Lapai Journal of Economics; Volume 8, No.1; 2024
Print ISSN: 2659-028X
Online ISSN: 2659-0271
DOI: https://dx.doi.org/10.4314/lje.v8i1.18
Published by Department of Economics, IBB University Lapai, Niger State, Nigeria

Revisiting the Money Supply and Real Output Nexus in Nigeria: Test of Neutrality Proposition?

James Tumba Henry*[1] & Adamu Jibrilla[1]

[1]*Department of Economics, Adamawa State University, Adamawa State, Nigeria*

*Correspondence Email: henry723@adsu.edu.ng

Abstract

This study investigates the money supply-real output nexus while examining the neutrality hypothesis for Nigeria utilizing data from 1980 to 2022. The study used the autoregressive distributed lag (ARDL) technique and the discrete threshold regression model. The finding supports the money neutrality hypothesis in the long run but non-neutrality in the short run. In order words, money supply does not have a significant influence on real output growth in the long-term but does in the short-term. Inflation was found to have a reducing consequence on real output growth in the long and short term, while real effective exchange rates have a reducing effect on real output in the long run but advance in the short run. Structural breaks before the year 2000 have a significant influence on GDP growth in both the long and short run. Sequel to these outcomes, the study suggests an optimum fiscal policy mix with modest monetary policy should be adopted in Nigeria with more attention on the fiscal responsibility of the government to influence changes in real variables. More so, the CBN should urgently begin to announce specific inflation targets for the country since it has a reducing impact on GDP growth in the long run while ensuring the attainment of a more realistic exchange rate for the naira by increasing domestic production for export in the long run.

Keywords: Money supply, real output, monetary policy, fiscal policy, inflation targets, Nigeria

JEL Classification: E51, R15

1. Introduction

In modern economies, central banks are responsible for formulating monetary policy to maintain internal and external balances simultaneously. Different strategies to achieve these objectives are employed globally, including monetary targeting; interest rate targeting; exchange rate targeting; inflation targeting and output growth targeting (Mishkin, 1999; Ahmed *et al.*, 2021). In Nigeria, the management of monetary policy by the Central Bank of Nigeria (CBN) has primarily been guided by two broad macroeconomic considerations; the attainment of price stability and sustainable real output growth. However, the CBN has only used monetary targeting and exchange rate targeting as frameworks for implementing its monetary policy (CBN, 2021). The exchange rate targeting framework was extensively used

between 1959 and 1974, while monetary targeting has been used from 1974 to date (CBN, 2011). The collapse of Bretton Woods necessitated this shift in strategy from the fixed exchange rate system in 1972 and the need to change the approach to reflect demand management to contain inflationary pressure and balance of payment disequilibrium (Uwatt, 2017). Since then, the CBN has repeatedly relied on monetary policy to achieve its macroeconomic objectives because it has dire implications for the conduct of fiscal and income policies. One of the instruments of monetary targeting employed in Nigeria is the money supply (Broad Money Supply, M2).

A change in the supply of money is assumed to increase or decrease real output via the investment channel by affecting aggregate demand. This is an instance of the non-neutrality of the supply of money. Conceptually, the neutrality proposition of supply of money connotes those fluctuations in supply of money influence prices and wages but not real output (economic growth). Theoretically, there is no accord on the linkage between the supply of money and output growth. This has led to the emergence of three schools of thought. According to Nwoko *et al*. (2016), these schools are Adam Smith's classical, Keynesian and Monetarist schools. The classical economists argued that given the equation of exchange with a constant velocity of money in circulation and the hypothesis that the economy functions at full employment level, changes in the supply of money would influence prices significantly deprived of any impact on real demand, real investment, and real GDP (Abdullahi & Kime, 2016; Saeed, 2022). However, Keynesian economists trust that changes in the supply of money will affect aggregate investment and output through a decrease or increase in interest rate (Olaleye, *et al.*, 2020). Similarly, the monetarists thought that a growth in the supply of money would result into rise in aggregate demand and when there is surplus capacity, the GDP (output) would also increase (Mansoor *et al*, 2018). The monetarist further argued that a rise in the supply of money would be inflationary if it fails to influence aggregate investment and real GDP (output) in the long run.

Despite these differences in opinion on the relationship between the supply of money and real output (GDP), the CBN yet uses monetary policy to adjust the economy (Nwoko *et al*., 2016). Thus, this study adds to the prevailing debate by exploring the nexus between money supply and real GDP growth and testing the cogency of the money neutrality hypothesis for Nigeria. To achieve this objective, annual data consisting of real output, supply of money, rate of inflation, lending interest rate and real effective exchange rate from 1980 to 2022 were used. The study objectives are fourfold: identify the breakpoint dates, analyze the dynamic relationship between money supply and real output, examine the neutrality hypothesis; and determine the threshold of money supply. The study uses a blend of techniques to investigate the relationship between money supply and real output in Nigeria.

2. Literature Review

Theoretical Literature

Myriads of theories try to describe the nexus between money supply and real GDP growth. However, all of them can be summarized under three broad classifications discussed in this section.

Classical theorists like Adam Smith, John Stuart Mill and David Ricardo's view of monetary policy are based on Irvin Fisher's quantity theory of money expressed as MV = PY. In the equation, M represents the supply of money, V represents the velocity of circulation, and PY represents the nominal GDP. Thus, PY stands for the current nominal GDP. Furthermore, the equation emphasizes that the market value of the entire final goods and services (current nominal GDP) must equal money supply times the mean number of periods a currency is utilized for transaction at a particular time (Nwoko *et al.*, 2016). In principle, the classical quantity theory of money relies on a dual assumption, transforming it into an approach to monetary policy. Classical theorists perceive that an economy is at all times at or near the natural level of real GDP and thus assume that income (Y) in Fisher's equation of exchange is static in the short term. The theory further assumes that the velocity of money is constant such that V in the equation of exchange is regarded as fixed (Omanukwue, 2010; El-Seoud, 2014). With the assumption of fixed income (Y) and velocity (V), the effect of expansionary or contractionary monetary policy would either rise or decline the general price levels (P) concerning the change in the supply of money (M). Thus, monetary policy expansion and contraction would lead to inflation and deflation, respectively, without impacting real variables (Li *et al*., 2020; Kloosterman *et al*., 2022).

As against the suggestion of the classical theory of money, Keynesian economists do not accept that a direct link exists between the supply of money and inflation (price level). These economists rejected the conception that an economy is near the natural level of real GDP when Y in the equation of exchange is assumed to be static. They also rejected the supposition of a constant velocity of money. Instead, Keynesian economists believed that there is an indirect relationship between the supply of money and real GDP (Samuel *et al.*, 2021). They argued that monetary policy expansion intensifies the stock of loanable funds obtainable in an economy, resulting in a decrease in lending interest rates. The fall in interest rates leads to a surge in aggregate expenditures on interest rate-responsive consumption and investment, thereby raising real GDP. It was concluded that monetary policy, especially the supply of money affects real GDP indirectly. However, Keynesian economists tend to be sceptical about the efficacy of monetary policy and thus place importance on fiscal policy, assumed to have a straight impact on real GDP growth.

Monetarists led by Milton Friedman presented a variant of classical theory by disputing the position of Keynesian economists on the relative ineffectiveness of monetary policy. The monetarists maintained that money demand is constant and does not respond to fluctuations in lending interest rates. Thus, monetary policy expansion tends to generate excess money in circulation, thereby increasing aggregate demand (Igbafe, 2022). However, unlike the classical theory, the monetarists opined that an economy might not continuously be at the full employment level of constant GDP. Furthermore, the school of thought argues that monetary policy expansion might lead to growth in constant GDP by growing aggregate demand in the short run (Chaitip *et al*., 2015). However, when an economy is operating at full level of employment, in the long-term, monetary policy expansion would translate to increases in prices (inflation) and will not influence the real GDP.

Empirical Review

Money Supply and Output

The nexus between the supply of money and real output growth has ambiguously attracted researchers worldwide, with little or no consensus on the latter's impact on the former. For instance, Kalubowila and Perera (2015) investigated the link between the supply of money and real GDP in Sri Lanka utilizing data from 1996 to 2014 and ECM estimation method. The outcome showed a strong linkage between real GDP and real money supply. In addition, it was also found that short-run adjustment comes from real GDP. In China, Chih-Hsiang *et al.* (2009) studied the effect of supply of money on real GDP and price utilizing data from 1993 to 2008. The investigation used the autoregressive integrated moving average (ARIMA) as its estimation technique. The result revealed that real GDP react to an adverse supply of money shocks. The study concluded that the Central Bank of China's fixed monetary growth seems suitable. In Bahrain, El-Seoud (2014) used the ECM and Granger causality methods to investigate the nexus between the real supply of money and real GDP utilizing data from 2000 to 2013. The result disclosed a one-way causality from real GDP to the real supply of money in the long and short term. Thus, it was concluded that the real money supply neutralizes real GDP growth within the study period. Chuku (2009) used a structural VAR method to investigate the impact of monetary policy volatility on GDP growth and prices in Nigeria utilizing data from 1986:Q1 to 2008:Q4. The result disclosed that monetary shocks (M2) have little effect on prices and GDP growth. On the other hand, monetary shocks (using REER and MRR) have a neutral impact on GDP growth. Therefore, it was concluded that manipulating the quantity of money supplied is Nigeria's most effective monetary policy instrument and emphasized the use of M2 instead of REER and MRR. Inam (2014) studied the role of money supply in influencing GDP growth in Nigeria employing data from 1985 to 2012 and ECM estimation procedure. The result exhibited that the supply of money exerts a significant positive effect on GDP growth. Thus, it was concluded that more importance should be placed on improving the country's monetary policy framework and strengthening institutions to maximize economic growth. Chude and Chude (2016) investigated the impact of a broad supply of money (M2) on GDP growth in Nigeria utilizing data from 1987 to 2010. The study adopted OLS as its estimation method. The outcome obtained exposed that there is a significant positive association between money supply and GDP growth. Furthermore, it was concluded that broad money supply (M2) significantly impacts output and prices in Nigeria.

Marshal (2016) studies the relationship between the supply of money and GDP growth in Nigeria. The study applied the VAR model and data from 1970 to 2014. The result showed that changes in M2 are significant in explaining differences in real GDP. Therefore, the study concluded that real GDP growth could be accomplished when monetary policy is extensively used in the long and short run by the CBN as its target. Inam and Ime (2017) examined the effect of monetary policy on GDP growth in Nigeria utilizing data from 1970 to 2012 while deploying the OLS and Granger causality techniques. The results revealed an insignificant positive linkage between money supply and economic growth. Similarly, no causality was found between the supply of money and GDP growth. Therefore, the CBN should make sure that the supply of money (M2) is effectively managed, controlled and monitored to promote GDP growth. Using the VECM and Pairwise Granger causality

techniques, Galadima and Ngada (2017) explored the effect of money supply on GDP growth utilizing data from 1981 to 2015 for Nigeria. The result revealed that money supply and lending interest rates have a significant-positive impact on GDP growth. Moreso, the result showed that the short-term lagged value of the supply of money hurts GDP growth. In contrast, the causality test outcome revealed a feedback effect between money supply and GDP growth. It was recommended that expansionary monetary policy achieve economic growth with greater emphasis on improving monetary policy and institutions to ensure an effective and efficient financial system. Audu *et al.* (2018) used F-M dual criteria and structural VAR model to examine the nexus among money supply, GDP and inflation dynamics in Nigeria utilizing data from 2009:M12 to 2018:M6. The outcome shows that the broadest money supply-M3 meets the F-M conditions and that the structural VAR result showed a highly insistent positive rejoinder of economic activities due to shocks. The study concluded that M3 contains more statistics about inflation and GDP than M2 and therefore recommended the approval of M3 as a new monetary aggregate. Odumusor (2019) investigated the effect of money supply on GDP growth in Nigeria utilizing data from 1976 to 2015. The study deployed the ECM and Granger causality test techniques. The outcome showed that money supply is insignificant in influencing GDP growth. In the long term, however, the effect of the supply of money was found to be significant but negatively influenced GDP growth, while no causality exists. The study concluded that an increase in the supply of money could not promote GDP growth. Thus, it was suggested that attention should be paid to the supply of money as a major monetary policy tool to achieve growth.

Neutrality of Money

Chen (2007) investigated the long-run money neutrality assumption in South Korea and Taiwan engaging data from 1970:Q1 to 2004:Q4 and 1965:Q1 to 2004:Q4 for the respective countries and a bivariate VAR model to estimation technique. The outcome provided enough evidence for money neutrality regarding real GDP growth in South Korea. Nevertheless, there is a minute attestation to believe that the long-run neutrality supposition holds for Taiwan. It was concluded that money neutrality does not hold for the two countries in the short term. Using the Fisher-Seater technique, Arintoko (2011) investigated the long-term neutrality of money and inflation in Indonesia applying data from 1970 to 2008. The result indicated that the long-run neutrality of money (M1 and M2) proposition does not hold regarding real GDP. At the same time, a significant positive linkage exists between the supply of money and inflation in the long run. It was concluded that monetary expansions positively influence real output in the long term. Sam *et al.* (2015) tested the neutrality of the money theory toward real output in Malaysia using quarterly data (1996:Q1 to 2014:Q4). The study used VECM to scrutinize the long-term behaviour of monetary aggregates regarding Malaysian economic growth. The result exhibited that there is minute evidence to back the assertion of money neutrality in the short and long runs. In addition, the outcome also revealed that monetary aggregate has short-run and long-run causality with real output. Therefore, the study concluded that the supply of money could be deployed as a nominal target to complement the discretionary policy. Moreira *et al.* (2016) evaluated the impact of a change in the supply of money on prices and real variables in the US utilizing data from 1959:Q1 to 2013:Q4. The structural VAR (SVAR) technique was applied. The result showed that deviations in the supply of money influence relative prices and have a

substantial effect on the inflation rate, unemployment, investment, and potential GDP ratio. The study concluded that money is not neutral since a variation in the supply of money affects prices and subsequently affects resource distribution.

Afsin and Imdat (2017) analyzed the money neutrality proposition concerning the level and volatility impact of the supply of money for the US using data spanning from 1959:M1 to 2016:M5. The study employed the EGARCH and ADCC-EGARCH to analyze the dynamic association between money supply growth and GDP growth. In the short run, the EGARCH mean equation result revealed that the lagged influence of money supply growth positively impacts GDP growth. The ADCC-EGARCH outcome showed that the volatility of GDP growth rate and money supply growth rate varies significantly in the short term with time. The study resolved that money neutrality does not hold for the US economy in the short run. Contrary to the finding of Afsin and Imdat (2017), Serletis and Koustas (2017) also tested the long-term money neutrality suggestion for the United States deploying data from 1967:Q1 to 2014:Q1. The estimation technique used is the SVAR model which pays attention to the variables' unit root and cointegration properties. The outcome obtained exhibited no significant evidence against long-run money neutrality. Thus, the study concluded that the neutrality assumption holds in the long run. Using panel data, Bozkurt (2018) investigated whether the money neutrality supposition applies to Turkey and other member states of the Shanghai Cooperation Organization from 2000 to 2016. Economic growth and money supply growth rate were utilized as explanatory variables. The study employed the Durbin-Hausmann and Dumitrescu-Hurlin panel cointegration and causality tests, respectively. The Durbin-Hausmann cointegration test result showed no generic long-term relationship among the groups. The study concluded that the money neutrality proposition is not applicable. On the other hand, the causality test revealed causality between the supply of money and GDP growth.

In Nigeria, Anoruo (2005) used a nonparametric unit root and cointegration technique to assess the money neutrality hypothesis utilizing quarterly data from 1970Q1 to 2002Q4. This study decomposed M2 into unanticipated and anticipated components. The outcome obtained indicates that there is cointegration between unanticipated money supply and real output. Similarly, the study could not reject the hypothesis of no cointegration between the anticipated supply of money and real GDP growth. The study concluded that the outcome of monetary policy is contingent on whether it is anticipated or not. Chuku (2011) examined the legitimacy of Nigeria's two long-run money neutrality propositions for the period 1960:Q1 to 2008:Q4. The study employed SVAR. The result showed that there is enough evidence that suggest the presence of long-term money neutrality. The study argued that the monetarists' anti-inflationary prescription is ineffective in managing the macroeconomics of Nigeria. The study recommended that a synchronized and harmonized monetary-fiscal policies framework may produce the anticipated outcomes on real GDP growth. Osuji and Chigbu (2013) studied the money neutrality controversy utilizing data from 1972 to 2010. The study applied the VAR model as its estimation technique. The result showed that the indicators of money neutrality were cointegrated with GDP growth, and therefore conjured a long-run relationship between the money neutrality debate and GDP growth in less developed countries. The study concluded that since the supply of money is inversely

correlated to GDP in Nigeria, inflation-regulating procedures should be sustained to check the excess supply of money. Nwanne (2017) examined the neutrality of the US money supply in Nigeria using annual data from 1965 to 2015. The study employed the VECM estimation technique. The outcome exposed that the US money supply is not neutral in the short and long runs. Furthermore, monetary policy in the US significantly impacted the Nigerian interest rate, consumer price index and GDP. Therefore, the study concluded that monetary policy in the US is an essential feature when designing monetary policy rules in Nigeria. Amassoma and Badmus (2020) re-appraised the cogency of Nigeria's long-run money neutrality hypothesis using time series observations from 1981 to 2018. The study employed the VECM estimation procedures. The outcomes refuted the cogency of long-term neutrality of money but that the Fishers effect exercised partial long-run neutrality of money. The study concluded that the neutrality hypothesis is not applicable due to institutional rigidities and defilement of the monetarist and classical position on monetary aggregates. Therefore, the study recommended sound policy synchronization to accomplish general macroeconomic objectives in the long term.

3. Methodology

This study aimed to investigate the linkage between money supply and real GDP growth rate in Nigeria and test the money neutrality hypothesis from 1980 to 2022. The dependent variable is real output growth (RGDPR) measured in millions of constant local currencies. The core explanatory variable is the money supply (M2) measured in millions of constant local currencies. We assumed that M2 has a direct positive influence on the real GDP growth rate (Chude & Chude, 2016). There are four variable that have direct impact on real output growth based on the classical, Keynesian and monetary theories: inflation rate (INF) (Audu *et al.,* 2018; Chuku, 2011) proxied by the consumer price index, interest rate (INT) (Inam & Ime, 2017; Amassoma & Badmus, 2020), exchange rate (EXR) (Galadima & Ngada, 2017), foreign direct investment (FDI), and openness to trade (TOP). The variable names, descriptions, sources, and expected signs are summarized in Table 2.

Table 2: Variables, Description, Signs and Sources

Variable	Description	Signs	Sources
RGDPR	Real GDP growth (annual %)	N/A	African Development Bank (ADB, 2023)
M2	Broad money supply (current LCU)	+	World Bank (WDI, 2023)
INF	Consumer prices (annual %)	-	World Bank (WDI, 2023)
INT	Lending interest rate (annual %)	+	World Bank (WDI, 2023)
REXR	Real effective exchange rate index (2010=100)	-	World Bank (WDI, 2023)
DUM_1	Break dates below year 2000	-	Author's
DUM_2	Break dates above the year 2000	-	Author's

Source: *Author's compilation*

To empirically examine the relationship between money supply (M2) and real GDP growth rate while testing the neutrality proposition for Nigeria, this study adopted the model specification of Marshal, 2016; Galadima and Ngada, 2017; and Inam and Ime, 2017. Thus, the functional equation of this study is specified as:

$RGDPR_t = f(LnM2_t, INF_t, INT_t, REXR_t, DUM_1, DUM_2)$ ……1

Where; RGDPR is the real GDP growth rate, LnM2 is the natural log of money supply, INF is the inflation rate, INT is the lending interest rate, REXR is the real effective exchange rate, DUM_1 indicates breakpoint dates below the year 2000, and DUM_2 represents breakpoints dates about year 2000. The transformed baseline equation for this study is given as:

$RGDPR_t = \alpha_0 + \alpha_1 LnM2_t + \alpha_2 INF_t + \alpha_3 INT_t + \alpha_4 REXR_t + \alpha_5 DUM_1 + \alpha_6 DUM_2 + \mu_t$ ……2

Where t is the period, α_0 to α_6 are estimated coefficients and μ is the disturbance term. The theoretical expectation of this study is that money supply (M2) would exert a significant positive impact on real GDP growth rate in the short-run and not in the long-run (Monetarist school of thought) and the long-run not in short-run (classical school of thought). Inflation and real exchange rates were expected to exert a significant negative effect on real GDP growth. Conversely, the lending interest rate is anticipated to exert a significant positive impact on the real GDP growth rate.

Conventional Unit Root Tests

The Augmented Dickey-Fuller (ADF) stationarity test estimation procedure takes the following forms:

(ADF-test): $\Delta Y_t = \alpha_1 + \alpha_2 t + \delta Y_{t-1} + \alpha_i \sum_{t-1}^{k} \Delta Y_{t-i} + \varepsilon_t$……3

Where ΔY_t denotes the lag difference of the variable under consideration. k is the number of lags and ε_t is the error term. The stationarity of the variables is tested using the following hypotheses: $H_0 : \delta 1 = 0$ (Null Hypothesis), (Where $\delta 1$ = p-1=0) $H_0 : \delta 1 < 0$ (Alternative Hypothesis). Premised on the critical values of individual statistics, if the null hypothesis cannot be rejected, then the variables are non-stationary at the level and require to undergo a higher-order differencing (Δ) procedure to reach stationarity and to detect the order of integration (Dickey & Fuller, 1979). These procedures were applied to each variable in equation [2].

On the other hand, the Phillips-Perron unit root test requires estimating the equation:

$Y_t = \alpha_0 + \rho Y_{t-1} + \pi_t$ ……4

Where: α_0 and ρ are estimated coefficients; and π_t is the disturbance term. Thus, the major difference between PP and ADF stationarity tests lies in the fact that the former uses non-parametric arithmetical procedures which account for serial correlation in the disturbance term in addition to including the lagged difference terms (Gujarati *et al.*, 2009). In both the PP and ADF procedures, the null hypothesis of non-stationarity (presence of random walk) is accepted if $\delta = 0$ and $\rho = I$, respectively, while it is rejected if $\delta < 0$ and $\rho < I$, respectively (Phillips & Perron, 1988).

Breakpoints Unit Root Test

In the existence of structural breaks, conventional stationarity tests are not reliable and are biased towards rejecting a unit root. Perron (1989) asserts that macroeconomic variables do not only comprise unit roots but also persistence disturbances arising from infrequent and

large shocks, whereas variables return to a deterministic trend after frequent and small shocks. The stationarity procedure is characterized by a solitary exogenous breakpoint following the primary asymptotic distribution assumption (Glynn *et al.,* 2007). It modified the Dickey-Fuller tests by including dummy variables to account for the exogenous structural break and fixed the breakpoint of the trend function. The breakpoint unit root test considered the presence of three (3) categories of structural breaks: (1) a crash model which permits a breakpoint in the intercept (level); (2) a changing growth model that permits a breakpoint in the gradient (slope); and (3) breaks that allow both effects to happen simultaneously. Thus, the breakpoints unit root test is expressed as:

$$\gamma_t = \rho_0 + \rho_1 DU_t + d(DTB)_t + \beta t + \alpha x_{t-1} + \sum_{i=1}^{p} \vartheta_i \Delta x_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots 5$$

$$\gamma_t = \rho_0 + \delta DT_t^* + \beta t + \alpha x_{t-1} + \sum_{i=1}^{p} \vartheta_i \Delta x_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 6$$

$$\gamma_t = \rho_0 + \rho_1 DU_t + d(DTB)_t + \delta DT_t + \beta t + \alpha x_{t-1} + \sum_{i=1}^{p} \vartheta_i \Delta x_{t-1} + \mu_t \quad \ldots\ldots\ldots\ldots 7$$

Where DU_t = intercept dummy indicating a level change; $DU_t = 1\ if\ (t > TB)$ and 0 otherwise; DT_t and DT_t^* = change in the slope of the trend; DT_t^* = t if t > TB and 0 otherwise; (DTB) = the crash dummy and is equal to 1 if t = TB+1 but 0 otherwise; and TB = break date. Hence, equations 5, 6 and 7 are estimated under the null hypothesis assumption that there is a random walk with a break date, whereas the alternate hypothesis (H_1) is a break trend stationary procedure with dummy variables included in the regression.

Autoregressive Distributed Lag (ARDL)

Pesaran and Shin created this method in 1999, and Pesaran, Shin, and Smith enhanced it in 2001 (Henry, 2019). The unlimited error correction model, which has various recompenses over other cointegration techniques, is the basis of the model. In addition, the method can be used for studies with a small sample size, so doing a bounds test is appropriate. It estimates the model's short- and long-term coefficients simultaneously, removing the need to worry about serial correlation or missing variables. Once the right lags have been chosen, the long-term relationship can be predicted using the ordinary least squares (OLS) method. The ARDL-ECM specification based on equation [2] is stated as:

$$\Delta RGDPR_t = \rho_0 + \alpha_1 RGDPR + \rho_2 LnM2_t + \rho_3 INF_t + \rho_4 INT_t + \rho_5 REXR_t + \rho_6 DUM_{1t} + \rho_7 DUM_{2t} + \sum_{i=0}^{k} \rho_{8i} \Delta RGDPR_{t-1} + \sum_{i=0}^{k} \rho_{9i} \Delta LnM2_{t-1} + \sum_{i=0}^{k} \rho_{10i} \Delta INF_{t-1} + \sum_{i=0}^{k} \rho_{11i} \Delta INT_{t-1} + \sum_{i=0}^{k} \rho_{12i} \Delta REXR_{t-1} + \sum_{i=0}^{k} \rho_{13i} \Delta DUM_{1t-1} + \sum_{i=0}^{k} \rho_{14i} \Delta DUM_{2t-1} + \mu_t \quad \ldots\ldots\ldots\ldots\ldots\ldots 8$$

Where: Δ = difference operator; Ln = log transformation; ρ_0 = intercept; μ_t = error term. Three steps make up the ARDL processes for assessing the association between the given variables. Estimating equation [4] for cointegration using OLS is the initial step. The hypothesis that guided the ARDL Bounds test procedure is given as: H_0 : $\rho_1 = \rho_2 = \rho_3 = \rho_4 = \alpha_5 = \rho_6 = \rho_7 = 0$ (indicates no co-integration).

H_1: $\rho_1 \neq \rho_2 \neq \rho_3 \neq \rho_4 \neq \rho_5 \neq \rho_6 \neq \rho_7 \neq 0$ (indicate co-integration).

Two sets of the f-statistic's critical bound values are produced to arrive at an acceptable conclusion. The null hypothesis (H_0) of no cointegration is accepted if the f-statistics computed is less than the lower bound critical levels. On the other hand, the null hypothesis (H_0) of no cointegration is rejected if the f-statistics computed is greater than the upper bound critical values, signifying cointegration exists. Nonetheless, it is inconclusive if the f-

statistics calculated fall within the bounds. The conditional long-term ARDL model for real GDP growth rate is computed as follows in the second step:

$$RGDPR_t = \rho_0 + \sum_{i=1}^{k} \rho_1 RGDPR_{t-1} + \sum_{i=1}^{k} \rho_2 LnM2_{t-1} + \sum_{i=1}^{k} \rho_3 INF_{t-1} + \sum_{i=1}^{k} \rho_4 INT_{t-1} + \sum_{i=1}^{k} \rho_5 REXR_{t-1} + \sum_{i=1}^{k} \rho_6 DUM_{1t-1} + \sum_{i=1}^{k} \rho_7 DUM_{2t-1} + \mu_t \quad \text{.....9}$$

Using the Akaike Information Criterion (AIC), the proper ARDL (a, b, c, d, e, f, and g) model was chosen. Lastly, by estimating the ECM model, the short-run dynamic parameters associated with the long estimate were determined. The ECM model is expressed as:

$$\Delta RGDPR_t = \rho_0 + \sum_{i=1}^{k} \rho_1 \Delta RGDPR_{t-1} + \sum_{i=0}^{k} \rho_2 \Delta LnM2_{t-1} + \sum_{i=0}^{k} \rho_3 \Delta INF_{t-1} + \sum_{i=0}^{k} \rho_4 \Delta INT_{t-1} + \sum_{i=0}^{k} \rho_5 \Delta REXR_{t-1} + \sum_{i=0}^{k} \rho_6 \Delta DUM_{1t-1} + \sum_{i=0}^{k} \rho_7 \Delta DUM_{2t-1} + \rho ECM_{t-i} + \mu_t \quad \text{.....10}$$

Where: ρ_1 to ρ_7 = short-term dynamic parameters of the model; ρ = adjustment mechanism.

4. Results

The prime statistical features like mean, standard deviation, minimum and maximum, skewness and kurtosis are summarized in Table 3. The result indicates that the min and max values of real GDPR are -6.62% and 15.34%, respectively, with an average value of 3.85 per cent. In addition, RGDPR is positively skewed with a kurtosis (peak) value of 3.2978. This finding implies that the average value of RGDPR is higher than its peak value, indicating that there are extreme values in the data. At the same time, money supply (M2) ranged between 0.1520 and 0.5220 billion naira with an average value of 0.9770. Money supply is also positively skewed with a peak (kurtosis) value of 3.9591. Besides, the inflation rate (INF) decreased from 72.8355 per cent in 1995 to 5.3880 per cent in 2007, its mean value is 18.9466 per cent within the period. In addition, inflation is positively skewed with a peak value of 5.4371. lending interest rate (INT) hovers around 8.92% and 31.65% as shown by the min and max values, respectively, with a mean of 17.32%. INT is also positively skewed with a peak of 3.60%. Lastly, REXR lies between 49.7763 naira and 536.9105 naira for the min and max values, respectively. The REXR average value is 147.0404, positively skewed and has a sharp peak of 6.1791. Similarly, the results presented in Table 4, indicate that no evidence of serial correlation amongst the variables used in this study because their coefficients are less than 0.75%.

Summary Statistics and Correlation Test

Table 3: Summary of descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
RGDPR	42	3.8499	4.2709	-6.6251	15.3292	0.2590	3.2978
LnM2	42	0.9770	0.1430	0.1520	0.5220	1.4285	3.9591
INF	42	18.9466	16.4549	5.3880	72.8355	1.8771	5.4371
INT	42	17.3243	4.8167	8.9167	31.6500	0.3575	3.6013
REXR	42	147.0404	114.3839	49.7763	536.9105	1.9733	6.1791

Note: Obs = Observations; Std. Dev. = Standard Deviation; Min = Minimum; Max = Maximum
Source: *Authors' computation*

Table 4: Correlation Matrix

Variable	RGDPR	M2	INF	INT	REXR
RGDPR	1.000000				
M2	-0.137137	1.000000			
INF	-0.104351	-0.228360	1.000000		
INT	0.358799	-0.275966	0.369446	1.000000	
EXR	-0.305468	-0.198338	-0.129163	-0.659245	1.000000

Source: Author's computation

Unit Root Tests

This study avoided spurious regression by testing the stationarity property of the variables, employing the conventional unit root test of Phillip-Peron (PP) and Augmented Dickey-Fuller (ADF). The outcomes shown in Table 5, indicate that both the PP and ADF tests show that variables are a mixture of I(0) and I(1). When structural breaks are observed in variables, conventional unit root tests lose that predictor power (Sun *et al.*, 2017). Thus, the breakpoint stationarity test was conducted and the outcomes are summarized in Table 6. In the breakpoint test, similar results with the PP and ADF were obtained except real effective exchange rate (REXR) that became stationary at I(0). The result also indicates that 70 per cent of the break dates are found below 2000 while 30 per cent are above it. Hence, two dummy variables were generated to capture years below 2000 and above it. Hence, the stationarity test outcomes support the application of the autoregressive distributed lag (ARDL) estimation technique.

Table 5: Conventional stationarity results

Test	PP Constant and Trend				ADF Constant and Trend				Remark
Variable	Level	Prob.	1st Diff	Prob.	Level	Prob.	1st Diff	Prob.	Order
RGDPR	-3.89	0.02**	N/A	N/A	-3.97	0.01**	N/A	N/A	I(0)
LnM2	12.15	1.00	-4.85	0.00	-1.63	0.76	-3.66	0.03**	I(1)
INF	-3.09	0.11	-12.23	0.00	-2.68	0.24	-5.98	0.00***	I(1)
INT	-2.03	0.56	-7.41	0.00	-2.43	0.35	-5.94	0.00***	I(1)
REXR	-2.30	0.42	-5.33	0.00	-2.00	0.58	-4.46	0.00***	1(1)

*Note: *** and ** = Significance at 5% and 10% levels; PP= Phillip-Peron; ADF= Augmented Dickey-Fuller; Prob.= Probability; N/A = Not Applicable* ***Source:*** *Authors' computation*

Table 6: Breakpoint stationarity results

Variable	Break Date	Level	Prob.	Break Date	1st Diff	Prob.	Remark
RGDPR	2014	-4.94	0.03	1985	-9.77	0.00***	I(0)
LnM2	2018	-3.16	0.85	2021	-6.93	0.00***	I(1)
INF	1999	-4.60	0.10	1995	-9.88	0.00***	I(1)
INT	1988	-4.58	0.10	1990	-7.86	0.00***	I(1)
REXR	1998	-9.79	0.00***	1986	-5.51	0.00***	I(0)

*Note: *** = Significance at 5% level; Prob.= Probability; N/A = Not Applicable*
Source: Authors' computation

Lag Selection Criteria

After testing for unit roots, we went further to check for optimal lag(s) to be included in the ARDL long and short-run estimates. The lag selection outcome is summarized in Table 7,

indicating that the sequential modified LR test statistic (LR), final prediction error (FPE), Akaike information criterion (AIC) and Hannan-Quinn information criterion (HQ) supported four (4) lags while the Schwarz information criterion (SC) chose one (1) lag. This finding indicates that the optimal lag(s) utilized did not exceed the four benchmarks, and the criterion that provided the least value was followed.

Table 7: Lag Selection Criteria

Lag	LR	FPE	AIC	SC	HQ
0	N.A	1.33e+09	35.19469	35.41016	35.27135
1	302.4278	393779.6	27.05961	28.35244*	27.51959
2	51.03721	238214.8	26.48513	28.85532	27.32843
3	32.62465	244698.0	26.31798	29.76553	27.54460
4	43.37111*	107845.1*	25.08253*	29.60744	26.69246*

Note: *N.A = not applicable,* ***Source:*** *Authors' computation*

Cointegration Test

After determining the optimum lag(s), we conducted the ARDL bounds test for cointegration. This test was done to ascertain whether there is a generic long-run relationship among the variables in equation [2] and the outcome is presented in Table 8. The outcome indicates that the F-statistic of 4.2929 falls outside the upper bounds at the 1%, 2.5%, 5% and 10% levels of significance, revealing cointegration amongst the variables. Thus, there is enough evidence to believe that the variables are cointegrated and the hypothesis of no generic cointegration was rejected.

Table 8: ARDL Bounds Test

F-Bounds Test		Null Hypothesis: No levels of relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	4.2929	10%	1.99	2.94
K	6	5%	2.27	3.28
Finite Sample	n > 40	2.5%	2.55	3.61
Actual Sample Size	41	1%	2.88	3.99

Note: *K = number of independent variables; Signif. = Significance; I(0) and I(1) = Upper and lower bounds*.
Source: *Authors' computation*

ARDL long and short-run estimated coefficients for economic growth equation

After observing that there is cointegration among variables in equation [2], the long-run and short-run coefficients were estimated and the outcomes are shown in Table 9. The long-run coefficients are presented in the upper part [a] of Table 9 while the short-run coefficients are in the lower part [b]. The regressand is real GDPR and the selected ARDL model is (1, 1, 2, 1, 2, 2, 0). In the long-run estimates, the coefficient of LnM2 exerts an insignificant negative impact on the real GDPR. This indicates that the money supply (M2) does not influence GDP growth in Nigeria in the long run, consequently, validating the money neutrality hypothesis. This finding conforms with the monetarist theory and empirical studies of (Chuku, 2011; Serletis & Koustas, 2017; Amassoma & Badmus, 2020) and

contradicts the findings of (Osuji & Chigbu, 2013; Sam *et al.*, 2015; Moreira *et al.*, 2016). Hence, the money neutrality proposition holds for Nigeria.

Moreover, INF and REXR exert a significant negative effect on the real GDPR in the long run at the 5% and 10% levels, respectively. This indicates that a 1% increase in inflation and real effective exchange rate reduces growth by 18.32% and 3.53% in the long run. These findings are in tandem with the theoretical expectation of this study and imply that high inflation rates and the depreciation of the naira hurt GDP growth in Nigeria. Lending interest rates exert an insignificant negative impact on real GDPR in the long run. Lastly, the effect of DUM_1 is significant and positive at the 10% level. This finding indicates that structural breaks that happened before the year 2000 significantly increased GDP growth by 11.47% while breaks after 2000 (DUM_2) are insignificant in the long run.

Table 9: ARDL long and short-run results

Dependent Variable: D(RGDPR)
Selected Model: ARDL(1, 1, 2, 1, 2, 2, 0)

a. Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnM2	-0.0383	1.9636	-0.0195	0.9846
INF	-0.1832	0.0607	-3.0164	0.0060***
INT	-0.2674	0.2098	-1.2742	0.2148
REXR	-0.0353	0.0126	-2.7928	0.0101**
DUM1	11.4701	5.0517	2.2705	0.0324**
DUM2	-3.8597	2.5393	-1.5200	0.1416

b. Short Run Coefficients

C	15.2768	2.8814	5.3019	0.0000***
@TREND	-0.2041	0.0523	-3.8998	0.0007***
D(LnM2)	-10.3556	3.6027	-2.8744	0.0083***
D(INF)	-0.1509	0.0341	-4.4192	0.0002***
D(INF(-1))	0.1049	0.0285	3.6839	0.0012***
D(INT)	0.0209	0.1589	0.1315	0.8965
D(REXR)	0.0229	0.0082	2.7835	0.0103**
D(REXR(-1))	0.0167	0.0095	1.7575	0.0916**
D(DUM1)	22.8263	3.0082	7.5879	0.0000***
D(DUM1(-1))	6.2128	3.4506	1.8005	0.0844**
ECT (-1)*	-1.0499	0.1655	-6.3458	0.0000***
R-squared	0.7995	Prob(F-statistic)		0.0000***
Adjusted R-squared	0.7326	Durbin-Watson stat		2.4525
F-statistic	11.9592	S.E. of regression		2.3654

Note: **** and ** = significance at 5% and 10% levels; Std. Error = standard error; Prob. = Probability.*
Source: *Authors' computation*

In the short run, the coefficients of money supply (LnM2) are negative and statistically significant at the 5 per cent level. This finding indicates that a 1% increase in money supply hurts economic growth by 10.36% in the short run and implies that the non-neutrality

hypothesis holds for Nigeria in the short run. This finding contradicts Afsin and Imdat (2017) and the monetarists' position that expansionary monetary policy would lead to growth in real GDP by increasing aggregate demand in the short run. Similarly, the impact of inflation (INF) on the real GDP growth rate (RGDPR) is negative and significant at the 5% level, indicating that the current year's inflation rate reduces economic growth by 1.5%. Contrarily, one period lagged inflation D(INF(-1)) promotes economic growth significantly in the short run. The effect of interest rates is still insignificant in the short. The coefficients of the current year's and one period lagged real effective exchange rate [D(REXR) and D(REXR (-1))] exert a positive and significant impact on real GDP growth rate (RGDPR) at the 10% level. This finding indicates that a relatively stable exchange rate in the short can promote economic growth. The coefficients of the structural breaks (DUM_1 and DUM_2) exert a positive and significant impact on the real GDP growth rate (RGDPR) at the 5% and 10% levels, respectively. These breaks resulting from regime change or shocks have promoted growth in Nigeria in the short run. Lastly, the coefficient of the error correction term [ECT (-1)*] is negative and significant at the 5% level. This result shows that 10.49% of short-run disequilibrium in real GDP growth rate (RGDPR) is corrected in the long run. This finding indicates a very weak speed of adjustment from short-run disequilibrium to long-run equilibrium. The R-squared and Adjusted R-squared indicate that 79% and 73%, respectively, of the variation in the real GDP growth rate (RGDPR) is explained by the independent variables. The value of the Durbin-Watson Statistic of 2.4525 indicates there is no serial correlation in the model and the value of the F-statistic 11.9592 with its probability (0.0000) shows the overall significance of the model. The result of the model selection graph is presented in Figure 1.

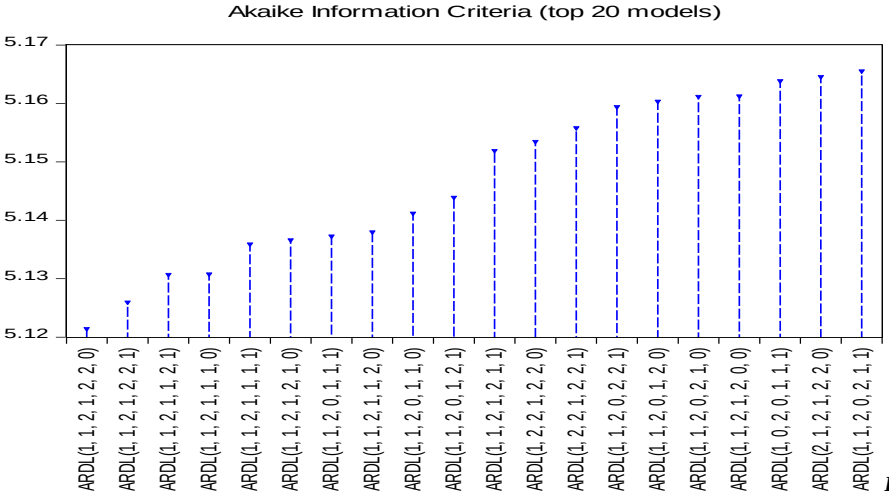

Fig 1: *Model Selection Criteria Graph*

Robustness Check

The result of the discrete threshold regression estimated using 42 observations after adjustment with real GDP growth rate (RGDPR) as the regressand and broad money supply (LnM2) as the threshold indicator is presented in Table 10. The result of the single threshold indicates that LnM2 can be divided into periods less than 25.0936 with 10 observations, periods less than or equal to 25.0936 but less than 28.0730 with 11 observations and periods less than or equal to 28.0936 with 21 observations. These results indicate money supply (LnM2) below 25.09% promotes economic growth (RGDPR) significantly at the 5% level. In comparison, moderate money supply (LnM2) between 25.09% and 28.07% exerts a positive-insignificant effect on GDP growth (RGDPR). Lastly, money supply (LnM2) of 28.07% and above reduced economic growth (RGDPR) by -2.67% significantly. Thus, we resolved that there is a threshold effect in the growth equation and that the supply of money above 28.07% can significantly reduce economic growth in the short run.

Table 10: Threshold estimate

Dependent Variable: RGDPR					
Threshold (ɤ)	Obs	Coefficient	Std. Error	t-Statistic	Prob.
LnM2 < 25.0936	10	10.234	2.258	4.531	0.00***
LnM2 <= 25.0936 but < 28.0730	11	1.1475	1.096	1.046	0.30
LnM2 <= 28.0730	21	-2.679	0.5887	-4.551	0.00***

*Note: *** and ** = significance at 5% and 10% level; Obs = observation*
Source: Authors' computation (2023)

Residual Diagnostic Test

To further validate the results obtained, the study conducted a post-estimation test to ascertain if the variables are normally distributed, have no serial correlation, no heteroskedasticity, and whether non-linear combinations of the regressors help to predict the regressand and the stability of the estimated equation. The outcomes of these assessments are presented in Table 11. The results indicate that variables are distributed normally, with no serial correlation and heteroskedasticity and the explanatory variables are adequate for predicting the outcome of the explained variable.

Table 11: Diagnostic Test Results

Test	F-statistic	Probability	Remark
Normality Test (Jarque-Bera)	5.2596	0.0721	Normal
Serial Correlation Test (Breusch-Godfrey LM)	2.1267	0.1421	No Serial Correlation
Heteroskedasticity Test (Breusch-Pagan-Godfrey)	0.4105	0.9618	No Heteroskedasticity
Explanatory Power (Ramsey RESET Test)	0.0770	0.7838	All variables are vital

Source: Author's computation

Model Stability Test

The CUSUM and CUSUM of Squares graphs in Figures 2 and 3 indicate that the equation estimated in this study cannot explored arbitrarily since the blue dotted lines remain within the 5 per cent critical boundaries. Hence, equation [2] is stable and can be deployed for policy formulation in both the long and short run.

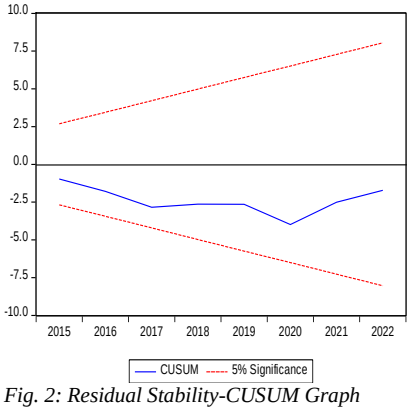

Fig. 2: Residual Stability-CUSUM Graph

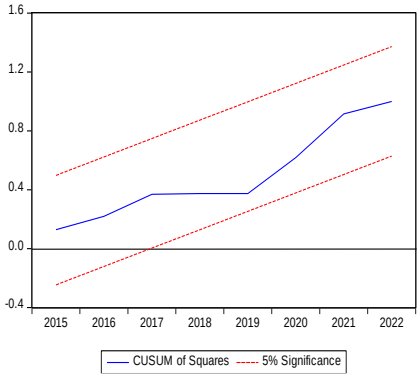

Fig 3: *Residual Stability-CUSUM of Squares Graph*

5. Conclusion and Recommendation

Employing the autoregressive distributed lag (ARDL) estimation technique, the result indicates that money supply (M2) has a negative and insignificant effect on real output growth in the long run but negative and significant in the short run. This finding indicates that the money neutrality proposition holds for Nigeria in the long run. At the same time, inflation exerts a reducing impact on GDP growth in both the long and short run, while a real effective exchange rate was found to have a reducing impact on GDP growth in the long run but promote it in the short run. In addition, structural breaks below the year 2000 exert a significant positive impact on GDP growth in both the long and short run. Conversely, the impact of lending interest rates and structural breaks above the year 2000 are insignificant. The results obtained from the robustness check utilizing the threshold regression test support the outcomes of the ARDL estimates.

Based on these outcomes, the study recommends that an optimum fiscal and monetary policy mix should be adopted in Nigeria with more emphasis on the fiscal responsibility of the government to influence changes in real variables. In addition, the CBN should urgently begin to announce specific inflation targets for the country since it has a reducing impact on GDP growth in the long run while ensuring the attainment of a more realistic exchange rate for the naira by increasing domestic production for export in the long term. In addition, a high money supply above 28.07% should be discouraged since it has a reducing influence on GDP growth in the short run. Conclusively, structural breaks should be accounted for when dealing with macroeconomic aggregates in Nigeria.

References

Abdullahi, Y. Z., & Kime, M. M. (2016). Money supply growth and its inflationary effect in Nigeria. *NDIC Quarterly*, 29(3), 70-96.

Afsin, S., & Imdat, D. (2017). Analysis of the neutrality of money for the US economy. *Journal of Applied Sciences*, 17(7), 365-373. DOI: 10.3923/jas.2017.365.373

Ahmed, R., Aizenman, J., & Jinjarak, Y. (2021). Inflation and exchange rate targeting challenges under fiscal dominance. *Journal of Macroeconomics*, 67, 103281. https://doi.org/10.1016/j.jmacro.2020.103281

Amassoma, D., & Badmus, A. (2020). Re-appraisal of the validity of long-run money neutrality: an evidence from Nigeria. *Economica*, 16(3). 53-73.

Anoruo, E. (2005). Testing neutrality of money for Nigeria: a nonparametric cointegration approach. *The IUP Journal of Monetary Economics*, 3(4), 16-25.

Arintoko, Z. (2011). Long-run money and inflation neutrality test in Indonesia. *Bulletin of Monetary, Economics and Banking*, 75-100.

Audu, S., Yaaba, B. N., & Ibrahim, H. (2018). Money supply, output and inflation dynamics in *Economics*, 8(6), 289-302. DOI: 10.5923/j.economics.20180806.08

Bozkurt, E. (2018). the hypothesis of neutrality of money: panel data analysis. *Journal of Yasar University*, 13(52), 322-327.

Central Bank of Nigeria (CBN, 2011). *Understanding Monetary Policy Series No. 1, What is Monetary Policy*? https://www.cbn.gov.ng/Out/EduSeries/Objectives%2520and%2520Targets%2520of%2520Monetary%2520Policy.pdf

Central Bank of Nigeria (CBN, 2021). *Understanding Monetary Policy Series No. 12: Inflation Targeting as a Monetary Policy Framework.* In: Mahmud, H., Duke, O. O., Bal-Keffi, L. R., Akinboyo, L. O., Audu, I., Ahmad, A. A., & Ajayi, O. I. (Eds). Abuja-Nigeria, Central Bank of Nigeria. https://www.cbn.gov.ng/out/2022/mpd/series%252012.pdf

Chaiitip, P., Chokethaworn, K., Chaiboonsri, C., & khounkhalax, M. (2015). Money supply influencing on economic growth-wide phenomena of APEC open region. *Procedia Economics and Finance*, 24, 108-115.

Chen, S. (2007). Evidence of the long-run neutrality of money: the case of South Korea and Taiwan. *Economic Bulletin*, 3(64), 1-18.

Chih-Hsiang, C., Kam, C. C., & Hung-Gay, F. (2009). Effect of money supply on real output and price in China. *China & World Economy*, 17(2), 35-44.

Chude, N. P., & Chude, D. I. (2016). Impact of broad money supply on Nigerian economic growth. *International Journal of Banking and Finance Research*, 2(1),46-53.

Chuku, A. C. (2011). Testing long-run neutrality propositions in a developing economy: the case of Nigeria. *Journal of Economic Research*, 16(1), 291-308.

Chuku, C. A. (2009). Measuring the effects of monetary policy innovations in Nigeria: a structural vector autoregressive (SVAR) approach. *African Journal of Accounting, Economics, Finance and Banking Research*, 5(5), 122-129.

Dickey, D. A., & Fuller, W. A. (1979). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49, 1057-1072.

El-Seoud, M. S. A. (2014). Testing the relationship between money supply and GDP in Bahrain. *International Journal of Economics, Commerce and Management*, 2(5), 1-16.

Galadima, M. D., & Ngada, M. H. (2017). Impact of money supply on economic growth in Nigeria (1981-2015). *Dutse Journal of Economics & Development Studies*, 3(1), 133-144.

Glynn, J., Perera, N., & Verma, R. (2007). Unit root tests and structural breaks: A survey with applications. *Revista de Metodos Cuantitativos para la Economia y la Empresa*, 3, 63-79.

Gujarati, N. D., Porter, C. D., & Gunasekar, S. (2009). *Basic econometrics: Special Indian Edition* (5th ed.). New Delhi: McGraw Hill.

Henry, J. T. (2019). Impact of oil price volatility on exchange rate in Nigeria. *International Journal of Research and Innovation in Social Science (IJRISS)*, III(II), 1-16.

Igbafe, T. A. (2022). Effectiveness of monetary policy in stimulating economic growth in Nigeria. *International Journal of Research in Social Science and Humanities*, 3(2), 34-42.

Inam, U. (2014). Money supply and economic growth in Nigeria: an econometric analysis (1985-2011). *Journal of Economics and Sustainable Development*, 5(12), 149-155.

Inam, U. S., & Ime, B. S. (2017). Monetary policy and economic growth: evidence from Nigeria. *Advances in Social Sciences Research Journal*, 4(6), 41-59.

Kalubowila, C. D., & Perera, W. S. N. (2015). The long-run relationship between money supply and real GDP: empirical evidence from Sri Lanka. *Researchgate.* DOI: 10.13140/RG.2.2.32082.25284

Kloosterman, R., Bonam, D., & Van Der Veer, K. (2022). The effects of monetary policy across fiscal regimes. *DeNederlandscheBank Working Paper*, 755, 1-42.

Li, Y., Sun, Y., & Chen, M. (2020). An evaluation of the impact of monetary easing policies in times of a pandemic. *Frontiers in Public Health*, 8, 627001. https://doi.org/10.3389/fpubh.2020.627001

Mansoor, A., Shoukat, Q., Bibi, S., Iqbal, K., Saeed, R., & Zaman, K. (2018). The relationship between money supply, price level and economic growth in Pakistan: Keynesian versus monetarist view. *Review of Economics & Business Studies*, 11(2), 49-64.

Marshal, I. (2016). The link between money supply and economic growth in Nigeria: an econometric investigation. *International Journal of Economics and Business Management*, 2(3), 42-51.

Mishkin, F. S. (1999). International experiences with different monetary policy regimes. *Journal of Monetary Economics*, 43(3), 579-605. https://doi.org/10.1016/S0304-3932(99)00006-9

Moreira, T. B. S., Tabak, B. M., Mendonca, M. J., & Sachsida, A. (2016). An evaluation of the non-neutrality of money. *PLoS One*, 11(3), e0145710. https://doi.org/10.1371/journal.pone.0145710

Nwanne, D. N. (2017). An examination of the neutrality of US money supply on the Nigerian economy. *Munich Personal RePEc Archive (MPRA) Paper*, No. 8227. https://mpra.ub.uni-muenchen.de/82227/

Nwoko, N. M., Ihemeje, J. C., & Anumadu, E. (2016). The impact of monetary policy on the economic growth of Nigeria. *African Research Review*, 10(3), 192-206. http://dx.doi.org/10.4314/afrrev.v10i3.13

Odumusor, C. J. (2019). Impact of money supply on the growth of the Nigerian economy. *IOSR Journal of Economics and Finance*, 10(1), 30-46. DOI: 10.9790/5933-1001023046

Olaleye, B. R., Olabode, A., Daramola, K. O., Oshatimi, O. O., Lawal, A. M. & Oladele, T.O. (2020). Analysis of the influence of interest rate on money supply and investment in Nigeria: A Vector Error Correction Model (VECM) Approach. *KIU Interdisciplinary Journal of Humanities and Social Sciences*, 1(3), 204-221.

Omanukwue, P. N. (2010). The quantity theory of money: Evidence from Nigeria. *Central Bank of Nigeria Economic and Financial Review*, 48(2), 91-107.

Osuji, C. C., & Chigbu, E. E. (2013). Money neutrality controversy in a developing economy. *Developing Country Studies*, 3 (1), 170-175.

Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica*, 57, 1361-1401.

Pesaran, M. H., Shin, Y., & Smith, R. J., (2001). Bounds testing approaches to the analysis of level relationships, *Journal of Applied Econometrics, 16, 289-326*.

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regressions. *Biometrica*, 75, 335-346.

Saeed, A-R, A. (2022). *Analysis of the Effect of Price and Money Supply on Economic Growth in Ghana: Vector Error Correction Model Approach* (Master Thesis, KDI School of Public Policy and Management, Sejong-si, South Korea)

Sam, Y. H., Geetha, C., Chandran, V. V., & Ahmed, A. (2015). Testing the neutrality of money towards real output: a case of Malaysia. *International Journal of Economics & Management Sciences,* 4(10), 1-9. DOI:10.4172/21626359.1000298

Samuel, O. F., Oghenekaro, A. O., Kodili, N. N., & Martins, A. O. (2021). Money supply & growth nexus: Evidence from Nigeria. *The Economics and Finance Letters*, 8(2), 117-129. https://doi.org/10.18488/journal.29.2021.82.117.129

Serletis, A., & Koustas, Z. (2017). Monetary neutrality. *Macroeconomic Dynamics*, 1365-1007, 1-17. DOI: 10.1017/S1365100517000621

Sun, C., Zhang, F., & Xu, M. (2017). Investigation of pollution haven hypothesis for China: An ARDL approach with breakpoint unit root tests. *Journal of Cleaner Production*, 161, 153-164. http//dx.doi.org/10.1016/j.jclepro.2017.05.119

Uwatt, U. B. (2017). Signals and episodes of recession and exchange rate crisis. *Central Bank of Nigeria Economic and Financial Review*, 55(4), 25-55.