags over the period of our study.

Establishing Relationships between Monetary Variables and Macro-Economic Indicators:

The models estimated, were specified as follows:

Short run relationships

$$\ln P = \beta_0 + \beta_1 \ln Ms + \lambda_1 \ln P_{t-1} + U_{1a} \quad \ldots 1a$$

$$\ln Y = \beta_2 + \beta_3 \ln Ms + \lambda_2 \ln Y_{t-1} + U_{2a} \quad \ldots 2a$$

$$\ln P = \beta_4 + \beta_5 \ln Ms + \beta_6 \ln Y + \lambda_3 \ln P_{t-1} + U_{3a} \quad \ldots 3a$$

$$\ln R = \beta_7 + \beta_8 \ln Ms + \lambda_4 \ln R_{t-1} + U_{4a} \quad \ldots 4a$$

$$\ln I = \beta_9 + \beta_{10} \ln R + \lambda_5 \ln I_{t-1} + U_{5a} \quad \ldots 5a$$

Where:

$\beta_1, \beta_3 \& \beta_5 > 0$; $\beta_6, \beta_8 \& \beta_{10} < 0$. These coefficients represent the elasticities of the dependent variables with respect to the explanatory variables in the models. λ_i are adjustment coefficients in the Koyck models, which are $O < \lambda_i < 1$.

Where;

P	=	Price level index
Ms	=	Money supply
Y	=	Gross Domestic Product
IR	=	Lending Interest Rate
INV	=	Investment

The above models (1a-5a) express the rate of change in the dependent variables as a function of the rates of changes in the independent variables in each model. For example, equation 3a states that the rate of change in the price level is a function of the rates of changes in the Money Supply, Gross Domestic Product and the value of inflation for the previous period.

The estimated parameters of the above models, obtained through the OLS, were found not to be significantly heteroscedastic (using the white's heteroscedasticity test). The estimates obtained were therefore unbiased, consistent and efficient. Otherwise, we would have proceeded to use the generally accepted best Instrumental Variable Method (IV) through the two-stage least squares process to estimate the parameters. In this circumstance, the value for the lagged dependent variables appearing as explanatory variables in the above Koyck Models would have been:

$$\ln P_{t-1} = \beta_0 + \beta_1 \ln MS_{t-1} \quad \ldots 1b$$

$$\ln Y_{t-1} = \beta_2 + \beta_3 \ln MS_{t-1} \quad \ldots 2b$$

$$\ln P_{t-1} = \beta_4 + \beta_5 \ln MS_{t-1} + \beta_6 Y_{t-1} \quad \ldots 3b$$

$$\ln R_{t-1} = \beta_7 + \beta_8 \ln MS_{t-1} \quad \ldots 4b$$

$$\ln I_{t-1} = \beta_9 + \beta_{10} \ln R_{t-1} \quad \ldots 5b$$

Long Run Relationships

In order to obtain the long run relationships, we divided the value of the short run parameters estimated in (i) above by the value of the adjustment coefficients (^) in each of the models (Gujarati & Porter, 2009). We then have;

$$\ln P = \alpha_{10} + \alpha_{11} \ln Ms \quad 1\gamma$$

$$\ln Y = \alpha_{20} + \alpha_{21} \ln Ms \quad 2\gamma$$

$$\ln P = \alpha_{30} + \alpha_{31}\ln Ms + \alpha_{32}\ln Y \quad 3\gamma$$
$$\ln R = \alpha_{40} + \alpha_{41}\ln Ms \quad 4\gamma$$
$$\ln I = \alpha_{50} + \alpha_{51}\ln R \quad 5\gamma$$

Where; $\alpha_j = -\beta ij\,\lambda j$

$_j$ = I to 5

Determination of Monetary Policy Lag

We used the adjustment coefficients (λ_i) estimated for each of the short run models, to estimate the optimum time required for the explanatory (Monetary) variable(s) to exhibit its full impact on the dependent variables.

With the Estimated short run Koyck models, the median lag is given as; $\frac{-\log 2}{\log \lambda_i}$

The median lag is the time required to accomplish the first half or 50 percent of the total change in the dependent variable, following a sustained change in the explanatory variable(s). The total lag is therefore twice the median lag. (Gujarati & Porter, 2009).

We employed the E-views (7.0) computer statistical package for regression and related statistical computations in the study.

FINDINGS OF THE EMPIRICAL RESULT

Unit Root Tests Results

The results of the tests on the variables are shown at tables 2 and 3 below;

Table 2: Quarterly Data Unit Root Test with Trend and Intercept Results

Variables	ADF Statistic at level form	**Integration Order**	5% critical value
Money Supply (M)	-6.2858*	I(0)	3.4566
GDP (Y)	-18.2067*	I(0)	3.4566
Price Level (P)	-7.6771*	I(0)	3.4566

Source: *Researcher's Estimate from Eview 9.0 (2020).*

Table 3: Annual Data Unit Root Test with Trend and Intercept Results

Variables	ADF Statistic at level form	**Integration order**	5% critical value
Money Supply (M)	-6.1517*	I(0)	3.2602
Interest Rate	-8.4947*	I(0)	3.2602
Investment	-4.1100*	I(0)	3.2602

Source: *Researcher's Estimate from Eview 9.0 (2020).*

All the coefficients of the test parameters were found to be negative. These satisfy the primary condition for stationary. From the results, money supply, GDP (Y), Price Level (P), Interest Rate and Investment were stationary in levels both the quarterly and annual data used and hence integrated of order zero i(0). The variables were therefore subjected to co-integration test. The result is shown below:

Table 4: Co-integration Test

Sample (adjusted): 1982 2019
Included observations: 36 after adjustments
Trend assumption: Linear deterministic trend
Series: M(2) GDP(2) PL(2) IR(2) IVN(2)
Lags interval (in first differences): 1 to 2
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value
None *	0.869302	175.7651	95.75366
At most 1 *	0.701105	102.5099	69.81889

At most 2 *	0.530909	59.03401	47.85613
At most 3 *	0.392755	31.78352	29.79707
At most 4	0.313576	13.82590	15.49471

Source: *Researcher's Estimate from Eview 9.0 (2020).*

The eigenvalue, trace statistic or Max-Eigen statistic and critical value are used to determine whether co-integrated variables exist. As we observed from the trace statistics, in absolute values, here only three variables were indicated cointegrating eqn(s) at the 0.05 level. The four cointegrating variables were M(2) GDP(2) PL(2) IR(2) since their trace statistic are greater than the 5% critical value (i.e. M [175.7651 > 95.75366], GDP [102.5099 > 69.81889] and PL [59.03401 > 47.85613] and IR [31.78352 > 29.79707] respectively. In other words, the null hypothesis of no co-integration among the variables is rejected since four indicated cointegrating eqn(s) at the 0.05 level. The test result shows the existence of long-run equilibrium relationship among the variables.

KOYCK SHORT RUN MODELS:

The following Regression results were obtained; using the Stationarized data to estimate the koyck Models as already specified.

Table 5a: Regression Results using Quarterly Data 1986 -2019

Regressors	**Dependent**	**M**	**Y**	**P_1L_{t-1} (λ),**	**Y_{t-1} (λ),**	**P_2L_{t-1} (λ),**	**R^2**	**Hetero**
1 : P_1L	-0.04	0.04	-	0.93*	-	-	0.99*	-
Tc	-0.25	1.46	-	25.04	-	-	8.27	7.13
2 : Y_t	1.68	0.04*	-	-	0.81*	-	0.96*	--
Tc	2.93	3.09	-	-	12.5	-	10.72	43.85
3 : P_2L	2.15*	0.16*	-0.28*	-	-	0.85*	0.99*	-
Tc	2.81	3.25	-2.91	-	-	19.28	62.72	8.97

Source: *Researcher's Estimate from Eview 9.0 (2020).*

Table 5b: With Annual Data; 1986 -2019

Regressor	**Dependent**	**M**	**IR**	**IR_{-1} (λ),**	**Inv_{-1} (λ),**	**R^2**	**Hetero**
4 : IR	2.57*	-0.02		0.27		0.16	
Tc	4.57	-1.15		1.67		2	4.43
5 : Inv	3.10*		-0.87*		0.97*	0.94*	
Tc	2.45		-2.552		16.732	161	0.31

Source: *Researcher's Estimate from Eview 9.0 (2020).*

*The Parameters that is significantly different from zero at 5% level

Table 5a and 5b shows the estimated short run models (1 to 3) using quarterly data.

Equation (1) shows that there is positive relationship between money supply and price level. A 100% increase in money supply explained an average of about 4% increase in the price level in the same quarter. This relationship is not significantly different from zero at 5% level. On the other hand, a 100% change in the previous quarters price level, on the average explained about 93% increase in the current price level. This shows that past values of the price level significantly influenced the succeeding quarter's price level. This relationship is high. The fitness of the regression model is 99%; and significantly different from zero. The model is homoscedastic; implying that the estimates are unbiased, consistent and efficient.

In equation (2), the estimated relationship shows that a 100% increase in money supply brought about an average 4% increase in the Gross Domestic Product. The relationship was found to be significant at 5% level. The parameters of the model are significant. It has 96% goodness of fit. The signs of the parameters are consistent with expectations.

Equation (3) is the inflation model with money supply, national output and past values of the price level as explanatory variables. The explanatory power of the model is 99% and significant at 5% level. All the parameters are

significantly different from zero. The adjustment coefficient of the model to equilibrium is 85%. The signs of the explanatory variables are in line with theoretical specifications. The model is not heteroscedastic. Therefore, the parameters are Best Linear Unbiased Estimates.

In Equation (4) is the lending interest rate model with money supply and the past value of the lending interest rate as deterministic variables. A 100% increase in money supply could explain on the average only about 2% decrease in the lending rate; per annum. Also, past values of the lending interest rate explained only about 27% of the changes in lending rate over the period. The explanatory power of the model is low at 16%. All the parameters of the model bear the correct signs but are not significantly different from zero. This implies that there are others variables not included in the model that significantly influenced the lending interest rate during the period. The low adjustment coefficient shows that the influence of the past values of the lending interest rate on the present value is not much. The insignificance of the adjustment coefficient implies that past values of Lending interest rate are not important in determining present rate. The significance of the constant term at 5% level connotes that other variables not captured in the model have significant impact on the lending interest rate.

Equation (5) expresses Gross Investment as a function of current lending interest rate and past values of investment. A 100% increase in the interest rate gave rise to an average of 87% decrease in investment. This relationship is significant. The parameters bore the correct signs. The model has 94% explanatory power. This result says that the current lending interest rate and past rates of investment were important factors that influenced current investment rate.

On a general note, the coefficients of the lagged dependent variables in each of the models represent the rate at which the impact of the other explanatory variables on the dependent variables in the models declined after each lag. The higher the Adjustment coefficient (λ), the lower the rate of decline in the coefficient of farther lagged explanatory variables. The past values of the explanatory variables that impact on the dependent variables then, becomes longer. Conversely, the lower the λ, the faster the rate of decline and hence, the shorter the period the past values of explanatory variables impacted on the dependent variables. From the foregoing, longer past values of money supply impacted on the price level more than on the GDP. Very long past values of lending interest rate impacted on investment. However, shorter distance past values of money supply influenced the lending interest rate.

In all the models, the values of λ are positive and less than unity. This is in line with theoretical (a-priori) requirements. All the values of λ in the models except one are significantly different from zero. The implication of these results is that the past values of the dependent variables had significant impacts on their succeeding values.

Long Run Models

These models show the Long run coefficients of the explanatory variables when the full impacts of all the influencing lagged explanatory variables are taken into account.

Table 6: Estimated Long Run Models using Quarterly Data

REGRESSORS	DEPENDENT	M	Y
1 : P_1L	-0.52	0.60	-
2: :Y	8.67	0.22	-
3 : P_2L	14.65	1.08	-1.89

Source: *Researcher's Estimate from Eview 9.0 (2020)*.

Table 7: Estimated Long Run Models using Annual Data

REGRESSORS	EQUATION	DEPENDENT	M	IR
4 : IR	4	3.54	-0.03	-
5 : INV	5	88.12	-	-24.58

Source: *Researcher's Estimate from Eview 9.0 (2020)*.

Computed by the author from the short run Koyck models estimated with.

The long run models depict the total impact of the explanatory variables on the dependent variables. Here, sufficient time is allowed for the explanatory variables to exert their full impacts on the dependent variables.

Equation (1) shows that a sustained 100% increase in the money supply will yield 60% increase in inflation; as against the 4% result obtained in the short run. This is reasonable.

In Equation (2), a hundred percent increase in the money stock could only generate twenty –two percent increase in the Gross Domestic Product; within the quarter; in the long run. This is also appalling.

Equation (3) says that a percentage increase in money supply yielded 1.08% (about the same percentage) increase in the price level. This relationship is remarkable. It shows a direct and approximately proportionate relationship between money supply and Price Level

The long run elasticity of interest rate with respect to money supply was found to be 0.03; implying that a sustained 100% increase in the money stock reduced the lending interest rate by 3%; in the long run. This is very low. However, the long run Investment function at Equation (5) shows that a percent increase in lending interest rate on the average reduced Investment by about twenty-five percent. This influence is high and significant.

Table 8: Estimating the Operating Lag: Quarterly Data

Equations	Dependent	(Λ),	Median lag	Full lag	
1	P_1L	0.928986	9.41	18.82qtrs	4yrs 9mnths
2	Y	0.806296	3.22	6.44qtrs	1yr 7mnths
3	P_2L	0.853117	4.36	8.72qtrs	2yrs 2mnths

Source: *Researcher's Estimate from Eview 9.0 (2020)*.

Table 9: Estimating the Operating Lag: Annual Data

Equations	Dependent	(λ),	Median lag	Full lag
4	IR	0.273508	0.53	1.06yr
5	Inv	0.964848	19.34	38.68yrs

Source: *Researcher's Estimate from Eview 9.0 (2020)*.

Using the adjustment coefficient of each model as obtained through regression for our short run models

This is the length of time from when a policy is introduced to when the impact of the policy has been fully manifested on the indicators. From the foregoing, we can call this the long run period. It is therefore the length of time required for the long run results to be achieved. The table above shows the estimated operating lag period for each of the models estimated using quarterly data.

Equation (1) shows that it took 9.41 quarters for a consistent rate of growth in money supply to accomplish 50% of its total impact on the price level. In order words, its full lag period when 100% of its impact on inflation had manifested was 18.82 quarters. This is four years and nine months (11yrs, 9months). This period is long. On the other hand, in Equation (2), a change in money supply took a year and seven months to exert its full impact on the Gross Domestic Output. In equation (3), the impacts of a given change in money supply and the GDP took 2 years and two months for the two variables to jointly accomplish their full impacts on inflation. The direct and inverse impacts of money supply and output on the price level respectively might have reduced the money supply lag as depicted at equation (1).

On the annual data, equation (4) shows that a sustained given rate of change in money supply at a time influenced the interest rate for up to a year. In other words, the operating lag period for changes in money supply to exert its full impact on the interest rate is one year; based on the result obtained for the period of the study. Also, a change in interest rate took 38years and eight months to accomplish its full impact on investment stock. This period is extra-ordinarily long. Since our study covered twenty-five years, this result might be interpreted to mean infinity.

Hypotheses:

(1) There is no significant relationship between Monetary Variables and Macro-economic Indicators:

In our tests based on short run results, sixty per cent of our monetary coefficients were found to be significant at 5% level of significance; while 40% were found to be not significantly different from zero. In the long run test, 60% of our coefficients were found to be significantly different from zero.

DECISION: Monetary variables significantly affected macro-economic indicators in both the short and long runs.

(2) Monetary Variables do not exert their full impacts on Macroeconomic Indicators instantaneously.

EQUATION	DEPENDENT VARIABLE	POLICY VARIABLES	LAG PERIODS	DECICION
1	Price Level	Money Supply	18.82 Quarters	Accept Null Hypothesis
2	GDP	Money Supply	6.44 Quarters	Accept Null Hypothesis
3	Price Level	Money Supply & GDP	8.72 Quarters	Accept Null Hypothesis
4	Interest Rate	Money Supply	1.06 Year	Reject Null Hypothesis
5	Investment	Interest Rate	16.68 Years	Accept Null Hypothesis.

From the results shown at the table above, the impact of Monetary policy variables on Macro-economic Indicators were seen to be instantaneous, only in one model (the Lending Interest Rate model); representing twenty percent of our models. The other eighty percent of the models were shown to display very long operational lag periods. This implies that it takes a very long time (that is about 16 years) for policies instituted through monetary variables to impact fully on the targeted Indicators.

DECISION: Accept the Null Hypothesis, that Monetary Variables do not exert their full impacts on the Macro-economic Indicators instantaneously because, it takes a very long time (that is about 16 years) for policies instituted through monetary variables to impact fully on the targeted Indicators.

SUMMARY

All the variables used in the study were found to be stationary at levels. The Koyck models estimated were found to be homoscedastic. The Koyck transformation / adjustment coefficients obtained in the study bore the correct signs and were of the expected magnitude. If all other factors remained unchanged in the Economy, Money Supply was not a significant factor that influenced Inflation in the short. The result was contrary in the long run. The outside lag period of changes in money supply impacting fully on the Price level was estimated to be 47 quarters. Money supply also did not granger because the Price level on a quarter lags.

Inflation was seen to have granger caused the Gross Domestic Product. Past also inflation values significantly influenced succeeding values. Money supply impacted significantly on the Gross Domestic Product; with moderate lag.

The influence of the joint interactions of money supply and National Output, impacted significantly on the General Price level. The strength of the impact of the changes in output on inflation was more than that of the money Supply. The impact of money supply on the lending interest rate was instantaneous, though not significant. The lending interest rate was an important factor that influenced Investment. The operating lag period was ambiguously high. Money supply significantly granger caused investment. All the parameters/coefficients estimated in the models bore the right signs.

POLICY IMPLICATIONS

The fact that all the coefficients of the policy variables bore the correct signs imply that there is prospect for the monetary policy tools/variables, examined in the study to be effective in stabilizing Inflation and Growth in the Nigerian Economy. The growth of Money Supply cannot be used to influence the general price level and the lending Interest Rate especially in the short run. Changes in the stock of Money Supply can be used to stimulate Economic Growth. Inflation can better be managed with proportionate growths in Money Supply and the Gross Domestic Product. Investment can be tracked by manipulating the lending interest rate.

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