The Impact of Monetary Policy and Its Lag on Economic Growth

Samuel Obafemi Dada and Kehinde Miracle Alabi

[1&2] Department of Finance, Faculty of Management Sciences, Ekiti State University

Email: [1]samuel.dada@eksu.edu.ng and [2]alabikehinde777@gmail.com

Abstract— The study examined the impact of monetary policy and its lag on economic growth in United Kingdom, United States of America and Nigeria from 1986 to 2016. The comparative study used Gross domestic Product as the dependent variable and also used monetary policy rate, inflation rate, interest rate, money supply and exchange rate as independent variables. The study used the Generalized Method of Moments to examine the effect of lag, Auto Regressive Distributed Lag modeling approach for long run analysis coupled with the Engle Granger causality test to reveal the direction of causality. Hence, it was revealed that monetary policy lag has a negative effect on economic growth in the three countries. Also, monetary policy was found to exert an insignificant effect on economic growth in the United Kingdom and United State of America while monetary policy was found to exert a significant effect on economic growth in Nigeria through the channel of money supply. Meanwhile, the causality test revealed that economic growth causes monetary policy in USA and Nigeria while both phenomena dictate each other's tune in the UK. Hence, it was recommended that policy makers should focus on reducing the existence of lags in the economy while monetary policy should not just be seen as a mere tool to display the tyranny of monetary authorities in Nigeria but should be adopted an effective tool of response to put the economy on track after a careful observation of the economy has shown that it is straying away from set targets and goals while the monetary policy should not be aggressively used as the market force mechanisms should be allowed to determine prices and phenomena within the economy. Also, monetary authorities should make use of money supply in sharply correcting the economy in Nigeria in case of any perceived deviation from set targets as this channel will bring about a substantial effect within the economy without so much delay to ensure that Nigeria catches up with other industrialized economy of the world.

Keywords— Monetary Policy, Economic Growth, Monetary Policy Lag, Generalized Method of Moments.

I. INTRODUCTION

Money is the bedrock of every economy. It has been considered as the major engine behind the development and stasis of any economy based on the way its controlled. In line with the above, the endogenous growth theory assumes that economic growth is spurred by factors within the economy. Also, Fiador (2015) posited that the financial system of a country including the rate of its development, rate of regulation and control has a major role to play in facilitating economic development. Obviously, one of the major factors which engender growth is the nature of the monetary policies as formulated by the monetary authority. Fiador (2015) corroborated this truth as she averred that even in managing financial systems; the key policy tool is undisputedly the monetary policy. Hence, the issue of cost of funds, volume of same, capital accumulation, stability and interplay of forces within the economy are all results of the actions and inactions of the monetary authorities through their policies. In support of the claim that monetary policy is very important policy in the economy, Mishkin (2007) opined that the monetary policy is a weapon that is need for financial stability and health of any economy in the world.

Specifically, monetary policy as explicated by Shaw (1973) refers to the conscious action taken by monetary authorities to alter the quantity, availability or cost of money. Hence, Jain and Khanna (2006) posited the economic development can be achieved through the adjustment of money supply and its direction to the needs of development in the economy. They emphasized that for economic development to take place, there is need to channel resources and funds to the technological and infrastructural aspect of the society. The implementation of monetary policy as delineated by Onderi (2014) boils down to the instruments, operating targets and the policy goals of the policy which are the major components and factors to be considered in the implementation of monetary policy. Onderi (2014) further considered price stability and economic growth as the ultimate goals of monetary policy while other goals fall in as intermediate targets.

Although, monetary policy remains a major tool to navigate the economy through economic vicissitudes, it can be disclosed that its improper use may as well hamper the growth of any economy. For instance, Fiador (2015) considered contractionary monetary policy as a

policy that may lead to undesirable results in the economy. Hence, the weapon of monetary policy is not only needed in an economy but the skill of use of it is likewise needed as the economy grows. As a result, there is a call for emphasis on monetary authorities who adopt various monetary policies in the economy. Although, the monetary authorities cannot affect inflation and other set targets directly in the economy, they really influence this economic phenomenon through some transmission mechanisms (Klasco, 2013). Correspondingly, Isedu (2013) asserted that the effect which monetary policy will exert on the economy is majorly a function of the ability of the monetary authorities to make precise and accurate assessment of the timing and outcome of their policies and actions. Consequently, this need for accuracy in the sphere of monetary policy has called for the consideration of lag in the process of formulating monetary policies in every country. However, despite the universality of monetary policy in various countries of the world, Nigeria has failed to make use of such universality has it has focused mostly on the oil sector which has turned out to be a 'Dutch disease' and its effect on the economy. Also, the government overshoots its budget to a point that the funds which were supposed to be used for infrastructural and social development have never been employed while monetary authorities have been forced to increase interest rates because of inflationary pressures (Isedu, 2013) coupled with the presence of information lopsidedness as a result of the state of the economy necessitating the unavoidable presence of monetary policy lag.

Statement of Problem

Economic growth responds significantly to monetary policy all over the world and Nigeria is not an exception. However, there exists a plethora of contribution in literature as regards this subject matter (Kutu, Nzimande & Msomi, 2017; Borio & Gambacorta, 2017; Drama, 2017; Inam & Ime, 2017; Najaf, 2017; Chan, 2016; Anowor & Okorie, 2016; Wong & Chong, 2015; ThankGod & Karimo, 2014). These studies range from those carried out on industrially, economically or technologically developed countries to those carried out on developing countries. However, due to the economic crisis that has rocked the world, there is need to revisit the influence of monetary policy on economic growth across the world. As a result, this study carried out a comparative analysis of the effect of monetary policy on economic growth. Furthermore, considering the conflicting result in literature as regards monetary policy whereby the financial liberalization school of thought assumes that financial liberalization engenders economic growth while the financial repression school

of thought assumes that repression improves growth. In the same manner, Kutu, Nzimade and Msomi (2017), Chan (2016) and Wong and Chong (2015) discovered that monetary policy has significant effect on economic growth while Drama (2017), Tang (2009) and Bokreta and Benanaya (2016) discovered otherwise. Also, AbuDalu, Elsadig, Almasaled and Abuelgasim (2014), Irfan and Amen (2011) and Anowor and Okorie (2016) discovered that monetary policy has positive effect on economic growth while Srithilat and Sun (2017) and Obadeyi Okhiria and Afolabi (2016) discovered otherwise and interestingly, Douanla (2014) discovered both effects on economic growth. Hence, given these mixed results it is necessary to inquire into the effect of monetary policy on economic growth to ascertain the real fact.

Furthermore, from the Nigerian standpoint, most studies (Inam & Ime, 2017; Anowor & Okorie, 2016; Akinjare-Victoria, Babajide and Okafor, 2016; Obadeyi, Okhiria & Afolabi, 2016) have failed to establish the direction of causality between the variables and were limited to the Error Correction Modeling technique. Also, these studies failed to consider the effect of monetary policy lag on economic growth and obviously failed to consider a comparative analysis with other countries of the world on the subject matter. Hence, this study investigates comparatively the effect of monetary policy and its lag on economic growth of Nigeria, United States of America (USA) and the United Kingdom (UK) through the use of the Auto Regressive Distributed Lag Modeling (ARDL) and the Generalized Method of Moments (GMM) techniques respectively coupled with the use of the Engle Granger Causality technique to examine the causal relationship between monetary policy, its lag and economic growth.

II. LITERATURE REVIEW

Conceptual Literature

Monetary Policy, its Lags and Economic Growth

Monetary policy refers to the policies and measures adopted by the government of a country to control the value, availability, direction, cost and supply of money in an economy in a bid to achieve set objectives. However, Smitha (2010) opined that monetary policy relates to non-monetary measures that are targeted at influencing the monetary environment such as regulation of prices, wages and income. Johnson (1978) considered monetary policy as the policy employed by the monetary authority of a nation in a bid to control the supply of money in order to achieve the macroeconomic objectives of the government. In the same manner, Einzing (1964) opined that monetary policy embraces

all the decisions of the government that has sustaining effect on the monetary system either they are monetary decisions or not.

Correspondingly, monetary policy has been considered as the Sulaiman (2006) as conscious effort by monetary authorities in a country to control the stock of money and the creation of credit through the use of quantitative and qualitative tools. Also, Cambazoglu and Karaalp (2012) posited that the transmission mechanism of monetary policy, that is the channels through which monetary policy affect economic growth can be split into the neo-classical channel and the non-neoclassical channel. They averred that the neo-classical channel relates to the traditional interest rate channels, asset price channel and the exchange rate channel. Meanwhile, the non-neoclassical channel involves majorly the credit or money supply channel.

Furthermore, the objectives of monetary policies involve ensuring price stability, economic growth, exchange rate stability, full employment and the balance of payments equilibrium. However, the achievement of these objectives has called for the consideration of lags in the implementation of monetary policy. As a result, Sulaiman (2006) considered time lag as the major lag affecting monetary policy in the economy. Time lag is considered as the length of time that exists between when there is need for a monetary policy action and when the action is taken. It is also the length of time between when an action is taken and when the effect of the action is felt in the economy. According to Friedman (1961) monetary policy effect is substantially felt in the economy only after a length of lag, as a result, he recommended that policy makers should forecast the existence of lags in the process of making policies to reduce the problem of instability in the country. Sulaiman (2006) further delineated time lags to involve inside and outside lag whereby the inside lag is the length of time between the need for an action and when it taken while outside lag is known as the time that lapses between when an action is taken and when the effect is substantially felt in the economy. However, irrespective of the kind of lag, monetary policy lags have been found to exert negative effect on economic growth (Sulaiman, 2006).

Theoretical Literature

McKinnon-Shaw Theory of Financial Liberalization
The financial liberalization theory started with the opinions of McKinnon (1973) and Shaw (1973) while building on the work of Schumpeter (1911). The theory emphasized on financial liberalization by considering the adverse effect of financial repression on economic growth. They posited that most developing countries are in such state because they are financially repressed, and as such, this repression has caused indiscriminate alteration and fluctuations of financial prices such as interest and foreign exchange rate.

Correspondingly, Shaw (1973) posited that liberalization of the economy leads to the increasing of the private savings to income in the economy. Hence, Isedu (2013) averred that financial liberalization will lead to significant economic benefits through the mechanisms of a more effective domestic savings mobilization, financial deepening and proper allocation of resources. Furthermore, the proponents of this theory assumed that the existence of repression or fixing of rates and allocation of credit by monetary authorities through their polices has destroyed the economies of developing countries by leading to a downward trend in savings and led to channeling of funds and encouragement of investment in unproductive sector of the economy. Mckinnon (1973) and Shaw (1973) challenged the classical theory and propounded the theory against financial repression assuming that interest rate should be determined by the market and not by government. Furthermore, liberalization encourages competition and innovation in the market, as a result, McKinnon (1973) assumes that such competition in the financial market will raise interest rates on deposits and lead to a high savings rate and also lead to financial innovation and import of proper managerial techniques in the economy.

Mundell-Fleming Model
The model has formulated by Mundell and Fleming (1963) as cited by Isedu (2013) considers the IS-LM model by Hicks (1937) as relayed by Iseidu (2013) as its bedrock for its assumptions and postulations. Due to the inability of the Keynesian and Classical models to address the combined effect of unemployment and inflation rather than the inverse relationship as considered by the Keynesian theory. Specifically, considering the need for a country to achieve both a strong internal as well as external balance, the proponents of this theory as relayed by Isiedu (2013) assumed that there is a need to make use of both the monetary and fiscal policy efficiently and simultaneously. Mundell-Fleming (1963) as quoted by Iseidu (2013) considered internal balance as domestic balance where there is full employment and stability of prices in the economy while external balance was seen as the equilibrium of the balance of payments. The advocates of this theory therefore posited that in a bid to

achieve internal balance in the economy, there is need to achieve a tradeoff between inflation and unemployment and this is where the essence of monetary and fiscal policies comes into play. However, in a bid to achieve external balance, Mundell-Fleming (1963) as alluded to by Iseidu (2013) assumed that there is a need to achieve equilibrium between exports and imports. They further assumed that the expansionary monetary policy can be achieved through the process of lowering the interest rate in the economy as it will spur the level of income and employment but it will also lead to increase in imports. Moreso, they assumed that the contractionary monetary policy can be achieved by increasing the rate of interest which will lead to a reduction in the level of income, investment, imports and employment.

Classical Quantity Theory of Money
The quantity theory of money was first developed by Jean Bodin in 1958 and was later refined by Irving Fisher in 1911 (Jhingan, 1997). The classical economists assumed that money is used only for transactionary purposes and as such are only used for exchange of goods and services. As a result, the quantity theory of money assumes that there is a strong connection between money supply and price level *Ceteris Paribus,* i.e. if all things are equal. The widely known equation in the theory is the famous Fisher's equation of exchange as modeled by Fisher (1911) which is identified as:

$$MV = PT$$

In the equation, 'M' is considered to represent the quantity of money in circulation, 'V' represents the number of times a unit of money is used in transaction per unit of time (velocity), 'P' represents the weighted average of all individual price, hence $P = \frac{MV}{T}$, meanwhile, 'T' refers to the sum and value of all the transactions per goods and services per unit of time.

However, the Fisher's equation of exchange was criticized based on the ground that velocity of money is not constant and it emphasized a lot on the volume of transactions money is used for rather than output which is the amount of goods and services exchange for the money itself. As a result of these criticisms, the equation was transformed as T which is the volume of transactions money is used for was substituted for Y which is the total amount of goods and services (Dalhatu, 2012).

$$MV = PY$$

Therefore, as a result of the introduction of Y into the equation, the theory shows that the monetary side of the economy is linked with the real sector of the economy as Y stands for real output. Hence, the postulation of the monetarist theory that a rise in money supply has no effect on real economy but only on the monetary side and the prices at which goods are exchanged is upheld (Onderi, 2014). In same manner, when money supply is reduced, the spending capacity of the people is reduced and this leads to a fall in prices (Dwivedi, 2010). However, the model has been criticized on the grounds that it did not sufficiently explain the general price movement and that the postulation that there is direct proportion in change in quantity of money and price level is non-existent today as there are other exogenous factors outside the model that affects changes in quantity of money and price level like infrastructural and political factors (Dalhatu, 2012).

Keynesian Monetary Theory
This theory as propounded by Keynes (1936) considered the essence of money to transcend just exchange of goods and services (transactionary motive). He asserted that money can also be used for precautionary and speculative purposes that is, guarding against unforeseen circumstances and for investment purposes. Keynes (1936) connects the demand for money to the fluctuations in interest rates. He further emphasized his point through the use of bonds price as example. He assumed that people hold money to buy bonds in the future expecting the prices to go down. According to Dwivedi (2010), the theory clearly spells out three motives for holding money which includes the precautionary, transactional and speculative motives of holding money. Furthermore, Keynes (1936) considered the demand for money (M_d) be a function of the transactionary (which includes precautionary i.e M_T) and speculative demand for money (M_{SP}). Hence, he formulated another equation identified as:

$M_d = M_T + M_{SP}$

Keynes (1936) assumed that the assumption of the constant velocity of money as propounded by the classical economists is a mere fallacy and that nominal interest rate is a more important factor that affects the velocity of money in an economy. As a result, he posited that demand for money is negatively related to interest rate which is a major divergence from the classical quantity of money.

Empirical Literature
Review from Industrially Developed Countries
Kutu, Nzimande and Msomi (2017) studied the effect of monetary policy on growth of industrial sector in China between 1994 and 2013. The study used industrial output production as the dependent variable and also

used interest rate, money supply, exchange rate and inflation rate as independent variables coupled with the use of Auto Regressive Distributed Lag (ARDL) modeling technique; it was revealed that monetary policy has significant impact on economic growth. Hence, it was suggested that interest rate should be stabilized to boost industrial production in the land.

Borio and Gambacorta (2017) studied the effect of monetary policy on bank lending in 14 developed countries between 1995 and 2014. The study used annual growth rate of loans as dependent variable and also used lending rate, inflation rate and price growth as independent variables coupled with the use of the Generalized Methods of Moments, it was revealed that monetary policy has negative effect on bank lending. Hence, the setting of rates at low level was recommended to boost bank lending and growth of the economy.

Chan (2016) studied the effect of money supply and inflation rate on economic growth in China between 1999 and 2015. The study used Gross domestic product as the dependent variable and also used money supply and inflation rate as the independent variables coupled with the use of the Vector Error Correction Modeling technique, it was revealed that money supply and inflation rate as monetary policy variables have significant effect on economic growth. Hence, it was suggested that a cautious regulation should be implemented to boost economic growth.

Mushtaq and Siddiqui (2016) studied the effect of interest rate as a monetary policy variable on bank deposits in 46 countries across the world between 1999 and 2014. The study used bank deposits as the dependent variable and also used interest rate as the independent variable coupled with the use of the Panel Auto Regressive Distributed Lag modeling technique; it was revealed that interest rate has positive effect on bank deposit. Hence, it was recommended that depositors' behaviour should be considered while making policies.

Nguyen, Papyrakis and Van Bergeijk (2019) did a vector- autoregressive analysis to measure the effects of monetary policy in Vietnamese economy using monthly data. The study find evidence suggesting that there could be prices stabilization if interest rate was manipulated. The study equally finds that there could be an increase in industrial production due to an expansion of broad money supply.

Review from Developing Countries
Drama (2017) studied the impact of monetary policy on economic growth in Cote d'Ivoire between 1990 and 2014. The study used Global oil price and world commodity price as dependent variables and also used exchange rate, interest rate, money supply as independent variables coupled with the use of Structural Vector Auto Regression technique, it was revealed that monetary policy has insignificant effect on economic output. Hence, it was suggested that the economy should be diversified and fiscal policy should be relied upon.

Srithilat and Sun (2017) studied the impact of monetary policy on economic development in Lao PDR between 1989 and 2016. The study used Gross Domestic product as the dependent variable and also used money supply, interest rate, inflation rate and exchange rate as independent variables coupled with the use of Error Correction Modeling technique, it was revealed that monetary policy has negative effect on economic growth. Hence, it was recommended that monetary authorities should make use of exchange and interest rates as monetary policy tools rather than money supply due to the inflationary effect.

Saqib and Aggarwal (2017) studied the effect of fiscal and monetary policy on economic growth in Pakistan between 1984 and 2014. The study used Gross domestic product as the dependent variable and also money supply and fiscal balance as independent variables coupled with the use of Johansen Co-integration test, it was divulged that monetary and fiscal policy has long run relationship with economic growth. Hence, it was recommended that monetary policy should be given proper attention to foster economic growth.

Najaf (2017) studied the effect of monetary policy on economic growth of Pakistan between 1982 and 2009. The study used Gross domestic product as the dependent variable and also used liquidity ratio, money supply and cash ratio as independent variables coupled with the use of the Vector Error Correction Modeling technique divulging that monetary policy has significant effect on economic growth. Hence, it was divulged that operations of the financial markets and employment should be improved upon to reduce inflation.

Aftab, Mohsin and Saboor (2016) studied the impact of monetary policy on economic growth in Pakistan between 1972 and 2011.

The study used Gross domestic product as the explained variable and also used money supply, inflation, exchange rate and interest rate as the explanatory variables twinned with the use of Correlation and the Ordinary Least Square technique divulging that monetary policy has significant effect on economic growth.

Bokreta and Benanaya (2016) studied the effect of fiscal and monetary policy on economic growth in Algeria between 1970 and 2014. The study used Gross Domestic Product per capita as dependent variable and also used government expenditure, net taxes, exchange rate and inflation rate as independent variables coupled with the use of the Vector Error Correction Modeling technique; it was revealed that monetary policy has an insignificant effect while fiscal policy has significant effect on economic growth. Hence, it was suggested that proper attention should be given to monetary policy in stimulating economic growth and petrol prices should be reduced.

Review from Nigeria

Inam and Ime (2017) studied the impact of monetary policy on economic growth in Nigeria between 1970 and 2012. The study used Gross Domestic Product as the dependent variable and also used money supply, inflation rate, government expenditure, interest rate, exchange rate, population and investment rate as independent variables coupled with the use of the Ordinary Least Square regression technique, it was divulged that monetary policy has insignificant effect on economic growth. Hence, it was recommended that government should increase productive population to assist in achieving economic growth.

Anowor and Okorie (2016) studied the impact of monetary policy on economic growth in Nigeria between 1982 and 2013. The study used Gross Domestic Product as the dependent variable and also used Interest rate; cash reserve ratio and monetary policy ratio as independent variables coupled with the use of the classical ordinary least square and the error correction modeling technique revealing that monetary policy has a positive effect on economic growth. The study recommended that attention should be given to cash reserve ratio in a bid to stabilize the economy.

Akinjare-Victoria, Babajide and Okafor (2016) studied the effect of monetary policy on economic growth in Nigeria between 1970 and 2013. The study used Gross Domestic Product as the dependent variable and also used exchange rate, interest rate, money supply and inflation rate as independent variables coupled with the use of Error Correction Mechanism, it was divulged that monetary policy has significant effect on economic growth. Hence, it was recommended that monetary policies should be used to create a favourable climate for investment and economic growth.

Obadeyi, Okhiria and Afolabi (2016) studied the impact of monetary policy on economic growth in Nigeria between 1990 and 2012. The study used gross domestic product as the dependent variable and also used inflation, interest rate, money supply and exchange rate as the independent variable coupled with the use of the classical Ordinary Least Square and Error Correction technique, it was revealed that monetary policy has negative effect on economic growth. Hence, it was recommended that monetary authorities should make use of countercyclical policy that will lead to the expansion of the economy.

Osmond, Egbulonu and Emerenini (2015) studied the impact of monetary policy variables on the manufacturing sector of Nigeria between 1981 and 2012. The study used Industry contribution to Gross Domestic Product as the dependent variable and also used Interest rate, credit to private sector, money supply and inflation as independent variables coupled with the use of Error Correction Modeling, it was revealed that monetary policy has significant effect on manufacturing sector of economy. Hence, it was revealed that monetary authorities should avoid inconsistencies in the implementation of policies.

III. METHODOLOGY

The study adpts an economic approach in the analysis of impact of monetary policy and its lag on economic growth. An econometric approach of the Generalized Method of Moments (GMM), Auto Regressive Distributed Lag (ARDL) Modeling and Engle Granger Causality technique was adopted to test for the relationship between the variables. The study made use of time series data spanning from 1986 through 2016. According to Arellano and Bond (1991), the use of the GMM technique allows for the provision of more information and precision in the analysis. The Auto Regressive Distributed Lag (ARDL) bounds testing methodology as developed by Pesaran and Shin (1999) has been favoured above the co-integration analysis developed by Engle and Granger (1987) and Johansen and Juselius (1990) due to the low power problems associated with the co-integration analysis. It is used in cases of mixed integration (Shrestha & Chowdhury, 2007). The methodology as developed by Granger (1969) shows whether a change in a variable will cause a change in another variable. Causality can be unidirectional, bidirectional or no relation at all based on the probability value of the F-statistics.

Model Specification

The objective of the study is to investigate the impact of monetary policy and its lag on economic growth in USA, UK and Nigeria. Hence, the model formulated for the study as adopted from the study of Obadeyi, Okhiria and Afolabi (2016) is stated hereunder:

GDP = f (INFR, INTR, MS, EXGR).

Where:

GDP = Gross Domestic Product
INFL = Inflation Rate
INTR = Interest Rate
MS = Money Supply
EXGR = Exchange Rate

However, after modifications by the researcher in a bid to bridge more knowledge gaps by considering the impact of another monetary policy variable on economic growth, the modified model is stated below as:

GDP = f (MPR, INFL, INTR, MS, EXGR, μ)……………………………………. (1)

This model can for the purpose of simplicity be stated in the econometric form of equation as depicted below:

$$GDP = B_0 + B_1 MPR + B_2 INFL + B_3 INTR + B_4 MS + B_5 EXGR + \mu \ldots\ldots\ldots\ldots\ldots (2)$$

Where;

GDP = Gross Domestic Product
MPR = Monetary Policy Rate
INFL = Inflation Rate
INTR = Interest Rate
MS = Money Supply
EXGR = Exchange Rate
μ = Error Term
B_0 = Constant Parameter
$B_1 - B_5$ = Coefficients of Regression

In a bid to avoid spuriousity in estimation, the study moves an inch by process of loglinearization and the entire and the entire model becomes:

$$Log (GDP) = B_0 + B_1 Log(MPR) + B_2 Log(INFL) + B_3 Log(INTR) + B_4 Log(MS) + B_5 Log(EXGR) + \mu \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:-

Log = Natural Logarithm

From equation 3 above, the research model can further be stated in time series form as depicted below:-

$$Log(GDP)_t = B_0 + B_1 Log(MPR)_t + B_2 Log(INFL)_t + B_3 Log(INTR)_t + B_4 Log(MS)_t + B_5 Log(EXGR)_t + \mu \ldots\ldots\ldots\ldots\ldots (4)$$

Where: -

t = Time Lag

Again, by formulating the Error Correction Model (ECM) for the Auto Regressive Distributed Lag (ARDL) Model as obtained from equation (3), the model becomes:

$$\Delta Log(GDP)$$
$$B_0 + \sum_{i=0}^{n} B_1 Log(MPR)_{t-1} + \delta +$$
$$\sum_{i=0}^{n} B_2 Log(INFL)_{t-1} + \delta +$$
$$\sum_{i=0}^{n} B_3 Log(INTR)_{t-1} + \delta + \sum_{i=0}^{n} B_4 Log(MS)_{t-1} +$$
$$\delta + \sum_{i=0}^{n} B_5 Log(EXGR)_{t-1} + \delta + \sum_{i=0}^{n}(ECM)_{t-1} +$$
$$\delta + \sum t \ldots\ldots\ldots\ldots\ldots (5)$$

Where: -

Δ	-	Change
t_{-1}	-	Lagged value of each variables
$\sum_t$	-	White noise/residual
$\sum_{i=0}^{n}(ECM)_{t-1}$	-	Error

Correction term

In testing for the existence of long run equilibrium relationship, the error correction model i.e. equation (5) can be conducted by placing some restrictions on estimated long run coefficient of variables. Therefore, the hypothesis for the test is formulated as follows:

H_0: $B_1 = B_2 = B_3 = B_4 = B_5 = 0$ (There is no long run equilibrium relationship or No co-integration)

H_1: $B_1 \neq B_2 \neq B_3 \neq B_4 \neq B_5 \neq 0$ (There is the presence of long run equilibrium relationship or co-integration exist)

IV. ANALYSIS AND DISCUSSION OF RESULT

This segment of the study discusses the analysis and result of the study. Regression analysis was conducted using E-Views 9.

GMM Short Run Analysis to examine the effect of Monetary Policy Lag on Economic Growth in Nigeria, USA and UK

Table 1: GMM Result for Nigeria: Dependent Variable: GDP

	Coefficient	Std. Error	t-Statistics	Prob.
GDP(-1)	0.844037	0.087529	9.642913	0.0000
MPR	-0.011534	0.023149	-0.498225	0.6244
MPR(-1)	-0.050199	0.037712	-1.331101	0.1998
INFL	-0.042981	0.012816	-3.353727	0.0035
INFL(-1)	0.016762	0.011385	1.472237	0.1582
INTR	0.032350	0.022029	1.468488	0.1592
INTR(-1)	-0.033883	0.040483	-0.836984	0.4136

MS	-0.118146	0.074160	-1.593129	0.1285
MS(-1)	0.147576	0.085949	1.717024	0.1031
EXGR	0.016802	0.022311	0.753093	0.4611
EXGR(-1)	-0.113942	0.044501	-2.560424	0.0197
C	4.001395	2.194582	1.823306	0.0849

R^2=0.991638 DW-Stat. = 1.911456 / Source: Author's Computation

Table 2: GMM Result for USA: Dependent Variable: GDP

	Coefficient	Std. Error	t-Statistics	Prob.
GDP(-1)	1.001684	0.033121	30.24354	0.0000
MPR	-0.004747	0.033745	-0.140683	0.8899
MPR(-1)	-0.044892	0.033052	-1.358232	0.1932
INFL	-0.002150	0.004629	-0.464507	0.6485
INFL(-1)	0.000815	0.004056	0.200945	0.8433
INTR	0.011918	0.021319	0.559022	0.5839
INTR(-1)	0.001364	0.017505	0.077892	0.9389
MS	0.229194	0.074215	3.088262	0.0071
MS(-1)	-0.265897	0.083217	-3.195218	0.0056
EXGR	0.044203	0.067413	0.655707	0.5213
EXGR(-1)	-0.022195	0.041615	-0.533333	0.6011
C	1.020885	0.438411	2.328600	0.0333

R^2=0.998986 DW-Stat. = 2.842250 / Source: Author's Computation

Table 3: GMM Result for UK: Dependent Variable: GDP

	Coefficient	Std. Error	t-Statistics	Prob.
GDP(-1)	1.122529	0.338671	3.314513	0.0211
MPR	-0.013038	0.043772	-0.297868	0.7778
MPR(-1)	-0.038857	0.030101	-1.290861	0.2532
INFL	-0.002953	0.010954	-0.269628	0.7982
INFL(-1)	0.003916	0.007993	0.489972	0.6449
INTR	0.012237	0.007611	1.607793	0.1688
INTR(-1)	0.002220	0.009531	0.232951	0.8250
MS	0.013668	0.052918	0.258290	0.8065
MS(-1)	-0.086118	0.031568	-2.728050	0.0414
EXGR	0.086455	0.089642	0.964453	0.3791
EXGR(-1)	0.083411	0.082760	1.007860	0.3598
C	-2.178914	7.551061	-0.288557	0.7845

R^2=0.999179 DW-Stat. = 2.906495 / Source: Author's Computation

Summarily, it can be deduced that monetary policy rate, its lagged value and inflation has negative effect on economic growth in the three countries.

However, Money supply and its lagged value had a negative and positive effect on economic growth in Nigeria while money supply lag had negative effect on economic growth in USA and UK while money supply has positive effect on economic growth in both countries.

Bounds Test Results for the three countries
Table 4: Co Co-Integration Result (Nigeria)

F-Statistics	Lower Bound (5%)	Upper Bound (5%)
4.520553	2.04	3.24

Source: Author's Computation

Table 5: Co-Integration Result (USA)

F-Statistics	Lower Bound (5%)	Upper Bound (5%)
14.29118	2.04	3.24

Source: Author's Computation

Table 6: Co-Integration Result (UK)

F-Statistics	Lower Bound (5%)	Upper Bound (5%)
18.51191	2.04	3.24

Source: Author's Computation

Hence, it can be deduced that there exists a long run relationship between monetary policy and economic growth in the three countries.

ARDL Long Run Results for the three countries
Table 7: Long Run Result of the Model (Nigeria): Dependent Variable: GDP

Variable	Co-Efficient	Std. Error	T-Statistics	Prob.
MPR	-0.128198	0.333066	-0.384904	0.7038
INFL	-0.021715	0.130889	-0.165903	0.8697
INTR	0.185392	0.413274	0.448594	0.6579
MS	0.290865	0.083859	3.468484	0.0021
EXGR	-0.170319	0.257754	-0.660779	0.5153
C	18.964158	3.767020	5.034260	0.0000

Source: Author's Computation

Table 8: Long Run Result of the Model (USA) Dependent Variable: GDP

Variable	Co-Efficient	Std. Error	T-Statistics	Prob.
MPR	-0.415770	0.783071	-0.530948	0.6008
INFL	0.191541	0.249884	0.766521	0.4515
INTR	0.231184	0.447721	0.516357	0.6108
MS	0.736585	0.360925	2.040829	0.0534
EXGR	-0.000182	0.834883	-0.000218	0.9998
C	7.959018	10.383005	0.766543	0.4515

Source: Author's Computation

Table 9: Long Run Result of the Model (UK): Dependent Variable: GDP

Variable	Co-Efficient	Std. Error	T-Statistics	Prob.
MPR	-0.454971	1.148627	-0.396099	0.6990
INFL	0.534722	1.597021	0.334825	0.7435
INTR	0.106834	0.401268	0.266241	0.7946
MS	0.231656	0.223696	1.035582	0.3208
EXGR	0.667035	1.942477	0.343394	0.7372
C	18.630471	11.668807	1.596605	0.1363

Source: Author's Computation

Hence, from the long run results of the countries, it can be inferred that monetary policy rate, inflation rate and exchange rate exert negative effect on economic growth in Nigeria as only monetary policy rate has negative effect on economic growth in the UK while monetary policy rate and exchange rate has negative effect on economic growth in the USA as other variables exert positive influence on economic growth in all countries.

However, monetary policy has no significant effect on economic growth in UK and USA while Money Supply has a substantial effect on economic growth in Nigeria as a monetary policy variable.

Hence, from the long run results of the countries, it can be inferred that monetary policy rate, inflation rate and exchange rate exert negative effect on economic growth

in Nigeria as only monetary policy rate has negative effect on economic growth in the UK while monetary policy rate and exchange rate has negative effect on economic growth in the USA as other variables exert positive influence on economic growth in all countries.

However, monetary policy has no significant effect on economic growth in UK and USA while Money Supply has a substantial effect on economic growth in Nigeria as a monetary policy variable.

Table 10: Engle Granger Causality Result (Nigeria)

MPR does not Granger Cause GDP	**29**	**0.15150**	**0.8602**
GDP does not Granger Cause MPR		1.51394	0.2403
INFL does not Granger Cause GDP	29	0.19414	0.8248
GDP does not Granger Cause INFL		2.28891	0.1231
INTR does not Granger Cause GDP	29	0.25095	0.7801
GDP does not Granger Cause INTR		3.62778	0.0420
MS does not Granger Cause GDP	29	1.32348	0.2849
GDP does not Granger Cause MS		0.48099	0.6240
EXGR does not Granger Cause GDP	29	0.61308	0.5499
GDP does not Granger Cause EXGR		0.46142	0.6359

Source: Analysis Output using E-views 9 by author

Table 11: Engle Granger Causality Result (USA)

MPR does not Granger Cause GDP	**29**	**2.19591**	**0.1331**
GDP does not Granger Cause MPR		10.3340	0.0006
INFL does not Granger Cause GDP	26	2.53237	0.1035
GDP does not Granger Cause INFL		1.74106	0.1997
INTR does not Granger Cause GDP	29	0.82085	0.4520
GDP does not Granger Cause INTR		5.51882	0.0107
MS does not Granger Cause GDP	29	0.29109	0.7501
GDP does not Granger Cause MS		18.2689	2.E-05
EXGR does not Granger Cause DP	29	0.54805	0.5851
GDP does not Granger Cause EXGR		1.92416	0.1679

Source: Analysis Output using E-views 9 by author

Table 13: Engle Granger Causality Result (UK)

MPR does not Granger Cause GDP	**27**	**8.02204**	**0.0024**
GDP does not Granger Cause MPR		6.84234	0.0049
INFL does not Granger Cause GDP	26	0.85814	0.4383
GDP does not Granger Cause INFL		1.58696	0.2281
INTR does not Granger Cause GDP	18	1.46729	0.2663
GDP does not Granger Cause INTR		3.04419	0.0823
MS does not Granger Cause GDP	29	0.38526	0.6844
GDP does not Granger Cause MS		9.17098	0.0011
EXGR does not Granger Cause GDP	29	0.67054	0.5208
GDP does not Granger Cause EXGR		0.92691	0.4095

Source: Analysis Output using E-views 9 by author

The result revealed that economic growth causes Interest Rate in the Nigerian context as compared to the USA context where economic growth causes Monetary Policy Rate and Interest Rate. Also, in UK, it was revealed that there exists a bi-directional causality between economic growth and Monetary Policy Rate while economic growth causes Interest Rate and Money Supply.

Interestingly, the model was found to be highly significant and devoid of auto correlation, non-functionality, heteroskedasticity, instability and

abnormal distribution as a result of the values of the LM Serial Correlation test, Heteroskedasticity test, Ramsey Reset Test, CUSUM test and Normality Test showed that the findings of the study can be relied upon for policy recommendation.

V. CONCLUSION AND RECOMMENDATION

The study examined the impact of monetary policy and its lag on economic growth in United Kingdom, United States of America and Nigeria. The comparative study used Gross domestic Product as the dependent variable and also used monetary policy rate, inflation rate, interest rate, money supply and exchange rate as independent variables. The study used the Generalized Method of Moments to examine the effect of lag, Auto Regressive Distributed Lag modeling approach for long run analysis coupled with the Engle Granger causality test to reveal the direction of causality. Hence, it was revealed that monetary policy lag has a negative effect on economic growth in the three countries. Also, monetary policy was found to exert an insignificant effect on economic growth in the United Kingdom and United State of America while monetary policy was found to exert a significant effect on economic growth in Nigeria through the channel of money supply. Meanwhile, the causality test revealed that economic growth causes monetary policy in USA and Nigeria while both phenomena dictate each other's tune in the UK. Hence, it was recommended that policy makers should focus on reducing the existence of lags in the economy while monetary policy should not just be seen as a mere tool to display the tyranny of monetary authorities in Nigeria but should be adopted a an effective tool of response to put the economy on track after a careful observation of the economy has shown that it is straying away from set targets and goals while the monetary policy should not be aggressively used as the market force mechanisms should be allowed to determine prices and phenomena within the economy. Also, monetary authorities should make use of money supply in sharply correcting the economy in Nigeria in case of any perceived deviation from set targets as this channel will bring about a substantial effect within the economy without so much delay to ensure that Nigeria catches up with other industrialized economy of the world.

REFERENCES

[1] AbuDalu, A., Elsadig, M. A., Almasaled, S. W., & Abuelgasim, I. E. (2014). The Real Effective Exchnage Rate Impact on ASEAN -5 Economic Growth. *International Journal of Economics and Management Sciences, 3*(2), 1-11.

[2] Aftab, A., Mohsin, A. Q., & Saboor, A. (2016). Impact of Monetary Policy in Economic Growth in Pakistan: Evaluation and Analysis. *Pakistan Journal of Social Sciences, 36*(1), 131-140.

[3] Akinjare-Victoria, A. A., Babajide, I. A. A., & Okafor, T. (2016). Monetary Policy and its Effectiveness on Economic Development in Nigeria. *International Business Management, 10*(22), 5336-5340.

[4] Anowor, O. F., & Okorie, G. C. (2016). A Reassessment of the Impact of Monetary Policy on Economic Growth: Study of Nigeria. *International Journal of Developing and Emerging Economies, 4*(1), 82-90.

[5] Arellano, M., & Bond, S. (1991). Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. *Review of Economic Studies, 58*(1), 287-297.

[6] Bokreta, K., & Benanaya, D. (2016). The Fiscal-Monetary Policy and Economic Growth in Algeria: VECM Approach. *International Journal of Social, Educational, Economic, Business and Industrial Engineering, 10*(9), 3074-3078.

[7] Borio, C., & Gambacorta, L. (2017). Monetary Policy and Bank Lending in a Low Interest Rate Environment: Diminishing Effectiveness? *Bank for International Settlements Paper Series.*

[8] Chan, W. (2016). *Analysis on Money Supply, Inflation Rate and Economic Growth through Empirical Study.* (B.Sc. Thesis). Hong Kong Baptist University.

[9] Dalhatu, A. (2012). *Monetary Policy and Price Stability in Nigeria (December 2006 through February 2012).* (M.Sc. Thesis). Ahamdu Bello University, Zaria.

[10] Douanla, L. T. (2014). Assessing the Effect of Monetary Policy on Economic growth in Franc Zone. *MPRA Paper Series.*

[11] Drama, B. G. H. (2017). Estimation of the Impact of Monetary Policy on Economic Growth: The Case of Cote d'Ivoire in Line with SVAR Methodology. *Applied Economics and Finance, 4*(4), 66-83.

[12] Dwivedi, D. N. (2010). *Macroeconomics.* Delhi: McGraw Hill Ltd.

[13] Einzing, P. (1964). *Monetary Policy: Ends and Means.* England: Penguin Books.

[14] Engle, R. F., & Granger, C. W. J. (1987). Co-Integration and Error Correction Representation: Estimation and Testing. *Econometrica, 55*(1), 251-276.

[15] Fiador, V. O. L. (2015). *Monetary Policy and Economic Performance-Evidence from Selected*

African Countries. (Ph.D. Thesis). University of Cape Town. South Africa.

[16] Fisher, I. (1911). *The Purchasing Power of Money.* New York: Kelley.

[17] Friedman, M. (1961). The lags in the Effect of Monetary Policy. *Journal of Political Economy, 69*(1-2), 11-18.

[18] Granger, C. W. J. (1969). Investigating Causal Relations by Econometric Models and Cross-Spectral Methods. *Econometrica, 37*(1), 428-438.

[19] Inam, U., & Ime, B. S. (2017). Monetary Policy and Economic Growth in Nigeria: Evidence from Nigeria. *Advances in Social Sciences Research Journal, 4*(6), 41-59.

[20] Irfan, H., & Amen, U. (2011). Impact of Monetary Policy on Gross Domestic Product. *Interdisciplinary Journal of Contemporary Research in Business, 3*(1), 1348-1361.

[21] Isedu, M. (2013). *Effects of Monetary Policy on Macroeconomic Performance: The Case of Nigeria.* (Ph.D. Thesis). University of Greenwich.

[22] Jain, T. R., & Khanna, O. P. (2006). *Macroeconomic Management.* Delhi: Nee Kunj Print Process.

[23] Jhingan, M. I. (1997). *Macroeconomic Theory.* Delhi: Nisha Enterprises.

[24] Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Co-Integration-with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics, 52*(1), 169-210.

[25] Johnson, H. G. (1978). Selected Essays in Monetary Economics: Monetary Theory and Policy. *American Economic Review, 50*(11), 335-384.

[26] Keynes, J. M. (1936). *The General Theory of Employment, Interest and Money.* London: MacMillan Ltd.

[27] Klasco, J. (2013). *Mathematical Analysis of the Transmission Mechanism of Monetary Policy of the National Bank of Slovakia.* (Ph.D. thesis). Comenius University. Slovakia.

[28] Kutu, A. A., Nzimande, N. P., & Msomi, S. (2017). Effectiveness of Monetary Policy and the Growth of Industrial Sector in China. *Journal of Economics and Behavioral Studies, 9*(3), 46-59.

[29] McKinnon, R. (1973). *Money and Capital in Economic Development.* Washington D.C.: Brookings Institution

[30] Mishkin, F. (1996). The Channels of Monetary Transmission: Lessons for Monetary Policy. *National Bureau of Economic Research Working Papers.*

[31] Mushtaq, S., & Siddiqui, D. A. (2016). Effect of Interest Rate on Bank Deposits: Evidences from Islamic and Non-Islamic Economies. *Future Business Journal, 3*(2017), 1-8.

[32] Najaf, R. (2017). IS Monetary Policy Necessary for the Economic Development of Less Developed Countries with Special Reference to Pakistan. *Business and Economics Journal, 8*(1), 1-3.

[33] Nguyen, T M. L., Papyrakis, E., & Van Bergeijk, P. A. G. (2019). Using monthly data Assessing the price and output effects of monetary policy in Vietnam: evidence from a VAR analysis, *Applied Economics, 51*(44), 4800-4819, doi:10.1080/00036846.2019.1602708.

[34] Obadeyi, J. A., Okhiria, A. O., & Afolabi, V. K. (2016). Evaluating the Impact of Monetary Policy on the Growth of Emerging Economy: Nigerian Experience. *American Journal of Economics, 6*(5), 241-249.

[35] Onderi, V. N. (2014). *The Impact of Monetary Policy on Economic Growth and Price Stability in Kenya: 1992-2013.* (M.Sc. Thesis). Kenyatta University. Kenya.

[36] Osmond, N. O., Egbulonu, K. G., & Emerenini, F. M. (2015). Monetary Policy and the Manufacturing Sector in Nigeria. *SSRG International Journal of Economics and Management Sciences, 2*(1), 17-25.

[37] Pesaran, H. M., & Shin, Y. (1999). An Autoregressive Distributed Lag Modeling Approach to Co-integration Analysis. *In S. Strom, A. Holly and P. Diamond (Eds.), Econometrics and Economic Theory in the 20th Century:* The Ranger Frisch Centennial.

[38] Saqib, N., & Aggarwal, P. (2017). Impact of Fiscal and Monetary Policy on Economic Growth in an Emerging Economy. *International Journal of Applied Business and Economic Research, 15*(4), 457-462.

[39] Schumpeter, J. A. (1911). *The Theory of Economic Development, An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle.* Cambridge MA, Harvard University Press.

[40] Shaw, E. S. (1973). *Financial Deepening in Economic Development.* New York: Oxford University Press.

[41] Shrestha, M. B., & Chowdhury, K. (2007). Testing Financial Liberalization Hypothesis with ARDL modeling Approach. *Applied Financial Economics, 17*(1), 1529-1540.

[42] Smitha, T. H. (2010). *Impact of Monetary Policy on the Indian Economy in the Post-Reform Period.* (Ph.D. Thesis). Cochin University of Science and Technology. Kerala.

[43] Srithilat, K., & Sun, G. (2017). The Impact of Monetary Policy on Economic Development: Evidence from Lao PDR. *Global Journal of Human-Social Science, 17*(2), 9-15.

[44] Sulaiman, L. A. (2006). *Monetary and Fiscal Policies Management.* Akure: Adeyemo Publishing House.

[45] Tang, A. (2009). *The Short-Term Impact of Monetary Policy on Economic Growth and Inflation.* (M.Ba. Thesis). University of North Carolina. USA.

[46] ThankGod, O. A., & Karimo, T. M. (2014). Monetary Policy Effectiveness, Output Growth and Inflation in Nigeria. *International Journal of Economics, Finance and Management, 3*(6), 301-307.

[47] Wong, K. M., & Chong, T. T. (2015). What Should Central Banks Target? Evidence on the Impact of Monetary Policy Regimes on Economic Growth. (*Unpublished Paper*).