



# MONETARY POLICY; HOW EFFICIENT ON NIGERIAN ECONOMIC GROWTH?

**Gbarato, Ledum Moses**

Department of Finance and Banking,  
Faculty of Management Sciences,  
University of Port Harcourt,  
Rivers State,  
Nigeria.

**Pamogho, Monday Benedict**

Department of Finance and Banking,  
Faculty of Management Sciences,  
University of Port Harcourt,  
Rivers State,  
Nigeria.

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## ABSTRACT

*Purpose: All efforts in this study have being to examine how efficient monetary policy is on Nigerian economic growth for the period 1986 to 2018.*

*Design/Methodology: The research design adopted in this study was ex-post facto design, where secondary data were sourced from CBN bulletin and NBS annual reports for the period 1986 to 2018. The monetary policy proxied by money supply, exchange rate, cash reserve ratio and monetary policy rate while economic growth for the same period was measured by nominal gross domestic product. All the variables were stationary at difference 1(1) using the ADF unit root test on their logged values. While Johansen Co-integration test was used to determine prevalence of significant long run relationship, the error correction model was employed as basis for concluding analysis on time series data.*

*Findings: The results of the study reveal that while money supply exerts significant but negative influence, all other employed monetary policy instruments such as exchange rate, cash reserve ratio and monetary policy rate all have marginal effects on the economy; however, while exchange rate exhibits unexpected positive effect, only cash reserve ratio and monetary policy rate exhibit expected negative effect on economic growth, suggesting their innate potentials to manage the economy if well employed. On the overall, monetary policy explains 51% of the changes in economic growth in Nigeria within the period of study.*

*Conclusion: Premised on the findings of this study, it is evident that money supply if well administered stands taller and capable amongst other employed instruments of monetary policy to manage and drive economic activities in Nigeria.*

*Recommendations: Therefore, considering the complementary role of monetary policy with fiscal policy, the study recommended amongst others, that, monetary authorities should frequently review and align the use of monetary policy instruments to tailor nominated economic objectives with much emphasis on money supply which it's significant influence can greatly promote or retard the social as well as economic well-being of the citizens. .*

*Contribution of the study: Employing nominal GDP is a good quantifiable measure that reveals the current Nigerian economic growth trend in relation to monetary policy instruments.*

**KEYWORDS:** Money Supply, Exchange Rate, Cash Reserve Ratio, Monetary policy rate, Economic Growth, Nigeria.

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## 1. INTRODUCTION

Economic growth as sustained increase in the output level of goods and services needed by citizens of a country stands pivotal among nominated objectives of a country. It is imperative for an organized national conscious effort qualified for economic growth which is commensurate to the attendant's challenges associated with population growth in a given country. Erudite academics such as Anyanwu (2014); Barro and Sala-i-Martin (1995); Twinoburyo and Odhiambo (2018), empirically, advocate that capital

accumulation, growth in labor participation, advancement of knowledge, and technological progress are major factors that enhance economic growth. Meanwhile, policy environment is viewed as a determinant of these major factors (Smith, 2004). This is because exchange amongst the demand and supply of these factors are affected by the quantum of money in circulation, level of interest rate, exchange rate, inflation, etc. in the economy, which all require efficient management of which policy making and implementation play vital role in that capacity. Nwoko,



Ihemeje and Anumadu (2016) posit that Nigerian government adopts three types of public policies which are monetary policy, fiscal policy and income policy tools, to carry out the objective of income distribution and allocation of resources like any other country. However, in Nigeria, government has always relied on monetary policy as a way of achieving certain economic objective in the economy such macroeconomic objectives which include; employment, economic growth and development, balance of payment equilibrium and relatively stable general price level (Nwoko, Ihemeje & Anumadu, 2016). The reason for choosing monetary policy is the fact that monetary policy has very serious implications for both fiscal and income policy measures.

Monetary policy conceived as a mixture of deliberated systems to regulate the cost, supply, value of the stock of money in an economy, in line with the estimated economic activity level (Anowor & Okorie, 2016; Folawewo & Osinubi, 2006), when efficiently managed, stands to yield low and stable inflation which is believed to promote economic growth (Twinoburyo & Odhiambo, 2018). However, a poor monetary policies with attendant high and volatile inflationary occurrences distort the allocation of productive resources, thereby hampering economic growth in the long term (Hossain, 2014; Twinoburyo & Odhiambo, 2018). This serves as one of the core function displayed by the Central Bank of Nigeria (CBN) aimed at achieving price stability, equilibrium, rapid economic growth, full-employment, and external balance (Fasanya, Onakoya & Agboluaje, 2013). This prominent task of the CBN is achieved through the administration of various monetary policy instruments which include: money supply, interest rate, exchange rate, cash reserve ratio, etc. Therefore, efficient blending of these monetary policy instruments in line with preconceived nominated economic objectives whether to contrast or expand the circulation of money spurs economic growth in the country.

## STATEMENT OF PROBLEM

Monetary policy has been largely debated as indispensable tool to industrial sector growth (Osakwe, Ibenta, & Ezeabasili, 2019) which by extension a catalyst to economic growth. Although, some empirical studies such as Adesoye. (2014); Nasko (2016); Ogunmuyiwa. and Ekone (2010); Udude, (2014) have shown that monetary policy has not significantly influence economic growth of Nigeria, however, recent studies reveal that the management of monetary policy have greatly improved with associated high growth of domestic output (Okafor, Oshoko & Thomas, 2015). This is revealed as Adegbite and Alabi (2013); Anowor and Okorie (2016); Okafor, Oshoko and Thomas (2015); Osakwe, Ibenta, and Ezeabasili, (2019) empirically conclude that monetary policy exert significant influence on economic growth, but in most cases having money supply as the only significant monetary policy tool.

This suggests a lacuna in effective administration of other monetary policy instruments needed to combat macroeconomic challenges in form of price instability, incessant poverty and increasing unemployment rate. Okafor, Oshoko & Thomas (2015) assert that monetary policy implementation in a developing country like Nigeria faces additional challenges that are not present in developed economies; such has fiscal dominance and the treat of currency substitution. Based on the frequently changing business environment, fiscal, monetary and other macro-economic policies, Nigeria has not been able to harness her economic potentials for rapid economic development (Ogbole, 2010).

Therefore, in lieu of the aforementioned macroeconomic conditions amidst times of expansion and contraction policy, yet, reported growth has not been a sustainable one as there is evidence of price instability, growing poverty among the populace informed the concern on whether or not instruments of monetary policy actually impact on the Nigerian economy.

It becomes imperative for this study to examine the activities and performance of Nigerian monetary policy in relation to economic growth. Specifically, the study seeks to:

- i) Investigate the influence of money supply on nominal gross domestic product in Nigeria.
- ii) Examine the nature of relationship between exchange rate and nominal gross domestic product in Nigeria.
- iii) Ascertain the influence of cash reserve ratio on nominal gross domestic product in Nigeria
- iv) Determine the nature of relationship between monetary policy rate and nominal gross domestic product in Nigeria.

## 2. LITERATURE REVIEW

### The Concept of Monetary Policy

Although there abound several definitions of monetary policy, nevertheless, they concurred that set of mechanism is put in place as a check to control and regulate to achieve nominated objectives. The Wikipedia encyclopedia (2015) defines monetary policy as the process by which the monetary authority of a country controls the supply of money, often targeting an inflation rate or interest rate to ensure price stability and general trust in the currency. Antonio (2019) defines monetary policy as a deliberate action by the monetary authorities to influence the quantity and cost of the currency in order to achieve desired objectives that guarantee the maintenance of macroeconomic equilibria. The implementation of this action is chosen by the operational variable which may be monetary aggregates or interest rates (such as their handling) in order to manage the amount of money in the economy. The importance of the currency in socio-



economic life has made policy makers and other actors seek to design monetary policies of special recognition (Antonio, 2019). Monetary policy is maintained through actions such as increasing interest rate, or changing the amount of money banks need to keep in vault (Nwoko, IHEMEJE & ANUMADU, 2016).

It has been a common believe that twin policies - fiscal and monetary policies - seek at achieving relative macroeconomic stability (Adesoye, 2014). Over the year, the superiority of one over the other in realizing macroeconomic stability has generated seminar debate. The Keynesians argued that fiscal policy is more potent than monetary policy, however, the monetarists led by Milton Friedman on the other hand believed the other way round (Adesoye, 2014). Meanwhile, in this study, our sole concern hinges on the efficacy of monetary policy on Nigerian economic growth, considering the fact that monetary policy instruments such as money supply, interest rates, cash reserve ratio, exchange rate alongside treasury bills when well harnessed by independent monetary authorities have the capability to achieve macroeconomic stability in the country.

### **Macroeconomic Variables' Interference in Economic Activities**

Over the years, exchange rate, interest rate, unemployment level, inflation rate, balance of payment deficit amongst other macroeconomic variables have pose a lot of concern to policy makers due to their influential presence on economic growth.

### **Exchange Rates**

Antonio (2019) argues that the exchange problems must be solved either through diversification of the economy and the consequences of export diversification, since most of the inputs used in the production process depend on imports, that is, large flows of external resources into the balance of payments and also because of the level of imports. Thus, the exchange problems affect:

- (a) The performance of economic activity, which may cause large shocks in the market for goods and services on the supply side;
- (b) As well as in the supply of foreign exchange in the foreign exchange market. Therefore, this procedure may impede the effectiveness and efficiency of economic policy instruments and therefore affect the objective variable.

### **Interest Rates**

Alade (2015) posit that interest rates are important toolkits of monetary policy as they are taken into account when dealing with issues involving investment, inflation, exchange rate and unemployment. There is the tendency to reduce interest rates by the Central bank at times that demand increasing investment and consumption in order to

stimulate economic growth. Nevertheless, anecdotal evidence suggests that pursuing low interest rate as a macroeconomic policy could have adverse implications including inducing a cycle of economic bubbles as experienced in Japan in 1990s and the United States leading to the global economic and financial crisis in 2007 to 2012 (Alade, 2015). Consequently, the monetary authorities have explored various interest rate levels, designed to influence the tempo and direction of economic activities in the desired directions (Alade, 2015).

### **Inflation/Price instability**

Inflation is viewed as persistent increase in the general price level within the economy which affects the value of the domestic currency (Fatukasi, 2012). It is not once and for all upward price movement but has to be sustained over time and affect all goods and services within the economy. Among other factors such as excess aggregate demand, increasing production cost, Emeka (2013) posits that fiscal and monetary policy direction are other factors attributed to inflation. This suggests that in a situation of excess money supply, excess demand is created in the economy at the expense of less supply either in the public or in the private sector, thereby breeding fall in purchasing power, foreign exchange devaluation, amongst others.

### **Unemployment**

Unemployment has been defined as situation whereby people, who are physically fit, capable, qualified and ready to work at any time, but without jobs (Fatukasi, 2012). The issue of unemployment in Nigeria is highly different compared to other nations due to high level of corruption, mismanagement of public funds, among others over the years (Suleiman, Yusuf & Suleiman, 2019). One major challenge of policy makers is how to maintain low unemployment level as well as relatively stable prices so as to achieve higher economic growth.

### **The Concept of Economic Growth**

Economic growth does not only showcases increase in a country's production (in goods and services) but also indicates citizens' welfare ladder which are all informed by the country's policies. Ogbulu and Torbira (2012) defined economic growth as a sustained rise in the output of goods, services and employment opportunities with the sole aim of improving the economic and financial welfare of the citizens. Therefore, the nature of policies advocated by a country determines its level of economic growth.

### **Monetary Policy Management: Strong Mechanism for Economic Stability**

The management of multiple monetary targets such as: price stability, promotion of growth, achieving full employment, smoothing the business cycle, preventing



financial crises, stabilizing long-term interest rates and the real exchange rate are the prime objectives of monetary policy (Kahn, 2010). Through the control of monetary policy targets such as the price of money (interest rate - both short term and long term), the quantity of money and reserve money amongst others; monetary authorities directly and indirectly control the demand for money, money supply, or the availability of money (overall liquidity), and hence affect output and private sector investment (Nasko, 2016).

Emefiele (2018) on Central Bank of Nigeria review, *acknowledged that monetary policy in the review period, was informed by key considerations which included; the slow output recovery; high but moderating inflation rate which remained above the Bank's target range; continuing liquidity surfeit in the banking system; weak macro-prudential indicators; growing sovereign debt and low fiscal buffers. These developments and the need to achieve the Bank's mandate of price and exchange rate stability provided the basis for the sustenance of the tight monetary policy stance in the first half of the year.*

Osakwe et al. (2019) assert that monetary policy in Nigeria has experienced two main phases which are: the era of direct control (1959-1986) and the era of market-based

controls (1986-date). In the era of direct control, the CBN used directives targeted at specific sectors to fix or control interest rate, exchange rate, determine credit allocation to choice sectors, etc. Omotor (2007) was of the opinion that the direct control mechanism was ineffective because of the heavy influence from political consideration normally conveyed to the CBN through the Ministry of Finance.

The identification of a policy rate that promotes price stability without constraining economic growth is the preoccupation of the monetary authorities (Andrew & Boris, 2014).

Emefiele (2018) specified most of the monetary instruments deployed in pursuit of economic growth and stability to include: Monetary Policy Rate (MPR), Cash Reserve Ratio (CRR), Liquidity Ratio (LR), Open Market Operations (OMO), Discount Window Operations (DWO), Exchange Rate (EXR), Money Supply (MS), Currency Swap which is commonly used in avoiding pressure on third country currency as in the implementation of the bilateral currency swap between the Central Bank of Nigeria and the People's Bank of China, thereby disusing US dollar (Emefiele, 2018).

Nasko (2016) classified instruments of monetary policy into two categories. (1) Quantitative, general or indirect. (2) Qualitative, selective or direct.

**Table 1: Classification of Monetary Policy (MP) Instruments**

S/N	Category of MP Instruments	
<b>A</b>	<b>Quantitative, General or Indirect</b>	<b>Instruments Target</b>
1	Bank rate policy	Minimum-lending rate of the CBN at which it rediscounts first class bills of exchange and government securities held by the commercial bank.
2	Open market operations	Sale and purchase of securities in the money market by the CBN either to contract or expand monetary base through reserves of commercial banks.
3	Reserve requirements	The fraction of total deposit liabilities which commercial banks are required to maintain in the form of cash reserve with the CBN
<b>B</b>	<b>Qualitative, Selective or Direct</b>	Used to influence specific types of credit for particular purposes.
1	Direct credit control	Maximum percentage or amount of loans Deposit Money (DMB) Banks can loan out to different economic sectors or activities, interest rate caps, liquid asset ratio and issue credit guarantee to preferred loans.
2	Moral suasion	CBN issues licenses or operating permit to DMB and also regulates the operation of the banking system. It can, from this advantage, persuade banks to follow certain paths such as credit restraint or expansion, increased savings mobilization and promotion of exports through financial support, which otherwise they may not do, on the basis of their risk/return assessment.
3	Prudential guidelines	The CBN may in writing require the DMB to exercise particular care in their operations in order that specified outcomes are realized. Key elements of prudential guidelines remove some discretion from bank management and replace it with rules in decision-making.

Source: Authors' Compilation, 2019.

Sanusi (2002) in Nasko (2016) asserts that the ability of the CBN to pursue an effective monetary policy in a globalized and rapidly integrated financial market

environment depends on several factors which include, instituting appropriate legal framework, institutional structure and conducive political environment which allows



the Bank to operate with reference to exercising its instrument and operational autonomy in decision-making, the degree of coordination between monetary and fiscal policies to ensure consistency and complementarity, the overall macroeconomic environment, including the stage of development, depth and stability of the financial markets as

well as the efficiency of the payments and settlement systems, the level and adequacy of information and communication facilities and the availability of consistent, adequate, reliable, high quality and timely information to Central Bank of Nigeria.

**Table 2: Monetary Policy Instruments, Targets and Objectives**

Monetary Policy Instruments	Operational Goals	Intermediate Goals	Objective
Money Supply	Expansionary/ Tightening activities	>Domestic demand and supply	>Inflation control >GDP growth
Exchange Rate	Interbank rate	>Net external demand and supply	>Balance of Payment >Price stability
Interest Rate	Lending rate	>Asset pricing	>Stability of price and financial market
Cash Reserve Ratio	Short term interest rate	>Short and long term interest rate	>Employment
Monetary Policy Rate	Interbank call rates	>Short and long term interest rate	>Stability of price and financial market
Open Market Operation	>Treasury Bill >Liquidity Ratio	>Interest rate	>Stability of price and financial market
Discount Window Operations	Monetary Base	>M1, M2	>GDP growth
Currency Swap	Bilateral exchange	>Avoidance of 3 <sup>rd</sup> Party Pressure on Exchange	>Price stability >GDP growth

Source: Adapted from Antonio (2019); Gichuki et al. (2012)

### Challenges for Monetary Policy Management in Nigeria

Associated challenges in monetary policy have greatly contributed to its inability to achieve optimal result as preconceived. These challenges amongst others include:

#### i) External Factors:

a) **Foreign Currency Dominance:** For decades, the mainstream view has been that countries can achieve price stability and minimize excessive output variability by adopting flexible inflation targeting and floating exchange rates. The gains from policy coordination were thought to be modest at best, and the prescription was for countries to keep their houses in order (Murray, 2011). This consensus is increasingly untenable for several reasons. Globalisation has steadily increased the impact of international developments on all our economies. This in turn has made any deviations from the core assumptions of the canonical view even more critical. In particular, growing dominant currency pricing (DCP) is reducing the shock absorbing properties of flexible exchange rates and altering the inflation-output volatility trade-off facing monetary policy makers. And most fundamentally, a destabilising asymmetry at the heart of the IMFS is growing. While

the world economy is being reordered, the US dollar remains as important as when Bretton Woods collapsed (Carney, 2019).

b) **Inequality in international Trade:** Nigeria's import are more of capital goods compared to its export which are more of agricultural goods. This unavoidable reliance for foreign capital intensive goods makes exchange rate policy epileptic, which is, always falling to their tune.

#### ii) Internal Factors:

a) **Absolute or partial deviation from set objectives:** Antonio (2019) asserts that in many central banks, once the Monetary Policy objectives have been defined, they over time are distancing themselves from their reach and tend to assume other objectives, without the procedures in the use of the instruments being adjusted. This practice, instead of making it possible to correct the observed deviations, results in a greater distance in the scope of the objectives initially defined. Friedman (1968) argues that monetary policy managers must pursue the monetary objectives that are controllable by their instruments, and if they follow the non-controllable ones, they may be the source of economic disturbances.



**b) Loyalty to Fiscal Will:** Most times monetary policy makers seem to dance to the dictates of their appointers more than being independent of their policies in relation to national growth.

**c) Financial Exclusion:** Good number of Nigerians especially the low income earners are still outside the range of banking services.

**d) Cash Hoarding:** Even politicians, the custodians of the country's coffers for fear of witch-hunting and probing keep most of their money outside banking network, thereby, posing great challenge to the monetary authority to adequately ascertain accurate quantum of money in circulation, talk less of how to control.

**e) Others include:** Poor implementation of policy, partial or total non-compliance by financial intermediaries.

Ike (1989) identified the following factors as challenges to effective monetary policy. This include:

- i. Inadequacy of monetary policy instruments.
- ii. Non-development of the money and capital markets
- iii. Low interest rate structure
- iv. Slow monetary transmission system
- v. The effect of stagnation in the Nigeria economy
- vi. Restrictionary nature of externally imposed credit ceilings
- vii. Inadequacy of money supply in relation to GNP.
- viii. Inefficient guidelines of the Central Bank in the Second tier Foreign Exchange Market (SFEM).

## Theoretical Framework

### i) The Keynesian Theory

Nwoko, Ihemeje and Anumadu (2016) posit that the Keynesian theory did not buy the notion that the relationship between money and price is direct and proportional. They share the view that it is indirect through the rate of interest. Also they reject the notion that the economy is always at or near the natural level of real GDP so that  $Y$  in the equation of exchange can be regarded as fixed. They also reject the proposition that the velocity of circulation of money is constant (Nwoko, et al, 2016). From the Keynesian mechanism, monetary policy works by influencing interest rate which influences investment decisions and consequently, output and income and the multiples process (Amacher & Ulbrich, 1989).

In the Keynesian theory, monetary policy plays a crucial role in affecting economic activity, it contends that the change in the supply of money can permanently change such variables as the rate of interest, the aggregate demand and the level of employment, output and income (Jelilov, Gylych; Onder, Evren, 2016b). Keynes believe in the existence of unemployment equilibrium, this implies that an increase in money supply can bring about permanent increases in the level of output and as well the ultimate

influence of money supply on the price level depends upon its influence on aggregate demand and the elasticity of the supply of aggregate output (Jhingan, 2010).

### ii) The Classical Monetary Theory

Proponents of the classical model which include: Jean Baptist Say, Adam Smith, David Richardo Pigu with common beliefs, attempt to explain the determination, savings and investment with respect to money (Onyiewu, 2013). In the classical system, the main function of money is to act as medium of exchange, it determined the general level of prices in which goods and services will be exchanged (Jelilov, Gylych; Chidigo, Mary; Onder, Evren, 2016). This relationship between money and the price level is explained in terms of the quantity theory of money (Jelilov, Gylych; Muhammad Yakubu, Maimuna, 2015). The classical quantity theory of money states that the price level is a function of the supply of money, where:  $MV=PT$  where  $M$ ,  $V$ ,  $P$ , and  $T$  are the supply of money, velocity of money, price level and the volume of transactions (Jhingan, 2010). The classical economists believe that the economy automatically tends towards full employment level by laying emphasis on price level and on how best to eliminate inflation (Amacher & Ulbrich, 1989).

### iii) The Monetarist Quantity Theory

Like any school of thought, Friedman (1963) emphasized on the supply of money as the key factor affecting the well-being of the economy and as well, accepted the need for an effective monetary policy to stabilize an economy. He also has the notion that, in order to promote steady growth rate, money supply should grow at a fixed rate, instead of being regulated and altered by the monetary authority(ies). Friedman equally argued that since money supply might be demanded for reasons other than anticipated transaction, it can be held in different forms such as money, bonds, equities, physical goods and human capital. Each form of this wealth has a unique characteristic of its own and a different yield. These effects will ultimately increase aggregate money demand and expand output (Nwoko, et al, 2016). The Monetarists acknowledge that the economy may not always be operating at the full employment level of real GDP. Thus, in the short-run, monetarists argue that expansionary monetary policies may increase the level of real GDP by increasing aggregate demand. However, in the long-run, when the economy is operating at the full employment level, they argue that the quantity theory remains a good approximation of the link between the supply of money, price level, and the real GDP (Nwoko, et al, 2016).

### iv) The Modern Approach

The modern economist reject the Keynesian view that link between the supply of money and output is the rate of interest, this theory considered only two types of assets; bonds and speculative cash balances, and the allocation depended on the rate of interest which in turn resulted in



changes in output (Jhingan, 2010). This theory is a restatement of the quantity theory in the modern terms, this theory view velocity of circulation as a stable function of a limited number of key variables, the velocity bears a stable and predictable relationship to a limited number of other variables, and determines how much money people will hold rather than motive for holding more and sees money as the main type of asset which yields a flow of services to its holders, according to the functions it performs (Friedman 1956).

#### v) The Quantity Theory

The quantity theory was first developed by Irving Fisher in the inter-war years, and is a basic theoretical explanation for the link between money and the general price level (Geoff, 2012). Irving Fisher, in his quantity theory of money, opine that like other classical writers the short-run monetary control was dictated by interest rates which were sticky but in the long-run the demand of influence was real cash balance. Fisher further assumed that the rise in commodity prices would precedes the increased in interest rate which was regarded as main channel of the firms operation cost (Jelilov, 2016).

#### Empirical Review

Udude (2014) empirically investigates the impact of monetary policy on the growth of Nigeria economy between the period of 1981 and 2012 with the objective of finding out the impact of various monetary policy instruments (money supply, interest rate, exchange rate and liquidity ratio) in enhancing economic growth of the country Techniques which include Augmented Dickey Fuller Unit Root Test, Johansen Cointegration Test and Vector Error Correction Mechanism (VECM) were employed. The result of the vector error correction mechanism (VECM) test indicates that only exchange rate exerted significant impact on economic growth in Nigeria while other variables did not. Equally, only money supply though statistically insignificant possessed the expected sign while others contradicted expectation. The study concluded that monetary policy did not impact significantly on economic growth of Nigeria within the period under. The study recommended among others that Commercial banks and other financial intermediaries must be forced to ensure compliance with the stipulated prudential guidelines.

Adesoye (2014) critically examines the dynamic interaction between monetary policy tools in stimulating economic growth, as well as stabilizing the economy from external shocks in Nigeria. The paper considered key monetary time series variables and real growth of output in formulating Vector Autoregressive (VAR) models which showed interdependence interaction between the period of 1970 and 2007. The pair-wise Granger-Causality test conducted showed that the growth rate of real output is not a leading indicator for any monetary variables. The forecast

error variance decomposition (FEVD) test results indicate that the variance in the real growth rate of GDP can significantly be accounted for by innovation in itself over the 10 years period, compare to any of the next important factors taken as the growth rate of money supply (GM2), savings rate (SR), lending rate (LR) and exchange rate (EXR). This implies that there is ARCH effect associated with variance of growth rate of GDP as a result of shock to its previous growth rate.

Okafor et al (2015) investigates the impact of monetary policy innovations on growth rate of output in Nigeria. This study utilized times series data within the period of 1985 to 2012 which was sourced from the statistical bulletin of Central Bank of Nigeria, Nigerian Investment Promotion Commission (NIPC) and Securities and Exchange Commission (SEC). The study employed Vector Autoregressive (VAR) estimation technique in the analysis of data. The result showed that money supply exerts significant influence on growth of output in Nigeria while exchange rate and interest rate were insignificant. The study recommended that exchange rate and interest rate should be regulated. It also suggested the need for monetary authorities to implement policy that effectively enhanced money supply.

Nasko (2016) examines the impact of monetary policy on economic growth in Nigeria using multiple regression on time-series data covering the range of 1990 to 2010. All the variables employed which include money supply, interest rate, financial deepening and gross domestic product were all found to have marginal impact on the economic growth of Nigeria. In summary, the study found marginal impact on growth due to change in monetary policy application. The study recommends that to fasten up the rate of growth of the Nigerian economy, the government needs to initiate and push forward effective and efficient monetary policy measures via money supply, interest rate and financial deepening in order to adequately stabilize prices, reduce poverty and inequality there by encouraging holistic macroeconomic growth.

Nwoko et al (2016) evaluates the extent to which the Central Bank of Nigeria Monetary Policies could effectively be used to promote economic growth, covering the period of 1990-2011. The influence of money supply, average price, interest rate and labour force were tested on Gross Domestic Product using the multiple regression models as the main statistical tool of analysis. Study reveals that CBN Monetary Policy measures are effective in regulating both the monetary and real sector aggregates such as employment, prices, level of output and the rate of economic growth. Empirically, the findings indicate that average price and labour force have significant influence on Gross Domestic Product while money supply was not significant. Interest rate was negative and statistically significant. It recommended that Central Bank Monetary Policy could be



an effective tool to encourage investment, reduce unemployment, reduce lending rate and stabilize the economy of Nigeria.

Anowor (2016) empirically reassessed the impact of monetary policy on economic growth of Nigeria adopting the Error Correction Model approach. It utilized time series secondary data spanning between 1982 and 2013. The result showed that a unit increase in Cash Reserve Ratio (CRR) led to approximately seven units increase in economic growth in Nigeria. The result was in consonance with economic literature as monetary policy among other objectives is geared towards achieving the macroeconomic objectives of sustained economic growth and price stability. Therefore, the study recommends that monetary authorities should give priority attention to CRR monetary policy tool as it will produce a more desired result in terms of economic stabilization. And also some combination of fiscal policy measures are needed to attain the complementary balance required to drive an economy towards the desired goals.

Maiga (2017) examines the impact of interest rate of economic growth in Nigeria from 1990 to 2013. Investment was used as the dependent variable against Interest rate as the independent variable. Employing the Ordinary Least Square, the result found that the interest rate has a slight impact on growth; however the growth can be improved by lower the interest rate which will increase the investment. The study recommended that Nigerian authorities should set interest rate policies that will boost the economic growth. Therefore, proper measure should be taken in order to have a more rapid economic growth.

Ufoeze (2018) investigated the effect of monetary policy on economic growth in Nigeria. The natural log of the GDP was used as the dependent variable against the explanatory monetary policy variables: monetary policy rate, money supply, exchange rate, lending rate and investment for the period covering 1986 to 2016. The study adopted an Ordinary Least Squared technique, Granger Causality test and also conducted the unit root and co-integration tests. The core finding of this study showed that monetary policy rate, interest rate, and investment have insignificant positive effect on economic growth in Nigeria. Money supply however has significant positive effect on growth in Nigeria. Exchange rate has significant negative effect on GDP in Nigeria. Money supply and investment granger cause economic growth, while economic growth causes interest rate in Nigeria. Thus, the study concluded that monetary policy can be effectively used to control Nigerian economy and thus a veritable tool for price stability and improve output.

Osakwe et al (2019) examined the effect of monetary policy on the performance of the Manufacturing sector in Nigeria. The explanatory variables are monetary policy rate, Treasury bills rate, Cash reserve requirement and money supply; while the dependent variable is the Manufacturing

(MANU) sector output. The study adopted an ex-post facto research design and used secondary data obtained from the CBN Statistical Bulletin covering the period 1986 to 2017. Employing Augmented Dicker Fuller stationarity test and the Autoregressive Distributive Lag (ARDL), the results indicate that: monetary policy tools have significant effect on the manufacturing sector output in Nigeria in the short run only. The study thus concludes that monetary policy tools may not be a long run policy instrument for the growth of the manufacturing sector output in Nigeria but rather short run instruments. This study recommended that money supply and treasury bills can be used in the short run as policy instruments to maintain macroeconomic stability in Nigeria with reference to the manufacturing sector.

Yakubu, Sani, Obiezue and Aliyu (2019) investigated the impact of exchange rate volatility on trade flows in Nigeria using monthly data for the period 1997 – 2016. A GARCH model was used to generate the nominal exchange rate volatility series. To detect the long-run relationship among variables, the ARDL bounds testing approach was employed. Also, the Granger causality test was applied to ascertain the direction of causality among the variables. The study found that exchange rate volatility affected Nigeria's trade flows negatively, in the short-run but does not in the long-run. As such the Central Bank of Nigeria would find some trade benefits from intervening immediately to stabilise the foreign exchange market in the face of volatility. Also, the study showed that ignoring exchange rate volatility could negatively impact on Nigeria's trade flows especially in the short-run.

Omodero (2019) investigates the effect of money supply in enhancing economic growth in Nigeria and Ghana. The study employs data from 2009 to 2018 and uses Ordinary Least Squares regression technique for analysis of the data the findings reveal that broad money supply (M2) has an insignificant negative influence on RGDP in Nigeria, but in Ghana the impact is significant and positive. Broad money supply (M3) exerts insignificant positive influence on RGDP in Nigeria, but significant negative impact on RGDP in Ghana while credit to private sectors (CPS) has insignificant positive influence on RGDP in both Nigeria and Ghana. The study among others suggests that the Monetary Authorities in the two countries should come up with monetary policy strategies that will help drive the economy better and such policies should consider M2 and CPS more as their contributions are necessary for economic expansion that lead to more output and employment.

Although, these findings show mixed results supposedly initiated by data source, time and methods of study, however, money supply (Okafor, Oshoko & Thomas, 2015; Osakwe, Ibenta, & Ezeabasili, 2019; Ufoeze, Odimgbe, Ezeabalisi & Alajekwu, 2018), and exchange rate (Fasanya, 2013; Udende, 2014) stand taller in their





influences on Nigerian economic growth in relation to other monetary policy instruments.

### 3. MATERIALS AND METHODS

The research design adopted in this study was ex-post facto design (the use of secondary data). This study is to empirically examine the efficiency of monetary policy on Nigerian economy. Data used in this study were all observational secondary panel data extracted from the Central Bank of Nigeria (CBN) statistical bulletin for the period 1986-2018. We aimed at examining the relationship between Monetary Policy (Measured by Money Supply, Exchange Rate, Cash Reserve Ratio, and Monetary Policy Rate) and economic growth for same period measured by Nominal Gross Domestic Product.

The study employs the ADF unit root test to ascertain the stationarity properties of the time series data used in the study; this is done to avoid any tendency of using a spurious data in making undependable predictions in the estimates. Also, to examine the long run equilibrium relationship among the employed variables, Johansen co-integration test becomes essential for this purpose; thereafter, the error correction model was employed to investigate the nature of prevailing long run sensitivities of the explained variable in relation to the explanatory variables, at the same time predicting the speed with which the explained variable adjusts to long run equilibrium after short run distortions in the study's explanatory variables.

#### Model Specification:

The theoretical foundation of monetary policy-economic growth nexus is anchored on Keynesian mechanism, which advocates that monetary policy works by influencing interest rate which influences investment decisions and consequently, output and income and the multiples process (Amacher & Ulbrich, 1989). Therefore, we can specify a four-predictor model of monetary policy-economic growth model adapted from Ufoeze, et al (2018) where GDP which measures economic growth was used as a function of monetary policy rate, money supply, exchange rate, interest rate and investment (proxies of monetary policy). However, for the sake of this study, the nominal GDP will be employed to capture economic growth trend in Nigeria. Reasons for this are that: this has not been deflated unlike the real GDP. This brings the dependent variable to the same page with the

independent variables which are not also deflated. Besides, it portrays the current price of products which indicates the largest amongst other indicators of economic growth as common to emerging countries like Nigeria (Bhole, 2006). Therefore, employing nominal GDP will be a good quantifiable measure of economic growth of Nigeria for this study.

Thus,

Nominal Gross Domestic Product (NGDP) expressed as a function of Money Supply (MS), Exchange Rate (EXR), Cash Reserve Ratio (CRR) and Monetary Policy Rate (MPR).

The functional form of the model is:  $NGDP = f(MS, EXR, CRR, MPR)$

Where

NGDP = Nominal Gross Domestic

MS = Money Supply

EXR = Exchange Rate

CRR = Cash Reserve Ratio

MPR = Monetary Policy Rate

The econometric model for the research is set explicitly as follows:

$$\ln NGDP = \beta_0 + \beta_1 \ln MS + \beta_2 \ln EXR + \beta_3 \ln CRR + \beta_4 \ln MPR + \mu$$

Where

$\mu_t$  = Error term,  $\beta_0$  = Intercept

$\beta_1, \beta_2, \beta_3$  and  $\beta_4$  = Coefficients

$\ln$  = Natural Logarithm of variables employed to transform the time series data from possible stochastic effect associated with the time series data at level.

It is believed that the a priori expectations of the explanatory variables in relation to NGDP appear thus:  $\beta_1 > 0, \beta_2 < 0, \beta_3 < 0, \beta_4 < 0$ . Hence, MS, EXR, CRR, MPR = (+, -, -, -).

### 4. RESULTS AND DISCUSSION

As earlier stated, Money Supply (MS), Exchange Rate (EXR), Cash Reserve Ratio (CRR) and Monetary Policy Rate (MPR). are used to capture monetary policy, while Nominal Gross Domestic Product (NGDP) employed to proxy economic growth for the period 1986 to 2018. These data are hence presented under appendix 1.

**Table 3: ADF Stationarity (Unit Root) Test Result**

Variable	ADF test statistic	Critical Value			Order of Integration	Prob.
		1%	5%	10%		
LnNGDP	-4.151081	-4.284580	-3.562882	-3.215267	I(1)	0.0137
LnMS	-4.636554	-4.284580	-3.562882	-3.215267	I(1)	0.0043
LnEXR	-4.925322	-4.284580	-3.562882	-3.215267	I(1)	0.0021
LnCRR	-5.043574	-4.284580	-3.562882	-3.215267	1(1)	0.0016
LnMPR	-6.814277	-4.284580	-3.562882	-3.215267	1(1)	0.0000

Source: E-view (Version 10) Output on 1986 to 2018 Data

N/B: Critical Values at 5% is Considered Significant

From ADF Unit root test result as shown above, comparing the ADF test statistic value with the Critical values at 5% significant level, every one of the variables is stationary at difference 1(1). This goes to reveal that all variables have a significantly predictive trend qualify for

subsequent estimation and forecast as they all integrated in order 1(1).

And because all the variables are at stationary at difference, this now move us to long-run tests and analysis using the differenced data.

**Table 4: Johansen Co-integration Test Result**

Date: 10/15/19 Time: 06:02

Sample (adjusted): 1990 2018

Included observations: 29 after adjustments

Trend assumption: Linear deterministic trend (restricted)

Series: D(LNNGDP) D(LNMS) D(LNEXR) D(LNCRR) D(LNMPR)

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	Prob.**
None *	0.854321	137.2896	88.80380	0.0000
At most 1 *	0.699064	81.42539	63.87610	0.0008
At most 2 *	0.581123	46.60049	42.91525	0.0205
At most 3	0.426176	21.36535	25.87211	0.1645
At most 4	0.165818	5.257801	12.51798	0.5598

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level

\* denotes rejection of the hypothesis at the 0.05 level

\*\*MacKinnon-Haug-Michelis (1999) p-values

Source: E-view (Version 10) Output on 1986 to 2018 Data

The results of Johansen's co-integration analysis shown in table 4 above indicate the prevalence of three co-integrating equations (Trace statistic > 0.05 critical values). The probability levels of the three co-integrating equations which are all significant at 0.05 level confirms prevalence of significant long-run relationship in Nigeria, among the various instruments of Monetary Policy under study and NGDP. This insinuates that the employed variables are

significantly related with each other even in the occurrence of variation.

More so, there is need to determine the adjustment for the discrepancies between the long-run and short-run interaction of the times series which requires the use of error correction estimation mechanism.

**Table 5: Error Correction Estimate Output for the Model**

Dependent Variable: D(NGDP)  
 Estimation Method: Least Squares  
 Date: 10/15/19 Time: 11:30  
 Sample (adjusted): 1988 2018  
 Included observations: 31 after adjustment

Variables	Coefficient	Std. Error	t-Statistic	Prob.
ECM(-1)	-0.897585	0.22092	-4.06288	0.0001
D(MS)	-0.232433	0.08914	-2.60754	0.0103
D(EXR)	0.240067	0.29095	0.82511	0.4109
D(CRR)	-0.040676	0.18399	-0.22108	0.8254
D(MPR)	-0.358685	0.35725	-1.00403	0.3174
Constant	-0.062632	0.08433	-0.74270	0.4591
<b>R-Squared</b>	0.511625	<b>Log likelihood</b>		-11.77195
<b>Adj. R<sup>2</sup></b>	0.389531	<b>Akaike Info Criterion</b>		1.211093
<b>Sum Sq. resid</b>	3.879051	<b>Schwarz Criterion</b>		1.534897
<b>S. E. equation</b>	0.402029	<b>Mean dependent Var</b>		-0.020987
<b>F-Statistic</b>	4.190425	<b>S.D. dependent Var</b>		0.514547
<b>Prob(F-stat)</b>	0.000092	<b>Durbin-Watson stat</b>		2.130583

Source: E-view (Version 10) Output on 1986 to 2018 Data

Based on the ECM coefficient of -0.897585 in Table 5 above, we can deduce that the discrepancies between the long-run and short-run can be corrected backwards by 89.8% and the model viability is approved premised on the F-statistics of 4.190425. However, the coefficient of determination of 51.2 percent shows the variation in Nominal Gross Domestic Growth explained by the predictor variables used in the model. Also, as instruments of monetary policy, only money supply exert significant but negative relationship with nominal gross domestic product. On the other hand while all the explanatory variables exert negative influences, only exchange rate exert positive influence on NGDP in Nigeria as at the period of study. Meanwhile, as cash reserve ratio and monetary policy rate conform to the a priori expectation, the results of money supply as well as exchange rate negate our a priori expectations in their relationship with NGDP.

The significant influence of money supply on nominal gross domestic product indicates that the supply of money is a strong monetary policy instrument capable of accelerating economic growth of Nigeria, of which if efficiently administered, it will spur economic activities and thereby increase employment opportunities and improve the standard of living. However, its negative relationship as revealed within the study period suggests that money supply has not been efficiently employed to achieve the nominated

economic objectives. This suggests the tendency of supply of money abuse where preplanned injected money meant for circulation to propel economic activities are misappropriated in form of capital flight, wrong sector funding and embezzlement, thereby, empowering instability in prices, unemployment rate, balance of payment deficit, retardation in citizens' welfare which all define economic growth.

The result of exchange rate is not only contrary to expectation by being positive but also reveals a marginal effect on Nigerian economic growth. This suggests that strong dependence on exchange rate as monetary policy tool will not promote output level of goods and services especially in balance of payment.

In the results of cash reserve ratio and monetary policy ratio where both instruments exert desired inverse relationship with output level of goods and services in Nigeria, however, their effects on economic growth are marginal. This suggests that the uses of cash reserve ratio and monetary policy rate have not been fully employed, although they serve as good instruments that can yield desired economic objectives.

These findings find consonance with the studies of Okafor et al (2015); ofoeze et al (2018); Osakwe et al (2019) where their findings reveal that while money supply play significant role in influencing economic growth, in most cases, that of exchange rate, interest rate, monetary policy



rate demonstrate marginal effect on economic growth of Nigeria.

## 5. CONCLUSION AND RECOMMENDATIONS

All efforts in this study have being to examine how efficient monetary policy is on Nigerian economic growth for the period 1986 to 2018, using error correction model as basis for concluding analysis on time series data. It is evident that from the findings that money supply if well administered stands taller and capable amongst other employed instruments of monetary policy to manage and drive economic activities in Nigeria. All other employed monetary policy instruments such as exchange rate, cash reserve ratio and monetary policy rate all have marginal effects on the economy, however, while exchange rate exhibits unexpected positive effect, only cash reserve ratio and monetary policy rate exhibit expected negative effect on economic growth, suggesting their innate potentials to manage the economy if well employed. On the overall, monetary policy explains 51% of the changes in economic growth in Nigeria. Therefore, considering complementary role of monetary policy with fiscal policy, the study recommended amongst others, that, monetary authorities should frequently review and align the use of monetary policy instruments to tailor nominated economic objectives with much emphasis on money supply which it's significant influence can greatly promote or retard the social as well as economic well-being of the citizens.

### Contribution of the Study

Several empirical studies such as Alade (2015); Anowor et al (2016); Fasanya et al (2013); Omodero (2019) have examined monetary policy-economic growth nexus, thereby, forming the bedrock for this research, with emphasis on real gross domestic product as measure of economic growth. However, in this study, the nominal GDP was employed to capture economic growth trend in Nigeria. Reasons for this are that: this has not been deflated unlike the real GDP. This brings the dependent variable to the same page with the independent variables which are not also deflated. Besides, it portrays the current price of products which indicates the largest amongst other indicators of economic growth as common to emerging countries like Nigeria (Bhole, 2006). Therefore, employing nominal GDP is a good quantifiable measure that reveals the current Nigerian economic growth trend in relation to monetary policy instruments.

### Acknowledgement:

The knowledge and idea extracted from all the referenced materials consulted have to great extent facilitated this paper. Therefore, we sincerely express our profound thanks unto them, most especially the work of Nasko (2016) whose

theoretical discussion boosted the theoretical foundation of this study.

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## APPENDICES

### Appendix 1: Data of Variables Employed in the Study

YEAR	NGDP	MS	EXR	CRR	MPR
	N'B	N'B	N : \$	%	%
1986	202.44	27.39	3.32	2.00	10.00
1987	249.44	33.67	4.19	2.00	12.75
1988	320.33	45.45	5.35	2.50	12.75
1989	419.20	47.06	7.65	3.00	18.50
1990	499.68	68.66	9.00	3.00	18.50
1991	596.04	87.50	9.75	3.50	15.50
1992	909.80	129.09	19.66	4.00	17.50
1993	1,259.07	198.48	22.63	4.00	26.00
1994	1,762.81	266.94	21.89	4.00	13.50
1995	2,895.20	318.76	21.89	5.00	13.50
1996	3,779.13	370.33	21.89	5.00	13.50
1997	4,111.64	429.73	21.89	6.00	13.50
1998	4,588.99	525.64	21.89	8.00	13.50
1999	5,307.36	699.73	93.39	9.80	18.00



2000	6,897.48	1,036.08	102.24	10.80	14.00
2001	8,134.14	1,315.87	112.00	10.60	20.50
2002	11,332.25	1,599.49	121.89	10.00	16.50
2003	13,301.56	1,985.19	129.76	8.60	15.00
2004	17,321.30	2,263.59	133.33	9.70	15.00
2005	22,269.98	2,814.85	131.59	4.20	13.00
2006	28,662.47	4,027.90	128.60	5.00	10.00
2007	32,995.38	5,809.83	125.51	3.00	9.50
2008	39,157.88	9,166.84	119.05	3.00	9.75
2009	44,285.56	10,780.63	148.89	1.25	6.00
2010	54,612.26	11,525.53	150.31	1.00	6.25
2011	62,980.40	14,306.78	154.15	8.00	12.00
2012	71,713.94	16,485.13	157.48	12.00	12.00
2013	80,092.56	18,989.35	157.31	12.00	12.00
2014	89,043.62	21,218.81	159.11	16.30	13.00
2015	94,144.96	21,718.86	197.00	24.00	11.00
2016	101,489.49	28,501.89	305.00	22.50	14.00
2017	113,711.63	28,669.58	305.00	22.50	14.00
2018	127,762.55	33,359.25	307.00	22.50	14.00

Source: CBN Statistical Bulletin, 2018

N/B: \*MPR is a continuation of MRR from 2006

\*MS connotes of M2 values that range from 1986 to 2008 and M3 values that range from 2009 to 2018.

\*NGDP = NominalGDP, MS = Money Supply, EXR = Exchange Rate, CRR = Cash Reserve Ratio, MPR = Monetary Policy Rate.

### Appendix 2: Results of Error Correction Model

Vector Error Correction Estimates

Date: 10/15/19 Time: 11:30

Sample (adjusted): 1988 2018

Included observations: 31 after adjustments

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
LNNNGDP(-1)	1.000000
LNMS(-1)	-0.429641 (0.11156) [-3.85132]
LNEXR(-1)	0.075531 (0.07950) [0.95008]
LNCRR(-1)	0.153958 (0.14699)



	[ 1.04738]				
LNMPR(-1)	-0.877305 (0.35541) [-2.46845]				
C	2.602947				
Error Correction:	D(LNNGDP)	D(LNMS)	D(LNEXR)	D(LNCRR)	D(LNMPR)
CointEq1	-0.897585 (0.22092) [-4.06288]	0.227376 (0.55213) [ 0.41181]	-0.520249 (0.13766) [-3.77921]	0.285123 (0.28179) [ 1.01182]	0.081534 (0.14059) [ 0.57993]
D(LNNGDP(-1))	0.117340 (0.16311) [ 0.71938]	0.077862 (0.40765) [ 0.19100]	0.311311 (0.10164) [ 3.06294]	-0.113937 (0.20805) [-0.54764]	0.076274 (0.10380) [ 0.73480]
D(LNMS(-1))	-0.232433 (0.08914) [-2.60754]	-0.697496 (0.22278) [-3.13092]	-0.151701 (0.05554) [-2.73119]	0.066441 (0.11370) [ 0.58436]	-0.001016 (0.05673) [-0.01791]
D(LNEXR(-1))	0.240067 (0.29095) [ 0.82511]	0.323859 (0.72714) [ 0.44539]	-0.216675 (0.18130) [-1.19515]	-0.002932 (0.37111) [-0.00790]	0.080598 (0.18516) [ 0.43530]
D(LNCRR(-1))	-0.040676 (0.18399) [-0.22108]	0.075674 (0.45982) [ 0.16457]	0.187033 (0.11464) [ 1.63142]	-0.058506 (0.23468) [-0.24930]	0.152443 (0.11709) [ 1.30197]
D(LNMPR(-1))	-0.358685 (0.35725) [-1.00403]	0.628820 (0.89283) [ 0.70430]	-0.285753 (0.22261) [-1.28367]	0.389489 (0.45568) [ 0.85475]	-0.364002 (0.22735) [-1.60108]
C	-0.062632 (0.08433) [-0.74270]	-0.105055 (0.21076) [-0.49846]	0.143039 (0.05255) [ 2.72210]	0.085033 (0.10756) [ 0.79053]	-0.018887 (0.05367) [-0.35192]
R-squared	0.511625	0.496175	0.412476	0.063281	0.200996
Adj. R-squared	0.389531	0.370218	0.265594	-0.170898	0.001245
Sum sq. resids	3.879051	24.22877	1.506131	6.311043	1.570979
S.E. equation	0.402029	1.004755	0.250510	0.512796	0.255847
F-statistic	4.190425	3.939261	2.808228	0.270225	1.006230
Log likelihood	-11.77195	-40.16718	2.891777	-19.31596	2.238373
Akaike AIC	1.211093	3.043044	0.265047	1.697804	0.307202
Schwarz SC	1.534897	3.366847	0.588850	2.021607	0.631005
Mean dependent	-0.020987	-0.011707	0.138521	0.078076	0.003017
S.D. dependent	0.514547	1.266092	0.292319	0.473899	0.256006
Determinant resid covariance (dof adj.)		8.06E-05			
Determinant resid covariance		2.24E-05			
Log likelihood		-53.99682			
Akaike information criterion		6.064311			



Schwarz criterion 7.914617  
 Number of coefficients 40

System: ECMPROB  
 Estimation Method: Least Squares  
 Date: 10/15/19 Time: 11:34  
 Sample: 1988 2018  
 Included observations: 31  
 Total system (balanced) observations 155

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.897585	0.220923	-4.062881	0.0001
C(2)	0.117340	0.163112	0.719382	0.4733
C(3)	-0.232433	0.089139	-2.607543	0.0103
C(4)	0.240067	0.290950	0.825114	0.4109
C(5)	-0.040676	0.183986	-0.221084	0.8254
C(6)	-0.358685	0.357246	-1.004028	0.3174
C(7)	-0.062632	0.084330	-0.742698	0.4591
C(8)	0.227376	0.552134	0.411813	0.6812
C(9)	0.077862	0.407652	0.191001	0.8488
C(10)	-0.697496	0.222777	-3.130921	0.0022
C(11)	0.323859	0.727144	0.445385	0.6568
C(12)	0.075674	0.459819	0.164574	0.8696
C(13)	0.628820	0.892834	0.704297	0.4826
C(14)	-0.105055	0.210758	-0.498462	0.6191
C(15)	-0.520249	0.137661	-3.779207	0.0002
C(16)	0.311311	0.101638	3.062945	0.0027
C(17)	-0.151701	0.055544	-2.731191	0.0073
C(18)	-0.216675	0.181295	-1.195149	0.2344
C(19)	0.187033	0.114644	1.631418	0.1054
C(20)	-0.285753	0.222606	-1.283674	0.2017
C(21)	0.143039	0.052547	2.722101	0.0075
C(22)	0.285123	0.281793	1.011819	0.3137

Determinant residual covariance 2.24E-05

$$\text{Equation: } D(\text{LNNGDP}) = C(1)*(\text{LNNGDP}(-1) - 0.42964107873*\text{LNMS}(-1) + 0.0755306789047*\text{LNEXR}(-1) + 0.15395761491*\text{LNCRR}(-1) - 0.877304726178*\text{LNMPR}(-1) + 2.60294742124) + C(2)*D(\text{LNNGDP}(-1)) + C(3)*D(\text{LNMS}(-1)) + C(4)*D(\text{LNEXR}(-1)) + C(5)*D(\text{LNCRR}(-1)) + C(6)*D(\text{LNMPR}(-1)) + C(7)$$

Observations: 31

R-squared	0.511625	Mean dependent var	-0.020987
Adjusted R-squared	0.389531	S.D. dependent var	0.514547
S.E. of regression	0.402029	Sum squared resid	3.879051
Durbin-Watson stat	2.130583		

$$\text{Equation: } D(\text{LNMS}) = C(8)*(\text{LNNGDP}(-1) - 0.42964107873*\text{LNMS}(-1) + 0.0755306789047*\text{LNEXR}(-1) + 0.15395761491*\text{LNCRR}(-1) - 0.877304726178*\text{LNMPR}(-1) + 2.60294742124) + C(9)*D(\text{LNNGDP}(-1))$$





$$-1)) + C(10)*D(LNMS(-1)) + C(11)*D(LNEXR(-1)) + C(12)*D(LNCRR(-1)) + C(13)*D(LNMPR(-1)) + C(14)$$

Observations: 31

R-squared	0.496175	Mean dependent var	-0.011707
Adjusted R-squared	0.370218	S.D. dependent var	1.266092
S.E. of regression	1.004755	Sum squared resid	24.22877
Durbin-Watson stat	2.331017		

$$\text{Equation: } D(LNEXR) = C(15)*(LNNGDP(-1) - 0.42964107873*LNMS(-1) + 0.0755306789047*LNEXR(-1) + 0.15395761491*LNCRR(-1) - 0.877304726178*LNMPR(-1) + 2.60294742124) + C(16)*D(LNNGDP(-1)) + C(17)*D(LNMS(-1)) + C(18)*D(LNEXR(-1)) + C(19)*D(LNCRR(-1)) + C(20)*D(LNMPR(-1)) + C(21)$$

Observations: 31

R-squared	0.412476	Mean dependent var	0.138521
Adjusted R-squared	0.265595	S.D. dependent var	0.292319
S.E. of regression	0.250510	Sum squared resid	1.506131
Durbin-Watson stat	2.193895		

$$\text{Equation: } D(LNCRR) = C(22)*(LNNGDP(-1) - 0.42964107873*LNMS(-1) + 0.0755306789047*LNEXR(-1) + 0.15395761491*LNCRR(-1) - 0.877304726178*LNMPR(-1) + 2.60294742124) + C(23)*D(LNNGDP(-1)) + C(24)*D(LNMS(-1)) + C(25)*D(LNEXR(-1)) + C(26)*D(LNCRR(-1)) + C(27)*D(LNMPR(-1)) + C(28)$$

Observations: 31

R-squared	0.063281	Mean dependent var	0.078076
Adjusted R-squared	-0.170898	S.D. dependent var	0.473899
S.E. of regression	0.512796	Sum squared resid	6.311043
Durbin-Watson stat	1.933272		

$$\text{Equation: } D(LNMPR) = C(29)*(LNNGDP(-1) - 0.42964107873*LNMS(-1) + 0.0755306789047*LNEXR(-1) + 0.15395761491*LNCRR(-1) - 0.877304726178*LNMPR(-1) + 2.60294742124) + C(30)*D(LNNGDP(-1)) + C(31)*D(LNMS(-1)) + C(32)*D(LNEXR(-1)) + C(33)*D(LNCRR(-1)) + C(34)*D(LNMPR(-1)) + C(35)$$

Observations: 31

R-squared	0.200996	Mean dependent var	0.003017
Adjusted R-squared	0.001245	S.D. dependent var	0.256006
S.E. of regression	0.255847	Sum squared resid	1.570979
Durbin-Watson stat	2.203133		